linux

```
mkdir -p /mnt/user/lanc/models
for file in /mnt/user/lanc/maize/*.fa; do
    base=$(basename "$file" .fa)
    echo "   $file ..."
    carve --dna -o /mnt/user/lanc/models/"${base}"_model.json "$file"
done
```

Carve /mnt/user/lanc/models

```
import os
from os.path import join, splitext, getsize
import cobra  #     cobra

#
model_dir = "models"

#           .json      SBML XML
model_files = [
    "Burkholderia.gladioli_10_model.json",
    "Burkholderia.gladioli_11_model.json",
    "Burkholderia.gladioli_12_model.json",
    "Burkholderia.gladioli_13_model.json",
    "Burkholderia.gladioli_14_model.json",
    "Burkholderia.gladioli_15_model.json",
    "Burkholderia.gladioli_16_model.json",
    "Burkholderia.gladioli_17_model.json",
    "Burkholderia.gladioli_18_model.json",
    "Burkholderia.gladioli_19_model.json",
    "Burkholderia.gladioli_1_model.json",
    "Burkholderia.gladioli_20_model.json",
    "Burkholderia.gladioli_21_model.json",
    "Burkholderia.gladioli_22_model.json",
    "Burkholderia.gladioli_23_model.json",
    "Burkholderia.gladioli_2_model.json",
    "Burkholderia.gladioli_3_model.json",
    "Burkholderia.gladioli_4_model.json",
    "Burkholderia.gladioli_5_model.json",
    "Burkholderia.gladioli_6_model.json",
    "Burkholderia.gladioli_7_model.json",
    "Burkholderia.gladioli_8_model.json",
```

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    "Burkholderia.gladioli_9_model.json",
    "Pantoea.dispersa_10_model.json",
    "Pantoea.dispersa_11_model.json",
    "Pantoea.dispersa_12_model.json",
    "Pantoea.dispersa_13_model.json",
    "Pantoea.dispersa_14_model.json",
    "Pantoea.dispersa_15_model.json",
    "Pantoea.dispersa_16_model.json",
    "Pantoea.dispersa_17_model.json",
    "Pantoea.dispersa_18_model.json",
    "Pantoea.dispersa_19_model.json",
    "Pantoea.dispersa_20_model.json",
    "Pantoea.dispersa_21_model.json",
    "Pantoea.dispersa_22_model.json",
    "Pantoea.dispersa_23_model.json",
    "Pantoea.dispersa_24_model.json",
    "Pantoea.dispersa_25_model.json",
    "Pantoea.dispersa_26_model.json",
    "Pantoea.dispersa_27_model.json",
    "Pantoea.dispersa_28_model.json",
    "Pantoea.dispersa_29_model.json",
    "Pantoea.dispersa_2_model.json",
    "Pantoea.dispersa_3_model.json",
    "Pantoea.dispersa_4_model.json",
    "Pantoea.dispersa_5_model.json",
    "Pantoea.dispersa_6_model.json",
    "Pantoea.dispersa_7_model.json",
    "Pantoea.dispersa_8_model.json",
    "Pantoea.dispersa_9_model.json",
    "Pantoea.dispersa_B_model.json",
    "Pantoea.dispersa_model.json",
    "Pantoea.stewartii_2_model.json",
    "Pantoea.stewartii_3_model.json",
    "Pantoea.stewartii_4_model.json",
    "Pantoea.stewartii_5_model.json",
    "Pantoea.stewartii_model.json"
]

#
species_mapping = {
    "Burkholderia.gladioli": "Bg",
    "Pantoea.dispersa": "Pd",
```

```
    "Pantoea.stewartii": "Ps"
}

#
counters = {species: 1 for species in species_mapping}

#
models = {}

for file_name in model_files:
    file_path = join(model_dir, file_name)

    #
    if os.path.getsize(file_path) == 0:
        print(f"    : {file_path},  :    ")
        continue

    try:
        #   SBML
        model = cobra.io.read_sbml_model(file_path)
    except Exception as e:
        print(f"    : {file_path},  : {e}")
        continue

    new_key = None
    #           Bg_1_model, Pd_1_model
    for species, prefix in species_mapping.items():
        if file_name.startswith(species):
            new_key = f"{prefix}_{counters[species]}_model"
            counters[species] += 1
            break
    if new_key is None:
        new_key = splitext(file_name)[0]

    models[new_key] = model

print("    ")
for key in models:
    print(key)
```

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Adding exchange reaction EX_26dap__M_e with default bounds for boundary metabolite: 26dap__M
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35md
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Adding exchange reaction EX_34dhbz_e with default bounds for boundary metabolite: 34dhbz_e.
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: LalaL
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_ad_e with default bounds for boundary metabolite: ad_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmcbtt_e with default bounds for boundary metabolite: cmcbtt_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3mcbtt_e with default bounds for boundary metabolite: fe3mcbtt_
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fmn_e with default bounds for boundary metabolite: fmn_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
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Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr__
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthox_e with default bounds for boundary metabolite: gthox_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald_
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malt_e with default bounds for boundary metabolite: malt_e.
Adding exchange reaction EX_mcbtt_e with default bounds for boundary metabolite: mcbtt_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pacald_e with default bounds for boundary metabolite: pacald_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
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Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_salc_e with default bounds for boundary metabolite: salc_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre6p_e with default bounds for boundary metabolite: tre6p_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_urea_e with default bounds for boundary metabolite: urea_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_xan_e with default bounds for boundary metabolite: xan_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_26dap__M_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_34dhbz_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_ad_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
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Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmcbtt_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
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Ignoring reaction 'EX_fe2_e' since it already exists.
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Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fmn_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
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Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
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Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthox_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
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Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malt_e' since it already exists.
Ignoring reaction 'EX_mcbtt_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pacald_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_salc_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre6p_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
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Ignoring reaction 'EX_urea_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_xan_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35md
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_ch4s_e with default bounds for boundary metabolite: ch4s_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmcbtt_e with default bounds for boundary metabolite: cmcbtt_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_creat_e with default bounds for boundary metabolite: creat_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dhap_e with default bounds for boundary metabolite: dhap_e.
Adding exchange reaction EX_dmso2_e with default bounds for boundary metabolite: dmso2_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
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Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3mcbtt_e with default bounds for boundary metabolite: fe3mcbtt
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glc__D_e with default bounds for boundary metabolite: glc__D_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_h2o2_e with default bounds for boundary metabolite: h2o2_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_isetac_e with default bounds for boundary metabolite: isetac_e.
Adding exchange reaction EX_isocap_e with default bounds for boundary metabolite: isocap_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lac__L_e with default bounds for boundary metabolite: lac__L_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__D_e with default bounds for boundary metabolite: lys__D_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_maltttr_e with default bounds for boundary metabolite: maltttr_e
Adding exchange reaction EX_mcbtt_e with default bounds for boundary metabolite: mcbtt_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
```

```
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_ocdcea_e with default bounds for boundary metabolite: ocdcea_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_ppa_e with default bounds for boundary metabolite: ppa_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_salc_e with default bounds for boundary metabolite: salc_e.
Adding exchange reaction EX_sel_e with default bounds for boundary metabolite: sel_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_slnt_e with default bounds for boundary metabolite: slnt_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_xan_e with default bounds for boundary metabolite: xan_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
```

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Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_ch4s_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmcbtt_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_creat_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dhap_e' since it already exists.
Ignoring reaction 'EX_dmso2_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3mcbtt_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
```

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Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glc__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_h2o2_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_isetac_e' since it already exists.
Ignoring reaction 'EX_isocap_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lac__L_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__D_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_maltttr_e' since it already exists.
Ignoring reaction 'EX_mcbtt_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_ocdcea_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
```

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Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_ppa_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_salc_e' since it already exists.
Ignoring reaction 'EX_sel_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_slnt_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_xan_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_26dap__M_e with default bounds for boundary metabolite: 26dap__M
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_ad_e with default bounds for boundary metabolite: ad_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
```

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Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmcbtt_e with default bounds for boundary metabolite: cmcbtt_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_creat_e with default bounds for boundary metabolite: creat_e.
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fmn_e with default bounds for boundary metabolite: fmn_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g6p_B_e with default bounds for boundary metabolite: g6p_B_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_glyc_e with default bounds for boundary metabolite: glyc_e.
```

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Adding exchange reaction EX_glyclt_e with default bounds for boundary metabolite: glyclt_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_ins_e with default bounds for boundary metabolite: ins_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__D_e with default bounds for boundary metabolite: lys__D_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pacald_e with default bounds for boundary metabolite: pacald_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_ppa_e with default bounds for boundary metabolite: ppa_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_salc_e with default bounds for boundary metabolite: salc_e.
Adding exchange reaction EX_sel_e with default bounds for boundary metabolite: sel_e.
```

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Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_slnt_e with default bounds for boundary metabolite: slnt_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre6p_e with default bounds for boundary metabolite: tre6p_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_xan_e with default bounds for boundary metabolite: xan_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_26dap__M_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_ad_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
```

```
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmcbtt_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_creat_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fmn_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_g6p_B_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_glyc_e' since it already exists.
Ignoring reaction 'EX_glyclt_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
```

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Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_ins_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__D_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pacald_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_ppa_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_salc_e' since it already exists.
Ignoring reaction 'EX_sel_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_slnt_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre6p_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
```

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Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_xan_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_12ppd__S_e with default bounds for boundary metabolite: 12ppd__S_
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_5mcsn_e with default bounds for boundary metabolite: 5mcsn_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hdda_e with default bounds for boundary metabolite: R_3hdda_e
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_creat_e with default bounds for boundary metabolite: creat_e.
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
```

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Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dha_e with default bounds for boundary metabolite: dha_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D_
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glc__D_e with default bounds for boundary metabolite: glc__D_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_glyc_e with default bounds for boundary metabolite: glyc_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald_
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__D_e with default bounds for boundary metabolite: lys__D_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
```

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Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_ppa_e with default bounds for boundary metabolite: ppa_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_sel_e with default bounds for boundary metabolite: sel_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_slnt_e with default bounds for boundary metabolite: slnt_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_xyl__D_e with default bounds for boundary metabolite: xyl__D_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_12ppd__S_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
```

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Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_5mcsn_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hdda_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_creat_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dha_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
```

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Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glc__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_glyc_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__D_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_ppa_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
```

```
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_sel_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_slnt_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_xyl__D_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_5oxpro_e with default bounds for boundary metabolite: 5oxpro_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hdda_e with default bounds for boundary metabolite: R_3hdda_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
```

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Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_creat_e with default bounds for boundary metabolite: creat_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dhap_e with default bounds for boundary metabolite: dhap_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fmn_e with default bounds for boundary metabolite: fmn_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D_
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glc__D_e with default bounds for boundary metabolite: glc__D_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald_
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_isobuta_e with default bounds for boundary metabolite: isobuta_e
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
```

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Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malt_e with default bounds for boundary metabolite: malt_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre6p_e with default bounds for boundary metabolite: tre6p_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_5oxpro_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hdda_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
```

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Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_creat_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dhap_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fmn_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glc__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
```

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Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_isobuta_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malt_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre6p_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_26dap__M_e with default bounds for boundary metabolite: 26dap__M
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35md
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Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: LalaD
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_ad_e with default bounds for boundary metabolite: ad_e.
Adding exchange reaction EX_ade_e with default bounds for boundary metabolite: ade_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmcbtt_e with default bounds for boundary metabolite: cmcbtt_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dhap_e with default bounds for boundary metabolite: dhap_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fer_e with default bounds for boundary metabolite: fer_e.
Adding exchange reaction EX_fmn_e with default bounds for boundary metabolite: fmn_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
```

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Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_glyclt_e with default bounds for boundary metabolite: glyclt_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lac__L_e with default bounds for boundary metabolite: lac__L_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__D_e with default bounds for boundary metabolite: lys__D_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_maltpt_e with default bounds for boundary metabolite: maltpt_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
```

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Adding exchange reaction EX_pacald_e with default bounds for boundary metabolite: pacald_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_ppa_e with default bounds for boundary metabolite: ppa_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_salc_e with default bounds for boundary metabolite: salc_e.
Adding exchange reaction EX_sel_e with default bounds for boundary metabolite: sel_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_slnt_e with default bounds for boundary metabolite: slnt_e.
Adding exchange reaction EX_stfrnA_e with default bounds for boundary metabolite: stfrnA_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_urea_e with default bounds for boundary metabolite: urea_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_xan_e with default bounds for boundary metabolite: xan_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_26dap__M_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
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Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_ad_e' since it already exists.
Ignoring reaction 'EX_ade_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmcbtt_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dhap_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fer_e' since it already exists.
Ignoring reaction 'EX_fmn_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
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Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_glyclt_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lac__L_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__D_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_maltpt_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pacald_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_ppa_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_salc_e' since it already exists.
Ignoring reaction 'EX_sel_e' since it already exists.
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Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_slnt_e' since it already exists.
Ignoring reaction 'EX_stfrnA_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_urea_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_xan_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_4hphac_e with default bounds for boundary metabolite: 4hphac_e.
Adding exchange reaction EX_5oxpro_e with default bounds for boundary metabolite: 5oxpro_e.
Adding exchange reaction EX_6hnac_e with default bounds for boundary metabolite: 6hnac_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_airs_e with default bounds for boundary metabolite: airs_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bhb_e with default bounds for boundary metabolite: bhb_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
```

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Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_creat_e with default bounds for boundary metabolite: creat_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fuc_e with default bounds for boundary metabolite: fuc_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr__
Adding exchange reaction EX_glc__D_e with default bounds for boundary metabolite: glc__D_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_glyclt_e with default bounds for boundary metabolite: glyclt_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_isobuta_e with default bounds for boundary metabolite: isobuta_e
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
```

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Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mso3_e with default bounds for boundary metabolite: mso3_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_orn__L_e with default bounds for boundary metabolite: orn__L_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_taur_e with default bounds for boundary metabolite: taur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
```

```
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_4hphac_e' since it already exists.
Ignoring reaction 'EX_5oxpro_e' since it already exists.
Ignoring reaction 'EX_6hnac_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_airs_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bhb_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_creat_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_fuc_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
```

```
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_glc__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_glyclt_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_isobuta_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mso3_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_orn__L_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
```

```
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_taur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_15dap_e with default bounds for boundary metabolite: 15dap_e.
Adding exchange reaction EX_26dap__M_e with default bounds for boundary metabolite: 26dap__M
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_4hphac_e with default bounds for boundary metabolite: 4hphac_e.
Adding exchange reaction EX_6hnac_e with default bounds for boundary metabolite: 6hnac_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acald_e with default bounds for boundary metabolite: acald_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_airs_e with default bounds for boundary metabolite: airs_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bhb_e with default bounds for boundary metabolite: bhb_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmcbtt_e with default bounds for boundary metabolite: cmcbtt_e.
```

```
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_creat_e with default bounds for boundary metabolite: creat_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_glyald_e with default bounds for boundary metabolite: glyald_e.
Adding exchange reaction EX_glyc_e with default bounds for boundary metabolite: glyc_e.
Adding exchange reaction EX_glyclt_e with default bounds for boundary metabolite: glyclt_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthox_e with default bounds for boundary metabolite: gthox_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m4po_e with default bounds for boundary metabolite: m4po_e.
```

```
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mso3_e with default bounds for boundary metabolite: mso3_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_salc_e with default bounds for boundary metabolite: salc_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_taur_e with default bounds for boundary metabolite: taur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_xan_e with default bounds for boundary metabolite: xan_e.
```

```
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_15dap_e' since it already exists.
Ignoring reaction 'EX_26dap__M_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_4hphac_e' since it already exists.
Ignoring reaction 'EX_6hnac_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acald_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_airs_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bhb_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmcbtt_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_creat_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
```

```
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_glyald_e' since it already exists.
Ignoring reaction 'EX_glyc_e' since it already exists.
Ignoring reaction 'EX_glyclt_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthox_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m4po_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mso3_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
```

```
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_salc_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_taur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_xan_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_15dap_e with default bounds for boundary metabolite: 15dap_e.
Adding exchange reaction EX_26dap__M_e with default bounds for boundary metabolite: 26dap__M
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_34dhcinm_e with default bounds for boundary metabolite: 34dhcinm
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_4hphac_e with default bounds for boundary metabolite: 4hphac_e.
Adding exchange reaction EX_5mcsn_e with default bounds for boundary metabolite: 5mcsn_e.
Adding exchange reaction EX_6hnac_e with default bounds for boundary metabolite: 6hnac_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_T4hcinnm_e with default bounds for boundary metabolite: T4hcinnm
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acgam1p_e with default bounds for boundary metabolite: acgam1p_e
Adding exchange reaction EX_ad_e with default bounds for boundary metabolite: ad_e.
Adding exchange reaction EX_airs_e with default bounds for boundary metabolite: airs_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
```

```
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_citr__L_e with default bounds for boundary metabolite: citr__L_e
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmcbtt_e with default bounds for boundary metabolite: cmcbtt_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3dcit_e with default bounds for boundary metabolite: fe3dcit_e
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fer_e with default bounds for boundary metabolite: fer_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fuc_e with default bounds for boundary metabolite: fuc_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_glc__D_e with default bounds for boundary metabolite: glc__D_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
```

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Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_glyc_e with default bounds for boundary metabolite: glyc_e.
Adding exchange reaction EX_glyclt_e with default bounds for boundary metabolite: glyclt_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_gua_e with default bounds for boundary metabolite: gua_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lac__L_e with default bounds for boundary metabolite: lac__L_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__D_e with default bounds for boundary metabolite: lys__D_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mso3_e with default bounds for boundary metabolite: mso3_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_ncam_e with default bounds for boundary metabolite: ncam_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pacald_e with default bounds for boundary metabolite: pacald_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
```

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Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_salc_e with default bounds for boundary metabolite: salc_e.
Adding exchange reaction EX_salchs4_e with default bounds for boundary metabolite: salchs4_e
Adding exchange reaction EX_salchs4fe_e with default bounds for boundary metabolite: salchs4
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_taur_e with default bounds for boundary metabolite: taur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_thym_e with default bounds for boundary metabolite: thym_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_xan_e with default bounds for boundary metabolite: xan_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_15dap_e' since it already exists.
Ignoring reaction 'EX_26dap__M_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_34dhcinm_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_4hphac_e' since it already exists.
Ignoring reaction 'EX_5mcsn_e' since it already exists.
Ignoring reaction 'EX_6hnac_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
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Ignoring reaction 'EX_T4hcinnm_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acgam1p_e' since it already exists.
Ignoring reaction 'EX_ad_e' since it already exists.
Ignoring reaction 'EX_airs_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_citr__L_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmcbtt_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3dcit_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fer_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_fuc_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
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Ignoring reaction 'EX_glc__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_glyc_e' since it already exists.
Ignoring reaction 'EX_glyclt_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_gua_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lac__L_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__D_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mso3_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_ncam_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pacald_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
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Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_salc_e' since it already exists.
Ignoring reaction 'EX_salchs4_e' since it already exists.
Ignoring reaction 'EX_salchs4fe_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_taur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_thym_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_xan_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_12ppd__R_e with default bounds for boundary metabolite: 12ppd__R
Adding exchange reaction EX_23camp_e with default bounds for boundary metabolite: 23camp_e.
Adding exchange reaction EX_23ccmp_e with default bounds for boundary metabolite: 23ccmp_e.
Adding exchange reaction EX_23cgmp_e with default bounds for boundary metabolite: 23cgmp_e.
Adding exchange reaction EX_23cump_e with default bounds for boundary metabolite: 23cump_e.
Adding exchange reaction EX_23dappa_e with default bounds for boundary metabolite: 23dappa_e
Adding exchange reaction EX_25dkglcn_e with default bounds for boundary metabolite: 25dkglcn
Adding exchange reaction EX_26dap__M_e with default bounds for boundary metabolite: 26dap__M
Adding exchange reaction EX_2ameph_e with default bounds for boundary metabolite: 2ameph_e.
Adding exchange reaction EX_2ddglcn_e with default bounds for boundary metabolite: 2ddglcn_e
```

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Adding exchange reaction EX_2dhglcn_e with default bounds for boundary metabolite: 2dhglcn_e
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
Adding exchange reaction EX_2pglyc_e with default bounds for boundary metabolite: 2pglyc_e.
Adding exchange reaction EX_34dhbz_e with default bounds for boundary metabolite: 34dhbz_e.
Adding exchange reaction EX_34dhcinm_e with default bounds for boundary metabolite: 34dhcinm_
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3amp_e with default bounds for boundary metabolite: 3amp_e.
Adding exchange reaction EX_3cmp_e with default bounds for boundary metabolite: 3cmp_e.
Adding exchange reaction EX_3gmp_e with default bounds for boundary metabolite: 3gmp_e.
Adding exchange reaction EX_3h4atb_e with default bounds for boundary metabolite: 3h4atb_e.
Adding exchange reaction EX_3hcinnm_e with default bounds for boundary metabolite: 3hcinnm_e
Adding exchange reaction EX_3hoxpac_e with default bounds for boundary metabolite: 3hoxpac_e
Adding exchange reaction EX_3hpppn_e with default bounds for boundary metabolite: 3hpppn_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_3oxoadp_e with default bounds for boundary metabolite: 3oxoadp_e
Adding exchange reaction EX_3ump_e with default bounds for boundary metabolite: 3ump_e.
Adding exchange reaction EX_4abut_e with default bounds for boundary metabolite: 4abut_e.
Adding exchange reaction EX_4ahmmp_e with default bounds for boundary metabolite: 4ahmmp_e.
Adding exchange reaction EX_4hba_e with default bounds for boundary metabolite: 4hba_e.
Adding exchange reaction EX_4hbald_e with default bounds for boundary metabolite: 4hbald_e.
Adding exchange reaction EX_4hbz_e with default bounds for boundary metabolite: 4hbz_e.
Adding exchange reaction EX_4hoxpac_e with default bounds for boundary metabolite: 4hoxpac_e
Adding exchange reaction EX_4hphac_e with default bounds for boundary metabolite: 4hphac_e.
Adding exchange reaction EX_4hpro_DC_e with default bounds for boundary metabolite: 4hpro_DC_
Adding exchange reaction EX_4hpro_LT_e with default bounds for boundary metabolite: 4hpro_LT_
Adding exchange reaction EX_4oxptn_e with default bounds for boundary metabolite: 4oxptn_e.
Adding exchange reaction EX_5aptn_e with default bounds for boundary metabolite: 5aptn_e.
Adding exchange reaction EX_6hnac_e with default bounds for boundary metabolite: 6hnac_e.
Adding exchange reaction EX_6pgc_e with default bounds for boundary metabolite: 6pgc_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaDglu_e with default bounds for boundary metabolite: LalaDglu_
Adding exchange reaction EX_LalaLglu_e with default bounds for boundary metabolite: LalaLglu_
Adding exchange reaction EX_Lcyst_e with default bounds for boundary metabolite: Lcyst_e.
Adding exchange reaction EX_R_3h6atha_e with default bounds for boundary metabolite: R_3h6atl
Adding exchange reaction EX_R_3hnonaa_e with default bounds for boundary metabolite: R_3hnona
Adding exchange reaction EX_R_3htd58e_e with default bounds for boundary metabolite: R_3htd58
Adding exchange reaction EX_T4hcinnm_e with default bounds for boundary metabolite: T4hcinnm_
Adding exchange reaction EX_abg4_e with default bounds for boundary metabolite: abg4_e.
Adding exchange reaction EX_abt__D_e with default bounds for boundary metabolite: abt__D_e.
Adding exchange reaction EX_abt_e with default bounds for boundary metabolite: abt_e.
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
```

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Adding exchange reaction EX_acald_e with default bounds for boundary metabolite: acald_e.
Adding exchange reaction EX_acgam_e with default bounds for boundary metabolite: acgam_e.
Adding exchange reaction EX_acglu_e with default bounds for boundary metabolite: acglu_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_acser_e with default bounds for boundary metabolite: acser_e.
Adding exchange reaction EX_actn__R_e with default bounds for boundary metabolite: actn__R_e
Adding exchange reaction EX_ad_e with default bounds for boundary metabolite: ad_e.
Adding exchange reaction EX_ade_e with default bounds for boundary metabolite: ade_e.
Adding exchange reaction EX_adn_e with default bounds for boundary metabolite: adn_e.
Adding exchange reaction EX_ag_e with default bounds for boundary metabolite: ag_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala_B_e with default bounds for boundary metabolite: ala_B_e.
Adding exchange reaction EX_ala_L_asp__L_e with default bounds for boundary metabolite: ala_L
Adding exchange reaction EX_ala_L_glu__L_e with default bounds for boundary metabolite: ala_L
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_alahis_e with default bounds for boundary metabolite: alahis_e.
Adding exchange reaction EX_alaleu_e with default bounds for boundary metabolite: alaleu_e.
Adding exchange reaction EX_alathr_e with default bounds for boundary metabolite: alathr_e.
Adding exchange reaction EX_alatrp_e with default bounds for boundary metabolite: alatrp_e.
Adding exchange reaction EX_all__D_e with default bounds for boundary metabolite: all__D_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arab__L_e with default bounds for boundary metabolite: arab__L_e
Adding exchange reaction EX_arbt6p_e with default bounds for boundary metabolite: arbt6p_e.
Adding exchange reaction EX_arbt_e with default bounds for boundary metabolite: arbt_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_ascb__L_e with default bounds for boundary metabolite: ascb__L_e
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_aso3_e with default bounds for boundary metabolite: aso3_e.
Adding exchange reaction EX_aso4_e with default bounds for boundary metabolite: aso4_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_balaala_e with default bounds for boundary metabolite: balaala_e
Adding exchange reaction EX_balabala_e with default bounds for boundary metabolite: balabala
Adding exchange reaction EX_balagly_e with default bounds for boundary metabolite: balagly_e
Adding exchange reaction EX_balaleu_e with default bounds for boundary metabolite: balaleu_e
Adding exchange reaction EX_balamd_e with default bounds for boundary metabolite: balamd_e.
Adding exchange reaction EX_bhb_e with default bounds for boundary metabolite: bhb_e.
Adding exchange reaction EX_btn_e with default bounds for boundary metabolite: btn_e.
Adding exchange reaction EX_btoh_e with default bounds for boundary metabolite: btoh_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_buts_e with default bounds for boundary metabolite: buts_e.
```

