print("INSTRUCTION:")

print("'THIS PROGRAM WORKS WHEN THE REACTANT IN THE MOLECULAR FORM'")

print("THE TWO REACTANT MUST BE IN THE FORM",'\n','Na2CO3(OR)1/2 H2O.')

print('NUMBERS AND DOTS SHOULD BE GIVEN WITHOUT SPACE. AND IF IT IS FRACTIONAL THEN GIVE SINGLE SPACE.')

reaction\_db = {

frozenset(['HCl', 'NaOH']): 'NaCl + H2O',

frozenset(['Na2CO3', 'HCl']): 'NaCl + CO2 + H2O',

frozenset(['Zn', 'CuSO4']): 'ZnSO4 + Cu',

frozenset(['AgNO3', 'NaCl']): 'AgCl + NaNO3',

frozenset(['CH4', 'O2']): 'CO2 + H2O',

frozenset(['Fe', 'S']): 'FeS',

frozenset(['H2O2']): 'H2O + O2',

frozenset(['Mg', 'HCl']): 'MgCl2 + H2',

frozenset(['SiO2', 'NaOH']): 'Na2SiO3 + H2O',

frozenset(['CaCO3']): 'CaO + CO2',

frozenset(['Mg','O2']): '2MgO',

frozenset(['Zn','H2SO4']): 'ZnSO4 + H2',

frozenset(['Fe','4H2O']): 'Fe3O4 + 4H2',

frozenset(['CaO','H2O']): 'ca(OH)2',

frozenset(['C','O2']): 'CO2',

frozenset(['2H2','O2']): '2H2O',

frozenset(['CH4','2O2']): 'CO2 + 2H2O',

frozenset(['C16H12O6','6O2']): '6CO2 + 6H2O + ENERGY',

frozenset(['2FeSO4','']): 'Fe2O3 + SO2 + SO3',

frozenset(['CaCO3','']): 'CaO + CO2',

frozenset(['2Pb(NO3)2','']): '2PbO + 4NO2',

frozenset(['2NaOH','Zn']): 'Na2ZnO2 + H2',

frozenset(['Na2CO3','2HCl']): '2NaCl + H2O + CO2',

frozenset(['NaHCO3','HCl']): 'NaCl + H2O + CO2',

frozenset(['Ca(OH)2','Cl2']): 'CaOCl2 + H2O',

frozenset(['2NaHCO3','']): 'Na2CO3 + H2O + CO2',

frozenset(['NaHCO3','10H2O']): 'Na2CO3.10H2O',

frozenset(['CaSO4.1/2 H2O','1/2 H2O']): 'CaSO4.2H2O',

frozenset(['2AgCl','']): '2Ag + Cl2',

frozenset(['2AgBr','']): '2Ag + Br2',

frozenset(['Na2SO4','BaCl2']): 'BaSO4 + 2NaCl',

frozenset(['ZnO','C']): 'Zn + CO',

frozenset(['MnO2','HCl']): 'MnCl2 + 2H2O + cl2',

frozenset(['2Cu','O2']): '2CuO',

frozenset(['4Al','3O2']): '2Al2O3',

frozenset(['Al2O3','6HCl']): '2AlCl3 + 3H2O',

frozenset(['Al2O3','2NaOH']): '2NaAlO2 + H2O',

frozenset(['Na2O','H2O']): '2NaOH',

frozenset(['K2O','H2O']): '2KOH',

frozenset(['2K','2H2O']): '2KOH + H2 + heat energy',

frozenset(['2Na','2H2O']): '2NaOH + H2 + heat energy',

frozenset(['Ca','2H2O']): 'Ca(OH)2 + H2',

frozenset(['2Al','3H2O']): 'Al2O3 + 3H2',

frozenset(['3Fe','4H2O']): 'Fe3O4 + 4H2',

frozenset(['2HgS','3O2']): '2HgO + 2SO2',

frozenset(['2HgO','']): '2Hg + O2',

