

John Paul College

Formative test 2012

CHEMISTRY 2.4

Demonstrate understanding of bonding, structure and energy changes

Credits: Four

INSTRUCTIONS

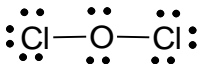
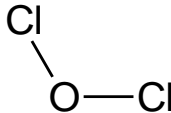
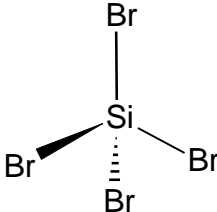
Answer **ALL** questions.

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You should aim to spend about **60 minutes** on this assessment

QUESTION ONE

- (a) Complete the table below by:
- Drawing the Lewis structure for the molecules
 - Drawing a diagram and giving the name for the shape of each molecule

Molecule	Lewis Structure	Diagram showing shape	Name of shape
Cl_2O			V-shaped
PF_3			
SiBr_4			
CS_2			

- (b) Discuss the factors that determine the shape of the molecules of Cl_2O and SiBr_4 .

SiBr_4 _____

Cl_2O _____

QUESTION THREE

(a) Write the appropriate name of the type of solid that matches the properties in the table below.

Types of solid: IONIC, COVALENT NETWORK, METALLIC, MOLECULAR

Solid	Melting point (°C)	Boiling point (°C)	Conducts electricity?	Soluble in water?	Type of solid
1.	961	2210	solid - yes molten - yes	No	
2.	<i>Sublimes at room temp.</i> 114	184	No	No	
3.	714	1418	solid - no molten - yes	Yes, solution conducts electricity	
4.	1662	2230	No	No	

(b) Explain why Solid 3 does not conduct electricity in the solid state but will conduct when molten and when dissolved in water.

(c) Discuss the differences in the electrical conductivity of solids 1 and 2 with reference to their structure and bonding.

Question Five

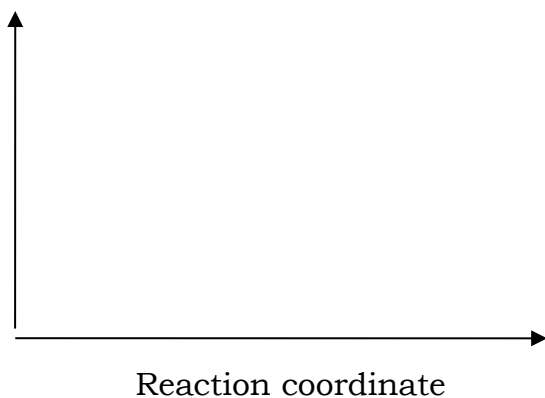
- (a) For each of the following indicate whether the process is endothermic or exothermic.

	Reaction	Endothermic or Exothermic?
(i)	Methane gas burning in a gas oven	
(ii)	Water drops evaporating off your skin	
(iii)	Water cooling down and freezing in a freezer	
(iv)	Al and Fe ₂ O ₃ are mixed in a flask creating a reaction that gives off a large amount of heat	

- (b) Sucrose (table sugar) C₁₂H₂₂O₁₁ can oxidise to CO₂(g) and H₂O(l)



- (i) Draw an energy profile for this reaction. Label the activation energy, E_A , and the enthalpy of reaction, $\Delta_r H$, on your diagram.



- (ii) Define the term 'activation energy'.

- (iii) Calculate the enthalpy change for the oxidation of 0.248 mol of sucrose.

(c) Ethanoic acid is made industrially by reacting methanol with carbon monoxide.



- (i) If 1.00 L of ethanoic acid is produced calculate the quantity of heat evolved during the reaction. The mass of 1.00 L of ethanoic acid is 1.044 kg.
 $M(\text{CH}_3\text{COOH}) = 60.1 \text{ g mol}^{-1}$

- (ii) Calculate the **volume** of ethanoic acid made when 3.00×10^6 kJ of energy are produced.