O'LEVELS

MOLES & STOICHIOMETRY

Multiple Choice Questions

MCQ - MOLES & STOICHIOMETRY

MCQ 1.a

17 The table shows the energy released by the complete combustion of some compounds used as fuels.

compound	formula	M_r	ΔH in kJ / mol
benzene	C_6H_6	78	–3270
heptane	C_7H_{16}	100	–4800
octane	C_8H_{18}	114	–5510
propane	C_3H_8	44	–2200

Which fuel releases the least energy when 1 g of the compound is completely burned?

A benzene

B heptane

C octane

D propane

5070_s14_qp12

MCQ 2.b

11 Sulfuric acid and potassium hydroxide can react together to form potassium hydrogensulfate, $KHSO_4$, and water only.

Which amounts of the reactants are required?

A equal masses of sulfuric acid and potassium hydroxide

B equal numbers of moles of sulfuric acid and potassium hydroxide

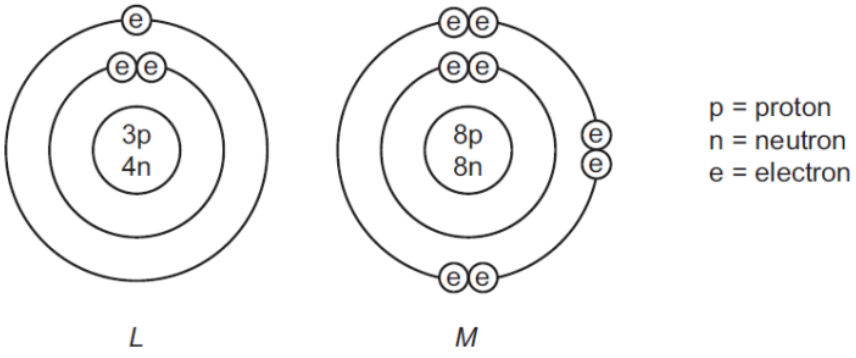
C 1 mol of sulfuric acid to 2 mol of potassium hydroxide

D 2 mol of sulfuric acid to 1 mol of potassium hydroxide

5070_s14_qp12

MCQ 3.d

12 The diagram shows the structures of the atoms of elements *L* and *M*.



L *M*

The elements combine to form a compound.

What is the mass of one mole of this compound?

A 11 g **B** 12 g **C** 23 g **D** 30 g

5070_s14_qp12

MCQ 4.b

9 An element, *E*, forms a hydride, EH_4, which contains 90.0% by mass of *E*.

If the relative atomic mass of hydrogen is 1, what is the relative atomic mass of *E*?

A 9 **B** 36 **C** 86 **D** 90

5070_s14_qp11

MCQ 5.d

10 A piece of chalk has a mass of 23.0 g. Chalk is impure calcium carbonate. When analysed, the chalk is found to contain 0.226 moles of pure calcium carbonate.
[M_r: $CaCO_3$, 100]

What is the percentage purity of the piece of chalk?

A 0.983% **B** 1.02% **C** 77.0% **D** 98.3%

5070_s14_qp11

MCQ 6.c

26 What is the percentage, by mass, of nitrogen in the fertiliser $(NH_4)_3PO_4$?
[A_r: H, 1; N, 14; O, 16; P, 31]

A 9.4% **B** 18.8% **C** 28.2% **D** 37.6%

5070_w13_qp12

MCQ 7.d

15 Sodium hydrogencarbonate decomposes on heating.

$$2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$$

In an experiment, a 5.0 mol sample of sodium hydrogencarbonate is heated.

Which volume of carbon dioxide, measured at room temperature and pressure, is evolved?

A 24 dm^3 **B** 36 dm^3 **C** 48 dm^3 **D** 60 dm^3

5070_w13_qp12

MCQ 8.b

10 18 g of water contains the same number of molecules as

A 18 g of ammonia gas.

B 2 g of hydrogen gas.

C 14 g of nitrogen gas.

D 16 g of oxygen gas.

5070_w13_qp12

MCQ 9.a

11 The complete combustion of 20 cm^3 of a gaseous alkane, **X**, requires 130 cm^3 of oxygen. Both volumes were measured at r.t.p..

What could be the identity of **X**?

A butane

B ethane

C methane

D propane

5070_w13_qp12

MCQ 10.d

11 Sodium hydrogencarbonate decomposes on heating.

$$2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$$

In an experiment, a 5.0 mol sample of sodium hydrogencarbonate is heated.

Which volume of carbon dioxide, measured at room temperature and pressure, is evolved?

