

- 1 (a) The table shows the names and formulae of three ions.

name of ion	formula of ion
calcium	$\text{Ca}^{2+}$
nitrate	$\text{NO}_3^-$
phosphate	$\text{PO}_4^{3-}$

What is the formula of calcium nitrate?

Put a cross (☒) in the box next to your answer.

(1)

- A**  $\text{Ca}_2\text{NO}_3$
- B**  $\text{CaNO}_3$
- C**  $\text{Ca}_3\text{NO}_2$
- D**  $\text{Ca}(\text{NO}_3)_2$

- (b) Complete the sentence by putting a cross (☒) in the box next to your answer.

The number of oxygen atoms in the formula  $\text{Ca}_3(\text{PO}_4)_2$  is

(1)

- A** 2
- B** 4
- C** 8
- D** 12

(c) The table gives some information about the elements sodium and sulfur.

	<b>sodium</b>	<b>sulfur</b>
metal or non-metal	metal	non-metal
atomic symbol	Na	S
number of electrons in one atom	11	16

Sodium sulfide is an ionic compound.

Describe, in terms of electron transfer, how sodium atoms react with sulfur atoms to form sodium sulfide.

Your description should include the charges on the ions formed.

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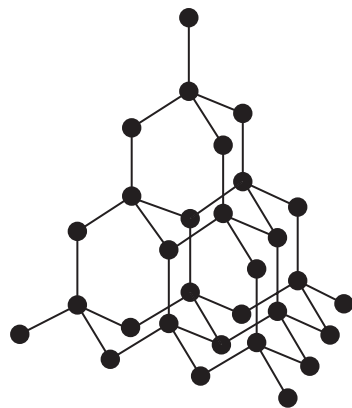
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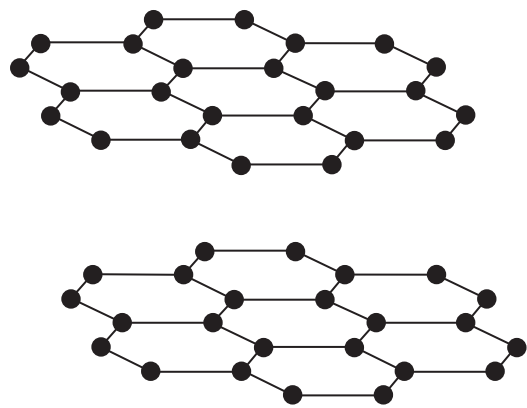
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2 (a) The structures of diamond and graphite are shown.



diamond



graphite

(i) State the maximum number of covalent bonds formed by a carbon atom in a diamond crystal.

(1)

(ii) Which of the following statements about diamond and graphite is true?

Put a cross (☒) in the box next to your answer.

(1)

- A they are both good conductors of electricity
- B they are both soluble in water
- C they both cut glass
- D they both have high melting points

(iii) Explain, in terms of its structure, why graphite is able to be used as a lubricant.

(2)

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(b) The atomic number of carbon is 6.

The atomic number of hydrogen is 1.

Draw a dot and cross diagram of a molecule of methane, CH<sub>4</sub>.

Show the outer shell electrons only.

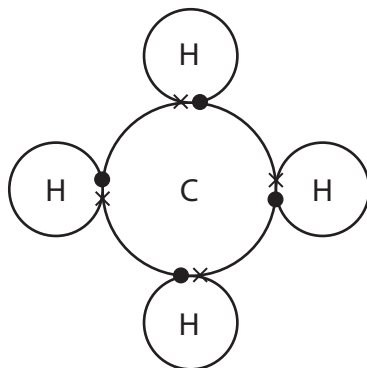
(2)





3 Many substances exist as molecules.

(a) The diagram shows the outer shell electrons in a molecule of methane, CH<sub>4</sub>.



(i) Each hydrogen atom is bonded to the carbon atom by a covalent bond.

Give the meaning of the term **covalent bond**.

(1)

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(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Methane is a typical simple molecular, covalent compound.

A property of methane is that

(1)

- A** it has a high melting point
- B** it is a good conductor of electricity
- C** there are weak bonds in its molecule
- D** it has a low boiling point





- 4 (a) The table shows some information about the atoms and the ions of chlorine and sodium.

Complete the table.

(3)

	symbol of		number of electrons in	
	atom	ion	atom	ion
chlorine	Cl	Cl <sup>-</sup>	17	
sodium	Na			10

- (b) When silver nitrate solution, AgNO<sub>3</sub>, is added to sodium chloride solution a white precipitate is formed.

(i) Write the balanced equation for this reaction.

(2)

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- (ii) Silver nitrate solution can be added to a solution to test for the presence of chloride ions.

In this test, dilute nitric acid is added to the solution, followed by the silver nitrate solution.

A white precipitate shows the presence of chloride ions.

Why must the dilute nitric acid be added to make this a reliable test?

Put a cross (☒) in the box next to your answer.

(1)

- A** to dilute the solution of chloride ions
- B** because the precipitate only forms if dilute nitric acid is added
- C** to stop the white precipitate changing colour
- D** to remove other ions that would also form a white precipitate