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Adding exchange reaction EX_butso3_e with default bounds for boundary metabolite: butso3_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_bzal_e with default bounds for boundary metabolite: bzal_e.
Adding exchange reaction EX_bzalc_e with default bounds for boundary metabolite: bzalc_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_carn_e with default bounds for boundary metabolite: carn_e.
Adding exchange reaction EX_cd2_e with default bounds for boundary metabolite: cd2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_chols_e with default bounds for boundary metabolite: chols_e.
Adding exchange reaction EX_chor_e with default bounds for boundary metabolite: chor_e.
Adding exchange reaction EX_chtbs_e with default bounds for boundary metabolite: chtbs_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmcbtt_e with default bounds for boundary metabolite: cmcbtt_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_confrl_e with default bounds for boundary metabolite: confrl_e.
Adding exchange reaction EX_creat_e with default bounds for boundary metabolite: creat_e.
Adding exchange reaction EX_crn_e with default bounds for boundary metabolite: crn_e.
Adding exchange reaction EX_cro4_e with default bounds for boundary metabolite: cro4_e.
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_csn_e with default bounds for boundary metabolite: csn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cu_e with default bounds for boundary metabolite: cu_e.
Adding exchange reaction EX_cyan_e with default bounds for boundary metabolite: cyan_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cytd_e with default bounds for boundary metabolite: cytd_e.
Adding exchange reaction EX_d23hb_e with default bounds for boundary metabolite: d23hb_e.
Adding exchange reaction EX_dad_2_e with default bounds for boundary metabolite: dad_2_e.
Adding exchange reaction EX_dca_e with default bounds for boundary metabolite: dca_e.
Adding exchange reaction EX_dmgly_e with default bounds for boundary metabolite: dmgly_e.
Adding exchange reaction EX_dmso2_e with default bounds for boundary metabolite: dmso2_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_drib_e with default bounds for boundary metabolite: drib_e.
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_ecto__L_e with default bounds for boundary metabolite: ecto__L_e
Adding exchange reaction EX_enter_e with default bounds for boundary metabolite: enter_e.
```

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Adding exchange reaction EX_eths_e with default bounds for boundary metabolite: eths_e.
Adding exchange reaction EX_ethso3_e with default bounds for boundary metabolite: ethso3_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_fad_e with default bounds for boundary metabolite: fad_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fcmcbtt_e with default bounds for boundary metabolite: fcmcbtt_e
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3dcit_e with default bounds for boundary metabolite: fe3dcit_e
Adding exchange reaction EX_fe3dhbzs3_e with default bounds for boundary metabolite: fe3dhbz
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_feenter_e with default bounds for boundary metabolite: feenter_e
Adding exchange reaction EX_fmn_e with default bounds for boundary metabolite: fmn_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_frmd_e with default bounds for boundary metabolite: frmd_e.
Adding exchange reaction EX_fru_e with default bounds for boundary metabolite: fru_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fuc_e with default bounds for boundary metabolite: fuc_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pc_e with default bounds for boundary metabolite: g3pc_e.
Adding exchange reaction EX_g3pi_e with default bounds for boundary metabolite: g3pi_e.
Adding exchange reaction EX_g3ps_e with default bounds for boundary metabolite: g3ps_e.
Adding exchange reaction EX_ga_e with default bounds for boundary metabolite: ga_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctn__D_e with default bounds for boundary metabolite: galctn__
Adding exchange reaction EX_galctn__L_e with default bounds for boundary metabolite: galctn__
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr__
Adding exchange reaction EX_galt_e with default bounds for boundary metabolite: galt_e.
Adding exchange reaction EX_galur_e with default bounds for boundary metabolite: galur_e.
Adding exchange reaction EX_gam_e with default bounds for boundary metabolite: gam_e.
Adding exchange reaction EX_glc__D_e with default bounds for boundary metabolite: glc__D_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_glcur_e with default bounds for boundary metabolite: glcur_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_glucan4_e with default bounds for boundary metabolite: glucan4_e
Adding exchange reaction EX_glucan6_e with default bounds for boundary metabolite: glucan6_e
Adding exchange reaction EX_glutar_e with default bounds for boundary metabolite: glutar_e.
Adding exchange reaction EX_gly_asn__L_e with default bounds for boundary metabolite: gly_asn
Adding exchange reaction EX_gly_asp__L_e with default bounds for boundary metabolite: gly_asp
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Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_gly_glu__L_e with default bounds for boundary metabolite: gly_glu
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_glyc2p_e with default bounds for boundary metabolite: glyc2p_e.
Adding exchange reaction EX_glyc3p_e with default bounds for boundary metabolite: glyc3p_e.
Adding exchange reaction EX_glyc_e with default bounds for boundary metabolite: glyc_e.
Adding exchange reaction EX_glygln_e with default bounds for boundary metabolite: glygln_e.
Adding exchange reaction EX_glyglu_e with default bounds for boundary metabolite: glyglu_e.
Adding exchange reaction EX_glygly_e with default bounds for boundary metabolite: glygly_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_glymet_e with default bounds for boundary metabolite: glymet_e.
Adding exchange reaction EX_glyphe_e with default bounds for boundary metabolite: glyphe_e.
Adding exchange reaction EX_glyser_e with default bounds for boundary metabolite: glyser_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gsn_e with default bounds for boundary metabolite: gsn_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_gua_e with default bounds for boundary metabolite: gua_e.
Adding exchange reaction EX_h2_e with default bounds for boundary metabolite: h2_e.
Adding exchange reaction EX_h2o2_e with default bounds for boundary metabolite: h2o2_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hco3_e with default bounds for boundary metabolite: hco3_e.
Adding exchange reaction EX_hexs_e with default bounds for boundary metabolite: hexs_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hisgly_e with default bounds for boundary metabolite: hisgly_e.
Adding exchange reaction EX_hishis_e with default bounds for boundary metabolite: hishis_e.
Adding exchange reaction EX_hom__L_e with default bounds for boundary metabolite: hom__L_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_ibt_e with default bounds for boundary metabolite: ibt_e.
Adding exchange reaction EX_icit_e with default bounds for boundary metabolite: icit_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_ins_e with default bounds for boundary metabolite: ins_e.
Adding exchange reaction EX_isetac_e with default bounds for boundary metabolite: isetac_e.
Adding exchange reaction EX_istfrnB_e with default bounds for boundary metabolite: istfrnB_e
Adding exchange reaction EX_istnt_e with default bounds for boundary metabolite: istnt_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__D_e with default bounds for boundary metabolite: leu__D_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
```

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Adding exchange reaction EX_leuleu_e with default bounds for boundary metabolite: leuleu_e.
Adding exchange reaction EX_lmn2_e with default bounds for boundary metabolite: lmn2_e.
Adding exchange reaction EX_lys__D_e with default bounds for boundary metabolite: lys__D_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__D_e with default bounds for boundary metabolite: mal__D_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malt_e with default bounds for boundary metabolite: malt_e.
Adding exchange reaction EX_malthx_e with default bounds for boundary metabolite: malthx_e.
Adding exchange reaction EX_man1p_e with default bounds for boundary metabolite: man1p_e.
Adding exchange reaction EX_man_e with default bounds for boundary metabolite: man_e.
Adding exchange reaction EX_manglyc_e with default bounds for boundary metabolite: manglyc_e
Adding exchange reaction EX_meoh_e with default bounds for boundary metabolite: meoh_e.
Adding exchange reaction EX_met_L_ala__L_e with default bounds for boundary metabolite: met_L
Adding exchange reaction EX_met__D_e with default bounds for boundary metabolite: met__D_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_metox__R_e with default bounds for boundary metabolite: metox__R_
Adding exchange reaction EX_metox_e with default bounds for boundary metabolite: metox_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mnl_e with default bounds for boundary metabolite: mnl_e.
Adding exchange reaction EX_mobd_e with default bounds for boundary metabolite: mobd_e.
Adding exchange reaction EX_mso3_e with default bounds for boundary metabolite: mso3_e.
Adding exchange reaction EX_na1_e with default bounds for boundary metabolite: na1_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nh4_e with default bounds for boundary metabolite: nh4_e.
Adding exchange reaction EX_ni2_e with default bounds for boundary metabolite: ni2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_no_e with default bounds for boundary metabolite: no_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_oaa_e with default bounds for boundary metabolite: oaa_e.
Adding exchange reaction EX_octa_e with default bounds for boundary metabolite: octa_e.
Adding exchange reaction EX_orn__D_e with default bounds for boundary metabolite: orn__D_e.
Adding exchange reaction EX_orn__L_e with default bounds for boundary metabolite: orn__L_e.
Adding exchange reaction EX_orn_e with default bounds for boundary metabolite: orn_e.
Adding exchange reaction EX_orot_e with default bounds for boundary metabolite: orot_e.
Adding exchange reaction EX_oxa_e with default bounds for boundary metabolite: oxa_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pacald_e with default bounds for boundary metabolite: pacald_e.
Adding exchange reaction EX_peamn_e with default bounds for boundary metabolite: peamn_e.
Adding exchange reaction EX_pentso3_e with default bounds for boundary metabolite: pentso3_e
```

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Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_pheme_e with default bounds for boundary metabolite: pheme_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pime_e with default bounds for boundary metabolite: pime_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_ppa_e with default bounds for boundary metabolite: ppa_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_ppoh_e with default bounds for boundary metabolite: ppoh_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_psuri_e with default bounds for boundary metabolite: psuri_e.
Adding exchange reaction EX_pta_e with default bounds for boundary metabolite: pta_e.
Adding exchange reaction EX_ptrc_e with default bounds for boundary metabolite: ptrc_e.
Adding exchange reaction EX_pydxn_e with default bounds for boundary metabolite: pydxn_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_rib__D_e with default bounds for boundary metabolite: rib__D_e.
Adding exchange reaction EX_s_e with default bounds for boundary metabolite: s_e.
Adding exchange reaction EX_salc_e with default bounds for boundary metabolite: salc_e.
Adding exchange reaction EX_salchs4_e with default bounds for boundary metabolite: salchs4_e
Adding exchange reaction EX_salchs4fe_e with default bounds for boundary metabolite: salchs4
Adding exchange reaction EX_sbt__D_e with default bounds for boundary metabolite: sbt__D_e.
Adding exchange reaction EX_sel_e with default bounds for boundary metabolite: sel_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_sheme_e with default bounds for boundary metabolite: sheme_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_slnt_e with default bounds for boundary metabolite: slnt_e.
Adding exchange reaction EX_so3_e with default bounds for boundary metabolite: so3_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_spmd_e with default bounds for boundary metabolite: spmd_e.
Adding exchange reaction EX_stfrnA_e with default bounds for boundary metabolite: stfrnA_e.
Adding exchange reaction EX_stfrnB_e with default bounds for boundary metabolite: stfrnB_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_sucr_e with default bounds for boundary metabolite: sucr_e.
Adding exchange reaction EX_sula_e with default bounds for boundary metabolite: sula_e.
Adding exchange reaction EX_sulfac_e with default bounds for boundary metabolite: sulfac_e.
Adding exchange reaction EX_taur_e with default bounds for boundary metabolite: taur_e.
Adding exchange reaction EX_tcb_e with default bounds for boundary metabolite: tcb_e.
Adding exchange reaction EX_tcynt_e with default bounds for boundary metabolite: tcynt_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
```

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Adding exchange reaction EX_thym_e with default bounds for boundary metabolite: thym_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_tsul_e with default bounds for boundary metabolite: tsul_e.
Adding exchange reaction EX_tton_e with default bounds for boundary metabolite: tton_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__D_e with default bounds for boundary metabolite: tyr__D_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpdp_e with default bounds for boundary metabolite: udcpdp_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_urate_e with default bounds for boundary metabolite: urate_e.
Adding exchange reaction EX_urea_e with default bounds for boundary metabolite: urea_e.
Adding exchange reaction EX_uri_e with default bounds for boundary metabolite: uri_e.
Adding exchange reaction EX_val__D_e with default bounds for boundary metabolite: val__D_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_vanlt_e with default bounds for boundary metabolite: vanlt_e.
Adding exchange reaction EX_xtsn_e with default bounds for boundary metabolite: xtsn_e.
Adding exchange reaction EX_xyl3_e with default bounds for boundary metabolite: xyl3_e.
Adding exchange reaction EX_xyl__D_e with default bounds for boundary metabolite: xyl__D_e.
Adding exchange reaction EX_xylb_e with default bounds for boundary metabolite: xylb_e.
Adding exchange reaction EX_xylu__L_e with default bounds for boundary metabolite: xylu__L_e
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_12ppd__R_e' since it already exists.
Ignoring reaction 'EX_23camp_e' since it already exists.
Ignoring reaction 'EX_23ccmp_e' since it already exists.
Ignoring reaction 'EX_23cgmp_e' since it already exists.
Ignoring reaction 'EX_23cump_e' since it already exists.
Ignoring reaction 'EX_23dappa_e' since it already exists.
Ignoring reaction 'EX_25dkglcn_e' since it already exists.
Ignoring reaction 'EX_26dap__M_e' since it already exists.
Ignoring reaction 'EX_2ameph_e' since it already exists.
Ignoring reaction 'EX_2ddglcn_e' since it already exists.
Ignoring reaction 'EX_2dhglcn_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_2pglyc_e' since it already exists.
Ignoring reaction 'EX_34dhbz_e' since it already exists.
```

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Ignoring reaction 'EX_34dhcinm_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_3amp_e' since it already exists.
Ignoring reaction 'EX_3cmp_e' since it already exists.
Ignoring reaction 'EX_3gmp_e' since it already exists.
Ignoring reaction 'EX_3h4atb_e' since it already exists.
Ignoring reaction 'EX_3hcinnm_e' since it already exists.
Ignoring reaction 'EX_3hoxpac_e' since it already exists.
Ignoring reaction 'EX_3hpppn_e' since it already exists.
Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_3oxoadp_e' since it already exists.
Ignoring reaction 'EX_3ump_e' since it already exists.
Ignoring reaction 'EX_4abut_e' since it already exists.
Ignoring reaction 'EX_4ahmmp_e' since it already exists.
Ignoring reaction 'EX_4hba_e' since it already exists.
Ignoring reaction 'EX_4hbald_e' since it already exists.
Ignoring reaction 'EX_4hbz_e' since it already exists.
Ignoring reaction 'EX_4hoxpac_e' since it already exists.
Ignoring reaction 'EX_4hphac_e' since it already exists.
Ignoring reaction 'EX_4hpro_DC_e' since it already exists.
Ignoring reaction 'EX_4hpro_LT_e' since it already exists.
Ignoring reaction 'EX_4oxptn_e' since it already exists.
Ignoring reaction 'EX_5aptn_e' since it already exists.
Ignoring reaction 'EX_6hnac_e' since it already exists.
Ignoring reaction 'EX_6pgc_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDglu_e' since it already exists.
Ignoring reaction 'EX_LalaLglu_e' since it already exists.
Ignoring reaction 'EX_Lcyst_e' since it already exists.
Ignoring reaction 'EX_R_3h6atha_e' since it already exists.
Ignoring reaction 'EX_R_3hnonaa_e' since it already exists.
Ignoring reaction 'EX_R_3htd58e_e' since it already exists.
Ignoring reaction 'EX_T4hcinnm_e' since it already exists.
Ignoring reaction 'EX_abg4_e' since it already exists.
Ignoring reaction 'EX_abt__D_e' since it already exists.
Ignoring reaction 'EX_abt_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acald_e' since it already exists.
Ignoring reaction 'EX_acgam_e' since it already exists.
Ignoring reaction 'EX_acglu_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
```

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Ignoring reaction 'EX_acser_e' since it already exists.
Ignoring reaction 'EX_actn__R_e' since it already exists.
Ignoring reaction 'EX_ad_e' since it already exists.
Ignoring reaction 'EX_ade_e' since it already exists.
Ignoring reaction 'EX_adn_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala_B_e' since it already exists.
Ignoring reaction 'EX_ala_L_asp__L_e' since it already exists.
Ignoring reaction 'EX_ala_L_glu__L_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_alahis_e' since it already exists.
Ignoring reaction 'EX_alaleu_e' since it already exists.
Ignoring reaction 'EX_alathr_e' since it already exists.
Ignoring reaction 'EX_alatrp_e' since it already exists.
Ignoring reaction 'EX_all__D_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arab__L_e' since it already exists.
Ignoring reaction 'EX_arbt6p_e' since it already exists.
Ignoring reaction 'EX_arbt_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_ascb__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_aso3_e' since it already exists.
Ignoring reaction 'EX_aso4_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_balaala_e' since it already exists.
Ignoring reaction 'EX_balabala_e' since it already exists.
Ignoring reaction 'EX_balagly_e' since it already exists.
Ignoring reaction 'EX_balaleu_e' since it already exists.
Ignoring reaction 'EX_balamd_e' since it already exists.
Ignoring reaction 'EX_bhb_e' since it already exists.
Ignoring reaction 'EX_btn_e' since it already exists.
Ignoring reaction 'EX_btoh_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_buts_e' since it already exists.
Ignoring reaction 'EX_butso3_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_bzal_e' since it already exists.
Ignoring reaction 'EX_bzalc_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_carn_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
```

```
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_chols_e' since it already exists.
Ignoring reaction 'EX_chor_e' since it already exists.
Ignoring reaction 'EX_chtbs_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmcbtt_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_confrl_e' since it already exists.
Ignoring reaction 'EX_creat_e' since it already exists.
Ignoring reaction 'EX_crn_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_csn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cu_e' since it already exists.
Ignoring reaction 'EX_cyan_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cytd_e' since it already exists.
Ignoring reaction 'EX_d23hb_e' since it already exists.
Ignoring reaction 'EX_dad_2_e' since it already exists.
Ignoring reaction 'EX_dca_e' since it already exists.
Ignoring reaction 'EX_dmgly_e' since it already exists.
Ignoring reaction 'EX_dmso2_e' since it already exists.
Ignoring reaction 'EX_drib_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_ecto__L_e' since it already exists.
Ignoring reaction 'EX_enter_e' since it already exists.
Ignoring reaction 'EX_eths_e' since it already exists.
Ignoring reaction 'EX_ethso3_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_fad_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fcmcbtt_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3dcit_e' since it already exists.
Ignoring reaction 'EX_fe3dhbzs3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
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Ignoring reaction 'EX_feenter_e' since it already exists.
Ignoring reaction 'EX_fmn_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_frmd_e' since it already exists.
Ignoring reaction 'EX_fru_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_fuc_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_g3pc_e' since it already exists.
Ignoring reaction 'EX_g3pi_e' since it already exists.
Ignoring reaction 'EX_g3ps_e' since it already exists.
Ignoring reaction 'EX_ga_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctn__D_e' since it already exists.
Ignoring reaction 'EX_galctn__L_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_galt_e' since it already exists.
Ignoring reaction 'EX_galur_e' since it already exists.
Ignoring reaction 'EX_gam_e' since it already exists.
Ignoring reaction 'EX_glc__D_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_glcur_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_glucan4_e' since it already exists.
Ignoring reaction 'EX_glucan6_e' since it already exists.
Ignoring reaction 'EX_glutar_e' since it already exists.
Ignoring reaction 'EX_gly_asn__L_e' since it already exists.
Ignoring reaction 'EX_gly_asp__L_e' since it already exists.
Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_gly_glu__L_e' since it already exists.
Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_glyc2p_e' since it already exists.
Ignoring reaction 'EX_glyc3p_e' since it already exists.
Ignoring reaction 'EX_glyc_e' since it already exists.
Ignoring reaction 'EX_glygln_e' since it already exists.
Ignoring reaction 'EX_glyglu_e' since it already exists.
Ignoring reaction 'EX_glygly_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_glymet_e' since it already exists.
Ignoring reaction 'EX_glyphe_e' since it already exists.
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Ignoring reaction 'EX_glyser_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gsn_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_gua_e' since it already exists.
Ignoring reaction 'EX_h2_e' since it already exists.
Ignoring reaction 'EX_h2o2_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hco3_e' since it already exists.
Ignoring reaction 'EX_hexs_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hisgly_e' since it already exists.
Ignoring reaction 'EX_hishis_e' since it already exists.
Ignoring reaction 'EX_hom__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_ibt_e' since it already exists.
Ignoring reaction 'EX_icit_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_ins_e' since it already exists.
Ignoring reaction 'EX_isetac_e' since it already exists.
Ignoring reaction 'EX_istfrnB_e' since it already exists.
Ignoring reaction 'EX_istnt_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__D_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_leuleu_e' since it already exists.
Ignoring reaction 'EX_lmn2_e' since it already exists.
Ignoring reaction 'EX_lys__D_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__D_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malt_e' since it already exists.
Ignoring reaction 'EX_malthx_e' since it already exists.
Ignoring reaction 'EX_man1p_e' since it already exists.
Ignoring reaction 'EX_man_e' since it already exists.
Ignoring reaction 'EX_manglyc_e' since it already exists.
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Ignoring reaction 'EX_meoh_e' since it already exists.
Ignoring reaction 'EX_met_L_ala__L_e' since it already exists.
Ignoring reaction 'EX_met__D_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_metox__R_e' since it already exists.
Ignoring reaction 'EX_metox_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mnl_e' since it already exists.
Ignoring reaction 'EX_mobd_e' since it already exists.
Ignoring reaction 'EX_mso3_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nh4_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_no_e' since it already exists.
Ignoring reaction 'EX_oaa_e' since it already exists.
Ignoring reaction 'EX_octa_e' since it already exists.
Ignoring reaction 'EX_orn__D_e' since it already exists.
Ignoring reaction 'EX_orn__L_e' since it already exists.
Ignoring reaction 'EX_orn_e' since it already exists.
Ignoring reaction 'EX_orot_e' since it already exists.
Ignoring reaction 'EX_oxa_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pacald_e' since it already exists.
Ignoring reaction 'EX_peamn_e' since it already exists.
Ignoring reaction 'EX_pentso3_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_pheme_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pime_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_ppa_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_ppoh_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_psuri_e' since it already exists.
Ignoring reaction 'EX_pta_e' since it already exists.
Ignoring reaction 'EX_ptrc_e' since it already exists.
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Ignoring reaction 'EX_pydxn_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_rib__D_e' since it already exists.
Ignoring reaction 'EX_s_e' since it already exists.
Ignoring reaction 'EX_salc_e' since it already exists.
Ignoring reaction 'EX_salchs4_e' since it already exists.
Ignoring reaction 'EX_salchs4fe_e' since it already exists.
Ignoring reaction 'EX_sbt__D_e' since it already exists.
Ignoring reaction 'EX_sel_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_sheme_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_slnt_e' since it already exists.
Ignoring reaction 'EX_so3_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_spmd_e' since it already exists.
Ignoring reaction 'EX_stfrnA_e' since it already exists.
Ignoring reaction 'EX_stfrnB_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_sucr_e' since it already exists.
Ignoring reaction 'EX_sula_e' since it already exists.
Ignoring reaction 'EX_sulfac_e' since it already exists.
Ignoring reaction 'EX_taur_e' since it already exists.
Ignoring reaction 'EX_tcb_e' since it already exists.
Ignoring reaction 'EX_tcynt_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_thym_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tsul_e' since it already exists.
Ignoring reaction 'EX_tton_e' since it already exists.
Ignoring reaction 'EX_tyr__D_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpdp_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_urate_e' since it already exists.
```

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Ignoring reaction 'EX_urea_e' since it already exists.
Ignoring reaction 'EX_uri_e' since it already exists.
Ignoring reaction 'EX_val__D_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_vanlt_e' since it already exists.
Ignoring reaction 'EX_xtsn_e' since it already exists.
Ignoring reaction 'EX_xyl3_e' since it already exists.
Ignoring reaction 'EX_xyl__D_e' since it already exists.
Ignoring reaction 'EX_xylb_e' since it already exists.
Ignoring reaction 'EX_xylu__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_5oxpro_e with default bounds for boundary metabolite: 5oxpro_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acgam1p_e with default bounds for boundary metabolite: acgam1p_e
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_citr__L_e with default bounds for boundary metabolite: citr__L_e
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
```

```
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_glyclt_e with default bounds for boundary metabolite: glyclt_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lac__L_e with default bounds for boundary metabolite: lac__L_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglugl
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
```