A 24 dm^3 **B** 36 dm^3 **C** 48 dm^3 **D** 60 dm^3

5070_w13_qp11

MCQ 11.c

12 Nitrogen and oxygen react according to the equation.

$$N_2(g) + 2O_2(g) \rightarrow 2NO_2(g)$$

The enthalpy change for the reaction shown is +66 kJ.

If two moles of nitrogen and two moles of oxygen are used, what will be the enthalpy change?

A +16.5 kJ **B** +33 kJ **C** +66 kJ **D** +132 kJ

5070_w13_qp11

MCQ 12.a

13 Which statement about the four gases carbon dioxide, CO_2, hydrogen, H_2, oxygen, O_2 and ozone, O_3 is correct?

A One mole of each gas occupies the same volume at a given temperature and pressure.

B Ozone has the fastest rate of diffusion at a given temperature and pressure.

C They are all denser than air.

D They are all elements.

5070_w13_qp11

MCQ 13.b

14 Two of the reactions used in the manufacture of nitric acid, HNO_3, are shown.

$$2NO + O_2 \rightarrow 2NO_2$$

$$4NO_2 + 2H_2O + O_2 \rightarrow 4HNO_3$$

What is the maximum number of moles of nitric acid which could be formed from one mole of nitrogen monoxide, NO?

A 0.5 **B** 1.0 **C** 2.0 **D** 4.0

5070_w12_qp12

MCQ 14.d

13 0.5 mol/dm^3 hydrochloric acid is added gradually to a flask containing 20 cm^3 of 2 mol/dm^3 sodium hydroxide solution.

What is the total volume, in cm^3, of the mixture in the flask when the solution is just neutral?

A 30 **B** 40 **C** 60 **D** 100

5070_w12_qp12

MCQ 15.c

31 Which contains the greatest mass of nitrogen?

A 0.5 moles $(NH_4)_2SO_4$

B 1 mole NH_4NO_3

C 1.5 moles $(NH_4)_3PO_4$

D 2 moles $CO(NH_2)_2$

5070_w12_qp11

MCQ 16.c

12 The M_r of oxygen, O_2, is 32 and the M_r of sulfur is 256.

What is the formula of a molecule of sulfur?

A S_2 **B** S_4 **C** S_8 **D** S_{16}

5070_w12_qp11

MCQ 17.b

8 A compound Y is the only substance formed when two volumes of dry ammonia gas react with one volume of dry carbon dioxide (both volumes measured at s.t.p.).

What is the most likely formula of Y?

A $(NH_4)_2CO_3$

B NH_2COONH_4

C $(NH_2)_2CO$

D NH_4COONH_4

5070_w12_qp11

MCQ 18.a

13 Analysis of a sample of an oxide of nitrogen gave the following data.

- percentage by mass of nitrogen 47%
- percentage by mass of oxygen 53%

What is the empirical formula of this oxide?
[A_r: N, 14; O, 16]

A NO **B** NO_2 **C** N_2O **D** N_2O_3

5070_w14_qp11

MCQ 19.d

13 Which fertiliser contains the greatest percentage by mass of nitrogen?

A $(NH_4)_2HPO_4$ $M_r = 132$

B $(NH_4)_2SO_4$ $M_r = 132$

C NH_4NO_3 $M_r = 80$

D $CO(NH_2)_2$ $M_r = 60$

5070_w14_qp12

MCQ 20.c

14 A volume of ethane, C_2H_6, at r.t.p. has a mass of 20 g.

What is the mass of an equal volume of propene, C_3H_6, at r.t.p.?

A 20 g **B** 21 g **C** 28 g **D** 42 g

5070_w14_qp12

MCQ 21.c

11 What is the empirical formula of a compound containing 12 g of carbon, 2 g of hydrogen and 16 g of oxygen only?

A CHO **B** CHO_2 **C** CH_2O **D** C_2HO

5070_w14_qp12

MCQ 22.a

11 What is the ratio of the number of molecules in 71 g of gaseous chlorine to the number of molecules in 2 g of gaseous hydrogen? [Relative atomic masses A_r (atomic weights): H, 1: C*l*, 35.5]

A 1:1 **B** 1:2 **C** 2:1 **D** 71:2

5070_w11_qp11

MCQ 23.c

12 What is the relative molecular mass M_r of $CuSO_4.5H_2O$?

A 160 **B** 178 **C** 186 **D** 250

5070_w11_qp11

MCQ 24.b

33 The compounds $CO(NH_2)_2$ and NH_4NO_3 are used as fertilisers.

The proportion of nitrogen by mass in $CO(NH_2)_2$ is ……1…… that in NH_4NO_3.

