Essential Pre-Uni Chemistry B4.3

GCSE C C C A Level P P P

Calculate the amount of substance in:

Part A **(a)**

$1.001\,\mathrm{g}$ of $\mathrm{CaCO_3\,(s)}$, to 3 significant figures

Part B **(b)**

$197\,\mathrm{kg}$ of $\mathrm{Au\,(s)}$, to 3 significant figures

Part C **(c)**

$1.4\,\mathrm{g}$ of $\mathrm{CO\,(g)}$, to 2 significant figures

Part D **(d)**

$2.006\,\mathrm{kg}$ of $\mathrm{Hg\,(l)}$, to 4 significant figures

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Part E **(e)**

$11.1\,\mathrm{g}$ of lithium carbonate, to 3 significant figures

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Part F **(f)**

$10.0\,\mathrm{mg}$ of lead(II) iodide, to 3 significant figures

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Essential Pre-Uni Chemistry B6.1

GCSE A Level

Calculate the amount of oxygen needed, and amount of carbon dioxide produced, in each of the cases below.

Part A $C_3H_8 + 5\,O_2 \longrightarrow 3\,CO_2 + 4\,H_2O$

$C_3H_8 + 5\,O_2 \longrightarrow 3\,CO_2 + 4\,H_2O$, using $1.0\,\text{mol}$ of C_3H_8

Calculate the amount of oxygen needed.

Calculate the amount of carbon dioxide produced.

Part B $C_2H_6O + 3\,O_2 \longrightarrow 2\,CO_2 + 3\,H_2O$

$C_2H_6O + 3\,O_2 \longrightarrow 2\,CO_2 + 3\,H_2O$, using $0.2\,\text{mol}$ of of C_2H_6O

Calculate the amount of oxygen needed.

Calculate the amount of carbon dioxide produced.

Part C $2\,CO + O_2 \longrightarrow 2\,CO_2$

$2\,CO + O_2 \longrightarrow 2\,CO_2$, using $4.0\,\text{moles of } CO$

Calculate the amount of oxygen needed:

Calculate the amount of carbon dioxide produced:

Part D $C_6H_{12}O_6 + 6\,O_2 \longrightarrow 6\,CO_2 + 6\,H_2O$

$C_6H_{12}O_6 + 6\,O_2 \longrightarrow 6\,CO_2 + 6\,H_2O$, using $0.040\,\text{moles of } C_6H_{12}O_6$

Calculate the amount of oxygen needed:

Calculate the amount of carbon dioxide produced:

Part E $C_2H_4O_2 + 2\,O_2 \longrightarrow 2\,CO_2 + 2\,H_2O$

$C_2H_4O_2 + 2\,O_2 \longrightarrow 2\,CO_2 + 2\,H_2O$, using $0.10\,\text{moles of } C_2H_4O_2$

Calculate the amount of oxygen needed:

Calculate the amount of carbon dioxide produced:

Essential Pre-Uni Chemistry B6.2

GCSE C C C A Level P P P

By considering a balanced equation each time, calculate the amount of water produced by complete combustion of the following in oxygen.

Part A **(a)**

$1\,\text{mole}$ of pentane, C_5H_{12}

Part B **(b)**

$2.5\,\text{moles}$ of heptane, C_7H_{16}

Part C **(c)**

$200\,\text{moles}$ of hydrogen, H_2

Part D **(d)**

$4.0\,\text{moles}$ of butane

Part E **(e)**

$0.0030\,\text{moles}$ of methane

Essential Pre-Uni Chemistry B6.3

GCSE C C C A Level P P P

Consider the equation for each reaction and hence calculate the amount of acid required for complete reaction in each of the following cases.

Part A **(a)**

$0.10\,\text{mol}$ NaOH reacting with H_2SO_4. Give your answer to 2 significant figures.

Part B **(b)**

HCl reacting with $20\,\text{g}$ of CaCO_3. Give your answer to 2 significant figures.

Part C **(c)**

$24\,\text{g}$ CuO reacting with HNO_3. Give your answer to 2 significant figures.

Part D **(d)**

$5.6\,\mathrm{g}\ \mathrm{Fe}$ reacting with HCl. Give your answer to 2 significant figures.

Part E **(e)**

$14.8\,\mathrm{g}$ of calcium hydroxide reacting with $\mathrm{H_2SO_4}$. Give your answer to 3 significant figures.

Part F **(f)**

$10\,\mathrm{g}$ of magnesium oxide reacting with nitric acid. Give your answer to 2 significant figures.

