

Part A

Multiple Choice: 10 marks

Attempt Questions 1-10

Allow about 10 minutes for this part

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample: $2 + 4 =$ (A) 2 (B) 6 (C) 8 (D) 9
 A ☐ B ☒ C ☐ D ☐

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A ☒ B ☒ C ☐ D ☐

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word **correct** and drawing an arrow as follows.

A ☒ B ☒ C ☐ D ☐
 correct ↖

► **Mark your answers for Questions 1 – 10 in the Answer Box on page 4**

1. How many atoms are there in 2.50 grams of pure carbon – 12?
 - (A) 1.25×10^{23}
 - (B) 2.50×10^{23}
 - (C) 2.5
 - (D) 5

2. The highest percentage of water occurs in which earth sphere?
 - (A) biosphere
 - (B) hydrosphere
 - (C) lithosphere
 - (D) atmosphere

3. Water is an agent of weathering.
Which of the following properties of water contribute to its ability to weather rock?
 - (i) Water has a relatively high boiling and melting point.
 - (ii) Water is a good solvent for many substances
 - (iii) Water has a lower density in the solid state than in the liquid state
 - (A) (i) and (ii) only
 - (B) (ii) and (iii) only
 - (C) (i) and (iii) only
 - (D) (iii) only

4. Which of the following is the strongest force between two molecules?
 - (A) dispersion forces
 - (B) dipole-dipole forces
 - (C) hydrogen bonding
 - (D) metallic bonding

5. Why does sucrose (sugar) dissolve when mixed with water?
 - (A) Water breaks apart the covalent bonds within the molecules
 - (B) Ionic bonds are formed between the water and the sucrose
 - (C) Dispersion forces cause the sucrose molecules to repel each other
 - (D) Water forms dipole-dipole forces with the polar bonds on the surface of the sugar.

6. Small animals, such as water striders, can walk across the surface of a pond. Which of the following properties of water allows this to happen?
- (A) viscosity
 - (B) surface tension
 - (C) boiling point
 - (D) density
7. 30 mL of 0.1 mol L^{-1} aluminium perchlorate, $\text{Al}(\text{ClO}_4)_3$, is diluted to a volume of 100 mL with water. What is the concentration of perchlorate ions in the final solution?
- (A) 0.09 mol L^{-1}
 - (B) 0.9 mol L^{-1}
 - (C) 0.03 mol L^{-1}
 - (D) 0.3 mol L^{-1}
8. What is the concentration of a solution formed when 2.00g of sodium hydroxide is dissolved in water to make 50.0 mL of solution?
- (A) 1.00 mol L^{-1}
 - (B) 0.50 mol L^{-1}
 - (C) 0.10 mol L^{-1}
 - (D) 0.05 mol L^{-1}
9. The equation below shows the simple reaction between water and chlorine.
- $$\text{H} - \text{O} - \text{H} + \text{Cl} - \text{Cl} \rightarrow \text{H} - \text{O} - \text{Cl} + \text{H} - \text{Cl}$$
- How many bonds are being broken in this reaction?
- (A) 2
 - (B) 3
 - (C) 4
 - (D) 6
10. Which of these values will be altered when a catalyst is used in a reaction?
- (A) activation energy
 - (B) ignition temperature
 - (C) specific heat capacity
 - (D) ΔH

Student No.

Part A: Answer grid for multiple choice questions.

Total/ 10

1.	A O	B O	C O	D O
2.	A O	B O	C O	D O
3.	A O	B O	C O	D O
4.	A O	B O	C O	D O
5.	A O	B O	C O	D O
6.	A O	B O	C O	D O
7.	A O	B O	C O	D O
8.	A O	B O	C O	D O
9.	A O	B O	C O	D O
10.	A O	B O	C O	D O

Part B. 38 marks

Attempt questions 11 -20

Allow about 35 minutes for this part

► Show all relevant working in questions involving calculations

Question 11 (2 marks)

Explain why different measures of concentration are important **(2marks)**

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Question 12 (3 marks)

Ammonia and water have similar molecular masses but different melting points and boiling points.

(a) Draw a Lewis electron dot structure for ammonia in the box below. **(1 mark)**

(b) Explain the difference between the boiling points of water and ammonia. **(2 marks)**

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Question 13 (5 marks)

Bore water is regularly tested to assess its suitability for drinking.

The quantity of chloride ion in bore water can be determined by the reaction of a sample with silver nitrate solution to produce a precipitate of insoluble silver chloride.

A 10.0 mL sample of bore water requires 24.7 mL of a 0.01 mol L^{-1} silver nitrate solution to react completely with all the chloride present.