The proportion of nitrogen by mole in $CO(NH_2)_2$ is ……2…… that in NH_4NO_3.

Which words correctly complete gaps 1 and 2?

	1	2
A	equal to	equal to
B	higher than	equal to
C	higher than	higher than
D	lower than	lower than

5070_s13_qp12

MCQ 25.b

11 One volume of a gaseous element X_2 combines with an equal volume of gaseous hydrogen to form two volumes of a gaseous hydride.

What is the formula for the hydride of *X*?

A H_2X **B** HX **C** HX_2 **D** H_2X_2

5070_s13_qp12

MCQ 26.d

12 The relative atomic mass of chlorine is 35.5.

What is the mass of 2 moles of chlorine gas?

A 17.75 g **B** 35.5 g **C** 71 g **D** 142 g

5070_s13_qp12

MCQ 27.c

11 In an experiment, 1 cm^3 of a gaseous hydrocarbon **X** required 4 cm^3 of oxygen for complete combustion to give 3 cm^3 of carbon dioxide. All gas volumes are measured at r.t.p.

Which formula represents **X**?

A C_2H_2 **B** C_2H_4 **C** C_3H_4 **D** C_3H_8

5070_s13_qp11

MCQ 28.b

12 What is the concentration of a solution containing 1.0 g of sodium hydroxide in 250 cm^3 of solution?

A 0.025 mol / dm^3

B 0.10 mol / dm^3

C 0.25 mol / dm^3

D 1.0 mol / dm^3

5070_s13_qp11

MCQ 29.a

13 What has the same mass as 0.25 mol of copper atoms?

A 0.5 mol of oxygen molecules

B 1 mol of sulfur dioxide molecules

C 1.5 mol of water molecules

D 2 mol of oxygen atoms

5070_s12_qp12

MCQ 30.c

37 A 10 cm^3 sample of a gaseous hydrocarbon is completely burnt in oxygen. The total volume of the products is 70 cm^3. All gas volumes are measured at room temperature and pressure.

Which equation represents the combustion of the hydrocarbon?

A $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

B $C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(g)$

C $C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g)$

D $2C_2H_6(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(g)$

5070_s12_qp11

MCQ 31.d

11 The equation for the burning of hydrogen in oxygen is shown.

$$2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$$

What does this equation indicate?

A 2 atoms of hydrogen combine with 2 atoms of oxygen.

B 2 g of hydrogen combine with 1 g of oxygen.

C 2 moles of steam can be obtained from 0.5 mole of oxygen.

D 2 moles of steam can be obtained from 1 mole of oxygen.

5070_s12_qp11

MCQ 32.a

9 15.0 cm^3 of 1.0 mol/dm^3 potassium hydroxide just neutralise 20.0 cm^3 of a solution of nitric acid.

What is the concentration of the acid?

A 0.75 mol/dm^3

B 1.0 mol/dm^3

C 1.5 mol/dm^3

D 7.5 mol/dm^3

5070_s12_qp11

MCQ 33.d

11 The equation for the reaction between calcium carbonate and hydrochloric acid is shown.

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$$

How many moles of calcium carbonate will give 24 cm^3 of carbon dioxide when reacted with an excess of the acid?

(Assume one mole of carbon dioxide occupies 24 dm^3.)

A 1 mol **B** 0.1 mol **C** 0.01 mol **D** 0.001 mol

5070_s11_qp11

MCQ 34.b

12 The empirical formula of a liquid compound is C_2H_4O.

To find the empirical formula, it is necessary to know the

A density of the compound.

B percentage composition of the compound.

C relative molecular mass of the compound.

D volume occupied by 1 mole of the compound.

5070_s11_qp11

MCQ 35.c

4 What is the mass of oxygen contained in 72 g of pure water?
[Relative atomic masses: H = 1; O = 16]

A 16 g **B** 32 g **C** 64 g **D** 70 g

5070_s11_qp11

MCQ 36.c

11 What is the concentration of iodine molecules, I_2, in a solution containing 2.54 g of iodine in 250 cm^3 of solution?

