

Level 3 AAQ Applied Science

Unit 2: Chemistry

Practice Paper 1

Time allowed: 1 hour (60 minutes)

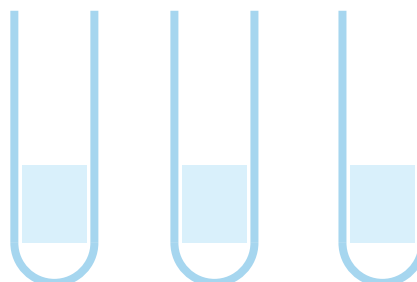
Total marks: 50

Student name _____

Class / centre _____

Instructions

- Answer all six questions.
- Write answers in the spaces provided
- Show working in calculations and include appropriate units.
- A calculator may be used.



Question 1 — Period 3 chemistry

(a) Magnesium reacts with oxygen. Give the formula of magnesium oxide. **(1)**

(b) Write a balanced equation for the reaction of sodium with oxygen to form sodium oxide. **(2)**

(c) Explain why silicon dioxide has a much higher melting point than sulfur dioxide. **(3)**

Total for Question 1 = 6 marks

Question 2 — Atomic structure and isotopes

(a) Iron has atomic number 26. Identify its block and period in the periodic table. **(2)**

(b) Write the electron configuration of Fe^{2+} in subshell notation. **(2)**

(c) A copper sample contains 69.2% copper-63 and 30.8% copper-65. Calculate its relative atomic mass, showing your working. **(3)**

Total for Question 2 = 7 marks

Question 3 — Organic chemistry

(a) Name the homologous series with general formula C_nH_{2n} for an acyclic hydrocarbon containing one double bond. **(1)**

(b) State the colour change when propene is shaken with bromine water. **(1)**

(c) Give the molecular formula of the product formed when propene reacts with hydrogen bromide. **(1)**

(d) Ethene reacts with bromine. Name the organic product, give its molecular formula, state the reaction type and explain what happens to the carbon-carbon double bond and where the two bromine atoms bond. **(5)**

Total for Question 3 = 8 marks

Question 4 — Energetics and equilibrium

(a) Define activation energy. **(2)**

(b) The enthalpy change of a reaction is -92 kJ mol^{-1} . State whether it is exothermic and explain your answer. **(2)**

(c) Explain why a catalyst increases reaction rate but does not change the enthalpy change. **(3)**

(d) Nitrogen and hydrogen react reversibly to form ammonia: $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$ at equilibrium. Predict and explain the effect of increased pressure on the equilibrium yield of ammonia at constant temperature. **(3)**

Total for Question 4 = 10 marks

Question 5 — Rates and quantitative chemistry

(a) State two changes that could increase the rate of reaction of magnesium ribbon with hydrochloric acid. **(2)**

(b) Calculate the amount of HCl in 25.0 cm³ of 0.400 mol dm⁻³ hydrochloric acid. **(3)**

(c) $\text{Mg} + 2\text{HCl}$ produces $\text{MgCl}_2 + \text{H}_2$. Calculate the maximum amount of H_2 produced from the acid in part (b), assuming excess magnesium. **(2)**

(d) Explain why repeat measurements improve confidence in an experimental rate measurement. **(2)**

Total for Question 5 = 9 marks

Question 6 — Isotopes and relative atomic mass

Magnesium has three naturally occurring isotopes. The data below are for one sample.

Isotope	Percentage abundance
Magnesium-24	79.0
Magnesium-25	10.0
Magnesium-26	11.0

(a) State what is meant by isotopes of the same element. **(2)**

(b) A magnesium sample contains 79.0% magnesium-24, 10.0% magnesium-25 and 11.0% magnesium-26. Calculate the relative atomic mass. Show your working. **(4)**

(c) Explain why the relative atomic mass of this magnesium sample is not a whole number. **(2)**

(d) A second magnesium sample has a greater percentage of magnesium-26 and a smaller percentage of magnesium-24, with magnesium-25 unchanged. Predict and explain the effect on its relative atomic mass. **(2)**

Total for Question 6 = 10 marks

TOTAL FOR PAPER = 50 MARKS