4.1 Stoichiometry

Question Paper

Level	IGCSE
Subject	Chemistry (0620)
Exam Board	Cambridge International Examinations (CIE)
Topic	Stoichiometry
Sub-Topic	4.1 Stoichiometry
Booklet	Question Paper

Time Allowed: **33 minutes**

Score: **/27**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	75%	60%	45%	35%	25%	<25%

1   The equation shows the reaction between magnesium and sulfuric acid.
    [A_r: H, 1; O, 16; Mg, 24; S, 32]

$$Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$$
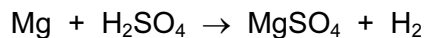
In this reaction, which mass of magnesium sulfate is formed when 6 g of magnesium react with excess sulfuric acid?

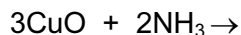**A**   8   **B**   24   **C**   30   **D**   60

2   Two atoms of magnesium, Mg, react with one molecule of oxygen, O_2.

What is the formula of the product?

A   MgO   **B** MgO_2 **C** Mg_2O **D** Mg_2O_2

3   Copper(II) oxide reacts with ammonia.

The left hand side of the balanced equation for this reaction is:

$$3CuO + 2NH_3 \rightarrow$$

What completes the equation?

A $3Cu + 2HNO_3$

B $3Cu + 2N + 3H_2O$

C $3Cu + N_2 + 3H_2O$

D $3Cu + 2NO + 3H_2O$

4   What is the relative formula mass, M_r, of $CaCO_3$?

A   50   **B**   68   **C**   100   **D**   204

5   A molecule, Z, contains two atoms of oxygen, six atoms of hydrogen and three atoms of carbon.

What is the formula of Z?

A CH_3CH_2CHO

B CH_3COCH_3

C $C_2H_5CO_2H$

D $C_3H_6CO_2H$

6   What are the electrode products when molten silver iodide is electrolysed between inert electrodes?

	cathode	anode
A	hydrogen	iodine
B	iodine	silver
C	silver	iodine
D	silver	oxygen

7   Iron forms an oxide with the formula Fe_2O_3.

What is the relative formula mass of this compound?

A   76   **B**   100   **C**   136   **D**   160
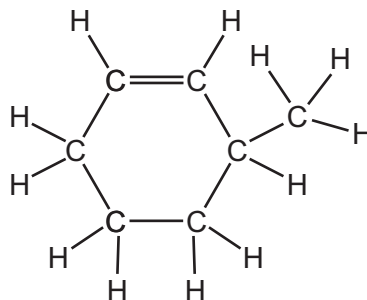
8   In athletics, banned drugs such as nandrolone have been taken illegally to improve performance. Nandrolone has the molecular formula $C_{18}H_{26}O_2$.

What is the relative molecular mass, M_r, of nandrolone?

(Relative atomic mass: H = 1; C = 12; O = 16)

A   46   **B**   150   **C**   274   **D**   306

9   The structure of an organic compound, X, is shown.

What is the molecular formula of X?

A C_6H_9 B C_6H_{12} C C_7H_{12} D C_7H_{14}

10   What is the relative molecular mass, M_r, of nitrogen dioxide?

A   15   B   23   C   30   D   46

11   A compound contains one atom of calcium, two atoms of hydrogen and two atoms of oxygen.

What is the correct chemical formula of the compound?

A CaO_2H_2 B $HOCaOH$ C H_2CaO_2 D $Ca(OH)_2$

12   The formulae of compounds W, X and Y are shown.

W $CuSO_4.5H_2O$

X $MgSO_4.7H_2O$

Y $Cu(NO_3)_2.6H_2O$

Which statement is correct?

A   W contains twice as many hydrogen atoms as oxygen atoms.

B   X contains the most oxygen atoms.

C   Y contains the most hydrogen atoms.

D   Y contains the same number of hydrogen and oxygen atoms.

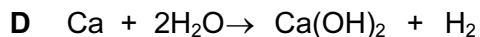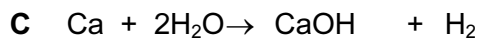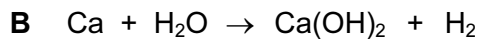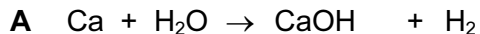13   Which relative molecular mass, M_r, is **not** correct for the molecule given?

	molecule	M_r
A	ammonia, NH_3	17
B	carbon dioxide, CO_2	44
C	methane, CH_4	16
D	oxygen, O_2	16

14   A compound with the formula XF_2 has a relative formula mass of 78.

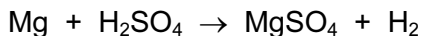What is element X?