A 0.01 mol / dm^3

B 0.02 mol / dm^3

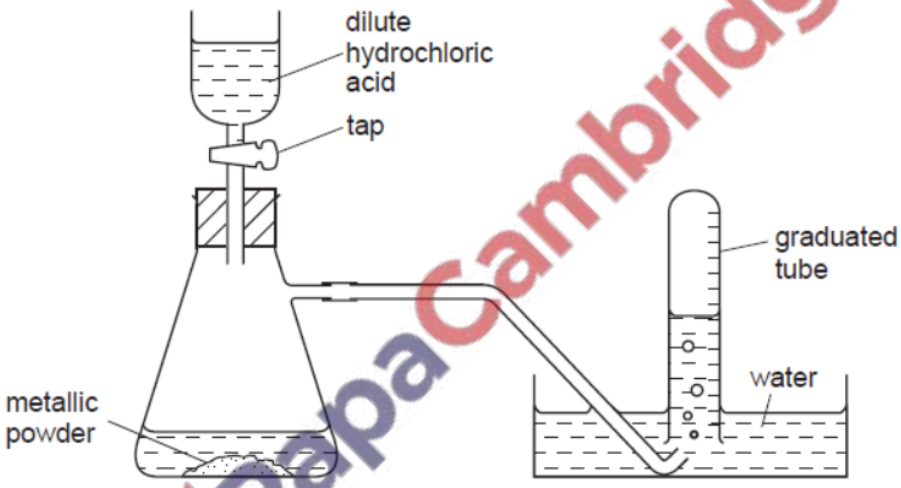
C 0.04 mol / dm^3

D 0.08 mol / dm^3

5070_w10_qp11

MCQ 37.a

32 The diagram shows apparatus for measuring the volume of hydrogen given off when an excess of dilute hydrochloric acid is added to powdered metal. The volume of gas is measured at room temperature and pressure.



The experiment is carried out three times, using the same mass of powder each time but with different powders:

- pure magnesium
- pure zinc
- a mixture of magnesium and zinc

Which powder gives the greatest volume of hydrogen and which the least volume?

	greatest volume of H_2	least volume of H_2
A	magnesium	zinc
B	magnesium	the mixture
C	zinc	magnesium
D	zinc	the mixture

5070_s10_qp11

MCQ 38.d

9 What is the mass of one mole of carbon-12?

A 0.012 g **B** 0.024 g **C** 1 g **D** 12 g

5070_s10_qp11

MCQ 39.a

10 Two different hydrocarbons each contain the same percentage by mass of hydrogen.

It follows that they have the same

A empirical formula.

B number of isomers.

C relative molecular mass.

D structural formula.

5070_s10_qp11

MCQ 40.c

32 What is the concentration of hydrogen ions in 0.05 mol/dm^3 sulfuric acid?

A 0.025 g/dm^3 **B** 0.05 g/dm^3 **C** 0.10 g/dm^3 **D** 2.0 g/dm^3

5070_w09_qp1

MCQ 41.a

12 Hydrogen reacts with oxygen as shown in the equation below.

$$2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$$

How much gas will remain if 2 dm^3 of hydrogen are reacted with 1 dm^3 of oxygen at room temperature?

A 0 dm^3 **B** 1 dm^3 **C** 2 dm^3 **D** 3 dm^3

5070_w09_qp1

MCQ 42.d

9 A sample of hydrogen is a mixture of the two isotopes $^{1}_{1}H$ and $^{2}_{1}H$.

The relative atomic mass of oxygen is 16.

What are possible values of the relative molecular mass of different molecules of water formed by the combination of oxygen and hydrogen?

1 18

2 19

3 20

A 1 only

B 1 and 2 only

C 1 and 3 only

D 1, 2 and 3

5070_w09_qp1

MCQ 43.c

10 Calcium reacts with water as shown.

$$Ca(s) + 2H_2O(l) \rightarrow Ca(OH)_2(aq) + H_2(g)$$

What is the total mass of the solution that remains when 40 g of calcium reacts with 100 g of water?

A 58 g **B** 74 g **C** 138 g **D** 140 g

5070_w09_qp1

MCQ 44.b

19 The fertiliser ammonium nitrate (NH_4NO_3, $M_r = 80$) is manufactured from ammonia (NH_3, $M_r = 17$) by a two-stage process.

Stage 1 $NH_3 + 2O_2 \rightarrow HNO_3 + H_2O$

Stage 2 $HNO_3 + NH_3 \rightarrow NH_4NO_3$

What is the maximum mass of fertiliser that can be made if only 17 tonnes of ammonia is available?

A 34 tonnes **B** 40 tonnes **C** 80 tonnes **D** 97 tonnes

5070_w08_qp1

MCQ 45.b

17 Carbon dioxide can be obtained as shown in the equation.

$$3Na_2CO_3 + 2H_3PO_4 \rightarrow 2Na_3PO_4 + 3CO_2 + 3H_2O$$

How many moles of phosphoric acid, H_3PO_4, are needed to produce 1.5 mol of carbon dioxide?