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Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_prohisglu_e with default bounds for boundary metabolite: prohisgl
Adding exchange reaction EX_pydxn_e with default bounds for boundary metabolite: pydxn_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_sel_e with default bounds for boundary metabolite: sel_e.
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_slnt_e with default bounds for boundary metabolite: slnt_e.
Adding exchange reaction EX_stfrnA_e with default bounds for boundary metabolite: stfrnA_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_5oxpro_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acgam1p_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
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Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_citr__L_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_glyclt_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lac__L_e' since it already exists.
```

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Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_prohisglu_e' since it already exists.
Ignoring reaction 'EX_pydxn_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_sel_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_slnt_e' since it already exists.
Ignoring reaction 'EX_stfrnA_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35md
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_5oxpro_e with default bounds for boundary metabolite: 5oxpro_e.
```

```
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_LalaLglu_e with default bounds for boundary metabolite: LalaLglu_
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hdcaa_e with default bounds for boundary metabolite: R_3hdcaa_
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fmn_e with default bounds for boundary metabolite: fmn_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_forglu_e with default bounds for boundary metabolite: forglu_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
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Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glc__D_e with default bounds for boundary metabolite: glc__D_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glyclt_e with default bounds for boundary metabolite: glyclt_e.
Adding exchange reaction EX_glygly_e with default bounds for boundary metabolite: glygly_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_leuleu_e with default bounds for boundary metabolite: leuleu_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglugl
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_maltpt_e with default bounds for boundary metabolite: maltpt_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mso3_e with default bounds for boundary metabolite: mso3_e.
Adding exchange reaction EX_na1_e with default bounds for boundary metabolite: na1_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_prohisglu_e with default bounds for boundary metabolite: prohisgl
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Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_taur_e with default bounds for boundary metabolite: taur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre6p_e with default bounds for boundary metabolite: tre6p_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_5oxpro_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_LalaLglu_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hdcaa_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
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Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fmn_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_forglu_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glc__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glyclt_e' since it already exists.
Ignoring reaction 'EX_glygly_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_leuleu_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
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Ignoring reaction 'EX_maltpt_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mso3_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_prohisglu_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_taur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre6p_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_12ppd__S_e with default bounds for boundary metabolite: 12ppd__S
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_4hba_e with default bounds for boundary metabolite: 4hba_e.
```

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Adding exchange reaction EX_5oxpro_e with default bounds for boundary metabolite: 5oxpro_e.
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: LalaL
Adding exchange reaction EX_LalaLglu_e with default bounds for boundary metabolite: LalaLglu_
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hdcaa_e with default bounds for boundary metabolite: R_3hdcaa_
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acald_e with default bounds for boundary metabolite: acald_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_creat_e with default bounds for boundary metabolite: creat_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dhap_e with default bounds for boundary metabolite: dhap_e.
Adding exchange reaction EX_diact_e with default bounds for boundary metabolite: diact_e.
Adding exchange reaction EX_dmgly_e with default bounds for boundary metabolite: dmgly_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fmn_e with default bounds for boundary metabolite: fmn_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
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Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr__
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glc__D_e with default bounds for boundary metabolite: glc__D_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glyclt_e with default bounds for boundary metabolite: glyclt_e.
Adding exchange reaction EX_glygly_e with default bounds for boundary metabolite: glygly_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hishis_e with default bounds for boundary metabolite: hishis_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leuleu_e with default bounds for boundary metabolite: leuleu_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglugl
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mso3_e with default bounds for boundary metabolite: mso3_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_ppi_e with default bounds for boundary metabolite: ppi_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
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Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_stfrnA_e with default bounds for boundary metabolite: stfrnA_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_taur_e with default bounds for boundary metabolite: taur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre6p_e with default bounds for boundary metabolite: tre6p_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_12ppd__S_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_4hba_e' since it already exists.
Ignoring reaction 'EX_5oxpro_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_LalaLglu_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hdcaa_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acald_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
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Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_creat_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dhap_e' since it already exists.
Ignoring reaction 'EX_diact_e' since it already exists.
Ignoring reaction 'EX_dmgly_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fmn_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glc__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glyclt_e' since it already exists.
Ignoring reaction 'EX_glygly_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hishis_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leuleu_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
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Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mso3_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_ppi_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_stfrnA_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_taur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre6p_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_5mcsn_e with default bounds for boundary metabolite: 5mcsn_e.
```

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Adding exchange reaction EX_5oxpro_e with default bounds for boundary metabolite: 5oxpro_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hdda_e with default bounds for boundary metabolite: R_3hdda_e
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_creat_e with default bounds for boundary metabolite: creat_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D_
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Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_ppa_e with default bounds for boundary metabolite: ppa_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_sel_e with default bounds for boundary metabolite: sel_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
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Adding exchange reaction EX_slnt_e with default bounds for boundary metabolite: slnt_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_5mcsn_e' since it already exists.
Ignoring reaction 'EX_5oxpro_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hdda_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
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Ignoring reaction 'EX_creat_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
```

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Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_ppa_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_sel_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_slnt_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_26dap__M_e with default bounds for boundary metabolite: 26dap__M
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_4abut_e with default bounds for boundary metabolite: 4abut_e.
Adding exchange reaction EX_6atha_e with default bounds for boundary metabolite: 6atha_e.
Adding exchange reaction EX_6pgc_e with default bounds for boundary metabolite: 6pgc_e.
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: LalaD
Adding exchange reaction EX_LalaLglu_e with default bounds for boundary metabolite: LalaLglu_
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3h6atha_e with default bounds for boundary metabolite: R_3h6atl
Adding exchange reaction EX_R_3hdda_e with default bounds for boundary metabolite: R_3hdda_e
Adding exchange reaction EX_R_3hhpa_e with default bounds for boundary metabolite: R_3hhpa_e
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Adding exchange reaction EX_R_3hhxa_e with default bounds for boundary metabolite: R_3hhxa_e
Adding exchange reaction EX_R_3hnonaa_e with default bounds for boundary metabolite: R_3hnona
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_R_3hpdeca_e with default bounds for boundary metabolite: R_3hpdec
Adding exchange reaction EX_R_3hphpa_e with default bounds for boundary metabolite: R_3hphpa_
Adding exchange reaction EX_R_3hpnona_e with default bounds for boundary metabolite: R_3hpnon
Adding exchange reaction EX_R_3hpocta_e with default bounds for boundary metabolite: R_3hpoct
Adding exchange reaction EX_R_3htd5e_e with default bounds for boundary metabolite: R_3htd5e_
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acglu_e with default bounds for boundary metabolite: acglu_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_ad_e with default bounds for boundary metabolite: ad_e.
Adding exchange reaction EX_airs_e with default bounds for boundary metabolite: airs_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_butso3_e with default bounds for boundary metabolite: butso3_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crn_e with default bounds for boundary metabolite: crn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dca_e with default bounds for boundary metabolite: dca_e.
Adding exchange reaction EX_diact_e with default bounds for boundary metabolite: diact_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_ethso3_e with default bounds for boundary metabolite: ethso3_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
```

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Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pe_e with default bounds for boundary metabolite: g3pe_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D_
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_glyc3p_e with default bounds for boundary metabolite: glyc3p_e.
Adding exchange reaction EX_glygly_e with default bounds for boundary metabolite: glygly_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_gua_e with default bounds for boundary metabolite: gua_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hpta_e with default bounds for boundary metabolite: hpta_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_isetac_e with default bounds for boundary metabolite: isetac_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_leuleu_e with default bounds for boundary metabolite: leuleu_e.
Adding exchange reaction EX_lys__D_e with default bounds for boundary metabolite: lys__D_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malt_e with default bounds for boundary metabolite: malt_e.
Adding exchange reaction EX_malthx_e with default bounds for boundary metabolite: malthx_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
```

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Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mso3_e with default bounds for boundary metabolite: mso3_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_nona_e with default bounds for boundary metabolite: nona_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdcea_e with default bounds for boundary metabolite: ocdcea_e.
Adding exchange reaction EX_octa_e with default bounds for boundary metabolite: octa_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pacald_e with default bounds for boundary metabolite: pacald_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phehpa_e with default bounds for boundary metabolite: phehpa_e.
Adding exchange reaction EX_phehxa_e with default bounds for boundary metabolite: phehxa_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_pheocta_e with default bounds for boundary metabolite: pheocta_e
Adding exchange reaction EX_phept_e with default bounds for boundary metabolite: phept_e.
Adding exchange reaction EX_ppa_e with default bounds for boundary metabolite: ppa_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pta_e with default bounds for boundary metabolite: pta_e.
Adding exchange reaction EX_ptrc_e with default bounds for boundary metabolite: ptrc_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_rib__D_e with default bounds for boundary metabolite: rib__D_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_sulfac_e with default bounds for boundary metabolite: sulfac_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_taur_e with default bounds for boundary metabolite: taur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_thym_e with default bounds for boundary metabolite: thym_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre6p_e with default bounds for boundary metabolite: tre6p_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
```

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Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_xan_e with default bounds for boundary metabolite: xan_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_26dap__M_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_4abut_e' since it already exists.
Ignoring reaction 'EX_6atha_e' since it already exists.
Ignoring reaction 'EX_6pgc_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_LalaLglu_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3h6atha_e' since it already exists.
Ignoring reaction 'EX_R_3hdda_e' since it already exists.
Ignoring reaction 'EX_R_3hhpa_e' since it already exists.
Ignoring reaction 'EX_R_3hhxa_e' since it already exists.
Ignoring reaction 'EX_R_3hnonaa_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_R_3hpdeca_e' since it already exists.
Ignoring reaction 'EX_R_3hphpa_e' since it already exists.
Ignoring reaction 'EX_R_3hpnona_e' since it already exists.
Ignoring reaction 'EX_R_3hpocta_e' since it already exists.
Ignoring reaction 'EX_R_3htd5e_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acglu_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_ad_e' since it already exists.
Ignoring reaction 'EX_airs_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
```

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Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_butso3_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dca_e' since it already exists.
Ignoring reaction 'EX_diact_e' since it already exists.
Ignoring reaction 'EX_ethso3_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_g3pe_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_glyc3p_e' since it already exists.
Ignoring reaction 'EX_glygly_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_gua_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
```

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Ignoring reaction 'EX_hpta_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_isetac_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_leuleu_e' since it already exists.
Ignoring reaction 'EX_lys__D_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malt_e' since it already exists.
Ignoring reaction 'EX_malthx_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mso3_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_nona_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdcea_e' since it already exists.
Ignoring reaction 'EX_octa_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pacald_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phehpa_e' since it already exists.
Ignoring reaction 'EX_phehxa_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_pheocta_e' since it already exists.
Ignoring reaction 'EX_phept_e' since it already exists.
Ignoring reaction 'EX_ppa_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pta_e' since it already exists.
Ignoring reaction 'EX_ptrc_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
```

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Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_rib__D_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_sulfac_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_taur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_thym_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre6p_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_xan_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_26dap__M_e with default bounds for boundary metabolite: 26dap__M
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3gmp_e with default bounds for boundary metabolite: 3gmp_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_3mba_e with default bounds for boundary metabolite: 3mba_e.
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_ade_e with default bounds for boundary metabolite: ade_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_alltn_e with default bounds for boundary metabolite: alltn_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
```

```
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cd2_e with default bounds for boundary metabolite: cd2_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_csn_e with default bounds for boundary metabolite: csn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glc__D_e with default bounds for boundary metabolite: glc__D_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_gly_pro__L_e with default bounds for boundary metabolite: gly_pr
Adding exchange reaction EX_glyc__R_e with default bounds for boundary metabolite: glyc__R_e
Adding exchange reaction EX_glyc_e with default bounds for boundary metabolite: glyc_e.
Adding exchange reaction EX_glyclt_e with default bounds for boundary metabolite: glyclt_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_gua_e with default bounds for boundary metabolite: gua_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
```

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Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglugl
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_na1_e with default bounds for boundary metabolite: na1_e.
Adding exchange reaction EX_nh4_e with default bounds for boundary metabolite: nh4_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_orn__L_e with default bounds for boundary metabolite: orn__L_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_ppa_e with default bounds for boundary metabolite: ppa_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
```

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Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_xan_e with default bounds for boundary metabolite: xan_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_26dap__M_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_3gmp_e' since it already exists.
Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_3mba_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_ade_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_alltn_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
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Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_csn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glc__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_gly_pro__L_e' since it already exists.
Ignoring reaction 'EX_glyc__R_e' since it already exists.
Ignoring reaction 'EX_glyc_e' since it already exists.
Ignoring reaction 'EX_glyclt_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_gua_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
```

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Ignoring reaction 'EX_nh4_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_orn__L_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_ppa_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_xan_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35md
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_5oxpro_e with default bounds for boundary metabolite: 5oxpro_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite:
Adding exchange reaction EX_R_3hhxa_e with default bounds for boundary metabolite: R_3hhxa_e
Adding exchange reaction EX_R_3httdca_e with default bounds for boundary metabolite: R_3httd
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
```

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Adding exchange reaction EX_ade_e with default bounds for boundary metabolite: ade_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_creat_e with default bounds for boundary metabolite: creat_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dca_e with default bounds for boundary metabolite: dca_e.
Adding exchange reaction EX_ddca_e with default bounds for boundary metabolite: ddca_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fer_e with default bounds for boundary metabolite: fer_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc_e with default bounds for boundary metabolite: fuc_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hco3_e with default bounds for boundary metabolite: hco3_e.
```

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Adding exchange reaction EX_hdca_e with default bounds for boundary metabolite: hdca_e.
Adding exchange reaction EX_hdcea_e with default bounds for boundary metabolite: hdcea_e.
Adding exchange reaction EX_hishis_e with default bounds for boundary metabolite: hishis_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lac__L_e with default bounds for boundary metabolite: lac__L_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglugl
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_na1_e with default bounds for boundary metabolite: na1_e.
Adding exchange reaction EX_nh4_e with default bounds for boundary metabolite: nh4_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdca_e with default bounds for boundary metabolite: ocdca_e.
Adding exchange reaction EX_ocdcea_e with default bounds for boundary metabolite: ocdcea_e.
Adding exchange reaction EX_octa_e with default bounds for boundary metabolite: octa_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_ppi_e with default bounds for boundary metabolite: ppi_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
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Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttdca_e with default bounds for boundary metabolite: ttdca_e.
Adding exchange reaction EX_ttdcea_e with default bounds for boundary metabolite: ttdcea_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_5oxpro_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R_3hhxa_e' since it already exists.
Ignoring reaction 'EX_R_3httdca_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_ade_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_creat_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dca_e' since it already exists.
Ignoring reaction 'EX_ddca_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
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Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fer_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hco3_e' since it already exists.
Ignoring reaction 'EX_hdca_e' since it already exists.
Ignoring reaction 'EX_hdcea_e' since it already exists.
Ignoring reaction 'EX_hishis_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lac__L_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nh4_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdca_e' since it already exists.
Ignoring reaction 'EX_ocdcea_e' since it already exists.
Ignoring reaction 'EX_octa_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
```

```
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_ppi_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_ttdca_e' since it already exists.
Ignoring reaction 'EX_ttdcea_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35md
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_5oxpro_e with default bounds for boundary metabolite: 5oxpro_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hdda_e with default bounds for boundary metabolite: R_3hdda_e
Adding exchange reaction EX_R_3hhxa_e with default bounds for boundary metabolite: R_3hhxa_e
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_R_3hpt_e with default bounds for boundary metabolite: R_3hpt_e.
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_actn__R_e with default bounds for boundary metabolite: actn__R_e
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
```

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Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_creat_e with default bounds for boundary metabolite: creat_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dca_e with default bounds for boundary metabolite: dca_e.
Adding exchange reaction EX_ddca_e with default bounds for boundary metabolite: ddca_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glx_e with default bounds for boundary metabolite: glx_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hdca_e with default bounds for boundary metabolite: hdca_e.
Adding exchange reaction EX_hdcea_e with default bounds for boundary metabolite: hdcea_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
```

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Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdca_e with default bounds for boundary metabolite: ocdca_e.
Adding exchange reaction EX_ocdcea_e with default bounds for boundary metabolite: ocdcea_e.
Adding exchange reaction EX_octa_e with default bounds for boundary metabolite: octa_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pta_e with default bounds for boundary metabolite: pta_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_stfrnA_e with default bounds for boundary metabolite: stfrnA_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_ttdcea_e with default bounds for boundary metabolite: ttdcea_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
```

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Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_5oxpro_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hdda_e' since it already exists.
Ignoring reaction 'EX_R_3hhxa_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_R_3hpt_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_actn__R_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_creat_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dca_e' since it already exists.
Ignoring reaction 'EX_ddca_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
```

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Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glx_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hdca_e' since it already exists.
Ignoring reaction 'EX_hdcea_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdca_e' since it already exists.
Ignoring reaction 'EX_ocdcea_e' since it already exists.
Ignoring reaction 'EX_octa_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pta_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
```

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Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_stfrnA_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_ttdcea_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_26dap__M_e with default bounds for boundary metabolite: 26dap__M
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_6hnac_e with default bounds for boundary metabolite: 6hnac_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: LalaD
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_ad_e with default bounds for boundary metabolite: ad_e.
Adding exchange reaction EX_adn_e with default bounds for boundary metabolite: adn_e.
Adding exchange reaction EX_airs_e with default bounds for boundary metabolite: airs_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_alltn_e with default bounds for boundary metabolite: alltn_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arab__D_e with default bounds for boundary metabolite: arab__D_e
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bhb_e with default bounds for boundary metabolite: bhb_e.
```

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Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_bzal_e with default bounds for boundary metabolite: bzal_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cd2_e with default bounds for boundary metabolite: cd2_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_csn_e with default bounds for boundary metabolite: csn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fer_e with default bounds for boundary metabolite: fer_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D_
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr__
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_glutar_e with default bounds for boundary metabolite: glutar_e.
Adding exchange reaction EX_gly_pro__L_e with default bounds for boundary metabolite: gly_pro
Adding exchange reaction EX_glyc__R_e with default bounds for boundary metabolite: glyc__R_e
Adding exchange reaction EX_glyc_e with default bounds for boundary metabolite: glyc_e.
Adding exchange reaction EX_glyclt_e with default bounds for boundary metabolite: glyclt_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_gua_e with default bounds for boundary metabolite: gua_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
```

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Adding exchange reaction EX_hishis_e with default bounds for boundary metabolite: hishis_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_isobuta_e with default bounds for boundary metabolite: isobuta_e
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_na1_e with default bounds for boundary metabolite: na1_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no_e with default bounds for boundary metabolite: no_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdcea_e with default bounds for boundary metabolite: ocdcea_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pacald_e with default bounds for boundary metabolite: pacald_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_ppa_e with default bounds for boundary metabolite: ppa_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_prohisglu_e with default bounds for boundary metabolite: prohisgl
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
```

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Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_thym_e with default bounds for boundary metabolite: thym_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_xan_e with default bounds for boundary metabolite: xan_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_26dap__M_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_6hnac_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_ad_e' since it already exists.
Ignoring reaction 'EX_adn_e' since it already exists.
Ignoring reaction 'EX_airs_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_alltn_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arab__D_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bhb_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_bzal_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
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Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_csn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fer_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_glutar_e' since it already exists.
Ignoring reaction 'EX_gly_pro__L_e' since it already exists.
Ignoring reaction 'EX_glyc__R_e' since it already exists.
Ignoring reaction 'EX_glyc_e' since it already exists.
Ignoring reaction 'EX_glyclt_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_gua_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hishis_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_isobuta_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
```

```
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdcea_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pacald_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_ppa_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_prohisglu_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_thym_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_xan_e' since it already exists.
```

```
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_5mcsn_e with default bounds for boundary metabolite: 5mcsn_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hdcaa_e with default bounds for boundary metabolite: R_3hdcaa_
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_adn_e with default bounds for boundary metabolite: adn_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_creat_e with default bounds for boundary metabolite: creat_e.
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
```

```
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_glyc_e with default bounds for boundary metabolite: glyc_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_isocap_e with default bounds for boundary metabolite: isocap_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__D_e with default bounds for boundary metabolite: lys__D_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malt_e with default bounds for boundary metabolite: malt_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
```

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Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_ppa_e with default bounds for boundary metabolite: ppa_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_sel_e with default bounds for boundary metabolite: sel_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_slnt_e with default bounds for boundary metabolite: slnt_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre6p_e with default bounds for boundary metabolite: tre6p_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_5mcsn_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hdcaa_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_adn_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
```

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Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_creat_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_glyc_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
```

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Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_isocap_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__D_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malt_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_ppa_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_sel_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_slnt_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre6p_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
```

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Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hdda_e with default bounds for boundary metabolite: R_3hdda_e
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bhb_e with default bounds for boundary metabolite: bhb_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_chor_e with default bounds for boundary metabolite: chor_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
```

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Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fer_e with default bounds for boundary metabolite: fer_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_glyc_e with default bounds for boundary metabolite: glyc_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_isocap_e with default bounds for boundary metabolite: isocap_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__D_e with default bounds for boundary metabolite: lys__D_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malt_e with default bounds for boundary metabolite: malt_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mmet_e with default bounds for boundary metabolite: mmet_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
```

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Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_ppa_e with default bounds for boundary metabolite: ppa_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_sel_e with default bounds for boundary metabolite: sel_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_slnt_e with default bounds for boundary metabolite: slnt_e.
Adding exchange reaction EX_stfrnA_e with default bounds for boundary metabolite: stfrnA_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hdda_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
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Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bhb_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_chor_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fer_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_gly_e' since it already exists.
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Ignoring reaction 'EX_glyc_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_isocap_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__D_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malt_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mmet_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_ppa_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_sel_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
```

```
Ignoring reaction 'EX_slnt_e' since it already exists.
Ignoring reaction 'EX_stfrnA_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_26dap__M_e with default bounds for boundary metabolite: 26dap__M
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_4hphac_e with default bounds for boundary metabolite: 4hphac_e.
Adding exchange reaction EX_6hnac_e with default bounds for boundary metabolite: 6hnac_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: LalaD
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_actn__R_e with default bounds for boundary metabolite: actn__R_e
Adding exchange reaction EX_ad_e with default bounds for boundary metabolite: ad_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
```

```
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_creat_e with default bounds for boundary metabolite: creat_e.
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dha_e with default bounds for boundary metabolite: dha_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fmn_e with default bounds for boundary metabolite: fmn_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
```

