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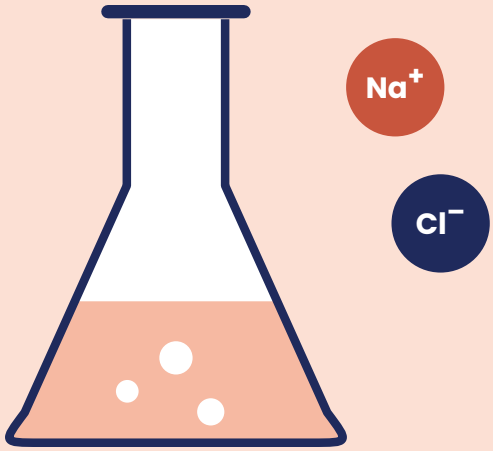
Year 10–11 • Cambridge IGCSE Chemistry 0620

Chemical Bonding

Topic Practice Paper

Exam-style questions on ionic, covalent and metallic bonding, giant structures and properties. Time: 45 minutes.



Ions | Ionic | Covalent | Giant covalent | Metallic | Properties

KEY IDEAS IN THIS PAPER — **CORE + EXTENDED**

Name: _____ Class: _____

Date set: _____ Date due: _____

What's inside

Question 1	Structure and properties	**7 marks**
Question 2	Ionic bonding in sodium chloride	**10 marks**
Question 3	Covalent bonding in simple molecules	**9 marks**
Question 4	Diamond and graphite	**9 marks**
Question 5	Metallic bonding [Extended]	**6 marks**
Question 6	Types of bonding	**4 marks**

Instructions

- Answer all questions in the spaces provided.
- You need a pen, a pencil and a ruler.
- [Extended] parts: Core candidates may skip (Core total: 32).
- Marks for each question are shown in [ ].

Total score

/ 45

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Chemical Bonding – Topic Practice Paper

Cambridge IGCSE Chemistry 0620 style. Answer all questions. Parts marked **[Extended]** are for Extended candidates; Core candidates may leave them out.

Question 1 Structure and properties

Table 1.1 shows some properties of four substances, P, Q, R and S.

substance	melting point / °C	boiling point / °C	conducts electricity when solid?	conducts electricity when molten?
P	801	1413	no	yes
Q	–95	69	no	no
R	1710	2230	no	no
S	1085	2562	yes	yes

Table 1.1

Each letter may be used once, more than once or not at all.

(a) State which substance, P, Q, R or S, is: **[4]**

(i) an ionic compound .....

(ii) a simple molecular substance .....

(iii) a giant covalent substance .....

(iv) a metal .....

(b) Explain why substance P does not conduct electricity when it is solid but does conduct when it is molten. **[2]**

.....

.....

(c) Deduce the physical state of substance Q at 25 °C. Give a reason. **[1]**

.....

.....

Total for this question: _____ / 7

Question 2 Ionic bonding in sodium chloride

Sodium reacts with chlorine to make sodium chloride, NaCl.

(a) Give the electronic configuration of: **[2]**

(i) a sodium atom .....

(ii) a sodium ion, Na^+ .....

(b) Describe, in terms of electrons, what happens to a sodium atom and a chlorine atom when they react to form ions. **[2]**

.....

.....

.....

(c) Fig. 2.1 shows the outer shell of a chloride ion. The electrons that came from the chlorine atom are shown as crosses (×). Complete Fig. 2.1 by adding the electron gained from sodium as a dot (•) and by writing the charge on the ion. **[2]**

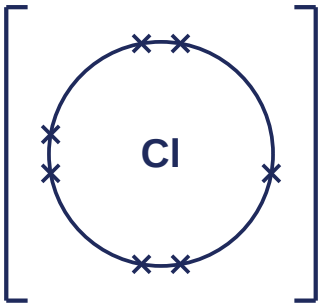


Fig. 2.1

(d) Sodium chloride has a high melting point. Explain why, in terms of its bonding. **[2]**

.....

.....

(e) **[Extended]** Deduce the formula of the ionic compound formed between: **[2]**

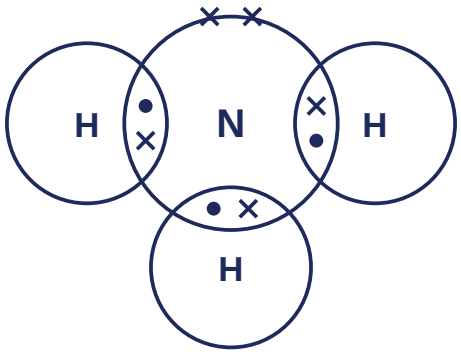
(i) calcium and chlorine .....

(ii) aluminium and oxygen .....