A 0.5 **B** 1.0 **C** 1.5 **D** 2.0

5070_w08_qp1

MCQ 46.d

14 When added to 20 cm^3 of 0.5 M sulphuric acid, which substance would give a neutral solution?

A 20 cm^3 of 0.5 M sodium hydroxide

B 10 cm^3 of 0.5 M sodium hydroxide

C 40 cm^3 of 1.0 M sodium hydroxide

D 20 cm^3 of 1.0 M sodium hydroxide

5070_w08_qp1

MCQ 47.b

10 Which gas contains the same number of molecules as 9 g of water?

A 2 g of hydrogen

B 14 g of nitrogen

C 32 g of oxygen

D 44 g of carbon dioxide

5070_s09_qp1

MCQ 48.d

11 The equation for the reaction between copper and nitric acid is shown.

$$v\text{Cu} + w\text{HNO}_3 \rightarrow x\text{Cu(NO}_3)_2 + y\text{NO} + z\text{H}_2\text{O}$$

v, *w*, *x*, *y* and *z* are whole numbers.

Which values of *v*, *w*, *x*, *y* and *z* balance the equation?

	v	*w*	*x*	*y*	*z*
A	1	2	1	1	1
B	1	4	1	2	2
C	3	4	3	2	2
D	3	8	3	2	4

5070_s09_qp1

MCQ 49.c

12 The mass of one mole of a chloride formed by a metal Y is 74.5 g.

What is the formula of the chloride?

A Y_3Cl **B** Y_2Cl **C** YCl **D** YCl_2

5070_s09_qp1

MCQ 50.c

20 When 20 cm^3 of a 2 mol/dm^3 solution of potassium hydroxide is mixed with 20 cm^3 of a 1 mol/dm^3 solution of sulphuric acid, the temperature of the mixture rises.

What best explains this?

A Sulphuric acid is a strong acid.

B The potassium hydroxide solution is more concentrated than the sulphuric acid solution.

C The reactants have a higher energy content than the products.

D Potassium hydroxide is a very strong alkali.

s/08/qp1

MCQ 51.d

13 One mole of a sample of hydrated sodium sulphide contains 162 g of water of crystallisation.

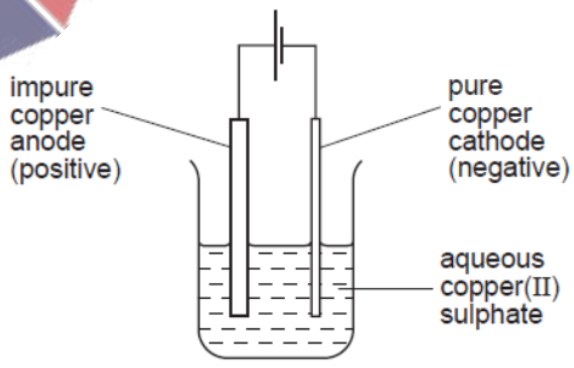
What is the correct formula of this compound?

A $Na_2S.3H_2O$ **B** $Na_2S.5H_2O$ **C** $Na_2S.7H_2O$ **D** $Na_2S.9H_2O$

s/08/qp1

MCQ 52.c

12 A sample of copper contains a metal impurity which is below copper in the reactivity series. The diagram shows the apparatus used for refining the sample.



The loss in mass of the anode (positive electrode) is 50 g and the gain in mass of the cathode (negative electrode) is 45 g.

What is the percentage purity of this sample of copper?

A 10.0 % **B** 11.1 % **C** 90.0 % **D** 95.0 %

s/08/qp1

MCQ 53.a

11 The element X forms a gaseous molecule X_2. One volume of X_2 combines with one volume of hydrogen to form two volumes of a gaseous hydride.

What is the formula for the hydride of X?

A HX **B** HX_2 **C** H_2X **D** H_2X_2

s/07/qp1

MCQ 54.c

12 Which substance has the highest percentage by mass of nitrogen?

A NH_4NO_3 $M_r = 80$

B $(NH_4)_2SO_4$ $M_r = 132$

C $CO(NH_2)_2$ $M_r = 60$

D $(NH_4)_3PO_4$ $M_r = 149$

s/07/qp1

MCQ 55.a

31 All ammonium salts on heating with sodium hydroxide produce ammonia gas.

From which ammonium salt can the greatest mass of ammonia be obtained?