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Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__D_e with default bounds for boundary metabolite: lys__D_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m4po_e with default bounds for boundary metabolite: m4po_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malt_e with default bounds for boundary metabolite: malt_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pacald_e with default bounds for boundary metabolite: pacald_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_ppa_e with default bounds for boundary metabolite: ppa_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_sel_e with default bounds for boundary metabolite: sel_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_slnt_e with default bounds for boundary metabolite: slnt_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre6p_e with default bounds for boundary metabolite: tre6p_e.
```

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Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_xan_e with default bounds for boundary metabolite: xan_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_26dap__M_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_4hphac_e' since it already exists.
Ignoring reaction 'EX_6hnac_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_actn__R_e' since it already exists.
Ignoring reaction 'EX_ad_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
```

```
Ignoring reaction 'EX_creat_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dha_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fmn_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__D_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m4po_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
```

```
Ignoring reaction 'EX_malt_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pacald_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_ppa_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_sel_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_slnt_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre6p_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_xan_e' since it already exists.
```

```
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_5oxpro_e with default bounds for boundary metabolite: 5oxpro_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hpba_e with default bounds for boundary metabolite: R_3hpba_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_bzal_e with default bounds for boundary metabolite: bzal_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cinnm_e with default bounds for boundary metabolite: cinnm_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_citr__L_e with default bounds for boundary metabolite: citr__L_e
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_creat_e with default bounds for boundary metabolite: creat_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
```

```
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctr__D_e with default bounds for boundary metabolite: galctr_
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_glyc_e with default bounds for boundary metabolite: glyc_e.
Adding exchange reaction EX_glyclt_e with default bounds for boundary metabolite: glyclt_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lac__L_e with default bounds for boundary metabolite: lac__L_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malt_e with default bounds for boundary metabolite: malt_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_phedca_e with default bounds for boundary metabolite: phedca_e.
Adding exchange reaction EX_phenona_e with default bounds for boundary metabolite: phenona_e
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
```

```
Adding exchange reaction EX_ppa_e with default bounds for boundary metabolite: ppa_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre6p_e with default bounds for boundary metabolite: tre6p_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_vanln_e with default bounds for boundary metabolite: vanln_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_5oxpro_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hpba_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
```

```
Ignoring reaction 'EX_bzal_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cinnm_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_citr__L_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_creat_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctr__D_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_glyc_e' since it already exists.
Ignoring reaction 'EX_glyclt_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
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Ignoring reaction 'EX_lac__L_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malt_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_phedca_e' since it already exists.
Ignoring reaction 'EX_phenona_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_ppa_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre6p_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
```

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Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_vanln_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_23camp_e with default bounds for boundary metabolite: 23camp_e.
Adding exchange reaction EX_23ccmp_e with default bounds for boundary metabolite: 23ccmp_e.
Adding exchange reaction EX_23cgmp_e with default bounds for boundary metabolite: 23cgmp_e.
Adding exchange reaction EX_23cump_e with default bounds for boundary metabolite: 23cump_e.
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
Adding exchange reaction EX_4hpro_LT_e with default bounds for boundary metabolite: 4hpro_LT
Adding exchange reaction EX_6pgc_e with default bounds for boundary metabolite: 6pgc_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lala
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_adn_e with default bounds for boundary metabolite: adn_e.
Adding exchange reaction EX_agm_e with default bounds for boundary metabolite: agm_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala_B_e with default bounds for boundary metabolite: ala_B_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cell4_e with default bounds for boundary metabolite: cell4_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cytd_e with default bounds for boundary metabolite: cytd_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
```

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Adding exchange reaction EX_drib_e with default bounds for boundary metabolite: drib_e.
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g1p_e with default bounds for boundary metabolite: g1p_e.
Adding exchange reaction EX_galctn__D_e with default bounds for boundary metabolite: galctn_
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glx_e with default bounds for boundary metabolite: glx_e.
Adding exchange reaction EX_glyc_e with default bounds for boundary metabolite: glyc_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gsn_e with default bounds for boundary metabolite: gsn_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hco3_e with default bounds for boundary metabolite: hco3_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hom__L_e with default bounds for boundary metabolite: hom__L_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malttr_e with default bounds for boundary metabolite: malttr_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_metsox_S__L_e with default bounds for boundary metabolite: metsox
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdca_e with default bounds for boundary metabolite: ocdca_e.
Adding exchange reaction EX_pac_e with default bounds for boundary metabolite: pac_e.
```

```
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pheme_e with default bounds for boundary metabolite: pheme_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_rib__D_e with default bounds for boundary metabolite: rib__D_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__D_e with default bounds for boundary metabolite: ser__D_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tmam_e with default bounds for boundary metabolite: tmam_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_tton_e with default bounds for boundary metabolite: tton_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_uri_e with default bounds for boundary metabolite: uri_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_23camp_e' since it already exists.
Ignoring reaction 'EX_23ccmp_e' since it already exists.
Ignoring reaction 'EX_23cgmp_e' since it already exists.
Ignoring reaction 'EX_23cump_e' since it already exists.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_4hpro_LT_e' since it already exists.
Ignoring reaction 'EX_6pgc_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_adn_e' since it already exists.
Ignoring reaction 'EX_agm_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala_B_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
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Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cell4_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cytd_e' since it already exists.
Ignoring reaction 'EX_drib_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_g1p_e' since it already exists.
Ignoring reaction 'EX_galctn__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glx_e' since it already exists.
Ignoring reaction 'EX_glyc_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gsn_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hco3_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hom__L_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
```

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Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malttr_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_metsox_S__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdca_e' since it already exists.
Ignoring reaction 'EX_pac_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pheme_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_rib__D_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__D_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tmam_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tton_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_uri_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: l
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
```

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Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hdcaa_e with default bounds for boundary metabolite: R_3hdcaa_
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_citr__L_e with default bounds for boundary metabolite: citr__L_e
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cyst__L_e with default bounds for boundary metabolite: cyst__L_e
Adding exchange reaction EX_dha_e with default bounds for boundary metabolite: dha_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
```

```
Adding exchange reaction EX_mevR_e with default bounds for boundary metabolite: mevR_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdcea_e with default bounds for boundary metabolite: ocdcea_e.
Adding exchange reaction EX_orn__L_e with default bounds for boundary metabolite: orn__L_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_prohisglu_e with default bounds for boundary metabolite: prohisgl
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hdcaa_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
```

```
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_citr__L_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cyst__L_e' since it already exists.
Ignoring reaction 'EX_dha_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mevR_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdcea_e' since it already exists.
Ignoring reaction 'EX_orn__L_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
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Ignoring reaction 'EX_prohisglu_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala__D_e with default bounds for boundary metabolite: ala__D_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cell4_e with default bounds for boundary metabolite: cell4_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
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Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fmn_e with default bounds for boundary metabolite: fmn_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g1p_e with default bounds for boundary metabolite: g1p_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mevR_e with default bounds for boundary metabolite: mevR_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdca_e with default bounds for boundary metabolite: ocdca_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
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Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala__D_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cell4_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fmn_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_g1p_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
```

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Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mevR_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdca_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_23camp_e with default bounds for boundary metabolite: 23camp_e.
Adding exchange reaction EX_23ccmp_e with default bounds for boundary metabolite: 23ccmp_e.
Adding exchange reaction EX_23cgmp_e with default bounds for boundary metabolite: 23cgmp_e.
Adding exchange reaction EX_23cump_e with default bounds for boundary metabolite: 23cump_e.
Adding exchange reaction EX_6pgc_e with default bounds for boundary metabolite: 6pgc_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: LalaL
Adding exchange reaction EX_R_3hdcaa_e with default bounds for boundary metabolite: R_3hdcaa_
Adding exchange reaction EX_R_3hhxa_e with default bounds for boundary metabolite: R_3hhxa_e
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_adn_e with default bounds for boundary metabolite: adn_e.
```

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Adding exchange reaction EX_ala__D_e with default bounds for boundary metabolite: ala__D_e.
Adding exchange reaction EX_ala_gln_e with default bounds for boundary metabolite: ala_gln_e
Adding exchange reaction EX_ala_his_e with default bounds for boundary metabolite: ala_his_e
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cell4_e with default bounds for boundary metabolite: cell4_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cyan_e with default bounds for boundary metabolite: cyan_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cytd_e with default bounds for boundary metabolite: cytd_e.
Adding exchange reaction EX_dca_e with default bounds for boundary metabolite: dca_e.
Adding exchange reaction EX_ddca_e with default bounds for boundary metabolite: ddca_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g1p_e with default bounds for boundary metabolite: g1p_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_glx_e with default bounds for boundary metabolite: glx_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gsn_e with default bounds for boundary metabolite: gsn_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
```

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Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_hdcea_e with default bounds for boundary metabolite: hdcea_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_malthp_e with default bounds for boundary metabolite: malthp_e.
Adding exchange reaction EX_malttr_e with default bounds for boundary metabolite: malttr_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_na1_e with default bounds for boundary metabolite: na1_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nh4_e with default bounds for boundary metabolite: nh4_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdca_e with default bounds for boundary metabolite: ocdca_e.
Adding exchange reaction EX_ocdcea_e with default bounds for boundary metabolite: ocdcea_e.
Adding exchange reaction EX_octa_e with default bounds for boundary metabolite: octa_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_salchs2_e with default bounds for boundary metabolite: salchs2_e
Adding exchange reaction EX_salchs2fe_e with default bounds for boundary metabolite: salchs2
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_so3_e with default bounds for boundary metabolite: so3_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
```

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Adding exchange reaction EX_tcynt_e with default bounds for boundary metabolite: tcynt_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_tsul_e with default bounds for boundary metabolite: tsul_e.
Adding exchange reaction EX_ttdcea_e with default bounds for boundary metabolite: ttdcea_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_uri_e with default bounds for boundary metabolite: uri_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_23camp_e' since it already exists.
Ignoring reaction 'EX_23ccmp_e' since it already exists.
Ignoring reaction 'EX_23cgmp_e' since it already exists.
Ignoring reaction 'EX_23cump_e' since it already exists.
Ignoring reaction 'EX_6pgc_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_R_3hdcaa_e' since it already exists.
Ignoring reaction 'EX_R_3hhxa_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_adn_e' since it already exists.
Ignoring reaction 'EX_ala__D_e' since it already exists.
Ignoring reaction 'EX_ala_gln_e' since it already exists.
Ignoring reaction 'EX_ala_his_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cell4_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
```

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Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cyan_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cytd_e' since it already exists.
Ignoring reaction 'EX_dca_e' since it already exists.
Ignoring reaction 'EX_ddca_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_g1p_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_glx_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gsn_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_hdcea_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_malthp_e' since it already exists.
Ignoring reaction 'EX_malttr_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nh4_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
```

```
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdca_e' since it already exists.
Ignoring reaction 'EX_ocdcea_e' since it already exists.
Ignoring reaction 'EX_octa_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_salchs2_e' since it already exists.
Ignoring reaction 'EX_salchs2fe_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_so3_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tcynt_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tsul_e' since it already exists.
Ignoring reaction 'EX_ttdcea_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_uri_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_23camp_e with default bounds for boundary metabolite: 23camp_e.
Adding exchange reaction EX_23ccmp_e with default bounds for boundary metabolite: 23ccmp_e.
Adding exchange reaction EX_23cgmp_e with default bounds for boundary metabolite: 23cgmp_e.
Adding exchange reaction EX_23cump_e with default bounds for boundary metabolite: 23cump_e.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35md
Adding exchange reaction EX_2pg_e with default bounds for boundary metabolite: 2pg_e.
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_6pgc_e with default bounds for boundary metabolite: 6pgc_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lala
```

```
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_adn_e with default bounds for boundary metabolite: adn_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala__D_e with default bounds for boundary metabolite: ala__D_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cell4_e with default bounds for boundary metabolite: cell4_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cytd_e with default bounds for boundary metabolite: cytd_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_enter_e with default bounds for boundary metabolite: enter_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
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Adding exchange reaction EX_gsn_e with default bounds for boundary metabolite: gsn_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hco3_e with default bounds for boundary metabolite: hco3_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_isobuta_e with default bounds for boundary metabolite: isobuta_e
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malttr_e with default bounds for boundary metabolite: malttr_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_meoh_e with default bounds for boundary metabolite: meoh_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mnl1p_e with default bounds for boundary metabolite: mnl1p_e.
Adding exchange reaction EX_mnl_e with default bounds for boundary metabolite: mnl_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_prohisglu_e with default bounds for boundary metabolite: prohisgl
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
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Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_urea_e with default bounds for boundary metabolite: urea_e.
Adding exchange reaction EX_uri_e with default bounds for boundary metabolite: uri_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_23camp_e' since it already exists.
Ignoring reaction 'EX_23ccmp_e' since it already exists.
Ignoring reaction 'EX_23cgmp_e' since it already exists.
Ignoring reaction 'EX_23cump_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_2pg_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_6pgc_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_adn_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala__D_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cell4_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cytd_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_enter_e' since it already exists.
```

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Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gsn_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hco3_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_isobuta_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malttr_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_meoh_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mnl1p_e' since it already exists.
Ignoring reaction 'EX_mnl_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
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Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_prohisglu_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_urea_e' since it already exists.
Ignoring reaction 'EX_uri_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_23camp_e with default bounds for boundary metabolite: 23camp_e.
Adding exchange reaction EX_23ccmp_e with default bounds for boundary metabolite: 23ccmp_e.
Adding exchange reaction EX_23cgmp_e with default bounds for boundary metabolite: 23cgmp_e.
Adding exchange reaction EX_23cump_e with default bounds for boundary metabolite: 23cump_e.
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
Adding exchange reaction EX_3gmp_e with default bounds for boundary metabolite: 3gmp_e.
Adding exchange reaction EX_6pgc_e with default bounds for boundary metabolite: 6pgc_e.
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_LalaDglu_e with default bounds for boundary metabolite: LalaDglu_
Adding exchange reaction EX_LalaLglu_e with default bounds for boundary metabolite: LalaLglu_
Adding exchange reaction EX_R_3hdcaa_e with default bounds for boundary metabolite: R_3hdcaa_
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_adn_e with default bounds for boundary metabolite: adn_e.
Adding exchange reaction EX_ala_L_asp__L_e with default bounds for boundary metabolite: ala_L
Adding exchange reaction EX_ala_L_thr__L_e with default bounds for boundary metabolite: ala_L
Adding exchange reaction EX_ala__D_e with default bounds for boundary metabolite: ala__D_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
```

```
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cell4_e with default bounds for boundary metabolite: cell4_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cyan_e with default bounds for boundary metabolite: cyan_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cytd_e with default bounds for boundary metabolite: cytd_e.
Adding exchange reaction EX_dca_e with default bounds for boundary metabolite: dca_e.
Adding exchange reaction EX_ddca_e with default bounds for boundary metabolite: ddca_e.
Adding exchange reaction EX_dha_e with default bounds for boundary metabolite: dha_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_glx_e with default bounds for boundary metabolite: glx_e.
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gsn_e with default bounds for boundary metabolite: gsn_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hdca_e with default bounds for boundary metabolite: hdca_e.
Adding exchange reaction EX_hdcea_e with default bounds for boundary metabolite: hdcea_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
```

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Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_malthp_e with default bounds for boundary metabolite: malthp_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdca_e with default bounds for boundary metabolite: ocdca_e.
Adding exchange reaction EX_ocdcea_e with default bounds for boundary metabolite: ocdcea_e.
Adding exchange reaction EX_octa_e with default bounds for boundary metabolite: octa_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tcynt_e with default bounds for boundary metabolite: tcynt_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttdca_e with default bounds for boundary metabolite: ttdca_e.
Adding exchange reaction EX_ttdcea_e with default bounds for boundary metabolite: ttdcea_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_uri_e with default bounds for boundary metabolite: uri_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_xan_e with default bounds for boundary metabolite: xan_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
```

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Ignoring reaction 'EX_23camp_e' since it already exists.
Ignoring reaction 'EX_23ccmp_e' since it already exists.
Ignoring reaction 'EX_23cgmp_e' since it already exists.
Ignoring reaction 'EX_23cump_e' since it already exists.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_3gmp_e' since it already exists.
Ignoring reaction 'EX_6pgc_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_LalaDglu_e' since it already exists.
Ignoring reaction 'EX_LalaLglu_e' since it already exists.
Ignoring reaction 'EX_R_3hdcaa_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_adn_e' since it already exists.
Ignoring reaction 'EX_ala_L_asp__L_e' since it already exists.
Ignoring reaction 'EX_ala_L_thr__L_e' since it already exists.
Ignoring reaction 'EX_ala__D_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cell4_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cyan_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cytd_e' since it already exists.
Ignoring reaction 'EX_dca_e' since it already exists.
Ignoring reaction 'EX_ddca_e' since it already exists.
Ignoring reaction 'EX_dha_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
```

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Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_glx_e' since it already exists.
Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gsn_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hdca_e' since it already exists.
Ignoring reaction 'EX_hdcea_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_malthp_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdca_e' since it already exists.
Ignoring reaction 'EX_ocdcea_e' since it already exists.
Ignoring reaction 'EX_octa_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
```

```
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tcynt_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_ttdca_e' since it already exists.
Ignoring reaction 'EX_ttdcea_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_uri_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_xan_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: l
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acgam_e with default bounds for boundary metabolite: acgam_e.
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cyst__L_e with default bounds for boundary metabolite: cyst__L_e
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
```

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Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_gam6p_e with default bounds for boundary metabolite: gam6p_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glx_e with default bounds for boundary metabolite: glx_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malthp_e with default bounds for boundary metabolite: malthp_e.
Adding exchange reaction EX_malttr_e with default bounds for boundary metabolite: malttr_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mnl_e with default bounds for boundary metabolite: mnl_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
```

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Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_urea_e with default bounds for boundary metabolite: urea_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acgam_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cyst__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
```

```
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_gam6p_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glx_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malthp_e' since it already exists.
Ignoring reaction 'EX_malttr_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mnl_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
```

```
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_urea_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_23camp_e with default bounds for boundary metabolite: 23camp_e.
Adding exchange reaction EX_23ccmp_e with default bounds for boundary metabolite: 23ccmp_e.
Adding exchange reaction EX_23cgmp_e with default bounds for boundary metabolite: 23cgmp_e.
Adding exchange reaction EX_23cump_e with default bounds for boundary metabolite: 23cump_e.
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
Adding exchange reaction EX_4abut_e with default bounds for boundary metabolite: 4abut_e.
Adding exchange reaction EX_6pgc_e with default bounds for boundary metabolite: 6pgc_e.
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_R_3hocta_e with default bounds for boundary metabolite: R_3hocta_
Adding exchange reaction EX_R_3httdca_e with default bounds for boundary metabolite: R_3httd
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acglu_e with default bounds for boundary metabolite: acglu_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_adn_e with default bounds for boundary metabolite: adn_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala_B_e with default bounds for boundary metabolite: ala_B_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cell4_e with default bounds for boundary metabolite: cell4_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
```

```
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cytd_e with default bounds for boundary metabolite: cytd_e.
Adding exchange reaction EX_dca_e with default bounds for boundary metabolite: dca_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_drib_e with default bounds for boundary metabolite: drib_e.
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g1p_e with default bounds for boundary metabolite: g1p_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_gam6p_e with default bounds for boundary metabolite: gam6p_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gsn_e with default bounds for boundary metabolite: gsn_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hco3_e with default bounds for boundary metabolite: hco3_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglugl
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nh4_e with default bounds for boundary metabolite: nh4_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdca_e with default bounds for boundary metabolite: ocdca_e.
```

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Adding exchange reaction EX_ocdcea_e with default bounds for boundary metabolite: ocdcea_e.
Adding exchange reaction EX_octa_e with default bounds for boundary metabolite: octa_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_prohisglu_e with default bounds for boundary metabolite: prohisgl
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_rib__D_e with default bounds for boundary metabolite: rib__D_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_salc_e with default bounds for boundary metabolite: salc_e.
Adding exchange reaction EX_ser__D_e with default bounds for boundary metabolite: ser__D_e.
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_uri_e with default bounds for boundary metabolite: uri_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_23camp_e' since it already exists.
Ignoring reaction 'EX_23ccmp_e' since it already exists.
Ignoring reaction 'EX_23cgmp_e' since it already exists.
Ignoring reaction 'EX_23cump_e' since it already exists.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_4abut_e' since it already exists.
Ignoring reaction 'EX_6pgc_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_R_3hocta_e' since it already exists.
Ignoring reaction 'EX_R_3httdca_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acglu_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_adn_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
```

```
Ignoring reaction 'EX_ala_B_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cell4_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cytd_e' since it already exists.
Ignoring reaction 'EX_dca_e' since it already exists.
Ignoring reaction 'EX_drib_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_g1p_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_gam6p_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gsn_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hco3_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
```

```
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nh4_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdca_e' since it already exists.
Ignoring reaction 'EX_ocdcea_e' since it already exists.
Ignoring reaction 'EX_octa_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_prohisglu_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_rib__D_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_salc_e' since it already exists.
Ignoring reaction 'EX_ser__D_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_uri_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
```

```
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: l
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cyst__L_e with default bounds for boundary metabolite: cyst__L_e
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glx_e with default bounds for boundary metabolite: glx_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
```

```
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mnl1p_e with default bounds for boundary metabolite: mnl1p_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_urea_e with default bounds for boundary metabolite: urea_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
```

```
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cyst__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glx_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mnl1p_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
```

```
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_urea_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acald_e with default bounds for boundary metabolite: acald_e.
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_adn_e with default bounds for boundary metabolite: adn_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_co_e with default bounds for boundary metabolite: co_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cyst__L_e with default bounds for boundary metabolite: cyst__L_e
Adding exchange reaction EX_dhap_e with default bounds for boundary metabolite: dhap_e.
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fad_e with default bounds for boundary metabolite: fad_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
```

```
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o2_e with default bounds for boundary metabolite: h2o2_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hom__L_e with default bounds for boundary metabolite: hom__L_e.
Adding exchange reaction EX_icit_e with default bounds for boundary metabolite: icit_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_malthp_e with default bounds for boundary metabolite: malthp_e.
Adding exchange reaction EX_malttr_e with default bounds for boundary metabolite: malttr_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_na1_e with default bounds for boundary metabolite: na1_e.
Adding exchange reaction EX_nh4_e with default bounds for boundary metabolite: nh4_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_prohisglu_e with default bounds for boundary metabolite: prohisgl
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
```

```
Adding exchange reaction EX_urea_e with default bounds for boundary metabolite: urea_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acald_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_adn_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_co_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cyst__L_e' since it already exists.
Ignoring reaction 'EX_dhap_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fad_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o2_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
```

```
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hom__L_e' since it already exists.
Ignoring reaction 'EX_icit_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_malthp_e' since it already exists.
Ignoring reaction 'EX_malttr_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nh4_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_prohisglu_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_urea_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: l
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala_L_thr__L_e with default bounds for boundary metabolite: ala_l
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
```

```
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_citr__L_e with default bounds for boundary metabolite: citr__L_e
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dha_e with default bounds for boundary metabolite: dha_e.
Adding exchange reaction EX_dhap_e with default bounds for boundary metabolite: dhap_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglyg
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hco3_e with default bounds for boundary metabolite: hco3_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglug
Adding exchange reaction EX_met_L_ala__L_e with default bounds for boundary metabolite: met_
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nh4_e with default bounds for boundary metabolite: nh4_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
```

```
Adding exchange reaction EX_ocdca_e with default bounds for boundary metabolite: ocdca_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_ppi_e with default bounds for boundary metabolite: ppi_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_prohisglu_e with default bounds for boundary metabolite: prohisgl
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala_L_thr__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_citr__L_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dha_e' since it already exists.
Ignoring reaction 'EX_dhap_e' since it already exists.
```

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Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hco3_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
Ignoring reaction 'EX_met_L_ala__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nh4_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdca_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_ppi_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_prohisglu_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
```

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Adding exchange reaction EX_23camp_e with default bounds for boundary metabolite: 23camp_e.
Adding exchange reaction EX_23ccmp_e with default bounds for boundary metabolite: 23ccmp_e.
Adding exchange reaction EX_23cgmp_e with default bounds for boundary metabolite: 23cgmp_e.
Adding exchange reaction EX_23cump_e with default bounds for boundary metabolite: 23cump_e.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35md
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_4abz_e with default bounds for boundary metabolite: 4abz_e.
Adding exchange reaction EX_4abzglu_e with default bounds for boundary metabolite: 4abzglu_e
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaLglu_e with default bounds for boundary metabolite: LalaLglu_
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acald_e with default bounds for boundary metabolite: acald_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_adn_e with default bounds for boundary metabolite: adn_e.
Adding exchange reaction EX_ala_B_e with default bounds for boundary metabolite: ala_B_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_alltn_e with default bounds for boundary metabolite: alltn_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arbt6p_e with default bounds for boundary metabolite: arbt6p_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_butso3_e with default bounds for boundary metabolite: butso3_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cell4_e with default bounds for boundary metabolite: cell4_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crn_e with default bounds for boundary metabolite: crn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cyst__L_e with default bounds for boundary metabolite: cyst__L_e
Adding exchange reaction EX_cytd_e with default bounds for boundary metabolite: cytd_e.
Adding exchange reaction EX_d23hb_e with default bounds for boundary metabolite: d23hb_e.
Adding exchange reaction EX_dca_e with default bounds for boundary metabolite: dca_e.
```