frozenset(['2Cu2S','3O2']): '2Cu2O + 2SO2',

frozenset(['2Cu2O','Cu2S']): '6Cu + SO2',

frozenset(['2ZnS','3O2']): '2ZnO + CO2',

frozenset(['ZnCo3','']): 'ZnO + CO2',

frozenset(['3MnO2','4Al']): '3Mn + 2Al2 + Heat',

frozenset(['Fe2O3','2Al']): '2Fe + Al2O3 + Heat',

frozenset(['CH3CH2OH','2O2']): '2CO2 + 3H2O',

frozenset(['CH3CH2OH']): 'CH3COOH',

frozenset(['2Na','2CH3CH2OH']): '2CH3CH2O-Na + H2',

frozenset(['CH3-CH2OH']): 'CH2=CH2 + H2O',

frozenset(['6CO2','6H2O']): 'C6H12O6 + 6O2',

frozenset(['O2']): 'O + O',

frozenset(['O','O2']): 'O3',

frozenset(['3HCl','Al(OH)3']): 'AlCl3 + 3H2O',

frozenset(['2HCl',' Mg(OH)2']): 'MgCl2 + 2H2O',

frozenset(['CH4','2O2']): 'CO2 + 2H2O',

frozenset(['Zn','H2SO4']): 'ZnSO4 + H2',

frozenset(['CH4','2O2']): 'CO2 + 2H2O',

frozenset(['N2','3H2']): '2NH3',

frozenset(['CaCO3','']): 'CaO + CO2',

frozenset(['CH4','2O2']): 'CO2 + 2H2O',

frozenset(['H2','Cl2']): '2HCl',

frozenset(['MgCO3','']): 'MgO + CO2',

frozenset(['2NH3','CO2']): 'H2NCONH2 + H2O',

frozenset(['4Fe','3O2']): '2Fe2O3',

frozenset(['H2S','Cl2']): '2HCl + S',

frozenset(['CuO','C']): 'Cu + CO',

frozenset(['S','H2']): 'H2S',

frozenset(['2KClO3']): '2KCl + 3O2',

frozenset(['Zn','2HCl']): 'ZnCl2 + H2',

frozenset(['2H2O2']): '2H2O + O2',

frozenset(['3Cl2','6KOH']): '5KCl + KClO3 +3H2O',

frozenset(['4Na','O2']): '2Na2O',

frozenset(['2Cl2','7O2']): '2Cl2O7',

frozenset(['Na2O','H2O']): '2NaOH',

frozenset(['Cl2O7','H2O']): '2HClO4',

frozenset(['Be(OH)2','2HCl']): 'BeCl2 + 2H2O',

frozenset(['Be(OH)2','2NaOH']): 'Na2BeO2 + 2H2O',

frozenset(['1/2 H2','e-']): 'H-',

frozenset(['1/2vBr2','e-']): 'Br-',

frozenset(['CH4','H2O']): 'CO + 3H2',

frozenset(['C','H2O']): 'CO + H2',

frozenset(['CO','H2O']): 'CO2 + H2',

frozenset(['2Li','H2']): '2LiH',

frozenset(['2Na','H2']): '2NaH',

frozenset(['4LiH','AlCl3']): 'Li[AlH4] + 3LiCl',

frozenset(['4NaH','B(OCH3)3']): 'Na[BH4] + 3CH3ONa',

frozenset(['CO','2H2']): 'CH3OH',

frozenset(['CH4','2D2']): 'CD4 + 2H2',

frozenset(['2NH3','3D2']): '2ND3 + 3H2',

frozenset(['CuO','H2']): 'Cu + H2O',

frozenset(['WO3','3 H2']): ' W + 3H2O',

frozenset(['2Na','2 H2O']): '2NaOH + H2',

frozenset(['Ba +','2H2O']): 'Ba(OH)2 + H2',

frozenset(['3Fe','4H2O']): 'Fe3O4 + 4H2',

frozenset(['Cl2','H2O']): 'HCl + HOCl',

