Paper 3

Questions are applicable for both core and extended candidates

1 The chemical elements are arranged in the Periodic Table in groups and periods.

(b) Chlorine, bromine and iodine are in Group VII of the Periodic Table.

(iii) Complete the dot-and-cross diagram in Fig. 3.1 for a molecule of iodine.

Show outer shell electrons only.

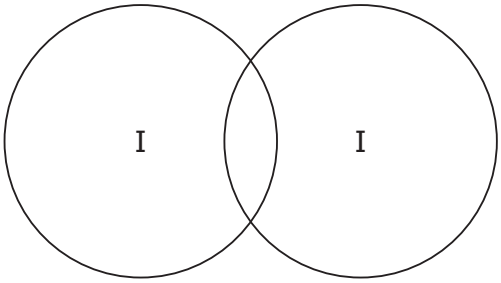


Fig. 3.1

[2]

2 This question is about compounds of nitrogen.

(a) Complete the dot-and-cross diagram in Fig. 3.1 of a molecule of ammonia.

Show outer shell electrons only.

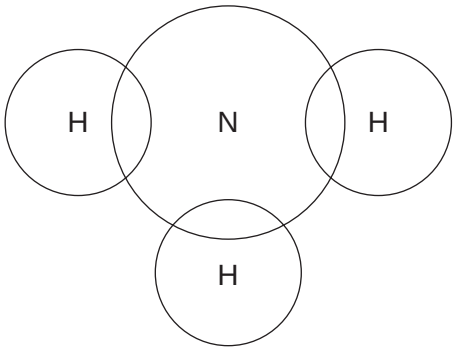


Fig. 3.1

[2]

3 This question is about nitrogen and compounds of nitrogen.

(a) Nitrogen is a non-metal. Nitrogen is a poor electrical conductor.

Describe two **other** physical properties which are typical of non-metals.

1 .....

2 .....

[2]

(c) Ammonia is a simple molecule with covalent bonds.

(i) Describe a covalent bond.

.....

..... [2]

(ii) Complete Fig. 8.1 to show the dot-and-cross diagram for a molecule of ammonia.

Show outer shell electrons only.

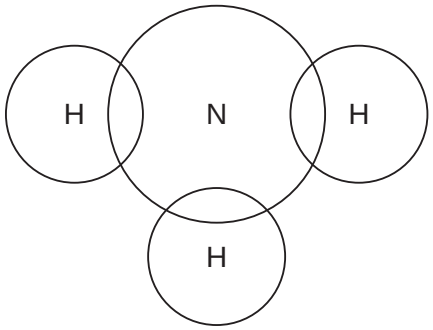


Fig. 8.1

[2]

4 Table 5.1 shows the properties of four substances.

Table 5.1

substance	boiling point	electrical conductivity of solid	electrical conductivity when molten	density in g / cm^3
aluminium	high	conducts	conducts	2.70
diamond				3.51
potassium bromide	high	does not conduct	conducts	2.75
sulfur	low	does not conduct		2.07

(a) Complete Table 5.1 to show the electrical conductivity of solid diamond and molten sulfur. [2]

(b) State **one** piece of evidence from Table 5.1 that shows that sulfur is a simple molecular substance.

..... [1]

5 (b) Aqueous chlorine reacts with aqueous potassium bromide as shown.

$$Cl_2 + 2KBr \rightarrow Br_2 + 2KCl$$

(iii) Complete the dot-and-cross diagram in Fig. 7.1 of a molecule of chlorine.

Show outer shell electrons only.

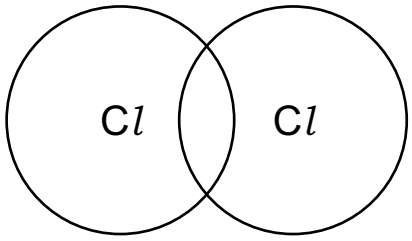


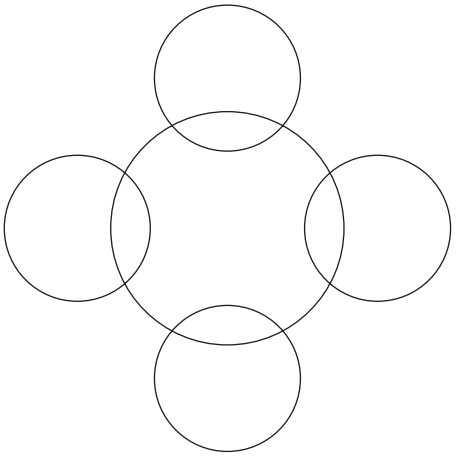
Fig. 7.1 [2]

6 Biogas is a mixture of gases produced when agricultural waste is broken down in the absence of oxygen.

The table compares the percentage by mass of the gases present in two samples of biogas, **X** and **Y**.

gas	biogas **X** /% by mass	biogas **Y** /% by mass
carbon dioxide	26	32
hydrogen	1	1
hydrogen sulfide	0.5	0.5
methane	67	56
nitrogen	4	9.5
oxygen	0.5	0.5
other gases		0.5

(b) Complete the diagram to show the electronic structure in a methane molecule. Show only the outer shell electrons.



[1]

Paper 4

Questions are applicable for both core and extended candidates unless indicated in the question

7 The elements in Group VII of the Periodic Table are known as the halogens. Halogens can form halide ions.

(d) Bromine molecules have covalent bonding.

(i) State what is meant by the term covalent bond.

.....