- (a) Write a balanced net ionic equation for this reaction. (1 mark)

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- (b) Calculate the number of moles of chloride ions in the sample. (2 marks)

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- (c) Determine the mass of chloride ions in the sample. (1 mark)

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- (d) Calculate the concentration of nitrate ions in the final solution. (1 mark)

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Question 14 (4 marks)

A student writes two wrong explanations in a chemistry test. Re-write the statements demonstrating your superior knowledge of chemistry. (4 marks)

<i>Wrong explanations</i>	<i>Corrected explanations</i>
<i>A large piece of wood burns faster than a bunch of twigs because it's a bigger object so the oxygen molecules in the air can collide with it easier. More collisions, faster rate.</i>	
<i>If the concentration of the reactants is reduced the reaction rate speeds up because it's easier for the particles to collide because it's not so crowded.</i>	

Question 15 (3 marks)

(a) Identify an industrial catalyst. (1 mark)

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(b) Explain the role of catalysts in chemical reactions. (2 marks)

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Question 16 (3 marks)

Dieseline is a mixture composed mainly of cetane, $C_{16}H_{34}$.

- (a) Write two balanced chemical equations showing cetane undergoing complete and incomplete combustion. (2 marks)

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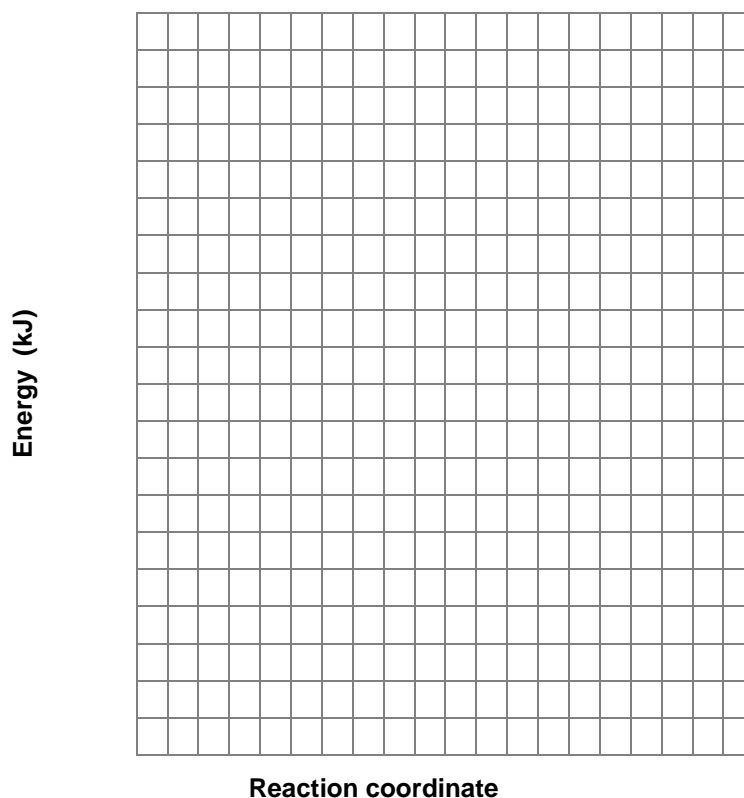
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- (b) Identify a problem associated with incomplete combustion. (1 mark)

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Question 17 (2 marks)

Draw an energy profile diagram on the graph grid for a reaction with a $\Delta H = +50$ kJ and an activation energy value of $+70$ kJ. Each y-axis square represents 10 kJ. (2 marks)



Question 18 (6 marks)

A sample of 2.0 g aluminium metal was burned in pure oxygen.

- (a) Write a chemical equation for this reaction. (1 mark)

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- (b) What volume of pure oxygen, measured at 25 °C and 100 kPa, is required to react with all of the aluminium metal? (3 marks)

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- (c) If the combustion were done in air, which is 21% oxygen by volume, what volume of air will be required? (1 mark)

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- (d) Justify the recycling of aluminum over that of extracting it from its ore. (1 mark)

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Question 19 (5 marks)

Active metals combine readily with oxygen either at room temperature or when heated.

- (a) In point form, write a procedure for a first hand investigation that will allow you to determine the mass change of magnesium when it combines with oxygen. **(3 marks)**

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- (b) Outline how you are going to determine the empirical formula of the oxide formed. **(2 marks)**

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Question 20 (5 marks)

Two 1.0 L containers are each filled with chlorine gas and helium gas at the same temperature (25 °C) and pressure (100 kPa)

- (a) Construct a table to compare the volume, the number of molecules and the number of atoms in each of the containers. **(3 marks)**

- (b) State the law that allows you to make this comparison. **(2 mark)**

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End of Test