frozenset(['2F2','2H2O']): '4HF + O2',

frozenset(['CO3','H2O']): 'HCO3 + OH',

frozenset(['NH3','H2O']): 'NH4 + OH',

frozenset(['HCl','H2O']): 'H3O + Cl',

frozenset(['SiCl4','2H2O']): 'SiO2 + 4HCl',

frozenset(['P4O10','6H2O']): '4H3PO4',

frozenset(['MCl2','Na2CO3']): 'MCO3 + 2NaCl',

frozenset(['MSO4','Na2CO3']): 'MCO3 + Na2SO4',

frozenset(['Ca(HCO3)2','']): 'CaCO3 + H2O + CO2',

frozenset(['Mg(HCO3)2','']): 'MgCO3 + H2O + CO2',

frozenset(['MgCO3','H2O']): 'Mg(OH)2 + CO2',

frozenset(['Ca(HCO3)2','Ca(OH)2']): '2CaCO3 + 2H2O',

frozenset(['Mg(HCO3)2','2Ca(OH)2']): '2CaCO3 + Mg(OH)2 + 2H2O',

frozenset(['2NaOH','D2O']): '2NaOD + HOD',

frozenset(['HCl','D2O']): 'DCl + HOD',

frozenset(['NH4Cl','4D2O']): 'ND4Cl + 4HOD',

frozenset(['BaO2','H2SO4']): 'BaSO4 + H2O2',

frozenset(['Na2O2','H2SO4']): 'Na2SO4 + H2O2',

frozenset(['H3PO2','D2O']): 'H2DPO2 + HDO',

frozenset(['Al4C3','12D2O']): '4Al(OD)3 + 3CD4',

frozenset(['CaC2','2D2O']): 'Ca(OD)2 + C2D2',

frozenset(['Mg3N2','6D2O']): '3Mg(OD)2 + 2 ND3',

frozenset(['Ca3P2','6D2O']): '3Ca(OD)2 + 2PD3',

frozenset(['H2O2','']): 'H2O + 1/2 O2',

frozenset(['PbS','4H2O2']): 'PbSO4 + 4H2',

frozenset(['HO2','OH']): 'H2O + 2e-',

frozenset(['2KMnO4','3H2O2']): '2MnO2 + 2KOH + 2H2O + 3O2',

frozenset(['2Ca','2H2']): '2CaH2',

frozenset(['4Li','O2']): '2Li2O',

frozenset(['2Na','O2']): 'Na2O2',

frozenset(['2Li','2C']): 'Li2C2',

frozenset(['2Li','2H2O']): '2LiOH+ H2',

frozenset(['2Na','2C2H5OH']): '2C2H5ONa + H2',

frozenset(['Li2CO3','']): 'Li2O + CO2',

frozenset(['NH4HCO3','NaCl']): 'NH4Cl + NaHCO3',

frozenset(['2NaHCO3','']): 'Na2CO3 + CO2 + H2O',

frozenset(['Na2CO3·10H2O','']): 'Na2CO3·H2O + 9H2O',

frozenset(['2BeCl2','LiAlH4']): '2BeH2 + LiCl + AlCl3',

frozenset(['2 BaO','O2']): '2BaO2',

frozenset(['Be(OH)2','2NaOH']): 'Na2BeO2 + 2H2O',

frozenset(['Be(OH)2','2HCl']): 'BeCl2 + 2H2O',

frozenset(['CaO','H2O']): 'Ca(OH)2',

frozenset(['CaO','CO2']): 'CaCO3',

frozenset(['CaO','H2O']): 'Ca(OH)2',

frozenset(['CaCO3','']): 'CaO + CO2 (it is a reversible reaction)',

frozenset(['CaO','SiO2']): 'CaSiO3',

frozenset(['6CaO','P4O10']): '2Ca3(PO4)2',

frozenset(['Al(OH3)','3HCL']): 'AlCl3 + 3H2O',

frozenset(['FeSO4','Fe(OH)2']): 'Fe(OH)2 + Na2SO4',