A 0.5 mol $(NH_4)_3PO_4$

B 0.5 mol $(NH_4)_2SO_4$

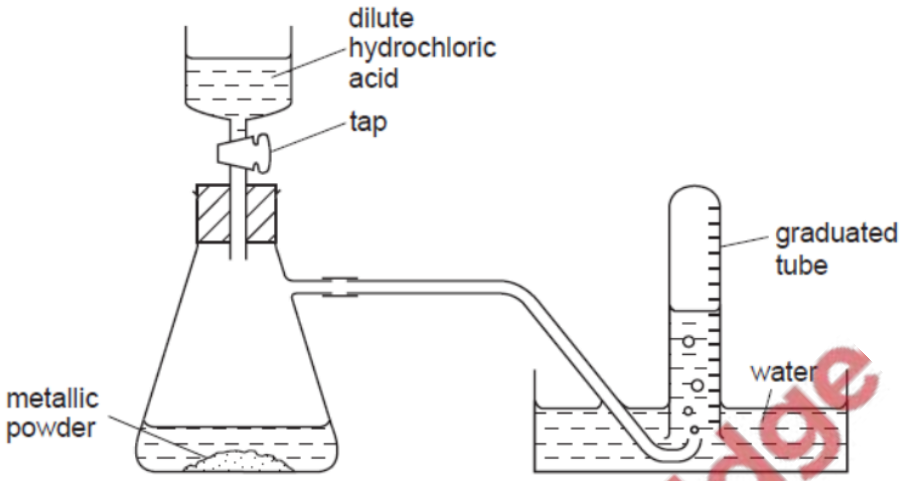
C 1.0 mol NH_4Cl

D 1.0 mol NH_4NO_3

w/07/qp1

MCQ 56.a

28 The diagram shows apparatus for measuring the volume of hydrogen given off when an excess of dilute hydrochloric acid is added to powdered metal. The volume of gas is measured at room temperature and pressure.



The experiment is carried out three times, using the same mass of powder each time but with different powders:

- pure magnesium
- pure zinc
- a mixture of magnesium and zinc

Which powder gives the greatest volume of hydrogen and which the least volume?

	greatest volume of H_2	least volume of H_2
A	magnesium	zinc
B	magnesium	the mixture
C	zinc	magnesium
D	zinc	the mixture

w/07/qp1

MCQ 57.d

12 The equation represents the action of dilute nitric acid on copper.

$$x\text{Cu} + y\text{HNO}_3 \rightarrow x\text{Cu(NO}_3)_2 + 4\text{H}_2\text{O} + 2\text{NO}$$

What are the values of x and y?

A $x = 1, y = 4$

B $x = 1, y = 8$

C $x = 3, y = 4$

D $x = 3, y = 8$

w/07/qp1

MCQ 58.c

10 Which quantity is the same for one mole of ethanol and one mole of ethane?

A mass

B number of atoms

C number of molecules

D volume at r.t.p.

w/06/qp1

MCQ 59.b

11 In an experiment 264 g of strontium reacts with 213 g of chlorine.

What is the formula of strontium chloride?

A $SrCl$ **B** $SrCl_2$ **C** $SrCl_3$ **D** Sr_2Cl

w/06/qp1

MCQ 60.d

25 What is the mass of aluminium in 204 g of aluminium oxide, Al_2O_3?

A 26 g **B** 27 g **C** 54 g **D** 108 g

w/05/qp1

MCQ 61.a

11 What is the ratio of the volume of 2 g of hydrogen to the volume of 16 g of methane, both volumes at r.t.p.?

A 1 to 1 **B** 1 to 2 **C** 1 to 8 **D** 2 to 1

w/05/qp1

MCQ 62.a

28 All ammonium salts on heating with sodium hydroxide produce ammonia gas.

From which ammonium salt can the greatest mass of ammonia be obtained?

A 0.5 mol $(NH_4)_3PO_4$

B 0.5 mol $(NH_4)_2SO_4$

C 1.0 mol NH_4Cl

D 1.0 mol NH_4NO_3

w/04/qp1

MCQ 63.c

18 The table shows the energy released by the complete combustion of some compounds used as fuels.

compound	formula	M_r	ΔH in kJ/mol
methane	CH_4	16	–880
ethanol	C_2H_5OH	46	–1380
propane	C_3H_8	44	–2200
heptane	C_7H_{16}	100	–4800

Which fuel produces the most energy when 1 g of the compound is completely burned?

A ethanol

B heptane

C methane

D propane

w/04/qp1

MCQ 64.a

11 'Cracking' of hydrocarbons breaks them into smaller molecules.

Which example of 'cracking' would produce the largest volume of products from one mole of hydrocarbon? Assume that all measurements are made at the same temperature and pressure.

