IGCSE CHEMISTRY 0620

Exam-style Practice Paper: The Mole and Stoichiometry

Topic practice paper in the style of Cambridge IGCSE Chemistry (0620), Theory questions.

CANDIDATE NAME	
CLASS	
DATE	

Time: 40 minutes **Total: 34 marks**

You will need: a calculator; a ruler

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, class and date in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Show your working in calculations. Give units where needed.
- Questions marked **Extended** cover Extended (Supplement) content.

INFORMATION

- The total mark for this paper is 34.
- The number of marks for each question or part question is shown in brackets [ ].
- Relative atomic masses (A_r): H = 1, He = 4, C = 12, N = 14, O = 16, Na = 23, Mg = 24, S = 32, Ca = 40.
- One mole of any gas occupies 24 dm^3 at room temperature and pressure (r.t.p.).
- The Avogadro constant is 6.02×10^{23} per mole.

For teacher's use

Question	1	2	3	4	5	Total
Max	6	7	6	6	9	34
Mark						

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[Turn over

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1 This question is about chemical formulae and relative formula mass.

(a) Define the term *relative formula mass*, M_r.

.....

..... [1]

(b) Complete Table 1.1 to show the relative formula mass of each compound.

compound	**formula**	**M_r**
water	H_2O	18
carbon dioxide	CO_2	
magnesium oxide	MgO	
calcium carbonate	$CaCO_3$	

Table 1.1

[3]

(c) Balance the equations.

(i) ..... Mg + ... O_2 → ..... MgO

[1]

(ii) ..... Na + ... H_2O → ..... NaOH + ... H_2

[1]

Extended

2 This question is about the mole and the Avogadro constant.

(a) State the value of the Avogadro constant.

..... [1]

(b) A sample of carbon dioxide, CO_2, has a mass of 8.8 g.
Calculate:

(i) the number of moles of CO_2 in the sample

.....

..... mol [1]

(ii) the number of molecules of CO_2 in the sample

.....

..... molecules [1]

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(iii) the volume of the sample at r.t.p.

.....

..... dm^3 [1]

(c) Calculate the mass of 0.25 mol of calcium carbonate, $CaCO_3$.

.....

..... g [1]

(d) A student has 1.0 g of hydrogen gas, H_2, and 1.0 g of helium gas, He.
Which sample contains more atoms? Explain your answer using moles.

.....

.....

..... [2]

Extended

3 When calcium carbonate is heated strongly, it decomposes.

$$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$$

(a) A student heats 25.0 g of calcium carbonate until it has all decomposed.
Calculate:

(i) the number of moles of $CaCO_3$ heated

.....

..... mol [1]

(ii) the maximum mass of calcium oxide, CaO, that can be made

.....

.....

..... g [2]

(iii) the volume of carbon dioxide made, measured at r.t.p.

.....

..... dm^3 [1]

(b) The student only obtains 11.2 g of calcium oxide.

(i) Calculate the percentage yield.

.....

..... % [1]

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(ii) Suggest **one** reason why the percentage yield is less than 100%.

……

…… [1]

Extended

4 Compound **X** contains carbon, hydrogen and oxygen only.

(a) Define the term *empirical formula*.

……

…… [1]

(b) Table 4.1 shows the percentage by mass of each element in compound **X**.

element	**carbon**	**hydrogen**	**oxygen**
percentage by mass	40.0	6.7	53.3

Table 4.1

Calculate the empirical formula of compound **X**. Show your working.

……

……

……

……

empirical formula = …… [3]

(c) The relative molecular mass, M_r, of compound **X** is 180.
Deduce the molecular formula of compound **X**.

……

……

molecular formula = …… [2]

5 This question is about the concentration of solutions.

(a) 4.0 g of sodium hydroxide, NaOH, is dissolved in water to make 250 cm^3 of solution.
Calculate the concentration of the solution in:

(i) g/dm^3

……

…… g/dm^3 [1]

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Extended

(ii) mol/dm^3.

……

…… mol/dm^3 [1]

Extended

(b) A student titrates 25.0 cm^3 of 0.100 mol/dm^3 sodium hydroxide with dilute sulfuric acid. Table 5.1 shows the results.

	rough	**1**	**2**	**3**
final burette reading / cm^3	20.70	20.55	40.50	21.20
initial burette reading / cm^3	0.00	0.50	20.55	1.20
volume of acid added / cm^3	20.70			

Table 5.1

(i) Complete Table 5.1.

[1]

(ii) Calculate the mean volume of acid added. Use only the results that are within 0.10 cm^3 of each other.

……

…… cm^3 [1]

(iii) The equation for the reaction is:

$$2NaOH(aq) + H_2SO_4(aq) \rightarrow Na_2SO_4(aq) + 2H_2O(l)$$

Calculate the concentration of the sulfuric acid in mol/dm^3. Use your answer to (b)(ii).

……

……

……

……

…… mol/dm^3 [3]

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(c) Calculate the percentage by mass of nitrogen in ammonium nitrate, NH_4NO_3.

.....

.....

.....

..... % [2]

END OF PAPER

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