frozenset(['6NaCN','Fe(OH) 2']): 'Na4 [Fe(CN)6]',

frozenset(['Nax','AgNO3']): 'AgX + NaNO3',

frozenset(['NaCN','HNO3']): 'NaNO3 + HCN',

frozenset(['Na2S','2HNO3']): '2NaNO3 + H2S',

frozenset(['NaCN','AgNO3']): 'AgCN + NaNO3',

frozenset(['Na2S','AgNO3']): 'Ag2S + NaNO3',

frozenset(['BaCl 2 ','Na2SO4']): 'BaSO4 + CO2',

frozenset(['CH3COONa','NaOH']): 'CH4 + Na2CO3',

frozenset(['CH3 Cl','Mg']): 'CH3MgCl',

frozenset(['CH3MgCl','H2O']): 'CH4 + Mg((OH)Cl',

frozenset(['CH4','Cl2']): 'CH3Cl + HCl',

frozenset(['CH3Cl','Cl2']): 'CH2Cl2 + HCl',

frozenset(['CH2Cl2','Cl2']): 'CHCl3 + HCl',

frozenset(['CHCl3','Cl2']): 'CCl4 + HCl',

frozenset(['CH3CH2OH','PCl5']): 'CH3CH2Cl + POCl 3 + HCl',

frozenset(['3CH3CH2OH','PCl3']): '3CH3CH2Cl + H3PO3',

frozenset(['CH3CH2OH','SOCl2']): 'CH3CH2Cl + SO2 + HCl',

frozenset(['CH3CH2Br','NaI']): 'CH3CH2I + NaBr',

frozenset(['CH3CH2Br','AgF']): 'CH3CH2F + AgBr',

frozenset(['CH3CH2COOAg','Br2']): 'CH3CH2Br + CO2+ AgBr',

frozenset(['CH3CH2Br','NaOCH2CH3']): 'CH3CH2OCH2CH3 + NaBr',

frozenset(['CH3CH2Br','2Li']): 'CH3CH2Li + LiBr',

frozenset(['4CH3CH2Br ','4Na-Pb']): '(CH3CH2)4Pb + 4NaBr + 3Pb',

frozenset(['CH3CH2Br','H2']): 'CH3-CH3 + HBr',

frozenset(['CH3CH2I','HI']): 'CH3-CH3 + I2',

frozenset(['CH3CH2Br','Mg']): 'CH3CH2MgBr',

frozenset(['CH3MgI','HO-H']): 'CH4 + MgI(OH)',

frozenset(['CH3MgI','C2H5 OH']): 'CH4 + MgI(OC2H5)',

frozenset(['C6H5N2Cl','KI']): 'C6H5I + N2 + KCl',

frozenset(['C6H5Cl','NaOH']): 'C6H5OH + NaCl',

frozenset(['C6H5Cl','2NH3']): 'C6H5NH2 + NH4Cl',

frozenset(['C6H5Cl','CuCN']): 'C6H5CN + CuCl',

frozenset(['CH3CHO',' PCl5']): 'CH3 3 CHCl2 + POCl',

frozenset(['CHCl3','HNO3']): 'CCl3NO2 + H2O',

frozenset(['CS2','3Cl2']): 'CCl4 + S2Cl2',

frozenset(['CCl4','H2O']): 'COCl2 + 2HCl',

frozenset(['CCl4','2HF']): '2HCl + CCl2F2',

frozenset(['SO3','H2O']): 'H2SO4',

frozenset(['N2','O2']): '2NO',

frozenset(['2NO','O2']): '2NO2',

frozenset(['NO','O3']): 'NO2 + O2',

frozenset(['CaCO3','H2SO4']): 'CaSO4 + H2O +CO2',

frozenset(['NO2','']): 'NO +(O)',

frozenset(['O','O2']): 'O3',

frozenset(['NO2','O']): 'NO + O2',

frozenset(['ClO','O']): 'Cl + O2',

frozenset(['2Ca(OH)2','2Cl2']): 'CaCl2 + Ca(OCl)2 + 2H2O',

frozenset(['Ca(OH)2','CO2']): 'CaCO3 + H2O',

frozenset(['2CaSO4.2H2O','']): '2CaSO4.1/2 H2O + 3H2O',