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Adding exchange reaction EX_dmso2_e with default bounds for boundary metabolite: dmso2_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_drib_e with default bounds for boundary metabolite: drib_e.
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_ecto__L_e with default bounds for boundary metabolite: ecto__L_e
Adding exchange reaction EX_enter_e with default bounds for boundary metabolite: enter_e.
Adding exchange reaction EX_ethso3_e with default bounds for boundary metabolite: ethso3_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_forglu_e with default bounds for boundary metabolite: forglu_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g1p_e with default bounds for boundary metabolite: g1p_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_galctn__D_e with default bounds for boundary metabolite: galctn_
Adding exchange reaction EX_gam6p_e with default bounds for boundary metabolite: gam6p_e.
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glc__D_e with default bounds for boundary metabolite: glc__D_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glx_e with default bounds for boundary metabolite: glx_e.
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gsn_e with default bounds for boundary metabolite: gsn_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hqn_e with default bounds for boundary metabolite: hqn_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_isetac_e with default bounds for boundary metabolite: isetac_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__D_e with default bounds for boundary metabolite: lys__D_e.
```

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Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malt_e with default bounds for boundary metabolite: malt_e.
Adding exchange reaction EX_malthp_e with default bounds for boundary metabolite: malthp_e.
Adding exchange reaction EX_malthx_e with default bounds for boundary metabolite: malthx_e.
Adding exchange reaction EX_malttr_e with default bounds for boundary metabolite: malttr_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_met__D_e with default bounds for boundary metabolite: met__D_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mnl1p_e with default bounds for boundary metabolite: mnl1p_e.
Adding exchange reaction EX_mnl_e with default bounds for boundary metabolite: mnl_e.
Adding exchange reaction EX_mso3_e with default bounds for boundary metabolite: mso3_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nh4_e with default bounds for boundary metabolite: nh4_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_octa_e with default bounds for boundary metabolite: octa_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_orn__D_e with default bounds for boundary metabolite: orn__D_e.
Adding exchange reaction EX_orn_e with default bounds for boundary metabolite: orn_e.
Adding exchange reaction EX_pac_e with default bounds for boundary metabolite: pac_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_pydxn_e with default bounds for boundary metabolite: pydxn_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_rib__D_e with default bounds for boundary metabolite: rib__D_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_salchs2fe_e with default bounds for boundary metabolite: salchs2
Adding exchange reaction EX_salchs4_e with default bounds for boundary metabolite: salchs4_e
Adding exchange reaction EX_salchs4fe_e with default bounds for boundary metabolite: salchs4
Adding exchange reaction EX_salchsx_e with default bounds for boundary metabolite: salchsx_e
Adding exchange reaction EX_sel_e with default bounds for boundary metabolite: sel_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
```

```
Adding exchange reaction EX_sucr_e with default bounds for boundary metabolite: sucr_e.
Adding exchange reaction EX_sulfac_e with default bounds for boundary metabolite: sulfac_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_tartr__D_e with default bounds for boundary metabolite: tartr__D
Adding exchange reaction EX_taur_e with default bounds for boundary metabolite: taur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre6p_e with default bounds for boundary metabolite: tre6p_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttdca_e with default bounds for boundary metabolite: ttdca_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_uri_e with default bounds for boundary metabolite: uri_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_23camp_e' since it already exists.
Ignoring reaction 'EX_23ccmp_e' since it already exists.
Ignoring reaction 'EX_23cgmp_e' since it already exists.
Ignoring reaction 'EX_23cump_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_4abz_e' since it already exists.
Ignoring reaction 'EX_4abzglu_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaLglu_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acald_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_adn_e' since it already exists.
Ignoring reaction 'EX_ala_B_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_alltn_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arbt6p_e' since it already exists.
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Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_butso3_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cell4_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cyst__L_e' since it already exists.
Ignoring reaction 'EX_cytd_e' since it already exists.
Ignoring reaction 'EX_d23hb_e' since it already exists.
Ignoring reaction 'EX_dca_e' since it already exists.
Ignoring reaction 'EX_dmso2_e' since it already exists.
Ignoring reaction 'EX_drib_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_ecto__L_e' since it already exists.
Ignoring reaction 'EX_enter_e' since it already exists.
Ignoring reaction 'EX_ethso3_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_forglu_e' since it already exists.
Ignoring reaction 'EX_g1p_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_galctn__D_e' since it already exists.
Ignoring reaction 'EX_gam6p_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glc__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glx_e' since it already exists.
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Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gsn_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hqn_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_isetac_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__D_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malt_e' since it already exists.
Ignoring reaction 'EX_malthp_e' since it already exists.
Ignoring reaction 'EX_malthx_e' since it already exists.
Ignoring reaction 'EX_malttr_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_met__D_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mnl1p_e' since it already exists.
Ignoring reaction 'EX_mnl_e' since it already exists.
Ignoring reaction 'EX_mso3_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nh4_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_octa_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_orn__D_e' since it already exists.
Ignoring reaction 'EX_orn_e' since it already exists.
Ignoring reaction 'EX_pac_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
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Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_pydxn_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_rib__D_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_salchs2fe_e' since it already exists.
Ignoring reaction 'EX_salchs4_e' since it already exists.
Ignoring reaction 'EX_salchs4fe_e' since it already exists.
Ignoring reaction 'EX_salchsx_e' since it already exists.
Ignoring reaction 'EX_sel_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_sucr_e' since it already exists.
Ignoring reaction 'EX_sulfac_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_tartr__D_e' since it already exists.
Ignoring reaction 'EX_taur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre6p_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_ttdca_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_uri_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_23camp_e with default bounds for boundary metabolite: 23camp_e.
Adding exchange reaction EX_23ccmp_e with default bounds for boundary metabolite: 23ccmp_e.
Adding exchange reaction EX_23cgmp_e with default bounds for boundary metabolite: 23cgmp_e.
Adding exchange reaction EX_23cump_e with default bounds for boundary metabolite: 23cump_e.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
```

```
Adding exchange reaction EX_6pgc_e with default bounds for boundary metabolite: 6pgc_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lala
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_adn_e with default bounds for boundary metabolite: adn_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala__D_e with default bounds for boundary metabolite: ala__D_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cell4_e with default bounds for boundary metabolite: cell4_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cytd_e with default bounds for boundary metabolite: cytd_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g1p_e with default bounds for boundary metabolite: g1p_e.
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglyg
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Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gsn_e with default bounds for boundary metabolite: gsn_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglugl
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_meoh_e with default bounds for boundary metabolite: meoh_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mnl1p_e with default bounds for boundary metabolite: mnl1p_e.
Adding exchange reaction EX_mnl_e with default bounds for boundary metabolite: mnl_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
```

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Adding exchange reaction EX_urea_e with default bounds for boundary metabolite: urea_e.
Adding exchange reaction EX_uri_e with default bounds for boundary metabolite: uri_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_23camp_e' since it already exists.
Ignoring reaction 'EX_23ccmp_e' since it already exists.
Ignoring reaction 'EX_23cgmp_e' since it already exists.
Ignoring reaction 'EX_23cump_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_6pgc_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_adn_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala__D_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cell4_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cytd_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
```

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Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_g1p_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gsn_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_meoh_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mnl1p_e' since it already exists.
Ignoring reaction 'EX_mnl_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
```

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Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_urea_e' since it already exists.
Ignoring reaction 'EX_uri_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_15dap_e with default bounds for boundary metabolite: 15dap_e.
Adding exchange reaction EX_6pgc_e with default bounds for boundary metabolite: 6pgc_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala__D_e with default bounds for boundary metabolite: ala__D_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_citr__L_e with default bounds for boundary metabolite: citr__L_e
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
```

```
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_gly_pro__L_e with default bounds for boundary metabolite: gly_pr
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hco3_e with default bounds for boundary metabolite: hco3_e.
Adding exchange reaction EX_hom__L_e with default bounds for boundary metabolite: hom__L_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglugl
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malthx_e with default bounds for boundary metabolite: malthx_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_met_L_ala__L_e with default bounds for boundary metabolite: met_L
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mnl1p_e with default bounds for boundary metabolite: mnl1p_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nh4_e with default bounds for boundary metabolite: nh4_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_prohisglu_e with default bounds for boundary metabolite: prohisgl
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
```

```
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_15dap_e' since it already exists.
Ignoring reaction 'EX_6pgc_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala__D_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_citr__L_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_gly_pro__L_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hco3_e' since it already exists.
Ignoring reaction 'EX_hom__L_e' since it already exists.
```

```
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malthx_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_met_L_ala__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mnl1p_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nh4_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_prohisglu_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: l
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
```

```
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cyst__L_e with default bounds for boundary metabolite: cyst__L_e
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g6p_e with default bounds for boundary metabolite: g6p_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hco3_e with default bounds for boundary metabolite: hco3_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglugl
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mevR_e with default bounds for boundary metabolite: mevR_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nh4_e with default bounds for boundary metabolite: nh4_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
```

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Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_prohisglu_e with default bounds for boundary metabolite: prohisgl
Adding exchange reaction EX_pydxn_e with default bounds for boundary metabolite: pydxn_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
```

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Ignoring reaction 'EX_cyst__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_g6p_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hco3_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mevR_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nh4_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_prohisglu_e' since it already exists.
Ignoring reaction 'EX_pydxn_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
```

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Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: l
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acgam1p_e with default bounds for boundary metabolite: acgam1p_e
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cell4_e with default bounds for boundary metabolite: cell4_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g1p_e with default bounds for boundary metabolite: g1p_e.
```

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Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hom__L_e with default bounds for boundary metabolite: hom__L_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglugl
Adding exchange reaction EX_met_L_ala__L_e with default bounds for boundary metabolite: met_L
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdcea_e with default bounds for boundary metabolite: ocdcea_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
```

```
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acgam1p_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cell4_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_g1p_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hom__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
```

```
Ignoring reaction 'EX_met_L_ala__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdcea_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_ala__D_e with default bounds for boundary metabolite: ala__D_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cell4_e with default bounds for boundary metabolite: cell4_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
```

```
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g1p_e with default bounds for boundary metabolite: g1p_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glx_e with default bounds for boundary metabolite: glx_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mnl_e with default bounds for boundary metabolite: mnl_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_ppi_e with default bounds for boundary metabolite: ppi_e.
```

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Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_salchs2_e with default bounds for boundary metabolite: salchs2_e
Adding exchange reaction EX_salchs2fe_e with default bounds for boundary metabolite: salchs2
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tre6p_e with default bounds for boundary metabolite: tre6p_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_urea_e with default bounds for boundary metabolite: urea_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_ala__D_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cell4_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
```

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Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_g1p_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glx_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mnl_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_ppi_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_salchs2_e' since it already exists.
Ignoring reaction 'EX_salchs2fe_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tre6p_e' since it already exists.
```

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Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_urea_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_15dap_e with default bounds for boundary metabolite: 15dap_e.
Adding exchange reaction EX_23camp_e with default bounds for boundary metabolite: 23camp_e.
Adding exchange reaction EX_23ccmp_e with default bounds for boundary metabolite: 23ccmp_e.
Adding exchange reaction EX_23cgmp_e with default bounds for boundary metabolite: 23cgmp_e.
Adding exchange reaction EX_23cump_e with default bounds for boundary metabolite: 23cump_e.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_4abut_e with default bounds for boundary metabolite: 4abut_e.
Adding exchange reaction EX_4abz_e with default bounds for boundary metabolite: 4abz_e.
Adding exchange reaction EX_4abzglu_e with default bounds for boundary metabolite: 4abzglu_e
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3httdca_e with default bounds for boundary metabolite: R_3httdc
Adding exchange reaction EX_abt__D_e with default bounds for boundary metabolite: abt__D_e.
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acgam_e with default bounds for boundary metabolite: acgam_e.
Adding exchange reaction EX_acglu_e with default bounds for boundary metabolite: acglu_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_ade_e with default bounds for boundary metabolite: ade_e.
Adding exchange reaction EX_adn_e with default bounds for boundary metabolite: adn_e.
Adding exchange reaction EX_agm_e with default bounds for boundary metabolite: agm_e.
Adding exchange reaction EX_airs_e with default bounds for boundary metabolite: airs_e.
Adding exchange reaction EX_ala_B_e with default bounds for boundary metabolite: ala_B_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_alltn_e with default bounds for boundary metabolite: alltn_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arab__L_e with default bounds for boundary metabolite: arab__L_e
Adding exchange reaction EX_arbt_e with default bounds for boundary metabolite: arbt_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_aso3_e with default bounds for boundary metabolite: aso3_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
```

```
Adding exchange reaction EX_cell4_e with default bounds for boundary metabolite: cell4_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cpgn_e with default bounds for boundary metabolite: cpgn_e.
Adding exchange reaction EX_cpgn_un_e with default bounds for boundary metabolite: cpgn_un_e
Adding exchange reaction EX_crn_e with default bounds for boundary metabolite: crn_e.
Adding exchange reaction EX_csn_e with default bounds for boundary metabolite: csn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cu_e with default bounds for boundary metabolite: cu_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cyst__L_e with default bounds for boundary metabolite: cyst__L_e
Adding exchange reaction EX_cytd_e with default bounds for boundary metabolite: cytd_e.
Adding exchange reaction EX_dca_e with default bounds for boundary metabolite: dca_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_drib_e with default bounds for boundary metabolite: drib_e.
Adding exchange reaction EX_enter_e with default bounds for boundary metabolite: enter_e.
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3dcit_e with default bounds for boundary metabolite: fe3dcit_e
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fmn_e with default bounds for boundary metabolite: fmn_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_forglu_e with default bounds for boundary metabolite: forglu_e.
Adding exchange reaction EX_fruur_e with default bounds for boundary metabolite: fruur_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pc_e with default bounds for boundary metabolite: g3pc_e.
Adding exchange reaction EX_g3pe_e with default bounds for boundary metabolite: g3pe_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D_
Adding exchange reaction EX_galctn__D_e with default bounds for boundary metabolite: galctn__
Adding exchange reaction EX_gam6p_e with default bounds for boundary metabolite: gam6p_e.
Adding exchange reaction EX_glc__D_e with default bounds for boundary metabolite: glc__D_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
```

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Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_glyald_e with default bounds for boundary metabolite: glyald_e.
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_glyc__R_e with default bounds for boundary metabolite: glyc__R_e
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gsn_e with default bounds for boundary metabolite: gsn_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hdca_e with default bounds for boundary metabolite: hdca_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hqn_e with default bounds for boundary metabolite: hqn_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__D_e with default bounds for boundary metabolite: lys__D_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malt_e with default bounds for boundary metabolite: malt_e.
Adding exchange reaction EX_malthp_e with default bounds for boundary metabolite: malthp_e.
Adding exchange reaction EX_malthx_e with default bounds for boundary metabolite: malthx_e.
Adding exchange reaction EX_malttr_e with default bounds for boundary metabolite: malttr_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_met__D_e with default bounds for boundary metabolite: met__D_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mnl_e with default bounds for boundary metabolite: mnl_e.
Adding exchange reaction EX_ncam_e with default bounds for boundary metabolite: ncam_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdca_e with default bounds for boundary metabolite: ocdca_e.
Adding exchange reaction EX_ocdcea_e with default bounds for boundary metabolite: ocdcea_e.
Adding exchange reaction EX_octa_e with default bounds for boundary metabolite: octa_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_orn_e with default bounds for boundary metabolite: orn_e.
```

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Adding exchange reaction EX_pac_e with default bounds for boundary metabolite: pac_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_ptrc_e with default bounds for boundary metabolite: ptrc_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_rbt_e with default bounds for boundary metabolite: rbt_e.
Adding exchange reaction EX_rib__D_e with default bounds for boundary metabolite: rib__D_e.
Adding exchange reaction EX_ser__D_e with default bounds for boundary metabolite: ser__D_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_sucr_e with default bounds for boundary metabolite: sucr_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_tartr__D_e with default bounds for boundary metabolite: tartr__D
Adding exchange reaction EX_taur_e with default bounds for boundary metabolite: taur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tre6p_e with default bounds for boundary metabolite: tre6p_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttdca_e with default bounds for boundary metabolite: ttdca_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_uri_e with default bounds for boundary metabolite: uri_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_xylu__L_e with default bounds for boundary metabolite: xylu__L_e
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_15dap_e' since it already exists.
Ignoring reaction 'EX_23camp_e' since it already exists.
Ignoring reaction 'EX_23ccmp_e' since it already exists.
Ignoring reaction 'EX_23cgmp_e' since it already exists.
Ignoring reaction 'EX_23cump_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
```

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Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_4abut_e' since it already exists.
Ignoring reaction 'EX_4abz_e' since it already exists.
Ignoring reaction 'EX_4abzglu_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3httdca_e' since it already exists.
Ignoring reaction 'EX_abt__D_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acgam_e' since it already exists.
Ignoring reaction 'EX_acglu_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_ade_e' since it already exists.
Ignoring reaction 'EX_adn_e' since it already exists.
Ignoring reaction 'EX_agm_e' since it already exists.
Ignoring reaction 'EX_airs_e' since it already exists.
Ignoring reaction 'EX_ala_B_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_alltn_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arab__L_e' since it already exists.
Ignoring reaction 'EX_arbt_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_aso3_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cell4_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cpgn_e' since it already exists.
Ignoring reaction 'EX_cpgn_un_e' since it already exists.
Ignoring reaction 'EX_crn_e' since it already exists.
Ignoring reaction 'EX_csn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
```

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Ignoring reaction 'EX_cu_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cyst__L_e' since it already exists.
Ignoring reaction 'EX_cytd_e' since it already exists.
Ignoring reaction 'EX_dca_e' since it already exists.
Ignoring reaction 'EX_drib_e' since it already exists.
Ignoring reaction 'EX_enter_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3dcit_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fmn_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_forglu_e' since it already exists.
Ignoring reaction 'EX_fruur_e' since it already exists.
Ignoring reaction 'EX_g3pc_e' since it already exists.
Ignoring reaction 'EX_g3pe_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctn__D_e' since it already exists.
Ignoring reaction 'EX_gam6p_e' since it already exists.
Ignoring reaction 'EX_glc__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_glyald_e' since it already exists.
Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_glyc__R_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gsn_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hdca_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hqn_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
```

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Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__D_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malt_e' since it already exists.
Ignoring reaction 'EX_malthp_e' since it already exists.
Ignoring reaction 'EX_malthx_e' since it already exists.
Ignoring reaction 'EX_malttr_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_met__D_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mnl_e' since it already exists.
Ignoring reaction 'EX_ncam_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdca_e' since it already exists.
Ignoring reaction 'EX_ocdcea_e' since it already exists.
Ignoring reaction 'EX_octa_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_orn_e' since it already exists.
Ignoring reaction 'EX_pac_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_ptrc_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_rbt_e' since it already exists.
Ignoring reaction 'EX_rib__D_e' since it already exists.
Ignoring reaction 'EX_ser__D_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
```

```
Ignoring reaction 'EX_sucr_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_tartr__D_e' since it already exists.
Ignoring reaction 'EX_taur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tre6p_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_ttdca_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_uri_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_xylu__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_15dap_e with default bounds for boundary metabolite: 15dap_e.
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lala
Adding exchange reaction EX_R_3hocta_e with default bounds for boundary metabolite: R_3hocta_
Adding exchange reaction EX_R_3httdca_e with default bounds for boundary metabolite: R_3httd
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmcbtt_e with default bounds for boundary metabolite: cmcbtt_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
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Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dca_e with default bounds for boundary metabolite: dca_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_glyc3p_e with default bounds for boundary metabolite: glyc3p_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_icit_e with default bounds for boundary metabolite: icit_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_octa_e with default bounds for boundary metabolite: octa_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
```

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Adding exchange reaction EX_prohisglu_e with default bounds for boundary metabolite: prohisgl
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_salc_e with default bounds for boundary metabolite: salc_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_sucr_e with default bounds for boundary metabolite: sucr_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tre6p_e with default bounds for boundary metabolite: tre6p_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_15dap_e' since it already exists.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_R_3hocta_e' since it already exists.
Ignoring reaction 'EX_R_3httdca_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmcbtt_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
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Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dca_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_glyc3p_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_icit_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_octa_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_prohisglu_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_salc_e' since it already exists.
```

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Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_sucr_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tre6p_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
Adding exchange reaction EX_4abz_e with default bounds for boundary metabolite: 4abz_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_R_3hdcaa_e with default bounds for boundary metabolite: R_3hdcaa_
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_citr__L_e with default bounds for boundary metabolite: citr__L_e
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crn_e with default bounds for boundary metabolite: crn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dca_e with default bounds for boundary metabolite: dca_e.
```

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Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_glc__D_e with default bounds for boundary metabolite: glc__D_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_glx_e with default bounds for boundary metabolite: glx_e.
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hdca_e with default bounds for boundary metabolite: hdca_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malthp_e with default bounds for boundary metabolite: malthp_e.
Adding exchange reaction EX_malttr_e with default bounds for boundary metabolite: malttr_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdca_e with default bounds for boundary metabolite: ocdca_e.
```

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Adding exchange reaction EX_ocdcea_e with default bounds for boundary metabolite: ocdcea_e.
Adding exchange reaction EX_octa_e with default bounds for boundary metabolite: octa_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttdca_e with default bounds for boundary metabolite: ttdca_e.
Adding exchange reaction EX_tton_e with default bounds for boundary metabolite: tton_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_4abz_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_R_3hdcaa_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_citr__L_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
```

```
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dca_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_glc__D_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_glx_e' since it already exists.
Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hdca_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malthp_e' since it already exists.
Ignoring reaction 'EX_malttr_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
```

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Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdca_e' since it already exists.
Ignoring reaction 'EX_ocdcea_e' since it already exists.
Ignoring reaction 'EX_octa_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_ttdca_e' since it already exists.
Ignoring reaction 'EX_tton_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_12ppd__R_e with default bounds for boundary metabolite: 12ppd__R
Adding exchange reaction EX_14glucan_e with default bounds for boundary metabolite: 14glucan
Adding exchange reaction EX_15dap_e with default bounds for boundary metabolite: 15dap_e.
Adding exchange reaction EX_23camp_e with default bounds for boundary metabolite: 23camp_e.
Adding exchange reaction EX_23ccmp_e with default bounds for boundary metabolite: 23ccmp_e.
Adding exchange reaction EX_23cgmp_e with default bounds for boundary metabolite: 23cgmp_e.
Adding exchange reaction EX_23cump_e with default bounds for boundary metabolite: 23cump_e.
Adding exchange reaction EX_23dappa_e with default bounds for boundary metabolite: 23dappa_e
Adding exchange reaction EX_23dhbzs3_e with default bounds for boundary metabolite: 23dhbzs3
Adding exchange reaction EX_26dap__M_e with default bounds for boundary metabolite: 26dap__M
Adding exchange reaction EX_2ameph_e with default bounds for boundary metabolite: 2ameph_e.
Adding exchange reaction EX_2ddglcn_e with default bounds for boundary metabolite: 2ddglcn_e
Adding exchange reaction EX_2dhglcn_e with default bounds for boundary metabolite: 2dhglcn_e
Adding exchange reaction EX_2hxmp_e with default bounds for boundary metabolite: 2hxmp_e.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
```