A   argon

B   calcium

C   neon

D   zirconium

15 What is the balanced chemical equation for the reaction between calcium and water?

    A $Ca + H_2O \rightarrow CaOH + H_2$

    B $Ca + H_2O \rightarrow Ca(OH)_2 + H_2$

    C $Ca + 2H_2O \rightarrow CaOH + H_2$

    D $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

16 The equation shows the reaction between magnesium and sulfuric acid.

$$Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$$

$$(Mg = 24, H = 1, S = 32, O = 16)$$

In this reaction, what mass of magnesium sulfate will be formed when 6 g of magnesium reacts with excess sulfuric acid?

    A 8   **B** 24   **C** 30   **D** 60

17 A compound has the formula CH_3CO_2H.

How should the relative molecular mass, M_r, of this compound be calculated?

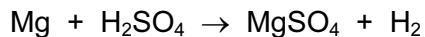   **A**   12 + 1 + 16

    B   3(12 + 1) + 2(12 + 16) + 1

    C $(4 \times 12) + (2 \times 1) + 16$

    D $(2 \times 12) + (4 \times 1) + (2 \times 16)$

18 The equation for the reaction between magnesium and dilute sulfuric acid is shown.

$$Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$$

M_r of $MgSO_4$ is 120

Which mass of magnesium sulfate will be formed if 12 g of magnesium are reacted with sulfuric acid?

A 5 g **B** 10 g **C** 60 g **D** 120 g

19 Methane, CH_4, burns in the air to form carbon dioxide and water.

What is the balanced equation for this reaction?

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

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

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

D $CH_4(g) + 3O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

20 The relative formula mass, M_r, of copper(II) sulfate, $CuSO_4$, is 160.

Which mass of sulfur is present in 160 g of copper(II) sulfate?

A 16 g **B** 32 g **C** 64 g **D** 128 g

21 What is the relative molecular mass (M_r) of HNO_3?

A 5 **B** 31 **C** 32 **D** 63

22 The chemical compositions of two substances, W and X, are given.
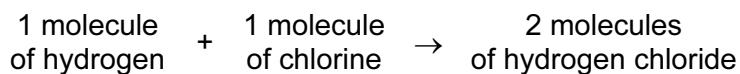
  W $Na(lSi_3)O_8$

  X $Ca(Al_2Si_2)O_8$
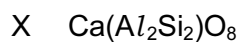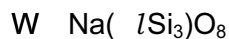
Which statements are correct?

  1 W and X contain the same amount of oxygen.

  2 W contains three times as much silicon as X.

  3 X contains twice as much aluminium as W.

A 1 and 2   **B** 1 and 3   **C** 2 and 3   **D** 1, 2 and 3

23 Hydrogen and chlorine react as shown.

$$\text{1 molecule of hydrogen} \quad + \quad \text{1 molecule of chlorine} \quad \rightarrow \quad \text{2 molecules of hydrogen chloride}$$

What is the equation for this reaction?

A $2H + 2Cl \rightarrow 2HCl$

B $2H + 2Cl \rightarrow H_2Cl_2$

C $H_2 + Cl_2 \rightarrow 2HCl$

D $H_2 + Cl_2 \rightarrow H_2Cl_2$

24 For each atom of carbon present in a molecule, there is an equal number of atoms of oxygen but twice as many atoms of hydrogen.

What is the formula of the molecule?

A $C_2H_2O_2$ **B** $C_2H_2O_4$ **C** $C_2H_4O_2$ **D** C_2H_6O
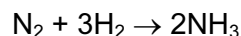
25 Water is formed when 48 g of oxygen combine with 6 g of hydrogen.

What mass of oxygen combines with 2 g of hydrogen?

A   12 g   **B**   16 g   **C**   96 g   **D**   144 g

26 Nitrogen and hydrogen react together to form ammonia.

$$N_2 + 3H_2 \rightarrow 2NH_3$$

When completely converted, 7 tonnes of nitrogen gives 8.5 tonnes of ammonia.

How much nitrogen will be needed to produce 34 tonnes of ammonia?

A   7 tonnes   **B**   8.5 tonnes   **C**   28 tonnes   **D**   34 tonnes

27 Which relative molecular mass, M_r, is **not** correct for the molecule given?

	molecule	M_r
A	ammonia, NH_3	17
B	carbon dioxide, CO_2	44
C	methane, CH_4	16
D	oxygen, O_2	16