Section A

Answer **all** questions.
Write your answers in the boxes provided at the end of the Section.

1 Which statement describes ionic bonding?

A a lattice of ions in a sea of electrons

B electrostatic attraction between oppositely charged ions

C the sharing of electrons between atoms to gain a noble gas configuration

D the transfer of electrons from atoms of a non-metal to the atoms of a metal

2 Which two statements about a covalent bond are correct?

1 It can be formed between two metal atoms.

2 It can be formed between two non-metal atoms.

3 It is formed by the transfer of electrons between atoms.

4 It is formed by sharing electrons between atoms.

A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

3 Two statements about metals are given.

1 Metals contain a lattice of negative ions in a ‘sea of electrons’.

2 The electrical conductivity of metals is due to the mobility of the electrons in the structure.

Which is correct?

A Both statements are correct and statement 1 explains statement 2.

B Both statements are correct but statement 1 does not explain statement 2.

C Statement 1 is correct and statement 2 is incorrect.

D Statement 2 is correct and statement 1 is incorrect.

4 What happens when sodium chloride melts?

A Covalent bonds are broken.

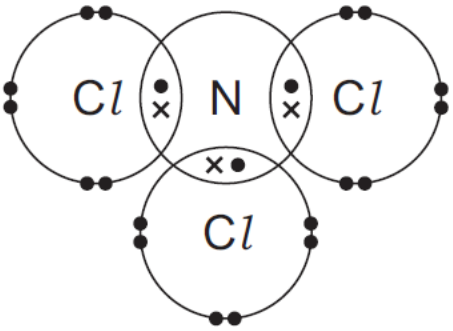
B Electrons are released from atoms.

C Electrostatic forces of attraction between ions are overcome.

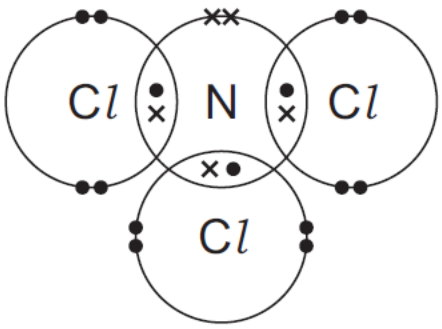
D Molecules are separated into ions.

5 What is the 'dot-and-cross' diagram for NCl_3?

A



B



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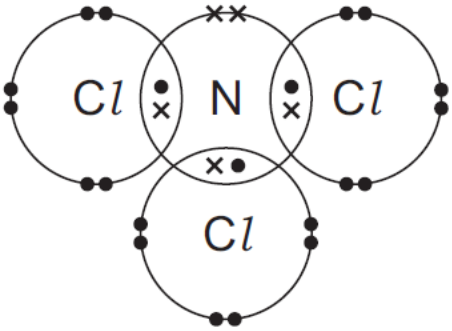

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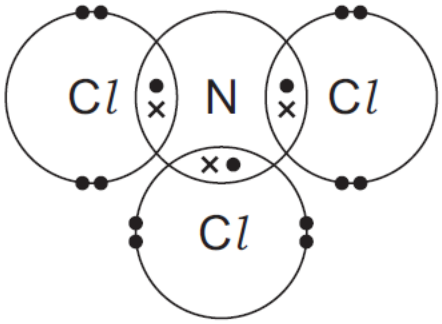


Question	1	2	3	4	5
Answer					

For Examiner's Use

Section B

Answer **all** questions.
Write your answers in the spaces provided.

6 Write a chemical equation, including **state symbols**, for each of the following reactions.

(a) Solid calcium carbonate decomposes to form solid calcium oxide and carbon dioxide gas.

……..…. [2]

(b) Solid sodium metal reacts explosively with water to form aqueous sodium hydroxide and hydrogen gas.

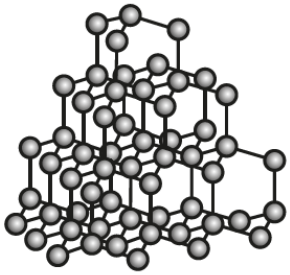
……..…. [2]

(c) Methane gas (CH_4) burns in oxygen to form carbon dioxide and water vapour.

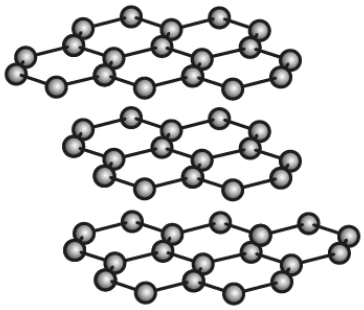
……..…. [2]

[Total: 6]

7 Diamond and graphite both consist of carbon atoms bonded together.
Their structures are shown below.



diamond



graphite

By referring to their structures, suggest an explanation for the following uses of diamond and graphite.

(a) Diamond is used in drill bits for drilling through rocks.

……..….

……..….

……..…. [2]

For Examiner's Use

(b) Graphite is used as a lubricant.

……

……

…… [2]

[Total: 4]

Section C

Answer **all** questions.
Write your answers in the spaces provided.

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8 (a) In the early nineteenth century, John Dalton, a British chemist, developed symbols and used them to represent elements and compounds. This was the beginning of atomic theory.

Dalton's symbols for some elements

Dalton's formulae for some compounds

name of compound	Dalton's formula
carbon monoxide	
ammonia	
water	

Some of our modern formulae for compounds show that Dalton's formulae were not always correct.

Describe how Dalton's formulae for carbon monoxide, ammonia and water compare to their modern formulae.

……

……

……

……

……

…… [4]

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(b) Chemists today develop code systems to make computer processing easier for research. One such code system uses proton numbers, in place of symbols, to represent chemical formulae. The following examples illustrate this code system.

name	formula	code
iron(II) bromide	$FeBr_2$	26, 35(2)
aluminium oxide	Al_2O_3	13(2), 8(3)
sodium chloride	NaC*l*	11, 17

Use this system to complete the table below.

name	formula	code
	KBr	
		29, 6, 8(3)
sulfur dioxide		

[6]

[Total: 10]

9 The table gives some information about the first ten elements in the Periodic Table and the compounds that they form with chlorine.

Symbol	H	He	Li	Be	B	C	N	O	F	Ne
Proton Number	1	2	3	4	5	6	7	8	9	10
Formula of chloride	HC*l*	-	LiC*l*	?	BCl_3	CCl_4	NCl_3	OCl_2	FC*l*	-
Melting point of chloride / ^oC	-114	-	614	410	-107	-23	-37	-20	-154	-
Boiling point of chloride / ^oC	-85	-	1382	547	13	77	71	2	-101	-

(a) Why are no data given for the chlorides of helium and neon?

……..…. [1]

(b) Use the information in the table to predict the formula for the chloride of beryllium.

……..…. [1]

(c) Draw a 'dot-and-cross' diagram to show the arrangement of the outer shell electrons in the chloride of lithium, LiC*l*.

[3]

(d) Draw a 'dot-and-cross' diagram to show the arrangement of the outer shell electrons in the chloride of fluorine, FC*l*.

For Examiner's Use

[2]

(e) Explain, in terms of **bonding and structure**, why LiC*l* has a higher melting and boiling point than FC*l*.

……

……

……

……

…… [3]

[Total: 10]

**********End of Paper**********