



Additional Assessment Materials
Summer 2021

Pearson Edexcel GCSE in Chemistry (1CH0)
Foundation

Resource Set Topic C: Calculations involving
masses

Questions

(Public release version)

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General guidance to Additional Assessment Materials for use in 2021

Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

4 (a) The molecular formula of butene is C_4H_8 .

Which of the following is the empirical formula of butene?

(1)

A CH

B CH_2

C C_4H_8

D $(CH_2)_4$

(b) Calculate the relative formula mass of butene, C_4H_8 .

(relative atomic masses: H = 1, C = 12)

$$4(12) + 8(1) = 56$$

(2)

relative formula mass 56

5 Two compounds of barium are barium sulfide and barium chloride.

- (d) (i) A beaker of barium chloride solution and a beaker of dilute sulfuric acid were placed on a balance, as shown in Figure 6.

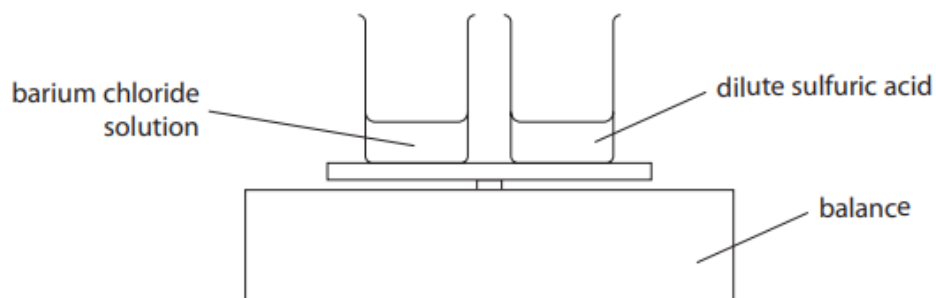


Figure 6

The total mass reading on the balance was 25.7 g.

The dilute sulfuric acid was poured into the barium chloride solution and the beaker replaced on the balance, as shown in Figure 7.

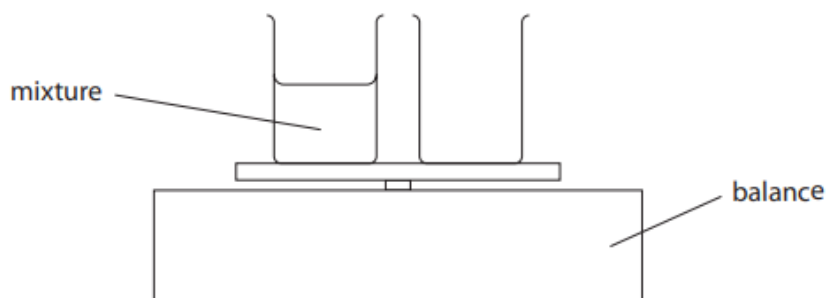


Figure 7

The mixture formed contained a white precipitate.

State the total mass reading on the balance after the reaction.

(1)

25.7g

8d

(d) A nickel sulfate solution is made by dissolving 23.5 g of nickel sulfate to make 250 cm³ of solution.

Calculate the concentration of the solution in g dm⁻³.

(2)

$$\frac{23.5}{250 \times 10^{-3}} = 94 \text{ g dm}^{-3}$$

concentration = 94 g dm⁻³

9 Most metals are extracted from ores found in the Earth's crust.

The method used to extract a metal from its ore is linked to the reactivity of the metal.

Part of the reactivity series is shown in Figure 14.

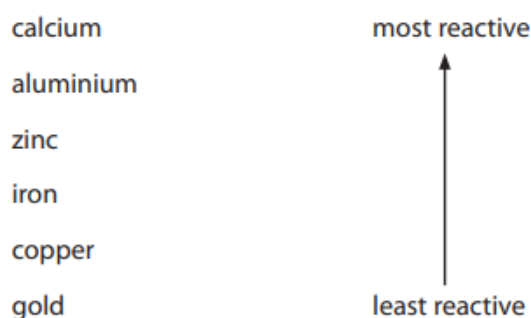
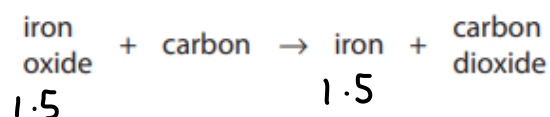


Figure 14

(a) Iron ore contains iron oxide.

