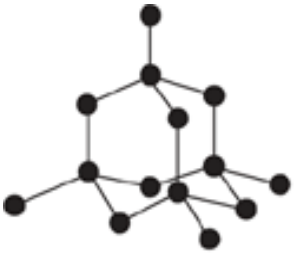
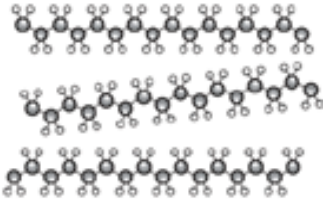
**1(a).** The structures of diamond, chlorine, $Cl_2$, and poly(ethene) are shown



Diamond

Chlorine, $Cl_2$



Poly(ethene)

All the substances contain covalent bonds between the atoms.

Explain which substance has the highest melting point.

Use your knowledge of structure and bonding.

**[6]**

**(b).**

i. Magnesium chloride is an ionic compound.

Explain why ionic compounds can conduct electricity when dissolved in water, but not when solid.

**[3]**

ii. Construct the dot and cross diagram for the ions in magnesium chloride, $MgCl_2$.

Show the outer electron shells only.

Dot and cross diagram:

**[2]**

**2.** An element has the electronic configuration 2.8.4.

Which group and period is the element in?

**A** Group 2 as it has 2 electron shells. Period 4 as it has 4 electrons in the outer shell.
**B** Group 2 as it has 2 electrons in the outer shell. Period 4 as it has 4 electron shells.
**C** Group 4 as it has 4 electron shells. Period 3 as it has 3 electrons in the outer shell.
**D** Group 4 as it has 4 electrons in the outer shell. Period 3 as it has 3 electron shells.

Your answer ☐ **[1]**

**3.** How did Mendeleev group elements together to develop his Periodic Table?

**A** Based on chemical properties and left gaps
**B** Based on mass number and atomic number
**C** Based on physical properties and atomic number
**D** Based on physical properties and left gaps

Your answer ☐ **[1]**

**4.** Which property is characteristic of a metal?

**A** It forms acidic oxides.
**B** It is brittle.
**C** It is malleable.
**D** It reacts with acid to form carbon dioxide gas.

Your answer ☐ **[1]**

**5.** Magnesium nitrate is an ionic compound.

i. Explain why magnesium forms $Mg^{2+}$ ions.

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---

**[1]**

ii. A solution containing magnesium ions reacts with a solution containing hydroxide ions.

Solid magnesium hydroxide is made.

Write the **balanced ionic** equation for this reaction.

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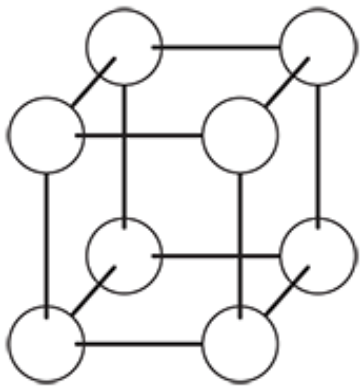
**[2]**

**6.** Salt is sodium chloride.

Complete the ball and stick model by labelling the sodium ions and the chloride ions.



**[2]**

**7. Fig. 21.1** shows two different polymer structures.

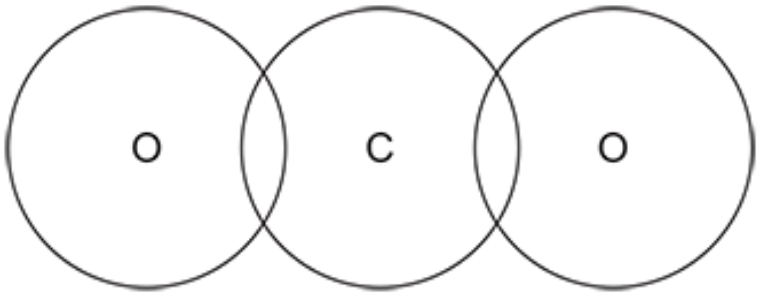

**Fig. 21.1**

Explain why polymers without cross-links can stretch more than polymers with cross-links.

**[2]**

**8.** Complete the dot and cross diagram to show the bonding in carbon dioxide, $CO_2$.

You only need to show the outer shell electrons.




**[2]**

**9.** The diagram shows a 3D space filling model of methane.

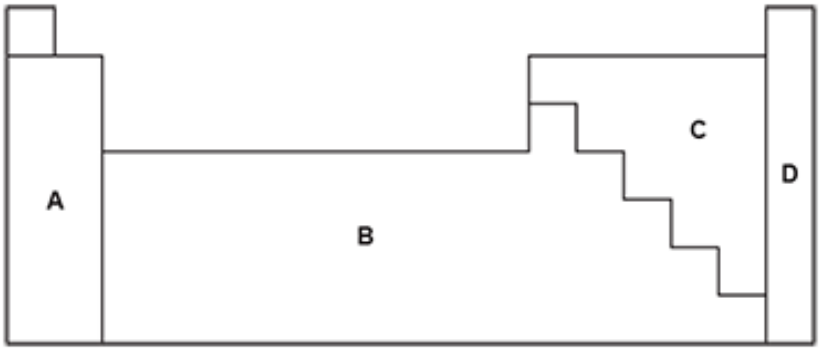
What are the limitations of showing methane as a 3D space filling model?

**A** It does not show how close together the atoms are.
**B** It does not show how many electrons are in a bond.
**C** It does not show the relative size of the atoms.
**D** It does not show the relative volume that the atoms take up.

Your answer ☐ **[1]**

**10.** An element reacts with oxygen to form an **acidic oxide**.

Which area of the Periodic Table is the element from?




Your answer ☐ **[1]**

**11.**

Zinc bromide is an ionic compound made from zinc ions, $Zn^{2+}$, and bromide ions, $Br^{-}$.

i. Construct a **balanced ionic** equation for the formation of zinc bromide.

_____ **[2]**

ii. Zinc bromide can conduct electricity when aqueous or molten, but not when solid.

Zinc metal can conduct electricity when solid.

Explain why.

Zinc bromide _____

_____

Zinc metal _____

_____

**[3]**

**12.** Which statement about the bonding in magnesium oxide is correct?

**A** There are strong covalent bonds between atoms.
**B** There are strong covalent bonds between ions.
**C** There are strong electrostatic forces between atoms.
**D** There are strong electrostatic forces between ions.

Your answer ☐ **[1]**

**13.** A Group 1 element reacts with a Group 7 element, so that both elements have a full outer shell of electrons. The table shows what happens to both elements during the reaction.

| | **Group 1 element** | **Group 7 element** |
|---|---|---|
| **A** | gains 1 electron | loses 1 electron |
| **B** | gains 2 electron | loses 2 electron |
| **C** | loses 1 electron | gains 1 electron |
| **D** | loses 2 electron | gains 2 electron |

Which row is correct?

Your answer ☐ **[1]**

**END OF QUESTION PAPER**