A $C_6H_{14}(g) \rightarrow 3C_2H_4(g) + H_2(g)$

B $C_8H_{18}(g) \rightarrow 2C_3H_8(g) + C_2H_2(g)$

C $C_{10}H_{22}(g) \rightarrow C_8H_{18}(g) + C_2H_4(g)$

D $C_{12}H_{26}(g) \rightarrow C_8H_{18}(g) + 2C_2H_4(g)$

w/04/qp1

MCQ 65.a

12 When 20 cm^3 of a gaseous alkene burns in an excess of oxygen, 60 cm^3 of carbon dioxide are formed. Both volumes are measured at r.t.p.

What is the formula of the alkene?

A C_3H_6

B C_3H_8

C C_6H_{12}

D C_6H_{14}

w/04/qp1

MCQ 66.

11 What is the mass of magnesium which completely reacts with 250 cm^3 of 1.0 mol/dm^3 sulphuric acid?

A 6 g **B** 12 g **C** 48 g **D** 96 g

w/03/qp1

MCQ 67.c

12 A volume of ethane, C_2H_6, at r.t.p. has a mass of 20 g.

What is the mass of an equal volume of propene, C_3H_6, at r.t.p.?

A 20 g **B** 21 g **C** 28 g **D** 42 g

w/03/qp1

MCQ 68.d

11 An 8 g sample of oxygen atoms contains the same number of atoms as 16 g of element **X**.

What is the relative atomic mass, A_r, of **X**?

A 4 **B** 8 **C** 16 **D** 32

s/06/qp1

MCQ 69.d

10 2 dm^3 of aqueous sodium hydroxide of concentration 5 mol/dm^3 were required for an experiment.

How many moles of sodium hydroxide were needed to make up this solution?

A 2.5 **B** 5 **C** 7 **D** 10

s/06/qp1

MCQ 70.c

28 Aluminium sulphate can be obtained as shown in the equation.

$$2Al(OH)_3 + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 6H_2O$$

How many moles of sulphuric acid are needed to produce 0.5 mol of aluminium sulphate?

A 0.5 **B** 1.0 **C** 1.5 **D** 3.0

s/05/qp1

MCQ 71.b

9 How many moles per dm^3 of gaseous carbon dioxide are there if 4.4 g occupies 500 cm^3?

A 0.1 mol/dm^3 **B** 0.2 mol/dm^3 **C** 2.2 mol/dm^3 **D** 8.8 mol/dm^3

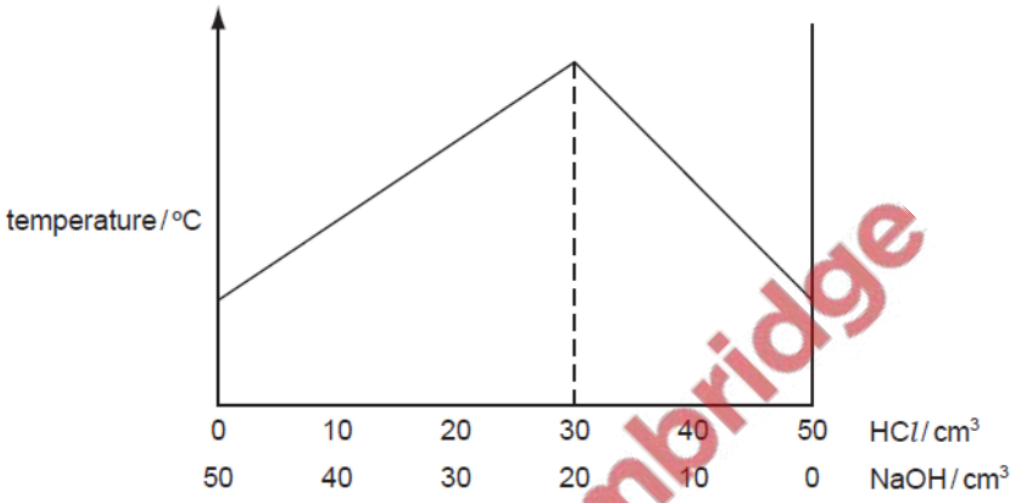
s/05/qp1

24 A solution of hydrochloric acid has a concentration of $2\,mol/dm^3$.

Different volumes of the acid are added to different volumes of aqueous sodium hydroxide.

$$NaOH + HCl \rightarrow NaCl + H_2O$$

The maximum temperature of each mixture is measured. The graph shows the results.



What is the concentration of the aqueous sodium hydroxide?