Balancing Equations

A Level

Part A Be and O

Balance the following equation, reducing coefficients to the smallest possible integers:

$\mathrm{Be} + \mathrm{O_2} \longrightarrow \mathrm{BeO}$

Part B Ce and O

Balance the following equation, reducing coefficients to the smallest possible integers:

$\mathrm{Ce} + \mathrm{O_2} \longrightarrow \mathrm{CeO_2}$

Part C Cr and Cl

Balance the following equation, reducing coefficients to the smallest possible integers:

$\mathrm{Cr} + \mathrm{Cl_2} \longrightarrow \mathrm{CrCl_3}$

Part D C and $\mathrm{CO_2}$

Balance the following equation, reducing coefficients to the smallest possible integers:

$\mathrm{C} + \mathrm{CO_2} \rightarrow \mathrm{CO}$

Part E NaCl and $\mathrm{CaCO_3}$

Balance the following equation, reducing coefficients to the smallest possible integers:

$\mathrm{NaCl} + \mathrm{CaCO_3} \longrightarrow \mathrm{Na_2CO_3} + \mathrm{CaCl_2}$

Part F $\mathrm{Fe_2O_3}$ and CO

Balance the following equation, reducing coefficients to the smallest possible integers:

$\mathrm{Fe_2O_3} + \mathrm{CO} \longrightarrow \mathrm{Fe} + \mathrm{CO_2}$

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TNT

A Level

TNT is used as an explosive. It can decompose according to the following equation:

$$2\mathrm{C_7H_5N_3O_6\,(s)} \longrightarrow 7\,\mathrm{CO\,(g)} + 7\,\mathrm{C\,(s)} + 5\,\mathrm{H_2O\,(g)} + 3\,\mathrm{N_2\,(g)}$$

Part A RMM

Calculate the relative molecular mass of TNT, rounding your answer to an integer.

Part B Moles of gas

The volume of gas produced at $400\,^\circ\mathrm{C}$, when $10\,\mathrm{g}$ of TNT explode, is to be calculated.

How many moles of gas are produced from $1\,\mathrm{mol}$ of TNT?

Part C Volume of gas

At $400\,^\circ\mathrm{C}$ and $1\,\mathrm{atm}$, $1\,\mathrm{mol}$ of gas occupies $55\,\mathrm{dm^3}$.

Calculate the volume of gas produced under these conditions from $10\,\mathrm{g}$ of TNT.

Essential Pre-Uni Chemistry B3.1

GCSE C C C A Level P P P

RTP = room temperature and pressure.

Any gas occupies $24\,\mathrm{dm}^3$ per mole at RTP.

Avogadro's number, $N_\mathrm{A} = 6.02 \times 10^{23}\,\mathrm{mol}^{-1}$.

Part A (a)

Calculate the volume occupied by $4.0\,\mathrm{moles}$ of gas at RTP.

Part B (b)

Calculate the volume occupied by $0.030\,\mathrm{moles}$ of gas at RTP.

Part C (c)

Calculate the volume occupied by 5.0×10^{18} atoms of helium gas at RTP.

Part D **(d)**

Calculate the volume occupied by 1.2×10^{24} molecules of ozone at RTP.

Part E **(e)**

Calculate the volume occupied by $8.0\,\mathrm{g}$ of $\mathrm{O_2}$ at RTP.

Part F **(f)**

Calculate the volume occupied by $1.1\,\mathrm{kg}$ of carbon dioxide at RTP.

Essential Pre-Uni Chemistry B3.2

GCSE A Level

RTP = room temperature and pressure.

Any gas occupies $24\,\mathrm{dm}^3$ per mole at RTP.

Avogadro's number, $N_\mathrm{A} = 6.02 \times 10^{23}$.

Part A (a)

Calculate the amount of gas (at RTP) in $4.8\,\mathrm{dm}^3$.

Part B (b)

Calculate the amount of gas (at RTP) in $12\,\mathrm{m}^3$.

Part C (c)

Calculate the amount of gas (at RTP) in $400\,\mathrm{cm}^3$. Give your answer to 2 significant figures.

Part D **(d)**

Calculate the amount of gas (at RTP) in $18\ \mathrm{ml}$.

Essential Pre-Uni Chemistry B3.5

GCSE C C C A Level P P P

RTP = room temperature and pressure.

Any gas occupies $24\,\mathrm{dm}^3$ per mole at RTP.

Avogadro's number, $N_\mathrm{A} = 6.02 \times 10^{23}$.

Part A (a)

Calculate the the mass of $1.0\,\mathrm{m}^3$ of neon at RTP.

Part B (b)

Calculate the the mass of $20\,\mathrm{cm}^3$ of $(\mathrm{CH_3})_2\mathrm{O}$ at RTP.

Part C (c)

Calculate the the mass of $420\,\mathrm{cm}^3$ of ammonia at RTP. Give your answer to 2 significant figures.