frozenset(['2H2O','3O2']): '2H2 + O2',

frozenset(['C2H5OH,','3O2']): '2CO2 + 3H2O',

frozenset(['CH4','2O2']): 'CO2 + 2H2O',

frozenset(['C2H4','3O2']): '2CO2 (g)+2H2O(l)',

frozenset(['C','2H2']): 'CH4',

frozenset(['H2','1/2 O2']): 'H2O',

frozenset(['C','O2']): 'CO2',

frozenset(['CH4','2O2']): 'CO2 + 2H2O',

frozenset(['CO2','2H2O']): 'CH4 + 2O2',

frozenset(['HCl','KOH']): 'KCl + H2O',

frozenset(['HNO3','KOH']): 'KNO3 + H2O',

frozenset(['H2SO4','2KOH']): 'K2SO4 + 2H2O',

frozenset(['H','OH']): 'H2O',

frozenset(['HCl','NaOH']): 'NaCl + H2O ',

frozenset(['NaCl','']): 'Na + Cl',

frozenset(['NH4NO3','']): 'NH4 + NO3',

frozenset(['CH4','2O2']): 'CO2 +2H2O ',

frozenset(['2PbS','3O2']): '2PbO + 2SO2',

frozenset(['2ZnS','3O2']): '2ZnO + 2SO2',

frozenset(['2Cu2S','3O2']): '2Cu2O + 2SO2',

frozenset(['4As','3O2']): '2As2O3',

frozenset(['S8','8O2']): '8SO2',

frozenset(['P4','5O2']): 'P4O10',

frozenset(['PbCO3','']): 'PbO + CO2',

frozenset(['CaCO3','']): 'CaO + CO2',

frozenset(['ZnCO3','']): 'ZnO + CO2',

frozenset(['MgCO3.CaCO3','']): 'MgO + CaO + 2CO2',

frozenset(['Fe2O3.3H2O','']): 'Fe2O3 + 3H2O',

frozenset(['Al2O3.2H2O','']): 'Al2O3 + 2H2O',

frozenset(['Fe2O3','3CO']): '2Fe + 3CO2',

frozenset(['CaO','SiO2']): 'CaSiO3',

frozenset(['2CuFeS2','O2']): '2FeS (l)+ Cu2S + SO2',

frozenset(['2FeS','SiO2']): 'CaSiO3',

frozenset(['FeO','SiO2']): 'FeSiO3',

frozenset(['ZnO','C']): 'Zn + CO',

frozenset(['Ag2O','H2']): '2Ag + H2O',

frozenset(['Fe3O4','4H2']): '3Fe + 4H2O',

frozenset(['BaO2','Mg']): 'BaO + MgO',

frozenset(['HgS','O2']): 'Hg + SO2',

frozenset(['2C','O2']): '2CO',

frozenset(['2CO','O2']): '2CO2',

frozenset(['2Fe','O2']): '2FeO',

frozenset(['2C','O2']): '2CO',

frozenset(['2FeO','']): '2Fe + O2',

frozenset(['2FeO','2C']): '2Fe + 2CO',

frozenset(['2BF3','6NaH']): 'B2H6 + 6NaF',

frozenset(['2B','N2']): ' 2BN ',

frozenset(['Al2O3','']): '2Al+ 3O',

frozenset(['4B','3O2']): '2B2O3',

frozenset(['2B','3H2SO4']): '2H3BO3 + 3SO2',

frozenset(['2B','6NaOH']): '2Na3BO3 + 3H2',

frozenset(['Na2B4O7','2NH4Cl']): '2NaCl + 2BN + B2O3 + 4H2O',

frozenset(['B4H10','H2']):'2B2H6',

frozenset(['B2H6','6H2O']): '2H3BO3 + 6H2',

frozenset(['B2H6','2LiH']): '2LiBH4',

frozenset(['B2H6','2NaH']): '2NaBH4',