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Adding exchange reaction EX_2pg_e with default bounds for boundary metabolite: 2pg_e.
Adding exchange reaction EX_2pglyc_e with default bounds for boundary metabolite: 2pglyc_e.
Adding exchange reaction EX_34dhbz_e with default bounds for boundary metabolite: 34dhbz_e.
Adding exchange reaction EX_34dhpac_e with default bounds for boundary metabolite: 34dhpac_e
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_3amp_e with default bounds for boundary metabolite: 3amp_e.
Adding exchange reaction EX_3cmp_e with default bounds for boundary metabolite: 3cmp_e.
Adding exchange reaction EX_3gmp_e with default bounds for boundary metabolite: 3gmp_e.
Adding exchange reaction EX_3hcinnm_e with default bounds for boundary metabolite: 3hcinnm_e
Adding exchange reaction EX_3hoxpac_e with default bounds for boundary metabolite: 3hoxpac_e
Adding exchange reaction EX_3hpppn_e with default bounds for boundary metabolite: 3hpppn_e.
Adding exchange reaction EX_3mb_e with default bounds for boundary metabolite: 3mb_e.
Adding exchange reaction EX_3pg_e with default bounds for boundary metabolite: 3pg_e.
Adding exchange reaction EX_3ump_e with default bounds for boundary metabolite: 3ump_e.
Adding exchange reaction EX_4abut_e with default bounds for boundary metabolite: 4abut_e.
Adding exchange reaction EX_4abzglu_e with default bounds for boundary metabolite: 4abzglu_e
Adding exchange reaction EX_4hba_e with default bounds for boundary metabolite: 4hba_e.
Adding exchange reaction EX_4hbald_e with default bounds for boundary metabolite: 4hbald_e.
Adding exchange reaction EX_4hbz_e with default bounds for boundary metabolite: 4hbz_e.
Adding exchange reaction EX_4hoxpac_e with default bounds for boundary metabolite: 4hoxpac_e
Adding exchange reaction EX_4hoxpacd_e with default bounds for boundary metabolite: 4hoxpacd
Adding exchange reaction EX_4hphac_e with default bounds for boundary metabolite: 4hphac_e.
Adding exchange reaction EX_4hpro_LT_e with default bounds for boundary metabolite: 4hpro_LT
Adding exchange reaction EX_4hthr_e with default bounds for boundary metabolite: 4hthr_e.
Adding exchange reaction EX_4oxptn_e with default bounds for boundary metabolite: 4oxptn_e.
Adding exchange reaction EX_5dglcn_e with default bounds for boundary metabolite: 5dglcn_e.
Adding exchange reaction EX_5mtr_e with default bounds for boundary metabolite: 5mtr_e.
Adding exchange reaction EX_6apa_e with default bounds for boundary metabolite: 6apa_e.
Adding exchange reaction EX_6hnac_e with default bounds for boundary metabolite: 6hnac_e.
Adding exchange reaction EX_6pgc_e with default bounds for boundary metabolite: 6pgc_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: LalaL
Adding exchange reaction EX_LalaDglu_e with default bounds for boundary metabolite: LalaDglu
Adding exchange reaction EX_LalaLglu_e with default bounds for boundary metabolite: LalaLglu
Adding exchange reaction EX_Lcyst_e with default bounds for boundary metabolite: Lcyst_e.
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e
Adding exchange reaction EX_abt__D_e with default bounds for boundary metabolite: abt__D_e.
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acac_e with default bounds for boundary metabolite: acac_e.
Adding exchange reaction EX_acald_e with default bounds for boundary metabolite: acald_e.
Adding exchange reaction EX_acgal1p_e with default bounds for boundary metabolite: acgal1p_e
Adding exchange reaction EX_acgal_e with default bounds for boundary metabolite: acgal_e.
Adding exchange reaction EX_acgam1p_e with default bounds for boundary metabolite: acgam1p_e
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Adding exchange reaction EX_acgam_e with default bounds for boundary metabolite: acgam_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_acmum_e with default bounds for boundary metabolite: acmum_e.
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_acon_C_e with default bounds for boundary metabolite: acon_C_e.
Adding exchange reaction EX_acser_e with default bounds for boundary metabolite: acser_e.
Adding exchange reaction EX_actn__R_e with default bounds for boundary metabolite: actn__R_e
Adding exchange reaction EX_ade_e with default bounds for boundary metabolite: ade_e.
Adding exchange reaction EX_agm_e with default bounds for boundary metabolite: agm_e.
Adding exchange reaction EX_airs_e with default bounds for boundary metabolite: airs_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala_B_e with default bounds for boundary metabolite: ala_B_e.
Adding exchange reaction EX_ala__D_e with default bounds for boundary metabolite: ala__D_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_all__D_e with default bounds for boundary metabolite: all__D_e.
Adding exchange reaction EX_alltn_e with default bounds for boundary metabolite: alltn_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arab__D_e with default bounds for boundary metabolite: arab__D_e
Adding exchange reaction EX_arab__L_e with default bounds for boundary metabolite: arab__L_e
Adding exchange reaction EX_arbt_e with default bounds for boundary metabolite: arbt_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_ascb__L_e with default bounds for boundary metabolite: ascb__L_e
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_aso3_e with default bounds for boundary metabolite: aso3_e.
Adding exchange reaction EX_aso4_e with default bounds for boundary metabolite: aso4_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_btn_e with default bounds for boundary metabolite: btn_e.
Adding exchange reaction EX_btoh_e with default bounds for boundary metabolite: btoh_e.
Adding exchange reaction EX_but_e with default bounds for boundary metabolite: but_e.
Adding exchange reaction EX_butso3_e with default bounds for boundary metabolite: butso3_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_bzal_e with default bounds for boundary metabolite: bzal_e.
Adding exchange reaction EX_bzalc_e with default bounds for boundary metabolite: bzalc_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cd2_e with default bounds for boundary metabolite: cd2_e.
Adding exchange reaction EX_cell4_e with default bounds for boundary metabolite: cell4_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
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Adding exchange reaction EX_chols_e with default bounds for boundary metabolite: chols_e.
Adding exchange reaction EX_chtbs_e with default bounds for boundary metabolite: chtbs_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmcbtt_e with default bounds for boundary metabolite: cmcbtt_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crn_e with default bounds for boundary metabolite: crn_e.
Adding exchange reaction EX_cro4_e with default bounds for boundary metabolite: cro4_e.
Adding exchange reaction EX_csn_e with default bounds for boundary metabolite: csn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cu_e with default bounds for boundary metabolite: cu_e.
Adding exchange reaction EX_cyan_e with default bounds for boundary metabolite: cyan_e.
Adding exchange reaction EX_cynt_e with default bounds for boundary metabolite: cynt_e.
Adding exchange reaction EX_cys__D_e with default bounds for boundary metabolite: cys__D_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cytd_e with default bounds for boundary metabolite: cytd_e.
Adding exchange reaction EX_damp_e with default bounds for boundary metabolite: damp_e.
Adding exchange reaction EX_dca_e with default bounds for boundary metabolite: dca_e.
Adding exchange reaction EX_dcmp_e with default bounds for boundary metabolite: dcmp_e.
Adding exchange reaction EX_ddca_e with default bounds for boundary metabolite: ddca_e.
Adding exchange reaction EX_dgmp_e with default bounds for boundary metabolite: dgmp_e.
Adding exchange reaction EX_dgsn_e with default bounds for boundary metabolite: dgsn_e.
Adding exchange reaction EX_dha_e with default bounds for boundary metabolite: dha_e.
Adding exchange reaction EX_dimp_e with default bounds for boundary metabolite: dimp_e.
Adding exchange reaction EX_din_e with default bounds for boundary metabolite: din_e.
Adding exchange reaction EX_dms_e with default bounds for boundary metabolite: dms_e.
Adding exchange reaction EX_dmso2_e with default bounds for boundary metabolite: dmso2_e.
Adding exchange reaction EX_dmso_e with default bounds for boundary metabolite: dmso_e.
Adding exchange reaction EX_dopa_e with default bounds for boundary metabolite: dopa_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_drib_e with default bounds for boundary metabolite: drib_e.
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_dump_e with default bounds for boundary metabolite: dump_e.
Adding exchange reaction EX_ecto__L_e with default bounds for boundary metabolite: ecto__L_e
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_ethso3_e with default bounds for boundary metabolite: ethso3_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fad_e with default bounds for boundary metabolite: fad_e.
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Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fcmcbtt_e with default bounds for boundary metabolite: fcmcbtt_e
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3dcit_e with default bounds for boundary metabolite: fe3dcit_e
Adding exchange reaction EX_fe3dhbzs3_e with default bounds for boundary metabolite: fe3dhbzs
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_feenter_e with default bounds for boundary metabolite: feenter_e
Adding exchange reaction EX_fmn_e with default bounds for boundary metabolite: fmn_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_frmd_e with default bounds for boundary metabolite: frmd_e.
Adding exchange reaction EX_fru_e with default bounds for boundary metabolite: fru_e.
Adding exchange reaction EX_frulys_e with default bounds for boundary metabolite: frulys_e.
Adding exchange reaction EX_fruur_e with default bounds for boundary metabolite: fruur_e.
Adding exchange reaction EX_fuc__L_e with default bounds for boundary metabolite: fuc__L_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g1p_e with default bounds for boundary metabolite: g1p_e.
Adding exchange reaction EX_g3pc_e with default bounds for boundary metabolite: g3pc_e.
Adding exchange reaction EX_g3pe_e with default bounds for boundary metabolite: g3pe_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_g3pi_e with default bounds for boundary metabolite: g3pi_e.
Adding exchange reaction EX_g3ps_e with default bounds for boundary metabolite: g3ps_e.
Adding exchange reaction EX_g6p_e with default bounds for boundary metabolite: g6p_e.
Adding exchange reaction EX_gal1p_e with default bounds for boundary metabolite: gal1p_e.
Adding exchange reaction EX_gal_bD_e with default bounds for boundary metabolite: gal_bD_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_galam_e with default bounds for boundary metabolite: galam_e.
Adding exchange reaction EX_galct__D_e with default bounds for boundary metabolite: galct__D
Adding exchange reaction EX_galctn__D_e with default bounds for boundary metabolite: galctn_
Adding exchange reaction EX_galctn__L_e with default bounds for boundary metabolite: galctn_
Adding exchange reaction EX_galt_e with default bounds for boundary metabolite: galt_e.
Adding exchange reaction EX_galur_e with default bounds for boundary metabolite: galur_e.
Adding exchange reaction EX_gam6p_e with default bounds for boundary metabolite: gam6p_e.
Adding exchange reaction EX_gam_e with default bounds for boundary metabolite: gam_e.
Adding exchange reaction EX_gbbtn_e with default bounds for boundary metabolite: gbbtn_e.
Adding exchange reaction EX_gdp_e with default bounds for boundary metabolite: gdp_e.
Adding exchange reaction EX_glc__D_e with default bounds for boundary metabolite: glc__D_e.
Adding exchange reaction EX_glcn__D_e with default bounds for boundary metabolite: glcn__D_e
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glcr_e with default bounds for boundary metabolite: glcr_e.
Adding exchange reaction EX_glcur1p_e with default bounds for boundary metabolite: glcur1p_e
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Adding exchange reaction EX_glcur_e with default bounds for boundary metabolite: glcur_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_glx_e with default bounds for boundary metabolite: glx_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_glyc2p_e with default bounds for boundary metabolite: glyc2p_e.
Adding exchange reaction EX_glyc3p_e with default bounds for boundary metabolite: glyc3p_e.
Adding exchange reaction EX_glyc__R_e with default bounds for boundary metabolite: glyc__R_e
Adding exchange reaction EX_glyc_e with default bounds for boundary metabolite: glyc_e.
Adding exchange reaction EX_glyclt_e with default bounds for boundary metabolite: glyclt_e.
Adding exchange reaction EX_glygly_e with default bounds for boundary metabolite: glygly_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gsn_e with default bounds for boundary metabolite: gsn_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_gtp_e with default bounds for boundary metabolite: gtp_e.
Adding exchange reaction EX_gua_e with default bounds for boundary metabolite: gua_e.
Adding exchange reaction EX_guln__L_e with default bounds for boundary metabolite: guln__L_e
Adding exchange reaction EX_h2_e with default bounds for boundary metabolite: h2_e.
Adding exchange reaction EX_h2o2_e with default bounds for boundary metabolite: h2o2_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hco3_e with default bounds for boundary metabolite: hco3_e.
Adding exchange reaction EX_hdca_e with default bounds for boundary metabolite: hdca_e.
Adding exchange reaction EX_hdcea_e with default bounds for boundary metabolite: hdcea_e.
Adding exchange reaction EX_hg2_e with default bounds for boundary metabolite: hg2_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hom__L_e with default bounds for boundary metabolite: hom__L_e.
Adding exchange reaction EX_hqn_e with default bounds for boundary metabolite: hqn_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_ibt_e with default bounds for boundary metabolite: ibt_e.
Adding exchange reaction EX_icit_e with default bounds for boundary metabolite: icit_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_idon__L_e with default bounds for boundary metabolite: idon__L_e
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_imp_e with default bounds for boundary metabolite: imp_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_isetac_e with default bounds for boundary metabolite: isetac_e.
Adding exchange reaction EX_isobuta_e with default bounds for boundary metabolite: isobuta_e
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Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lac__D_e with default bounds for boundary metabolite: lac__D_e.
Adding exchange reaction EX_lac__L_e with default bounds for boundary metabolite: lac__L_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_leuleu_e with default bounds for boundary metabolite: leuleu_e.
Adding exchange reaction EX_lipoate_e with default bounds for boundary metabolite: lipoate_e
Adding exchange reaction EX_lys__D_e with default bounds for boundary metabolite: lys__D_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_lyx__L_e with default bounds for boundary metabolite: lyx__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__D_e with default bounds for boundary metabolite: mal__D_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malt_e with default bounds for boundary metabolite: malt_e.
Adding exchange reaction EX_malthp_e with default bounds for boundary metabolite: malthp_e.
Adding exchange reaction EX_malthx_e with default bounds for boundary metabolite: malthx_e.
Adding exchange reaction EX_maltpt_e with default bounds for boundary metabolite: maltpt_e.
Adding exchange reaction EX_malttr_e with default bounds for boundary metabolite: malttr_e.
Adding exchange reaction EX_maltttr_e with default bounds for boundary metabolite: maltttr_e
Adding exchange reaction EX_man6p_e with default bounds for boundary metabolite: man6p_e.
Adding exchange reaction EX_man_e with default bounds for boundary metabolite: man_e.
Adding exchange reaction EX_manglyc_e with default bounds for boundary metabolite: manglyc_e
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_meoh_e with default bounds for boundary metabolite: meoh_e.
Adding exchange reaction EX_met__D_e with default bounds for boundary metabolite: met__D_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_metglcur_e with default bounds for boundary metabolite: metglcur
Adding exchange reaction EX_metsox_R__L_e with default bounds for boundary metabolite: metsox
Adding exchange reaction EX_metsox_S__L_e with default bounds for boundary metabolite: metsox
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mmet_e with default bounds for boundary metabolite: mmet_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mnl_e with default bounds for boundary metabolite: mnl_e.
Adding exchange reaction EX_mobd_e with default bounds for boundary metabolite: mobd_e.
Adding exchange reaction EX_mso3_e with default bounds for boundary metabolite: mso3_e.
Adding exchange reaction EX_mththf_e with default bounds for boundary metabolite: mththf_e.
Adding exchange reaction EX_n2o_e with default bounds for boundary metabolite: n2o_e.
Adding exchange reaction EX_na1_e with default bounds for boundary metabolite: na1_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nh4_e with default bounds for boundary metabolite: nh4_e.
Adding exchange reaction EX_ni2_e with default bounds for boundary metabolite: ni2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
```

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Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_no_e with default bounds for boundary metabolite: no_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_o2s_e with default bounds for boundary metabolite: o2s_e.
Adding exchange reaction EX_oaa_e with default bounds for boundary metabolite: oaa_e.
Adding exchange reaction EX_ocdca_e with default bounds for boundary metabolite: ocdca_e.
Adding exchange reaction EX_ocdcea_e with default bounds for boundary metabolite: ocdcea_e.
Adding exchange reaction EX_octa_e with default bounds for boundary metabolite: octa_e.
Adding exchange reaction EX_orn__D_e with default bounds for boundary metabolite: orn__D_e.
Adding exchange reaction EX_orn_e with default bounds for boundary metabolite: orn_e.
Adding exchange reaction EX_orot_e with default bounds for boundary metabolite: orot_e.
Adding exchange reaction EX_oxa_e with default bounds for boundary metabolite: oxa_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pac_e with default bounds for boundary metabolite: pac_e.
Adding exchange reaction EX_pacald_e with default bounds for boundary metabolite: pacald_e.
Adding exchange reaction EX_peamn_e with default bounds for boundary metabolite: peamn_e.
Adding exchange reaction EX_peng_e with default bounds for boundary metabolite: peng_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pheme_e with default bounds for boundary metabolite: pheme_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pime_e with default bounds for boundary metabolite: pime_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_ppa_e with default bounds for boundary metabolite: ppa_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_ppi_e with default bounds for boundary metabolite: ppi_e.
Adding exchange reaction EX_pppn_e with default bounds for boundary metabolite: pppn_e.
Adding exchange reaction EX_ppt_e with default bounds for boundary metabolite: ppt_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_pser__L_e with default bounds for boundary metabolite: pser__L_e
Adding exchange reaction EX_psuri_e with default bounds for boundary metabolite: psuri_e.
Adding exchange reaction EX_pta_e with default bounds for boundary metabolite: pta_e.
Adding exchange reaction EX_ptrc_e with default bounds for boundary metabolite: ptrc_e.
Adding exchange reaction EX_pydam_e with default bounds for boundary metabolite: pydam_e.
Adding exchange reaction EX_pydx_e with default bounds for boundary metabolite: pydx_e.
Adding exchange reaction EX_pydxn_e with default bounds for boundary metabolite: pydxn_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_r5p_e with default bounds for boundary metabolite: r5p_e.
Adding exchange reaction EX_raffin_e with default bounds for boundary metabolite: raffin_e.
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Adding exchange reaction EX_rbt_e with default bounds for boundary metabolite: rbt_e.
Adding exchange reaction EX_rib__D_e with default bounds for boundary metabolite: rib__D_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_rmn_e with default bounds for boundary metabolite: rmn_e.
Adding exchange reaction EX_s_e with default bounds for boundary metabolite: s_e.
Adding exchange reaction EX_salchs2_e with default bounds for boundary metabolite: salchs2_e
Adding exchange reaction EX_salchs2fe_e with default bounds for boundary metabolite: salchs2
Adding exchange reaction EX_salchs4fe_e with default bounds for boundary metabolite: salchs4
Adding exchange reaction EX_salchsx_e with default bounds for boundary metabolite: salchsx_e
Adding exchange reaction EX_salcn_e with default bounds for boundary metabolite: salcn_e.
Adding exchange reaction EX_sbt__D_e with default bounds for boundary metabolite: sbt__D_e.
Adding exchange reaction EX_sel_e with default bounds for boundary metabolite: sel_e.
Adding exchange reaction EX_ser__D_e with default bounds for boundary metabolite: ser__D_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_skm_e with default bounds for boundary metabolite: skm_e.
Adding exchange reaction EX_slnt_e with default bounds for boundary metabolite: slnt_e.
Adding exchange reaction EX_so3_e with default bounds for boundary metabolite: so3_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_spmd_e with default bounds for boundary metabolite: spmd_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_sucr_e with default bounds for boundary metabolite: sucr_e.
Adding exchange reaction EX_sulfac_e with default bounds for boundary metabolite: sulfac_e.
Adding exchange reaction EX_tag__D_e with default bounds for boundary metabolite: tag__D_e.
Adding exchange reaction EX_tartr__D_e with default bounds for boundary metabolite: tartr__D
Adding exchange reaction EX_tartr__L_e with default bounds for boundary metabolite: tartr__L
Adding exchange reaction EX_taur_e with default bounds for boundary metabolite: taur_e.
Adding exchange reaction EX_tcynt_e with default bounds for boundary metabolite: tcynt_e.
Adding exchange reaction EX_tet_e with default bounds for boundary metabolite: tet_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_thrp_e with default bounds for boundary metabolite: thrp_e.
Adding exchange reaction EX_thym_e with default bounds for boundary metabolite: thym_e.
Adding exchange reaction EX_thymd_e with default bounds for boundary metabolite: thymd_e.
Adding exchange reaction EX_tma_e with default bounds for boundary metabolite: tma_e.
Adding exchange reaction EX_tmao_e with default bounds for boundary metabolite: tmao_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_tsul_e with default bounds for boundary metabolite: tsul_e.
Adding exchange reaction EX_ttdca_e with default bounds for boundary metabolite: ttdca_e.
Adding exchange reaction EX_ttdcea_e with default bounds for boundary metabolite: ttdcea_e.
Adding exchange reaction EX_tton_e with default bounds for boundary metabolite: tton_e.
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Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tym_e with default bounds for boundary metabolite: tym_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_tyrp_e with default bounds for boundary metabolite: tyrp_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_uacgam_e with default bounds for boundary metabolite: uacgam_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_udpacgal_e with default bounds for boundary metabolite: udpacgal
Adding exchange reaction EX_udpg_e with default bounds for boundary metabolite: udpg_e.
Adding exchange reaction EX_udpgal_e with default bounds for boundary metabolite: udpgal_e.
Adding exchange reaction EX_udpglcur_e with default bounds for boundary metabolite: udpglcur
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_urate_e with default bounds for boundary metabolite: urate_e.
Adding exchange reaction EX_urea_e with default bounds for boundary metabolite: urea_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_xan_e with default bounds for boundary metabolite: xan_e.
Adding exchange reaction EX_xmp_e with default bounds for boundary metabolite: xmp_e.
Adding exchange reaction EX_xtsn_e with default bounds for boundary metabolite: xtsn_e.
Adding exchange reaction EX_xyl__D_e with default bounds for boundary metabolite: xyl__D_e.
Adding exchange reaction EX_xylu__L_e with default bounds for boundary metabolite: xylu__L_e
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_12ppd__R_e' since it already exists.
Ignoring reaction 'EX_14glucan_e' since it already exists.
Ignoring reaction 'EX_15dap_e' since it already exists.
Ignoring reaction 'EX_23camp_e' since it already exists.
Ignoring reaction 'EX_23ccmp_e' since it already exists.
Ignoring reaction 'EX_23cgmp_e' since it already exists.
Ignoring reaction 'EX_23cump_e' since it already exists.
Ignoring reaction 'EX_23dappa_e' since it already exists.
Ignoring reaction 'EX_23dhbzs3_e' since it already exists.
Ignoring reaction 'EX_26dap__M_e' since it already exists.
Ignoring reaction 'EX_2ameph_e' since it already exists.
Ignoring reaction 'EX_2ddglcn_e' since it already exists.
Ignoring reaction 'EX_2dhglcn_e' since it already exists.
Ignoring reaction 'EX_2hxmp_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_2pg_e' since it already exists.
Ignoring reaction 'EX_2pglyc_e' since it already exists.
Ignoring reaction 'EX_34dhbz_e' since it already exists.
Ignoring reaction 'EX_34dhpac_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
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Ignoring reaction 'EX_3amp_e' since it already exists.
Ignoring reaction 'EX_3cmp_e' since it already exists.
Ignoring reaction 'EX_3gmp_e' since it already exists.
Ignoring reaction 'EX_3hcinnm_e' since it already exists.
Ignoring reaction 'EX_3hoxpac_e' since it already exists.
Ignoring reaction 'EX_3hpppn_e' since it already exists.
Ignoring reaction 'EX_3mb_e' since it already exists.
Ignoring reaction 'EX_3pg_e' since it already exists.
Ignoring reaction 'EX_3ump_e' since it already exists.
Ignoring reaction 'EX_4abut_e' since it already exists.
Ignoring reaction 'EX_4abzglu_e' since it already exists.
Ignoring reaction 'EX_4hba_e' since it already exists.
Ignoring reaction 'EX_4hbald_e' since it already exists.
Ignoring reaction 'EX_4hbz_e' since it already exists.
Ignoring reaction 'EX_4hoxpac_e' since it already exists.
Ignoring reaction 'EX_4hoxpacd_e' since it already exists.
Ignoring reaction 'EX_4hphac_e' since it already exists.
Ignoring reaction 'EX_4hpro_LT_e' since it already exists.
Ignoring reaction 'EX_4hthr_e' since it already exists.
Ignoring reaction 'EX_4oxptn_e' since it already exists.
Ignoring reaction 'EX_5dglcn_e' since it already exists.
Ignoring reaction 'EX_5mtr_e' since it already exists.
Ignoring reaction 'EX_6apa_e' since it already exists.
Ignoring reaction 'EX_6hnac_e' since it already exists.
Ignoring reaction 'EX_6pgc_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_LalaDglu_e' since it already exists.
Ignoring reaction 'EX_LalaLglu_e' since it already exists.
Ignoring reaction 'EX_Lcyst_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_abt__D_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acac_e' since it already exists.
Ignoring reaction 'EX_acald_e' since it already exists.
Ignoring reaction 'EX_acgal1p_e' since it already exists.
Ignoring reaction 'EX_acgal_e' since it already exists.
Ignoring reaction 'EX_acgam1p_e' since it already exists.
Ignoring reaction 'EX_acgam_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_acmum_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_acon_C_e' since it already exists.
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Ignoring reaction 'EX_acser_e' since it already exists.
Ignoring reaction 'EX_actn__R_e' since it already exists.
Ignoring reaction 'EX_ade_e' since it already exists.
Ignoring reaction 'EX_agm_e' since it already exists.
Ignoring reaction 'EX_airs_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala_B_e' since it already exists.
Ignoring reaction 'EX_ala__D_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_all__D_e' since it already exists.
Ignoring reaction 'EX_alltn_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arab__D_e' since it already exists.
Ignoring reaction 'EX_arab__L_e' since it already exists.
Ignoring reaction 'EX_arbt_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_ascb__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_aso3_e' since it already exists.
Ignoring reaction 'EX_aso4_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_btn_e' since it already exists.
Ignoring reaction 'EX_btoh_e' since it already exists.
Ignoring reaction 'EX_but_e' since it already exists.
Ignoring reaction 'EX_butso3_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_bzal_e' since it already exists.
Ignoring reaction 'EX_bzalc_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cell4_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_chols_e' since it already exists.
Ignoring reaction 'EX_chtbs_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmcbtt_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
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Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crn_e' since it already exists.
Ignoring reaction 'EX_csn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cu_e' since it already exists.
Ignoring reaction 'EX_cyan_e' since it already exists.
Ignoring reaction 'EX_cynt_e' since it already exists.
Ignoring reaction 'EX_cys__D_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cytd_e' since it already exists.
Ignoring reaction 'EX_damp_e' since it already exists.
Ignoring reaction 'EX_dca_e' since it already exists.
Ignoring reaction 'EX_dcmp_e' since it already exists.
Ignoring reaction 'EX_ddca_e' since it already exists.
Ignoring reaction 'EX_dgmp_e' since it already exists.
Ignoring reaction 'EX_dgsn_e' since it already exists.
Ignoring reaction 'EX_dha_e' since it already exists.
Ignoring reaction 'EX_dimp_e' since it already exists.
Ignoring reaction 'EX_din_e' since it already exists.
Ignoring reaction 'EX_dms_e' since it already exists.
Ignoring reaction 'EX_dmso2_e' since it already exists.
Ignoring reaction 'EX_dmso_e' since it already exists.
Ignoring reaction 'EX_dopa_e' since it already exists.
Ignoring reaction 'EX_drib_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_dump_e' since it already exists.
Ignoring reaction 'EX_ecto__L_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_ethso3_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fad_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fcmcbtt_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3dcit_e' since it already exists.
Ignoring reaction 'EX_fe3dhbzs3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_feenter_e' since it already exists.
Ignoring reaction 'EX_fmn_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
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Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_frmd_e' since it already exists.
Ignoring reaction 'EX_fru_e' since it already exists.
Ignoring reaction 'EX_frulys_e' since it already exists.
Ignoring reaction 'EX_fruur_e' since it already exists.
Ignoring reaction 'EX_fuc__L_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_g1p_e' since it already exists.
Ignoring reaction 'EX_g3pc_e' since it already exists.
Ignoring reaction 'EX_g3pe_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_g3pi_e' since it already exists.
Ignoring reaction 'EX_g3ps_e' since it already exists.
Ignoring reaction 'EX_g6p_e' since it already exists.
Ignoring reaction 'EX_gal1p_e' since it already exists.
Ignoring reaction 'EX_gal_bD_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_galam_e' since it already exists.
Ignoring reaction 'EX_galct__D_e' since it already exists.
Ignoring reaction 'EX_galctn__D_e' since it already exists.
Ignoring reaction 'EX_galctn__L_e' since it already exists.
Ignoring reaction 'EX_galt_e' since it already exists.
Ignoring reaction 'EX_galur_e' since it already exists.
Ignoring reaction 'EX_gam6p_e' since it already exists.
Ignoring reaction 'EX_gam_e' since it already exists.
Ignoring reaction 'EX_gdp_e' since it already exists.
Ignoring reaction 'EX_glc__D_e' since it already exists.
Ignoring reaction 'EX_glcn__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_glcr_e' since it already exists.
Ignoring reaction 'EX_glcur1p_e' since it already exists.
Ignoring reaction 'EX_glcur_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_glx_e' since it already exists.
Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_glyc2p_e' since it already exists.
Ignoring reaction 'EX_glyc3p_e' since it already exists.
Ignoring reaction 'EX_glyc__R_e' since it already exists.
Ignoring reaction 'EX_glyc_e' since it already exists.
Ignoring reaction 'EX_glyclt_e' since it already exists.
Ignoring reaction 'EX_glygly_e' since it already exists.
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Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gsn_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_gtp_e' since it already exists.
Ignoring reaction 'EX_gua_e' since it already exists.
Ignoring reaction 'EX_guln__L_e' since it already exists.
Ignoring reaction 'EX_h2_e' since it already exists.
Ignoring reaction 'EX_h2o2_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hco3_e' since it already exists.
Ignoring reaction 'EX_hdca_e' since it already exists.
Ignoring reaction 'EX_hdcea_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hom__L_e' since it already exists.
Ignoring reaction 'EX_hqn_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_ibt_e' since it already exists.
Ignoring reaction 'EX_icit_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_idon__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_imp_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_isetac_e' since it already exists.
Ignoring reaction 'EX_isobuta_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lac__D_e' since it already exists.
Ignoring reaction 'EX_lac__L_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_leuleu_e' since it already exists.
Ignoring reaction 'EX_lipoate_e' since it already exists.
Ignoring reaction 'EX_lys__D_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_lyx__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__D_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
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Ignoring reaction 'EX_malt_e' since it already exists.
Ignoring reaction 'EX_malthp_e' since it already exists.
Ignoring reaction 'EX_malthx_e' since it already exists.
Ignoring reaction 'EX_maltpt_e' since it already exists.
Ignoring reaction 'EX_malttr_e' since it already exists.
Ignoring reaction 'EX_maltttr_e' since it already exists.
Ignoring reaction 'EX_man6p_e' since it already exists.
Ignoring reaction 'EX_man_e' since it already exists.
Ignoring reaction 'EX_manglyc_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_meoh_e' since it already exists.
Ignoring reaction 'EX_met__D_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_metglcur_e' since it already exists.
Ignoring reaction 'EX_metsox_R__L_e' since it already exists.
Ignoring reaction 'EX_metsox_S__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mmet_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mnl_e' since it already exists.
Ignoring reaction 'EX_mobd_e' since it already exists.
Ignoring reaction 'EX_mso3_e' since it already exists.
Ignoring reaction 'EX_mththf_e' since it already exists.
Ignoring reaction 'EX_n2o_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nh4_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_no_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_o2s_e' since it already exists.
Ignoring reaction 'EX_oaa_e' since it already exists.
Ignoring reaction 'EX_ocdca_e' since it already exists.
Ignoring reaction 'EX_ocdcea_e' since it already exists.
Ignoring reaction 'EX_octa_e' since it already exists.
Ignoring reaction 'EX_orn__D_e' since it already exists.
Ignoring reaction 'EX_orn_e' since it already exists.
Ignoring reaction 'EX_orot_e' since it already exists.
Ignoring reaction 'EX_oxa_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pac_e' since it already exists.
Ignoring reaction 'EX_pacald_e' since it already exists.
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Ignoring reaction 'EX_peamn_e' since it already exists.
Ignoring reaction 'EX_peng_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pheme_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pime_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_ppa_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_ppi_e' since it already exists.
Ignoring reaction 'EX_pppn_e' since it already exists.
Ignoring reaction 'EX_ppt_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_pser__L_e' since it already exists.
Ignoring reaction 'EX_psuri_e' since it already exists.
Ignoring reaction 'EX_pta_e' since it already exists.
Ignoring reaction 'EX_ptrc_e' since it already exists.
Ignoring reaction 'EX_pydam_e' since it already exists.
Ignoring reaction 'EX_pydx_e' since it already exists.
Ignoring reaction 'EX_pydxn_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_r5p_e' since it already exists.
Ignoring reaction 'EX_raffin_e' since it already exists.
Ignoring reaction 'EX_rbt_e' since it already exists.
Ignoring reaction 'EX_rib__D_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_rmn_e' since it already exists.
Ignoring reaction 'EX_s_e' since it already exists.
Ignoring reaction 'EX_salchs2_e' since it already exists.
Ignoring reaction 'EX_salchs2fe_e' since it already exists.
Ignoring reaction 'EX_salchs4fe_e' since it already exists.
Ignoring reaction 'EX_salchsx_e' since it already exists.
Ignoring reaction 'EX_salcn_e' since it already exists.
Ignoring reaction 'EX_sbt__D_e' since it already exists.
Ignoring reaction 'EX_sel_e' since it already exists.
Ignoring reaction 'EX_ser__D_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_skm_e' since it already exists.
Ignoring reaction 'EX_slnt_e' since it already exists.
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Ignoring reaction 'EX_so3_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_spmd_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_sucr_e' since it already exists.
Ignoring reaction 'EX_sulfac_e' since it already exists.
Ignoring reaction 'EX_tag__D_e' since it already exists.
Ignoring reaction 'EX_tartr__D_e' since it already exists.
Ignoring reaction 'EX_tartr__L_e' since it already exists.
Ignoring reaction 'EX_taur_e' since it already exists.
Ignoring reaction 'EX_tcynt_e' since it already exists.
Ignoring reaction 'EX_tet_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_thrp_e' since it already exists.
Ignoring reaction 'EX_thym_e' since it already exists.
Ignoring reaction 'EX_thymd_e' since it already exists.
Ignoring reaction 'EX_tma_e' since it already exists.
Ignoring reaction 'EX_tmao_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tsul_e' since it already exists.
Ignoring reaction 'EX_ttdca_e' since it already exists.
Ignoring reaction 'EX_ttdcea_e' since it already exists.
Ignoring reaction 'EX_tton_e' since it already exists.
Ignoring reaction 'EX_tym_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_tyrp_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_uacgam_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_udpacgal_e' since it already exists.
Ignoring reaction 'EX_udpg_e' since it already exists.
Ignoring reaction 'EX_udpgal_e' since it already exists.
Ignoring reaction 'EX_udpglcur_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_urate_e' since it already exists.
Ignoring reaction 'EX_urea_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_xan_e' since it already exists.
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Ignoring reaction 'EX_xmp_e' since it already exists.
Ignoring reaction 'EX_xtsn_e' since it already exists.
Ignoring reaction 'EX_xyl__D_e' since it already exists.
Ignoring reaction 'EX_xylu__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: l
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: LalaD
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e_
Adding exchange reaction EX_R_3hdcaa_e with default bounds for boundary metabolite: R_3hdcaa_
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_airs_e with default bounds for boundary metabolite: airs_e.
Adding exchange reaction EX_ala__D_e with default bounds for boundary metabolite: ala__D_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cell4_e with default bounds for boundary metabolite: cell4_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dha_e with default bounds for boundary metabolite: dha_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g1p_e with default bounds for boundary metabolite: g1p_e.
```