..... [2]

8 This question is about gases found in clean, dry air and gases found in polluted air.

(h) Complete the dot-and-cross diagram in Fig. 1.1 for a molecule of CO_2. **(extended only)**

Show outer shell electrons only. **(extended only)**

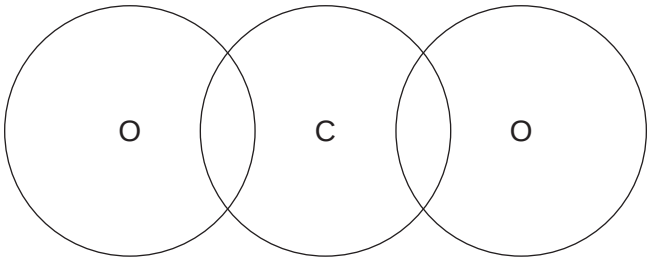


Fig. 1.1

[2]

9 This question is about ionic and covalent compounds.

(b) Carbon dioxide, CO_2, is a covalent compound.

Complete the dot-and-cross diagram in Fig. 3.3 to show the electronic configuration in a molecule of carbon dioxide. Show outer shell electrons only. **(extended only)**

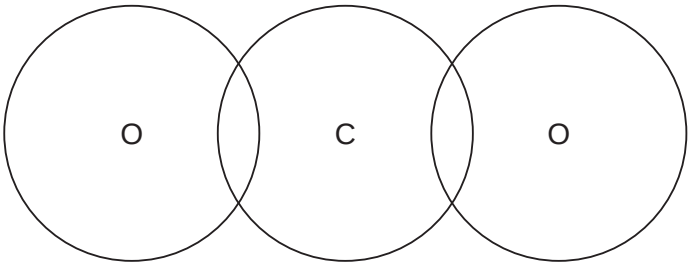


Fig. 3.3

[2]

(c) The melting points of sodium oxide and carbon dioxide are shown in Table 3.1.

Table 3.1

	melting point / °C
sodium oxide	1275
carbon dioxide	–78

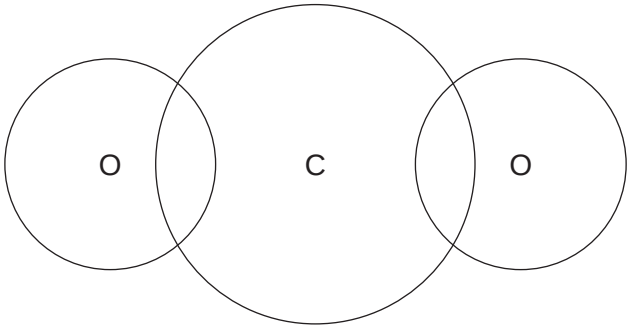
(ii) Carbon dioxide has a low melting point. **(extended only)**

State the general term for the weak forces that cause carbon dioxide to have a low melting point.

..... [1]

10 A student adds excess large pieces of magnesium carbonate, $MgCO_3$, to dilute hydrochloric acid, HC*l*, and measures the volume of carbon dioxide gas, CO_2, given off.

(c) Complete the dot-and-cross diagram to show the electron arrangement in a molecule of carbon dioxide.
Show outer shell electrons only. **(extended only)**

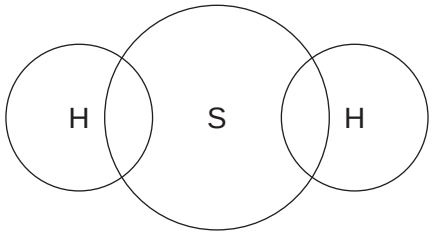


[2]

11 This question is about compounds of sulfur.

(b) Hydrogen sulfide has the formula H_2S.

(i) Complete the dot-and-cross diagram to show the electron arrangement in a molecule of hydrogen sulfide. Show outer shell electrons only. **(extended only)**

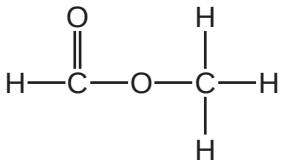


[2]

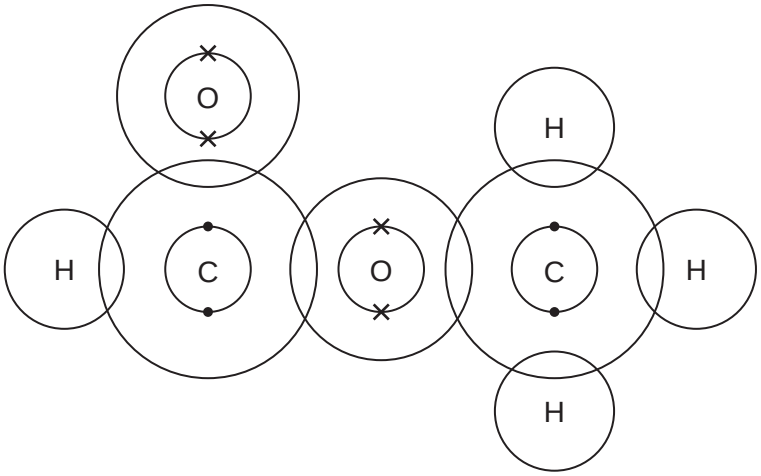
(ii) Balance the chemical equation for the reaction of hydrogen sulfide with sulfur dioxide shown.

$$.....H_2S + SO_2 \rightarrow .....S + ...H_2O$$ [1]

12 Ester **Y** has the structure shown.



(b) Complete the dot-and-cross diagram to show the arrangement of electrons in a molecule of ester **Y**. **(extended only)**



[3]