frozenset(['AlCl3','3H2O']): 'Al(OH)3 + 3HCl',

frozenset(['AlCl3','4NaOH']): 'NaAlO2 + 2H2O + 3NaCl',

frozenset(['HCOOH','H2SO4']): 'CO + H2SO4.H2O',

frozenset(['S8','8O2']): '8SO2',

frozenset(['HgS','O2']): 'Hg + SO2',

frozenset(['B4H10','H2']): '2B2H6',

frozenset(['Al(OH)3','3HCl']): 'AlCl3 + 3H2O',

frozenset(['2Al','3Cl']): '2AlCl',

frozenset(['AlCl3','3H2O']): 'Al(OH)3 + 3HCl',

frozenset(['CaCO3','']): 'CaO + CO2',

frozenset(['CaCO3','2HCl']): 'CaCl2 + H2O + CO2',

frozenset(['CO2','2Mg']): '2MgO+ C',

frozenset(['Si','4HCl']): 'SiCl4 + 2H2',

frozenset(['2NaN3','']): '2 Na + 3N2',

frozenset(['2N2','O2']): '2N2O',

frozenset(['NH4','OH']): 'NH3 + H2O',

frozenset(['NH3','H2O']): 'NH4 + OH (reversible reaction)',

frozenset(['HNO','2H']): 'HNO2 + H2O',

frozenset(['HNO3','6(H)']): 'NH2OH + 2H2O',

frozenset(['HNO3','8(H)']): 'NH3 + 3H2O',

frozenset(['2HNO3','8(H)']): 'H2N2O2 + 4H2O',

frozenset(['P','3O']): 'P4O6',

frozenset(['3NO','H2O']): '2HNO + NO',

frozenset(['2NO','O2']): '2NO2',

frozenset(['4HNO','']): '4NO+ 2H2O + O2',

frozenset(['Cl','CH4']): 'HCl + CH3',

frozenset(['PCl3','Cl2']): 'PCl5',

frozenset(['SO','NaOH']): 'NaHSO3',

frozenset(['S','O2']): 'SO2',

frozenset(['H2SO4','']): 'H2O + SO3',

frozenset(['NaCl','']): 'Na + Cl',

frozenset(['Na','OH']): 'NaOH',

frozenset(['H','H']): 'H2',

frozenset(['Cl','Cl']): 'Cl2',

frozenset(['2Na','Cl2']): '2NaCl',

frozenset(['2Fe','3Cl2']): '2FeCl3',

frozenset(['2Al','3Cl2']): '2AlCl',

frozenset(['Cu','Cl2']): 'CuCl',

frozenset(['H2','Cl2']): '2HCl',

frozenset(['2S','Cl2']): 'S2Cl2 ',

frozenset(['CH3','Cl2']): 'CH3Cl + Cl',

frozenset(['Cl','CH3']): 'CH3Cl',

frozenset(['2Cl','2H2O']): 'O2 + 4HCl',

frozenset(['Cl2','H2O']): 'HCl + HOCL',

frozenset(['HCl','NaOH']): 'NaCl + H2O',

frozenset(['CO','Cl2']): 'COCl2',

frozenset(['HCl','H2O']): 'H3O + Cl',

frozenset(['CaO','CO2']): 'CaCO3',

frozenset(['CH2O','O2']): 'CO2 + H2O',

}

def predict\_product(reactant1, reactant2):

key = frozenset([reactant1.strip(), reactant2.strip()])

return reaction\_db.get(key, "Reaction not found in database.")

r1 = input("Enter first reactant: ")

r2 = input("Enter second reactant: ")

product = predict\_product(r1, r2)

print('\u2794',f"Predicted product: {product}")