Iron is extracted from iron oxide by heating the oxide with carbon.



(ii) The formula of the iron oxide is Fe_2O_3 .

Calculate the maximum mass of iron that can be obtained from 240 tonnes of iron oxide, Fe_2O_3 .

(relative atomic masses: O = 16, Fe = 56)

$$\begin{aligned} \text{moles of } \text{Fe}_2\text{O}_3 &= \frac{240}{2(56)+3(16)} && (3) \\ &= \frac{240}{160} \\ &= 1.5 \end{aligned}$$

$$\begin{aligned} \text{mass of Fe} &= 1.5(56) \\ &= 84 \text{ tonnes} \end{aligned}$$

mass of iron = 84 tonnes

8d

(d) In an experiment, 3.5 g of element **A** reacted with 4.0 g of element **G** to form a compound.

Calculate the empirical formula of this compound.
(relative atomic masses: **A** = 7, **G** = 16)

You must show your working.

(3)

$$A: \frac{3.5}{7} = 0.5 \quad \frac{0.5}{0.25} = 2$$

$$G: \frac{4}{16} = 0.25 \quad \frac{0.25}{0.25} = 1$$

empirical formula of this compound = A_2G

6f

- (f) A titanium ore was analysed and found to contain 12 g of titanium atoms combined with 8.0 g of oxygen atoms.

Calculate the empirical formula of this titanium compound.
(relative atomic masses: Ti = 48, O = 16)

You must show your working.

$$\begin{array}{l} \text{Ti} : \frac{12}{48} = 0.25 \quad \frac{0.25}{0.25} = 1 \\ \text{O} : \frac{8}{16} = 0.5 \quad \frac{0.5}{0.25} = 2 \end{array} \quad (3)$$

empirical formula = TiO_2

- 8 Figure 11 shows the apparatus that can be used to electrolyse sodium sulfate solution using inert electrodes.

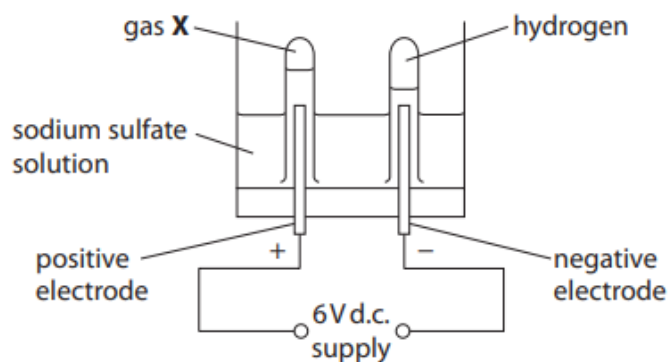


Figure 11

(b) The sodium sulfate solution was made by dissolving 28.4 g of sodium sulfate in water to make 250 cm³ of solution.

Calculate the concentration of this solution in g dm⁻³.

Give your answer to three significant figures.

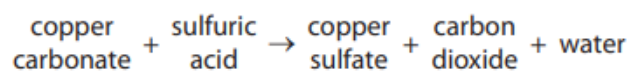
$$\frac{28.4}{250 \times 10^{-3}} = 113.6 \text{ g dm}^{-3}$$

(3)

concentration = 113.6 g dm⁻³

9aii

9 The word equation for the reaction between copper carbonate and dilute sulfuric acid is



(ii) Calculate the relative formula mass of copper carbonate, CuCO₃.
(relative atomic masses: C = 12.0, O = 16.0, Cu = 63.5)

(2)

$$63.5 + 12.0 + 3(16) = 123.5$$

relative formula mass of CuCO₃ = 123.5

9 Lithium, sodium and potassium are reactive metals in group 1 of the periodic table.

- (a) Sodium metal tarnishes in air to form a layer of sodium oxide on its surface.
0.92 g of sodium combined with 0.32 g of oxygen in this oxide.

Calculate the empirical formula of this sodium oxide.
(relative atomic masses: O = 16, Na = 23)

You must show your working.

