

ERUVIO MENTORING · EXTERNAL-STYLE EXAMINATION

Chemistry

Units 1 and 2 · Chemical fundamentals; molecular interactions and reactions

Paper 1 · Section 1

MULTIPLE CHOICE · 20 MARKS

STUDENT DETAILS

GIVEN NAME(S)

FAMILY NAME

SCHOOL

DATE

BOOK OF

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Structure of this examination

PAPER	SECTION	QUESTION TYPE	TIME	MARKS
Paper 1	Section 1	Multiple choice, 20 questions	10 min perusal 90 min working	20
	Section 2	Short response, 5 questions		30
Paper 2	Section 1	Short response, 9 questions	10 min perusal 90 min working	50
Total		34 questions	200 minutes	100

Instructions

- **Perusal time: 10 minutes. Working time: 90 minutes.**
- You may use a QCAA-approved scientific or graphics calculator. The QCAA Chemistry formula and data book is provided.
- Write using black or blue pen. Planning paper will not be marked.
- All questions are drawn from Unit 1 (chemical fundamentals: structure, properties and reactions) and Unit 2 (molecular interactions and reactions).
- **Section 1 contains 20 multiple choice questions.** Choose the best answer for each and record it on the response grid provided.

Answers must be recorded on the response grid on the final page. Marks are not deducted for incorrect answers, so attempt every question.

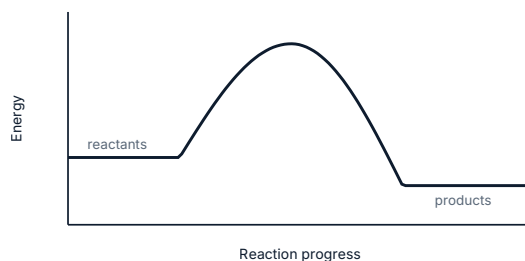
Section 1

Multiple choice · 20 questions · 20 marks

- 1 Chlorine exists as two isotopes, ^{35}Cl (75.8%) and ^{37}Cl (24.2%). The relative atomic mass of chlorine is
- A 35.0
 - B 35.5
 - C 36.0
 - D 37.0
- 2 The electron configuration of the calcium ion Ca^{2+} is
- A $1s^2 2s^2 2p^6 3s^2 3p^6$
 - B $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
 - C $1s^2 2s^2 2p^6 3s^2 3p^4$
 - D $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
- 3 Moving across period 3 from sodium to chlorine,
- A atomic radius increases and first ionisation energy decreases.
 - B atomic radius increases and first ionisation energy increases.
 - C atomic radius decreases and first ionisation energy decreases.
 - D atomic radius decreases and first ionisation energy increases.
- 4 A solid substance does not conduct electricity, but it does conduct when melted. The substance is most likely to be
- A a metal.
 - B a covalent molecular substance.
 - C an ionic compound.
 - D a covalent network solid.
- 5 The amount of substance, in mol, present in 8.00 g of sodium hydroxide ($M = 40.00 \text{ g mol}^{-1}$) is
- A 0.0200 mol
 - B 0.200 mol
 - C 5.00 mol
 - D 320 mol
- 6 A compound is found to contain 40.0% carbon, 6.7% hydrogen and 53.3% oxygen by mass. Its empirical formula is
- A CH_2O
 - B CHO
 - C CH_4O
 - D $\text{C}_2\text{H}_4\text{O}_2$

- 7 Hydrogen burns in oxygen: $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{g})$. When 4.0 mol of hydrogen is mixed with 1.0 mol of oxygen, the limiting reagent and the maximum amount of water formed are
- A hydrogen, 2.0 mol
 - B hydrogen, 4.0 mol
 - C oxygen, 1.0 mol
 - D oxygen, 2.0 mol

- 8 The energy profile shown represents a reaction in which



- A the products have less chemical potential energy than the reactants and ΔH is negative.
 - B the products have more chemical potential energy than the reactants and ΔH is positive.
 - C the activation energy is zero.
 - D energy is absorbed from the surroundings and the temperature of the surroundings falls.
- 9 When a metal salt is heated strongly in a flame, a characteristic colour is produced because
- A electrons are removed from the metal atoms and emit light as they leave.
 - B the metal ions vibrate more rapidly and give out light.
 - C electrons absorb energy and move to higher energy levels, then emit photons of specific energy as they fall back.
 - D the anion decomposes and releases a coloured gas.
- 10 4.0 g of methane burns completely in 16.0 g of oxygen to form carbon dioxide and water only. The total mass of the products is
- A 4.0 g
 - B 12.0 g
 - C 16.0 g
 - D 20.0 g
- 11 Which substance has hydrogen bonding between its molecules?
- A NH_3
 - B CH_4
 - C H_2S
 - D CO_2

- 12 In a paper chromatogram, the solvent front travels 8.0 cm from the baseline and a component travels 3.0 cm from the baseline. The R_f value of the component is
- A 0.27
 - B 0.38
 - C 2.7
 - D 5.0
- 13 The molar volume of an ideal gas at 25 °C and 100 kPa is 24.79 L mol⁻¹. The volume occupied by 1.50 mol of an ideal gas under these conditions is
- A 16.8 L
 - B 33.6 L
 - C 37.2 L
 - D 49.6 L
- 14 Which pair of aqueous solutions produces a precipitate when they are mixed?
- A sodium chloride and potassium nitrate
 - B potassium hydroxide and sodium nitrate
 - C ammonium chloride and sodium carbonate
 - D barium chloride and sodium sulfate
- 15 25.0 mL of 2.00 mol L⁻¹ hydrochloric acid is diluted with water to a final volume of 500.0 mL. The concentration of the diluted solution is
- A 0.0500 mol L⁻¹
 - B 0.100 mol L⁻¹
 - C 0.400 mol L⁻¹
 - D 40.0 mol L⁻¹
- 16 Compared with a solution of pH 5, a solution of pH 3 has a hydronium ion concentration that is
- A 100 times greater.
 - B 2 times greater.
 - C 100 times smaller.
 - D 2 times smaller.
- 17 Equal volumes of 0.10 mol L⁻¹ ethanoic acid and 0.10 mol L⁻¹ hydrochloric acid are compared. The ethanoic acid solution has
- A a lower pH, because it ionises completely.
 - B the same pH, because the concentrations are equal.
 - C a higher pH, because it contains fewer acidic hydrogen atoms.
 - D a higher pH, because it ionises only partially.
- 18 Raising the temperature increases the rate of a chemical reaction mainly because
- A the activation energy of the reaction is lowered.
 - B the concentration of the reactants increases.
 - C a greater proportion of collisions have energy equal to or greater than the activation energy.
 - D the reactant particles become smaller and so collide more often.

- 19 A catalyst increases the rate of a reaction by
- A increasing the average kinetic energy of the reactant particles.
 - B providing an alternative reaction pathway that has a lower activation energy.
 - C increasing the concentration of the reactants.
 - D increasing the energy released by the reaction.
- 20 25.0 mL of 0.100 mol L^{-1} sodium hydroxide is exactly neutralised by 20.0 mL of hydrochloric acid. The concentration of the hydrochloric acid is
- A $0.0800 \text{ mol L}^{-1}$
 - B 0.100 mol L^{-1}
 - C 0.125 mol L^{-1}
 - D 0.200 mol L^{-1}

Response grid

Shade or cross the box for your chosen answer

Question	A	B	C	D
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END OF SECTION 1