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Adding exchange reaction EX_glx_e with default bounds for boundary metabolite: glx_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_met__D_e with default bounds for boundary metabolite: met__D_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mnl_e with default bounds for boundary metabolite: mnl_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_thym_e with default bounds for boundary metabolite: thym_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_urea_e with default bounds for boundary metabolite: urea_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
```

```
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_R_3hdcaa_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_airs_e' since it already exists.
Ignoring reaction 'EX_ala__D_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cell4_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dha_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_g1p_e' since it already exists.
Ignoring reaction 'EX_glx_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
```

```
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_met__D_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mnl_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_thym_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_urea_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: l
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala__D_e with default bounds for boundary metabolite: ala__D_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
```

```
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cyan_e with default bounds for boundary metabolite: cyan_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cyst__L_e with default bounds for boundary metabolite: cyst__L_e
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
```

```
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pydam_e with default bounds for boundary metabolite: pydam_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tcynt_e with default bounds for boundary metabolite: tcynt_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_tsul_e with default bounds for boundary metabolite: tsul_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala__D_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
```

```
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cyan_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cyst__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pydam_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
```

```
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tcynt_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tsul_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: l
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_citr__L_e with default bounds for boundary metabolite: citr__L_e
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
```

```
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g6p_B_e with default bounds for boundary metabolite: g6p_B_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hco3_e with default bounds for boundary metabolite: hco3_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglugl
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mevR_e with default bounds for boundary metabolite: mevR_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_urea_e with default bounds for boundary metabolite: urea_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
```

```
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_citr__L_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_g6p_B_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hco3_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mevR_e' since it already exists.
```

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Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_urea_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: l
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: LalaD
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
```

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Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_ncam_e with default bounds for boundary metabolite: ncam_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdca_e with default bounds for boundary metabolite: ocdca_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
```

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Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
```

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Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_ncam_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdca_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: l
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_airs_e with default bounds for boundary metabolite: airs_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
```

```
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cyst__L_e with default bounds for boundary metabolite: cyst__L_e
Adding exchange reaction EX_dhap_e with default bounds for boundary metabolite: dhap_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglyg
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mevR_e with default bounds for boundary metabolite: mevR_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_na1_e with default bounds for boundary metabolite: na1_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nh4_e with default bounds for boundary metabolite: nh4_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
```

```
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdcea_e with default bounds for boundary metabolite: ocdcea_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ura_e with default bounds for boundary metabolite: ura_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_airs_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cyst__L_e' since it already exists.
```

```
Ignoring reaction 'EX_dhap_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mevR_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nh4_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdcea_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
```

```
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ura_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_23camp_e with default bounds for boundary metabolite: 23camp_e.
Adding exchange reaction EX_23ccmp_e with default bounds for boundary metabolite: 23ccmp_e.
Adding exchange reaction EX_23cgmp_e with default bounds for boundary metabolite: 23cgmp_e.
Adding exchange reaction EX_23cump_e with default bounds for boundary metabolite: 23cump_e.
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
Adding exchange reaction EX_6pgc_e with default bounds for boundary metabolite: 6pgc_e.
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_adn_e with default bounds for boundary metabolite: adn_e.
Adding exchange reaction EX_ala__D_e with default bounds for boundary metabolite: ala__D_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cell4_e with default bounds for boundary metabolite: cell4_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cyan_e with default bounds for boundary metabolite: cyan_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cytd_e with default bounds for boundary metabolite: cytd_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
```

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Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g6p_B_e with default bounds for boundary metabolite: g6p_B_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glx_e with default bounds for boundary metabolite: glx_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gsn_e with default bounds for boundary metabolite: gsn_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hco3_e with default bounds for boundary metabolite: hco3_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_malthp_e with default bounds for boundary metabolite: malthp_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_so3_e with default bounds for boundary metabolite: so3_e.
```

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Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tcynt_e with default bounds for boundary metabolite: tcynt_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_uri_e with default bounds for boundary metabolite: uri_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_23camp_e' since it already exists.
Ignoring reaction 'EX_23ccmp_e' since it already exists.
Ignoring reaction 'EX_23cgmp_e' since it already exists.
Ignoring reaction 'EX_23cump_e' since it already exists.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_6pgc_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_adn_e' since it already exists.
Ignoring reaction 'EX_ala__D_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cell4_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cyan_e' since it already exists.
```

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Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cytd_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_g6p_B_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glx_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gsn_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hco3_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_malthp_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
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Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_so3_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tcynt_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_uri_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_12ppd__S_e with default bounds for boundary metabolite: 12ppd__S
Adding exchange reaction EX_15dap_e with default bounds for boundary metabolite: 15dap_e.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35md
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lala
Adding exchange reaction EX_LalaDglu_e with default bounds for boundary metabolite: LalaDglu
Adding exchange reaction EX_LalaLglu_e with default bounds for boundary metabolite: LalaLglu
Adding exchange reaction EX_R3hdec4e_e with default bounds for boundary metabolite: R3hdec4e
Adding exchange reaction EX_abt__D_e with default bounds for boundary metabolite: abt__D_e.
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_acon_C_e with default bounds for boundary metabolite: acon_C_e.
Adding exchange reaction EX_agm_e with default bounds for boundary metabolite: agm_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala_B_e with default bounds for boundary metabolite: ala_B_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
```

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Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmcbtt_e with default bounds for boundary metabolite: cmcbtt_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crn_e with default bounds for boundary metabolite: crn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cyan_e with default bounds for boundary metabolite: cyan_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cyst__L_e with default bounds for boundary metabolite: cyst__L_e
Adding exchange reaction EX_dca_e with default bounds for boundary metabolite: dca_e.
Adding exchange reaction EX_ddca_e with default bounds for boundary metabolite: ddca_e.
Adding exchange reaction EX_dhap_e with default bounds for boundary metabolite: dhap_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_ecto__L_e with default bounds for boundary metabolite: ecto__L_e
Adding exchange reaction EX_etha_e with default bounds for boundary metabolite: etha_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fcmcbtt_e with default bounds for boundary metabolite: fcmcbtt_e
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3dcit_e with default bounds for boundary metabolite: fe3dcit_e
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_forglu_e with default bounds for boundary metabolite: forglu_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_g3pe_e with default bounds for boundary metabolite: g3pe_e.
Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_glc__D_e with default bounds for boundary metabolite: glc__D_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_gly_e with default bounds for boundary metabolite: gly_e.
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_glycol_e with default bounds for boundary metabolite: glycol_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_gthrd_e with default bounds for boundary metabolite: gthrd_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
```

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Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hdca_e with default bounds for boundary metabolite: hdca_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxa_e with default bounds for boundary metabolite: hxa_e.
Adding exchange reaction EX_icit_e with default bounds for boundary metabolite: icit_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_inost_e with default bounds for boundary metabolite: inost_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_lyx__L_e with default bounds for boundary metabolite: lyx__L_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malt_e with default bounds for boundary metabolite: malt_e.
Adding exchange reaction EX_malthx_e with default bounds for boundary metabolite: malthx_e.
Adding exchange reaction EX_malttr_e with default bounds for boundary metabolite: malttr_e.
Adding exchange reaction EX_meoh_e with default bounds for boundary metabolite: meoh_e.
Adding exchange reaction EX_met__D_e with default bounds for boundary metabolite: met__D_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_minohp_e with default bounds for boundary metabolite: minohp_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mnl_e with default bounds for boundary metabolite: mnl_e.
Adding exchange reaction EX_mobd_e with default bounds for boundary metabolite: mobd_e.
Adding exchange reaction EX_na1_e with default bounds for boundary metabolite: na1_e.
Adding exchange reaction EX_nac_e with default bounds for boundary metabolite: nac_e.
Adding exchange reaction EX_nh4_e with default bounds for boundary metabolite: nh4_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_octa_e with default bounds for boundary metabolite: octa_e.
Adding exchange reaction EX_pac_e with default bounds for boundary metabolite: pac_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_pser__L_e with default bounds for boundary metabolite: pser__L_e
Adding exchange reaction EX_ptrc_e with default bounds for boundary metabolite: ptrc_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_rib__D_e with default bounds for boundary metabolite: rib__D_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_rmn_e with default bounds for boundary metabolite: rmn_e.
```

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Adding exchange reaction EX_rnam_e with default bounds for boundary metabolite: rnam_e.
Adding exchange reaction EX_sel_e with default bounds for boundary metabolite: sel_e.
Adding exchange reaction EX_ser__D_e with default bounds for boundary metabolite: ser__D_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_slnt_e with default bounds for boundary metabolite: slnt_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_sucr_e with default bounds for boundary metabolite: sucr_e.
Adding exchange reaction EX_tagur_e with default bounds for boundary metabolite: tagur_e.
Adding exchange reaction EX_tartr__D_e with default bounds for boundary metabolite: tartr__D
Adding exchange reaction EX_taur_e with default bounds for boundary metabolite: taur_e.
Adding exchange reaction EX_tcynt_e with default bounds for boundary metabolite: tcynt_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tre6p_e with default bounds for boundary metabolite: tre6p_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_tsul_e with default bounds for boundary metabolite: tsul_e.
Adding exchange reaction EX_ttdca_e with default bounds for boundary metabolite: ttdca_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_12ppd__S_e' since it already exists.
Ignoring reaction 'EX_15dap_e' since it already exists.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_LalaDglu_e' since it already exists.
Ignoring reaction 'EX_LalaLglu_e' since it already exists.
Ignoring reaction 'EX_R3hdec4e_e' since it already exists.
Ignoring reaction 'EX_abt__D_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_acon_C_e' since it already exists.
Ignoring reaction 'EX_agm_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala_B_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
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Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmcbtt_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cyan_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cyst__L_e' since it already exists.
Ignoring reaction 'EX_dca_e' since it already exists.
Ignoring reaction 'EX_ddca_e' since it already exists.
Ignoring reaction 'EX_dhap_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_ecto__L_e' since it already exists.
Ignoring reaction 'EX_etha_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fcmcbtt_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3dcit_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_forglu_e' since it already exists.
Ignoring reaction 'EX_g3pe_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_glc__D_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
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Ignoring reaction 'EX_gly_e' since it already exists.
Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_glycol_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_gthrd_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hdca_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxa_e' since it already exists.
Ignoring reaction 'EX_icit_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_inost_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_lyx__L_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malt_e' since it already exists.
Ignoring reaction 'EX_malthx_e' since it already exists.
Ignoring reaction 'EX_malttr_e' since it already exists.
Ignoring reaction 'EX_meoh_e' since it already exists.
Ignoring reaction 'EX_met__D_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_minohp_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mnl_e' since it already exists.
Ignoring reaction 'EX_mobd_e' since it already exists.
Ignoring reaction 'EX_nac_e' since it already exists.
Ignoring reaction 'EX_nh4_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_octa_e' since it already exists.
Ignoring reaction 'EX_pac_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_pser__L_e' since it already exists.
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```
Ignoring reaction 'EX_ptrc_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_rib__D_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_rmn_e' since it already exists.
Ignoring reaction 'EX_rnam_e' since it already exists.
Ignoring reaction 'EX_sel_e' since it already exists.
Ignoring reaction 'EX_ser__D_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_slnt_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_sucr_e' since it already exists.
Ignoring reaction 'EX_tagur_e' since it already exists.
Ignoring reaction 'EX_tartr__D_e' since it already exists.
Ignoring reaction 'EX_taur_e' since it already exists.
Ignoring reaction 'EX_tcynt_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tre6p_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tsul_e' since it already exists.
Ignoring reaction 'EX_ttdca_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
```

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Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_gam6p_e with default bounds for boundary metabolite: gam6p_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glu__L_e with default bounds for boundary metabolite: glu__L_e.
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hom__L_e with default bounds for boundary metabolite: hom__L_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_maltttr_e with default bounds for boundary metabolite: maltttr_e
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
```

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Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_rib__D_e with default bounds for boundary metabolite: rib__D_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
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Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_gam6p_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glu__L_e' since it already exists.
Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hom__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_maltttr_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
```

```
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_rib__D_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35mdn
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: L
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: LalaD
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
```

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Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_glcn_e with default bounds for boundary metabolite: glcn_e.
Adding exchange reaction EX_glyb_e with default bounds for boundary metabolite: glyb_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hco3_e with default bounds for boundary metabolite: hco3_e.
Adding exchange reaction EX_hcys__L_e with default bounds for boundary metabolite: hcys__L_e
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_icit_e with default bounds for boundary metabolite: icit_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdca_e with default bounds for boundary metabolite: ocdca_e.
Adding exchange reaction EX_orn_e with default bounds for boundary metabolite: orn_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_stfrnA_e with default bounds for boundary metabolite: stfrnA_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
```

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Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_glcn_e' since it already exists.
```

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Ignoring reaction 'EX_glyb_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hco3_e' since it already exists.
Ignoring reaction 'EX_hcys__L_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_icit_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdca_e' since it already exists.
Ignoring reaction 'EX_orn_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_stfrnA_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
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Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: l
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acgam1p_e with default bounds for boundary metabolite: acgam1p_e
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala_L_thr__L_e with default bounds for boundary metabolite: ala_l
Adding exchange reaction EX_ala__D_e with default bounds for boundary metabolite: ala__D_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_aso3_e with default bounds for boundary metabolite: aso3_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_gam6p_e with default bounds for boundary metabolite: gam6p_e.
Adding exchange reaction EX_glyclt_e with default bounds for boundary metabolite: glyclt_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
```

