Section A

Answer **all** questions.

Write your answers in the boxes provided at the end of the Section.

- 1 Which of the following elements would be expected to form the largest ion (most number of electron shells) with a noble gas configuration?
 - A oxygen
 - B fluorine
 - C potassium
 - **D** magnesium
- Element P has an electronic configuration of 2.8.8.2.
 Element Q has an electronic configuration of 2.8.7.
 What is the likely chemical formula of the compound containing only P and Q?

A F	P ₇ Q ₂	В	PQ ₂	С	P_2Q	D	PQ
-----	---	---	-----------------	---	--------	---	----

- **3** A piece of zinc strip is burnt in oxygen to form zinc oxide. Which of the following chemical equation is correct?
 - A $2Zn + O_2 \rightarrow 2ZnO$
 - **B** $2Zn + O \rightarrow Zn_2O$
 - **C** $Zn + O_2 \rightarrow ZnO_2$
 - **D** $Zn + O \rightarrow ZnO$

- 4 Which particles enable the conduction of electricity through metals?
 - A positive ions and electrons
 - **B** positive ions and negative ions
 - **C** positive ions only
 - D electrons only

5 Which chemical equation is **not** balanced?

- $\textbf{A} \quad C_6H_{12}O_6 \ \textbf{+} \ 3O_2 \ \textbf{\rightarrow} \ 6CO_2 \ \textbf{+} \ 6H_2O$
- **B** 2HCl + CaCO₃ \rightarrow CaCl₂ + CO₂ + H₂O
- **C** $2KClO_3 \rightarrow 2KCl + 3O_2$
- **D** 4P + $5O_2 \rightarrow 2P_2O_5$

Question	1	2	3	4	5
Answer					

		Section B Answer all questions. Write your answers in the spaces provided.		For Examiner's Use
6	Bala	nce the following chemical equations.		
	(a)	$\dots S_8 + \dots S_2 \rightarrow \dots SO_3$	[1]	
	(b)	$\ldots \ldots C_3H_8 + \ldots \ldots O_2 \rightarrow \ldots \ldots CO_2 + \ldots H_2O$	[1]	
	(c)	$\dots \dots AlBr_3 + \dots \dots K_2SO_4 \rightarrow \dots \dots KBr + \dots Al_2(SO_4)_3$	[1]	
		[Tot	al: 3 marks]	
7	Scar	ndium is a metallic element with the symbol Sc and atomic number 21.		
	(a)	Describe the structure of a piece of scandium.		
	(b)	Scandium oxide has the chemical formula Sc ₂ O ₃ . Write the chemical formula of scandium sulfate and scandium hydroxide	 [2] e.	
		(i) scandium sulfate	[1]	
		(ii) scandium hydroxide	[1]	
		[Tot	al: 4 marks]	

5

8 Carbon is a highly versatile element that exists in different forms such as diamond, graphite and fullerene.

Figure 7.1 shows the structure of graphite.



An example of fullerene is the buckyball, which consists of 60 carbon atoms, covalently bonded in a cage-like structure (made of twenty hexagons and twelve pentagons), and resembles a soccer ball.

Figure 7.2 belows shows the structure of a buckyball, C₆₀.



For Examiner's Use

8	(a)	State a physical property of graphite.		For Examiner's Use
			[1]	
	(b)	By comparing the structures of graphite and buckyball, predict if buckyball can conduct electricity. Explain your answer.		
			[2]	

[Total: 3 marks]

Section C

Answer **all** questions.

Write your answers in the spaces provided.

9 Read the information about the chlorides of elements in Period 3 of the Periodic Table.

Elements and their chlorides

The formulae and chemical properties of the chlorides of the elements change across Period 3 (from sodium to argon).

The chlorides behave differently when they are added to water. Some of the chlorides dissolve in water to form a solution. Some *hydrolyse* when they are added to water. This means that they react chemically with water to produce new products (refer to Table 9.1 below).

Element	metal / non-metal	formula of main chloride	bonding in chloride	effect of adding chloride to water	products of adding chloride to water
Na	metal	NaC1	ionic	dissolves	NaCl(aq)
Mg	metal	MgCl ₂	ionic	dissolves	MgCl ₂ (aq)
Al	metal	AlCl ₃	covalent	hydrolyses	complex mixture of products including HCI(aq)
Si	non-metal	SiC14	covalent	hydrolyses	SiO ₂ (s) HCl(aq)
Р	non-metal	PC1 ₃	covalent	hydrolyses	H₃PO₃(aq) HCl(aq)
S	non-metal	S ₂ Cl ₂	covalent	hydrolyses	complex mixture of products including HCl(aq)
Cl	non-metal	Cl_2	covalent	hydrolyses	HClO(aq) HCl(aq)

Table 9.1

The chlorides have different formulae and the ratio of the element to chlorine changes across Period 3. Some examples are shown in the table below.

formula of chloride	ratio of element to chlorine
NaCl	1:1
MgCl ₂	1:2
AICl ₃	1:3

For Examiner's Use





For Examiner's Use

[2]

10 The table shows some information about the properties of compounds Li₂O and CH₄.

compound	melting point / °C	boiling point / °C	solubility in water	electrical conductivity at room temperature and pressure	
Li ₂ O	1438	2600	soluble	poor	
CH ₄	-182	-162	insoluble	poor	

(a) Draw 'dot-and-cross' diagram (show outer electrons only) for Li₂O.

(b)	What are the physical states of compounds Li_2O and CH_4 at room temperature and pressure?				
	Li ₂ O	:			
	CH_4	:	[2]		
(c)	Expl	ain, in terms of structure and bonding , why			
	(i)	compound Li ₂ O is unable to conduct electricity at room temperature and pressure.			
			[2]		

11

10	(c)	(ii)	compound CH₄ has a low melting point and a boiling point.	For Examiner's Use
				[2]
			[Total: 8 ma	rks]

ଛ୦ End of Paper ଦ୍ୟ