A $0.67\,mol/dm^3$

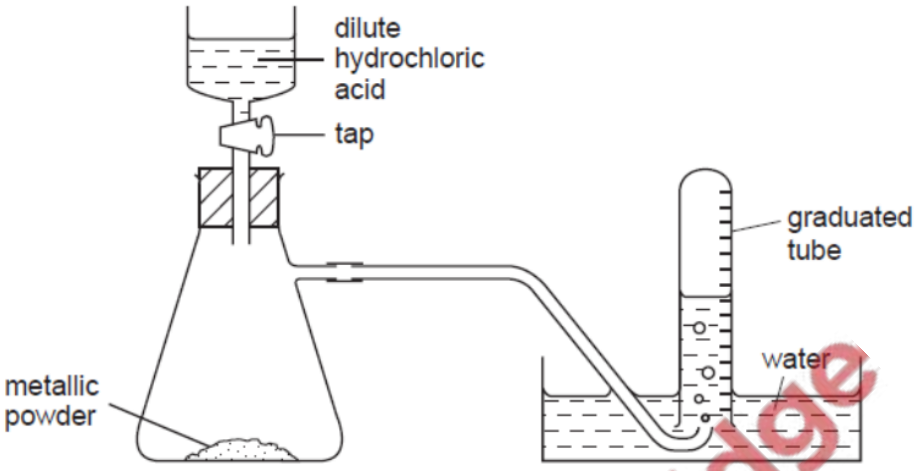
B $1.3\,mol/dm^3$

C $1.5\,mol/dm^3$

D $3.0\,mol/dm^3$

MCQ 73.a

19 The diagram shows apparatus for measuring the volume of hydrogen given off when an excess c dilute hydrochloric acid is added to powdered metal. The volume of gas is measured at roor temperature and pressure.



The experiment is carried out three times, using the same mass of powder each time but wit different powders:

- pure magnesium
- pure zinc
- a mixture of magnesium and zinc

Which powder gives the greatest volume of hydrogen and which the least volume?

	greatest volume of H_2	least volume of H_2
A	magnesium	zinc
B	magnesium	the mixture
C	zinc	magnesium
D	zinc	the mixture

s/04/qp1

MCQ 74.c

15 The equation for the burning of hydrogen in oxygen is shown below.

$$2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$$

Which information does this equation give about the reaction?

A 36 g of steam can be obtained from 16 g of oxygen.

B 2 g of hydrogen combine with 1 g of oxygen.

C 2 mol of steam can be obtained from 1 mol of oxygen.

D 2 atoms of hydrogen combine with 2 atoms of oxygen.

s/04/qp1

MCQ 75.b

14 The formula of an oxide of uranium is UO_2.

What is the formula of the corresponding chloride?

A UCl_2 **B** UCl_4 **C** U_2Cl **D** U_4Cl

s/04/qp1

MCQ 76.c

13 What is the concentration of iodine, I_2, molecules in a solution containing 2.54 g of iodine in 250 cm^3 of solution?

A 0.01 mol / dm^3 **B** 0.02 mol / dm^3 **C** 0.04 mol / dm^3 **D** 0.08 mol / dm^3

s/04/qp1

MCQ 77.d

12 The formula of china clay (aluminium silicate) was shown in an old book as $Al_2O_3.2SiO_2.2H_2O$.

This formula is shown in a modern book as $Al_2(OH)_xSi_2O_y$.

What are the values of *x* and *y* in the modern formula?

	x	*y*
A	2	4
B	2	5
C	4	3
D	4	5

s/04/qp1

MCQ 78.d

5 The relative molecular mass, M_r, of copper(II) sulphate, $CuSO_4$, is 160.

The relative molecular mass, M_r, of water is 18.

What is the percentage by mass of water in copper(II) sulphate crystals, $CuSO_4.5H_2O$?

A $\frac{18 \times 100}{160}$ **B** $\frac{5 \times 18 \times 100}{160 + 18}$ **C** $\frac{18 \times 100}{160 + 18}$ **D** $\frac{5 \times 18 \times 100}{160 + (5 \times 18)}$

s/04/qp1

MCQ 79.b

13 124 g of phosphorus vapour has the same volume as 71 g of chlorine gas at the same temperature and pressure.

What is the formula of a molecule of phosphorus?

A P_8 **B** P_4 **C** P_2 **D** P

MCQ 80.b

12 Which sulphide contains the greatest mass of sulphur in a 10 g sample?

sulphide	formula	mass of one mole / g
A	NiS	90
B	FeS_2	120
C	MoS_2	160
D	PbS	239

MCQ 81.d

5 A 25 cm^3 sample of dilute sulphuric acid contains 0.025 moles of the acid.

What is the hydrogen ion concentration in the solution?

A 0.25 mol / dm^3

B 0.50 mol / dm^3

C 1.00 mol / dm^3

D 2.00 mol / dm^3