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Adding exchange reaction EX_hco3_e with default bounds for boundary metabolite: hco3_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lac__D_e with default bounds for boundary metabolite: lac__D_e.
Adding exchange reaction EX_lac__L_e with default bounds for boundary metabolite: lac__L_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglugl
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_mal__L_e with default bounds for boundary metabolite: mal__L_e.
Adding exchange reaction EX_malthp_e with default bounds for boundary metabolite: malthp_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_met_L_ala__L_e with default bounds for boundary metabolite: met_l
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_na1_e with default bounds for boundary metabolite: na1_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_no3_e with default bounds for boundary metabolite: no3_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_orn_e with default bounds for boundary metabolite: orn_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_ptrc_e with default bounds for boundary metabolite: ptrc_e.
Adding exchange reaction EX_pydx_e with default bounds for boundary metabolite: pydx_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
Adding exchange reaction EX_rib__D_e with default bounds for boundary metabolite: rib__D_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tartr__D_e with default bounds for boundary metabolite: tartr__D_
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
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Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acgam1p_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala_L_thr__L_e' since it already exists.
Ignoring reaction 'EX_ala__D_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_aso3_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_gam6p_e' since it already exists.
Ignoring reaction 'EX_glyclt_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
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Ignoring reaction 'EX_hco3_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lac__D_e' since it already exists.
Ignoring reaction 'EX_lac__L_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_mal__L_e' since it already exists.
Ignoring reaction 'EX_malthp_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_met_L_ala__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_no3_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_orn_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_ptrc_e' since it already exists.
Ignoring reaction 'EX_pydx_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_rib__D_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tartr__D_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
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Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_13ppd_e with default bounds for boundary metabolite: 13ppd_e.
Adding exchange reaction EX_2obut_e with default bounds for boundary metabolite: 2obut_e.
Adding exchange reaction EX_5mcsn_e with default bounds for boundary metabolite: 5mcsn_e.
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: LalaI
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acgam1p_e with default bounds for boundary metabolite: acgam1p_e
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_argp_e with default bounds for boundary metabolite: argp_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_aso3_e with default bounds for boundary metabolite: aso3_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_chol_e with default bounds for boundary metabolite: chol_e.
Adding exchange reaction EX_cit_e with default bounds for boundary metabolite: cit_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_cytd_e with default bounds for boundary metabolite: cytd_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_etoh_e with default bounds for boundary metabolite: etoh_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
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Adding exchange reaction EX_g3pg_e with default bounds for boundary metabolite: g3pg_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_hco3_e with default bounds for boundary metabolite: hco3_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_malthp_e with default bounds for boundary metabolite: malthp_e.
Adding exchange reaction EX_malttr_e with default bounds for boundary metabolite: malttr_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_meoh_e with default bounds for boundary metabolite: meoh_e.
Adding exchange reaction EX_met_L_ala__L_e with default bounds for boundary metabolite: met_l
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_mnl_e with default bounds for boundary metabolite: mnl_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_orn_e with default bounds for boundary metabolite: orn_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pheme_e with default bounds for boundary metabolite: pheme_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_prohisglu_e with default bounds for boundary metabolite: prohisgl
Adding exchange reaction EX_ptrc_e with default bounds for boundary metabolite: ptrc_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
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Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_quin_e with default bounds for boundary metabolite: quin_e.
Adding exchange reaction EX_rib__D_e with default bounds for boundary metabolite: rib__D_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_rnam_e with default bounds for boundary metabolite: rnam_e.
Adding exchange reaction EX_serglugly_e with default bounds for boundary metabolite: serglugl
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tartr__D_e with default bounds for boundary metabolite: tartr__D_
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tmam_e with default bounds for boundary metabolite: tmam_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_13ppd_e' since it already exists.
Ignoring reaction 'EX_2obut_e' since it already exists.
Ignoring reaction 'EX_5mcsn_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acgam1p_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_argp_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_aso3_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_chol_e' since it already exists.
Ignoring reaction 'EX_cit_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
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Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_cytd_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_etoh_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_g3pg_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_hco3_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_malthp_e' since it already exists.
Ignoring reaction 'EX_malttr_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_meoh_e' since it already exists.
Ignoring reaction 'EX_met_L_ala__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_mnl_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
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Ignoring reaction 'EX_orn_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pheme_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_prohisglu_e' since it already exists.
Ignoring reaction 'EX_ptrc_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_quin_e' since it already exists.
Ignoring reaction 'EX_rib__D_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_rnam_e' since it already exists.
Ignoring reaction 'EX_serglugly_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tartr__D_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tmam_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: l
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lalal
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acgam_e with default bounds for boundary metabolite: acgam_e.
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_airs_e with default bounds for boundary metabolite: airs_e.
Adding exchange reaction EX_akg_e with default bounds for boundary metabolite: akg_e.
Adding exchange reaction EX_ala_L_thr__L_e with default bounds for boundary metabolite: ala_l
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
```

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Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_ch4s_e with default bounds for boundary metabolite: ch4s_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_dha_e with default bounds for boundary metabolite: dha_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3py
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fuc_e with default bounds for boundary metabolite: fuc_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_gam6p_e with default bounds for boundary metabolite: gam6p_e.
Adding exchange reaction EX_gcald_e with default bounds for boundary metabolite: gcald_e.
Adding exchange reaction EX_glyc_e with default bounds for boundary metabolite: glyc_e.
Adding exchange reaction EX_glyclt_e with default bounds for boundary metabolite: glyclt_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h2s_e with default bounds for boundary metabolite: h2s_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_id3acald_e with default bounds for boundary metabolite: id3acald
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_ind3ac_e with default bounds for boundary metabolite: ind3ac_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lac__D_e with default bounds for boundary metabolite: lac__D_e.
Adding exchange reaction EX_lac__L_e with default bounds for boundary metabolite: lac__L_e.
```

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Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglugl
Adding exchange reaction EX_malthx_e with default bounds for boundary metabolite: malthx_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_met_L_ala__L_e with default bounds for boundary metabolite: met_l
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_ocdca_e with default bounds for boundary metabolite: ocdca_e.
Adding exchange reaction EX_orn_e with default bounds for boundary metabolite: orn_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_ppal_e with default bounds for boundary metabolite: ppal_e.
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_ptrc_e with default bounds for boundary metabolite: ptrc_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt_
Adding exchange reaction EX_rib__D_e with default bounds for boundary metabolite: rib__D_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_tre_e with default bounds for boundary metabolite: tre_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acgam_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_airs_e' since it already exists.
Ignoring reaction 'EX_akg_e' since it already exists.
Ignoring reaction 'EX_ala_L_thr__L_e' since it already exists.
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Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_ch4s_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_dha_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_fuc_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_gam6p_e' since it already exists.
Ignoring reaction 'EX_gcald_e' since it already exists.
Ignoring reaction 'EX_glyc_e' since it already exists.
Ignoring reaction 'EX_glyclt_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h2s_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_id3acald_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_ind3ac_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lac__D_e' since it already exists.
Ignoring reaction 'EX_lac__L_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
```

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Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
Ignoring reaction 'EX_malthx_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_met_L_ala__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_ocdca_e' since it already exists.
Ignoring reaction 'EX_orn_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_ppal_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_ptrc_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_rib__D_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_tre_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_2m35mdntha_e with default bounds for boundary metabolite: 2m35md
Adding exchange reaction EX_35dnta_e with default bounds for boundary metabolite: 35dnta_e.
Adding exchange reaction EX_LalaDgluMdap_e with default bounds for boundary metabolite: Lala
Adding exchange reaction EX_LalaLglu_e with default bounds for boundary metabolite: LalaLglu
Adding exchange reaction EX_ac_e with default bounds for boundary metabolite: ac_e.
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acnam_e with default bounds for boundary metabolite: acnam_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_anhgm_e with default bounds for boundary metabolite: anhgm_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
```

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Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_bz_e with default bounds for boundary metabolite: bz_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dha_e with default bounds for boundary metabolite: dha_e.
Adding exchange reaction EX_dmgly_e with default bounds for boundary metabolite: dmgly_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_fald_e with default bounds for boundary metabolite: fald_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_for_e with default bounds for boundary metabolite: for_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_gln__L_e with default bounds for boundary metabolite: gln__L_e.
Adding exchange reaction EX_glx_e with default bounds for boundary metabolite: glx_e.
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_hxan_e with default bounds for boundary metabolite: hxan_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_malthp_e with default bounds for boundary metabolite: malthp_e.
Adding exchange reaction EX_maltttr_e with default bounds for boundary metabolite: maltttr_e
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
```

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Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nh4_e with default bounds for boundary metabolite: nh4_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_octscoa_e with default bounds for boundary metabolite: octscoa_e
Adding exchange reaction EX_orn_e with default bounds for boundary metabolite: orn_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pro__L_e with default bounds for boundary metabolite: pro__L_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_ptrc_e with default bounds for boundary metabolite: ptrc_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_pyr_e with default bounds for boundary metabolite: pyr_e.
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_tartr__D_e with default bounds for boundary metabolite: tartr__D
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tnt_e with default bounds for boundary metabolite: tnt_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_2m35mdntha_e' since it already exists.
Ignoring reaction 'EX_35dnta_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdap_e' since it already exists.
Ignoring reaction 'EX_LalaLglu_e' since it already exists.
Ignoring reaction 'EX_ac_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acnam_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_anhgm_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
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Ignoring reaction 'EX_bz_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
Ignoring reaction 'EX_dha_e' since it already exists.
Ignoring reaction 'EX_dmgly_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_fald_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_for_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_gln__L_e' since it already exists.
Ignoring reaction 'EX_glx_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_hxan_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_malthp_e' since it already exists.
Ignoring reaction 'EX_maltttr_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nh4_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
```

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Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_octscoa_e' since it already exists.
Ignoring reaction 'EX_orn_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pro__L_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_ptrc_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_pyr_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_tartr__D_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tnt_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.
Adding exchange reaction EX_14glucan_e with default bounds for boundary metabolite: 14glucan
Adding exchange reaction EX_15dap_e with default bounds for boundary metabolite: 15dap_e.
Adding exchange reaction EX_LalaDgluMdapDala_e with default bounds for boundary metabolite: l
Adding exchange reaction EX_acetone_e with default bounds for boundary metabolite: acetone_e
Adding exchange reaction EX_acmana_e with default bounds for boundary metabolite: acmana_e.
Adding exchange reaction EX_ala__L_e with default bounds for boundary metabolite: ala__L_e.
Adding exchange reaction EX_alaala_e with default bounds for boundary metabolite: alaala_e.
Adding exchange reaction EX_amp_e with default bounds for boundary metabolite: amp_e.
Adding exchange reaction EX_apc_e with default bounds for boundary metabolite: apc_e.
Adding exchange reaction EX_arg__L_e with default bounds for boundary metabolite: arg__L_e.
Adding exchange reaction EX_asn__L_e with default bounds for boundary metabolite: asn__L_e.
Adding exchange reaction EX_asp__L_e with default bounds for boundary metabolite: asp__L_e.
Adding exchange reaction EX_ca2_e with default bounds for boundary metabolite: ca2_e.
Adding exchange reaction EX_cellb_e with default bounds for boundary metabolite: cellb_e.
Adding exchange reaction EX_cgly_e with default bounds for boundary metabolite: cgly_e.
Adding exchange reaction EX_cl_e with default bounds for boundary metabolite: cl_e.
Adding exchange reaction EX_cm_e with default bounds for boundary metabolite: cm_e.
Adding exchange reaction EX_cmp_e with default bounds for boundary metabolite: cmp_e.
Adding exchange reaction EX_co2_e with default bounds for boundary metabolite: co2_e.
Adding exchange reaction EX_coa_e with default bounds for boundary metabolite: coa_e.
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Adding exchange reaction EX_cobalt2_e with default bounds for boundary metabolite: cobalt2_e
Adding exchange reaction EX_crtn_e with default bounds for boundary metabolite: crtn_e.
Adding exchange reaction EX_cu2_e with default bounds for boundary metabolite: cu2_e.
Adding exchange reaction EX_cys__L_e with default bounds for boundary metabolite: cys__L_e.
Adding exchange reaction EX_dha_e with default bounds for boundary metabolite: dha_e.
Adding exchange reaction EX_doxrbcn_e with default bounds for boundary metabolite: doxrbcn_e
Adding exchange reaction EX_dtmp_e with default bounds for boundary metabolite: dtmp_e.
Adding exchange reaction EX_dxyl_e with default bounds for boundary metabolite: dxyl_e.
Adding exchange reaction EX_f6p_e with default bounds for boundary metabolite: f6p_e.
Adding exchange reaction EX_fe2_e with default bounds for boundary metabolite: fe2_e.
Adding exchange reaction EX_fe3_e with default bounds for boundary metabolite: fe3_e.
Adding exchange reaction EX_fe3pyovd_kt_e with default bounds for boundary metabolite: fe3pyo
Adding exchange reaction EX_fol_e with default bounds for boundary metabolite: fol_e.
Adding exchange reaction EX_fum_e with default bounds for boundary metabolite: fum_e.
Adding exchange reaction EX_fusa_e with default bounds for boundary metabolite: fusa_e.
Adding exchange reaction EX_gal_e with default bounds for boundary metabolite: gal_e.
Adding exchange reaction EX_gam6p_e with default bounds for boundary metabolite: gam6p_e.
Adding exchange reaction EX_glyglygln_e with default bounds for boundary metabolite: glyglygl
Adding exchange reaction EX_gmp_e with default bounds for boundary metabolite: gmp_e.
Adding exchange reaction EX_h2o_e with default bounds for boundary metabolite: h2o_e.
Adding exchange reaction EX_h_e with default bounds for boundary metabolite: h_e.
Adding exchange reaction EX_his__L_e with default bounds for boundary metabolite: his__L_e.
Adding exchange reaction EX_ile__L_e with default bounds for boundary metabolite: ile__L_e.
Adding exchange reaction EX_indole_e with default bounds for boundary metabolite: indole_e.
Adding exchange reaction EX_k_e with default bounds for boundary metabolite: k_e.
Adding exchange reaction EX_lcts_e with default bounds for boundary metabolite: lcts_e.
Adding exchange reaction EX_leu__L_e with default bounds for boundary metabolite: leu__L_e.
Adding exchange reaction EX_lys__L_e with default bounds for boundary metabolite: lys__L_e.
Adding exchange reaction EX_lysglugly_e with default bounds for boundary metabolite: lysglugl
Adding exchange reaction EX_m_xyl_e with default bounds for boundary metabolite: m_xyl_e.
Adding exchange reaction EX_melib_e with default bounds for boundary metabolite: melib_e.
Adding exchange reaction EX_meoh_e with default bounds for boundary metabolite: meoh_e.
Adding exchange reaction EX_met__L_e with default bounds for boundary metabolite: met__L_e.
Adding exchange reaction EX_mg2_e with default bounds for boundary metabolite: mg2_e.
Adding exchange reaction EX_mn2_e with default bounds for boundary metabolite: mn2_e.
Adding exchange reaction EX_nmn_e with default bounds for boundary metabolite: nmn_e.
Adding exchange reaction EX_no2_e with default bounds for boundary metabolite: no2_e.
Adding exchange reaction EX_novbcn_e with default bounds for boundary metabolite: novbcn_e.
Adding exchange reaction EX_o2_e with default bounds for boundary metabolite: o2_e.
Adding exchange reaction EX_orn_e with default bounds for boundary metabolite: orn_e.
Adding exchange reaction EX_p_xyl_e with default bounds for boundary metabolite: p_xyl_e.
Adding exchange reaction EX_pep_e with default bounds for boundary metabolite: pep_e.
Adding exchange reaction EX_phe__L_e with default bounds for boundary metabolite: phe__L_e.
```

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Adding exchange reaction EX_pi_e with default bounds for boundary metabolite: pi_e.
Adding exchange reaction EX_pnto__R_e with default bounds for boundary metabolite: pnto__R_e
Adding exchange reaction EX_ppap_e with default bounds for boundary metabolite: ppap_e.
Adding exchange reaction EX_progly_e with default bounds for boundary metabolite: progly_e.
Adding exchange reaction EX_ptrc_e with default bounds for boundary metabolite: ptrc_e.
Adding exchange reaction EX_pyovd_kt_e with default bounds for boundary metabolite: pyovd_kt
Adding exchange reaction EX_ribflv_e with default bounds for boundary metabolite: ribflv_e.
Adding exchange reaction EX_ser__L_e with default bounds for boundary metabolite: ser__L_e.
Adding exchange reaction EX_so4_e with default bounds for boundary metabolite: so4_e.
Adding exchange reaction EX_succ_e with default bounds for boundary metabolite: succ_e.
Adding exchange reaction EX_thm_e with default bounds for boundary metabolite: thm_e.
Adding exchange reaction EX_thr__L_e with default bounds for boundary metabolite: thr__L_e.
Adding exchange reaction EX_tol_e with default bounds for boundary metabolite: tol_e.
Adding exchange reaction EX_trp__L_e with default bounds for boundary metabolite: trp__L_e.
Adding exchange reaction EX_ttrcyc_e with default bounds for boundary metabolite: ttrcyc_e.
Adding exchange reaction EX_tyr__L_e with default bounds for boundary metabolite: tyr__L_e.
Adding exchange reaction EX_uaccg_e with default bounds for boundary metabolite: uaccg_e.
Adding exchange reaction EX_udcpp_e with default bounds for boundary metabolite: udcpp_e.
Adding exchange reaction EX_ump_e with default bounds for boundary metabolite: ump_e.
Adding exchange reaction EX_val__L_e with default bounds for boundary metabolite: val__L_e.
Adding exchange reaction EX_zn2_e with default bounds for boundary metabolite: zn2_e.
Ignoring reaction 'EX_14glucan_e' since it already exists.
Ignoring reaction 'EX_15dap_e' since it already exists.
Ignoring reaction 'EX_LalaDgluMdapDala_e' since it already exists.
Ignoring reaction 'EX_acetone_e' since it already exists.
Ignoring reaction 'EX_acmana_e' since it already exists.
Ignoring reaction 'EX_ala__L_e' since it already exists.
Ignoring reaction 'EX_alaala_e' since it already exists.
Ignoring reaction 'EX_amp_e' since it already exists.
Ignoring reaction 'EX_arg__L_e' since it already exists.
Ignoring reaction 'EX_asn__L_e' since it already exists.
Ignoring reaction 'EX_asp__L_e' since it already exists.
Ignoring reaction 'EX_ca2_e' since it already exists.
Ignoring reaction 'EX_cellb_e' since it already exists.
Ignoring reaction 'EX_cgly_e' since it already exists.
Ignoring reaction 'EX_cl_e' since it already exists.
Ignoring reaction 'EX_cmp_e' since it already exists.
Ignoring reaction 'EX_co2_e' since it already exists.
Ignoring reaction 'EX_coa_e' since it already exists.
Ignoring reaction 'EX_cobalt2_e' since it already exists.
Ignoring reaction 'EX_crtn_e' since it already exists.
Ignoring reaction 'EX_cu2_e' since it already exists.
Ignoring reaction 'EX_cys__L_e' since it already exists.
```

```
Ignoring reaction 'EX_dha_e' since it already exists.
Ignoring reaction 'EX_dtmp_e' since it already exists.
Ignoring reaction 'EX_dxyl_e' since it already exists.
Ignoring reaction 'EX_f6p_e' since it already exists.
Ignoring reaction 'EX_fe2_e' since it already exists.
Ignoring reaction 'EX_fe3_e' since it already exists.
Ignoring reaction 'EX_fe3pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_fol_e' since it already exists.
Ignoring reaction 'EX_fum_e' since it already exists.
Ignoring reaction 'EX_gal_e' since it already exists.
Ignoring reaction 'EX_gam6p_e' since it already exists.
Ignoring reaction 'EX_glyglygln_e' since it already exists.
Ignoring reaction 'EX_gmp_e' since it already exists.
Ignoring reaction 'EX_h2o_e' since it already exists.
Ignoring reaction 'EX_h_e' since it already exists.
Ignoring reaction 'EX_his__L_e' since it already exists.
Ignoring reaction 'EX_ile__L_e' since it already exists.
Ignoring reaction 'EX_indole_e' since it already exists.
Ignoring reaction 'EX_k_e' since it already exists.
Ignoring reaction 'EX_lcts_e' since it already exists.
Ignoring reaction 'EX_leu__L_e' since it already exists.
Ignoring reaction 'EX_lys__L_e' since it already exists.
Ignoring reaction 'EX_lysglugly_e' since it already exists.
Ignoring reaction 'EX_m_xyl_e' since it already exists.
Ignoring reaction 'EX_melib_e' since it already exists.
Ignoring reaction 'EX_meoh_e' since it already exists.
Ignoring reaction 'EX_met__L_e' since it already exists.
Ignoring reaction 'EX_mg2_e' since it already exists.
Ignoring reaction 'EX_mn2_e' since it already exists.
Ignoring reaction 'EX_nmn_e' since it already exists.
Ignoring reaction 'EX_no2_e' since it already exists.
Ignoring reaction 'EX_o2_e' since it already exists.
Ignoring reaction 'EX_orn_e' since it already exists.
Ignoring reaction 'EX_p_xyl_e' since it already exists.
Ignoring reaction 'EX_pep_e' since it already exists.
Ignoring reaction 'EX_phe__L_e' since it already exists.
Ignoring reaction 'EX_pi_e' since it already exists.
Ignoring reaction 'EX_pnto__R_e' since it already exists.
Ignoring reaction 'EX_ppap_e' since it already exists.
Ignoring reaction 'EX_progly_e' since it already exists.
Ignoring reaction 'EX_ptrc_e' since it already exists.
Ignoring reaction 'EX_pyovd_kt_e' since it already exists.
Ignoring reaction 'EX_ribflv_e' since it already exists.
```

```
Ignoring reaction 'EX_ser__L_e' since it already exists.
Ignoring reaction 'EX_so4_e' since it already exists.
Ignoring reaction 'EX_succ_e' since it already exists.
Ignoring reaction 'EX_thm_e' since it already exists.
Ignoring reaction 'EX_thr__L_e' since it already exists.
Ignoring reaction 'EX_tol_e' since it already exists.
Ignoring reaction 'EX_trp__L_e' since it already exists.
Ignoring reaction 'EX_tyr__L_e' since it already exists.
Ignoring reaction 'EX_uaccg_e' since it already exists.
Ignoring reaction 'EX_udcpp_e' since it already exists.
Ignoring reaction 'EX_ump_e' since it already exists.
Ignoring reaction 'EX_val__L_e' since it already exists.
Ignoring reaction 'EX_zn2_e' since it already exists.


Bg_1_model
Bg_2_model
Bg_3_model
Bg_4_model
Bg_5_model
Bg_6_model
Bg_7_model
Bg_8_model
Bg_9_model
Bg_10_model
Bg_11_model
Bg_12_model
Bg_13_model
Bg_14_model
Bg_15_model
Bg_16_model
Bg_17_model
Bg_18_model
Bg_19_model
Bg_20_model
Bg_21_model
Bg_22_model
Bg_23_model
Pd_1_model
Pd_2_model
Pd_3_model
Pd_4_model
```

```
Pd_5_model
Pd_6_model
Pd_7_model
Pd_8_model
Pd_9_model
Pd_10_model
Pd_11_model
Pd_12_model
Pd_13_model
Pd_14_model
Pd_15_model
Pd_16_model
Pd_17_model
Pd_18_model
Pd_19_model
Pd_20_model
Pd_21_model
Pd_22_model
Pd_23_model
Pd_24_model
Pd_25_model
Pd_26_model
Pd_27_model
Pd_28_model
Pd_29_model
Pd_30_model
Ps_1_model
Ps_2_model
Ps_3_model
Ps_4_model
Ps_5_model
```

```python
import numpy as np
import matplotlib.pyplot as plt

metabolite_ids = ["n2_e", "n2_p", "n2_c"]

#
for model in models.values():
    matches = [rxn for rxn in model.reactions
               if any(met.id in metabolite_ids for met in rxn.reactants)]
    print(f"Model: {model.id}")
```

```
    if matches:
        for rxn in matches:
            print(f"{rxn.id}: {rxn.reaction}\nGPR: {rxn.gene_reaction_rule}\n")
    else:
        print(f"No reactions found with {metabolite_ids} as a reactant.")

#     ID
model_ids = [model.id for model in models.values()]
substrate_matrix = np.array([
    [any(met.id == met_id for rxn in model.reactions for met in rxn.reactants)
     for model in models.values()]
    for met_id in metabolite_ids
])

#
plt.figure(figsize=(24, 2.5))
plt.imshow(substrate_matrix, cmap='gray', aspect='auto', interpolation='nearest', vmin=0, vma
plt.xticks(np.arange(len(model_ids)), model_ids, rotation=45)
plt.yticks(np.arange(len(metabolite_ids)), metabolite_ids)
plt.xlabel('Model ID')
plt.ylabel('Substrate')
plt.title('Presence of Target Metabolites as Reactants')
plt.grid(axis='y', color='gray', linestyle='--', linewidth=0.5)
for x in range(len(model_ids)):
    plt.axvline(x - 0.5, color='lightgray', linestyle='-', linewidth=0.8)
plt.clim(1, 0)  #     True/1     False/0
plt.colorbar(label='Presence (1=Yes, 0=No)', ticks=[0, 1])
plt.tight_layout()
plt.show()

print("-" * 40)
```

```
Model: Burkholderia_gladioli_10_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_11_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_12_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_13_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_14_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
```

```
Model: Burkholderia_gladioli_15_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_16_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_17_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_18_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_19_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_20_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_21_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_22_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_23_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_2_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_3_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_4_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_5_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_6_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_7_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_8_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Burkholderia_gladioli_9_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_10_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_11_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_12_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_13_model
```

```
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_14_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_15_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_16_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_17_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_18_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_19_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_20_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_21_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_22_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_23_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_24_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_25_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_26_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_27_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_28_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_29_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_2_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_3_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_4_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_5_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
Model: Pantoea_dispersa_6_model
No reactions found with ['n2_e', 'n2_p', 'n2_c'] as a reactant.
```