(3)

$$\text{Na: } \frac{0.92}{23} = 0.04 \quad \frac{0.04}{0.02} = 2$$

$$\text{O: } \frac{0.32}{16} = 0.02 \quad \frac{0.02}{0.02} = 1$$

empirical formula of sodium oxide = Na_2O

4e

(e) The concentration of a calcium chloride solution is 12 g dm^{-3} .

Calculate the volume of this solution, in cm^3 , that contains 9.0g of calcium chloride.

You must show your working.

$$\frac{9}{12} = 0.75 \text{ dm}^3$$

(3)

$$0.75 \times 1000 = 750 \text{ cm}^3$$

volume of solution = 750 cm^3

8cii

(c) Figure 14 shows the formulae of a molecule of butane and of a molecule of pentane. Butane and pentane are neighbouring members of the same homologous series.

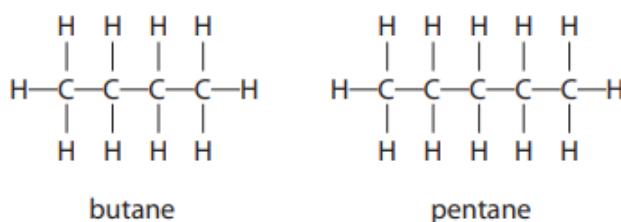


Figure 14

(ii) Butane has the formula C_4H_{10} .

Calculate the mass of carbon in 100 g of butane.

Give your answer to three significant figures.

(relative atomic masses: H = 1.00, C = 12.0;

relative formula mass: C_4H_{10} = 58.0)

You must show your working.

$$\frac{4(12)}{58.0} \times 100 = 82.7586$$

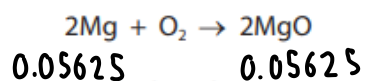
(3)

$$\approx 82.8$$

mass of carbon = 82.8 g

9b

- (b) Magnesium burns in excess oxygen to form magnesium oxide.
The balanced equation for this reaction is



Starting with 1.35g of magnesium, calculate the maximum mass of magnesium oxide that could be formed in this reaction.
(relative atomic masses: O = 16.0, Mg = 24.0)

You must show your working.

(3)

$$\text{moles of Mg} = \frac{1.35}{24.0}$$

$$= 0.05625$$

$$\text{moles of MgO} = 0.05625$$

$$\text{mass of MgO} = 0.05625 \times (16.0 + 24.0)$$

$$= 2.25$$

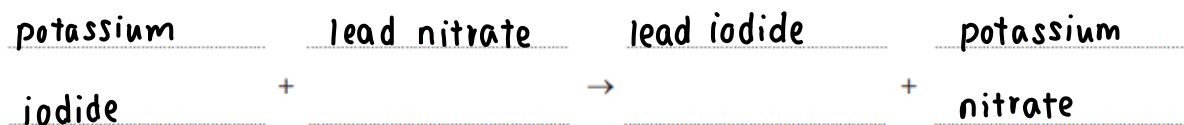
$$\text{mass of magnesium oxide} = 2.25 \text{ g}$$

3 (a) A student investigated the reaction between potassium iodide and lead nitrate.

- (i) Solutions of potassium iodide and lead nitrate were mixed together. Lead iodide and potassium nitrate were formed.

Complete the word equation.

(2)



- (ii) The student recorded the total mass of the reactants and the total mass of the products.

The results are shown in Figure 4.

	reactants	products
total mass in g	21.7	21.7

Figure 4

State how the results in Figure 4 show that mass is conserved in this reaction.

(1)

The total mass of reactants and products are the same.

7cii

(c) Ethanol is present in alcoholic drinks, such as wine.

When a bottle of wine is left open some of the ethanol reacts with the oxygen in the air to form ethanoic acid, CH_3COOH , and water.

(ii) Which calculation shows the percentage by mass of hydrogen in ethanoic acid?

(relative atomic mass of hydrogen, $\text{H} = 1$,
relative formula mass of ethanoic acid, $\text{CH}_3\text{COOH} = 60$)

A $\frac{1}{60} \times 100$

B $\frac{3}{60} \times 100$

C $\frac{4}{60} \times 100$

D $\frac{60}{1} \times 100$

(1)

TOTAL FOR PAPER IS 36 MARKS