Total for this question: _____ / 10

Question 3 Covalent bonding in simple molecules

Fig. 3.1 shows a dot-and-cross diagram for a molecule of ammonia, NH_3. Only the outer shell electrons are shown.



key: ✕ electron from nitrogen ● electron from hydrogen

Fig. 3.1

(a) State what is meant by a *covalent bond*. **[1]**

.....

.....

(b) Use Fig. 3.1 to state the number of: **[2]**

(i) bonding pairs of electrons in one ammonia molecule .....

(ii) non-bonding (lone) pairs of electrons on the nitrogen atom .....

(c) **[Extended]** Ammonia has a boiling point of –33 °C. Explain, in terms of the forces involved, why ammonia has a low boiling point. **[2]**

.....

.....

.....

(d) Suggest why liquid ammonia does **not** conduct electricity. **[1]**

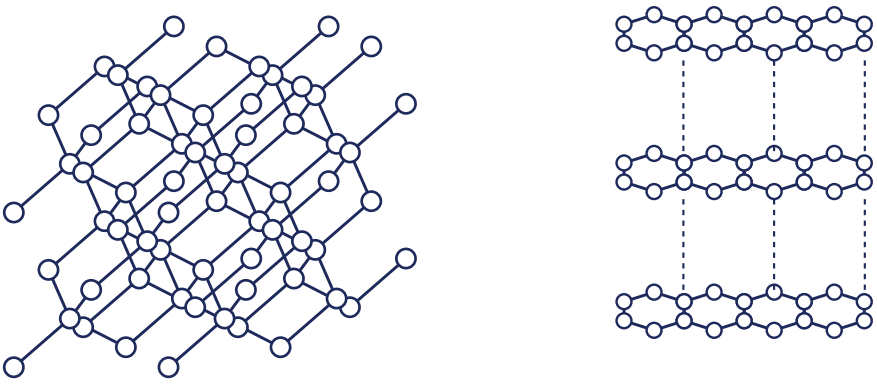
.....

(e) **[Extended]** Draw a dot-and-cross diagram for a molecule of carbon dioxide, CO_2, in the box. Show the outer shell electrons only. **[3]**

Total for this question: _____ / 9

Question 4 Diamond and graphite

Diamond and graphite are two forms of the element carbon. Fig. 4.1 shows the structures of diamond and graphite. Each circle represents a carbon atom.



A B

Fig. 4.1

(a) State which structure, A or B, is graphite. **[1]**

.....

(b) State the number of covalent bonds formed by each carbon atom in: **[2]**

(i) diamond .....

(ii) graphite .....

(c) Graphite is used as an electrode in electrolysis. Explain why graphite conducts electricity. **[2]**

.....

.....

.....

(d) Graphite is also used as a lubricant. Explain why, using its structure. **[2]**

.....

.....

.....

(e) Diamond is used in the tips of drills for cutting rock. Explain why, using its structure. **[2]**

.....

.....

.....

Total for this question: _____ / 9

Question 5 Metallic bonding [Extended]

Fig. 5.1 shows a model of the structure of a metal such as copper.

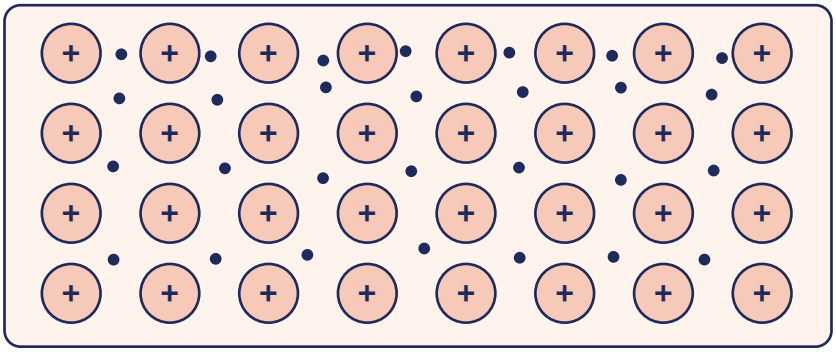


Fig. 5.1

(a) Describe metallic bonding. **[2]**

.....

.....

.....

(b) Explain why copper is a good conductor of electricity. **[1]**

.....

(c) Copper is malleable. Explain why, using Fig. 5.1. **[2]**

.....

.....

(d) Silicon(IV) oxide, SiO_2, has a structure similar to diamond. State **one** physical property of silicon(IV) oxide that is similar to diamond. **[1]**

.....

Total for this question: _____ / 6

Question 6 Types of bonding

This question is about the type of bonding in compounds.

(a) Put a tick in **one** box in each row of Table 6.1 to show the type of bonding in each compound. **[2]**

substance	ionic	covalent
potassium bromide, KBr		
methane, CH_4		
calcium oxide, CaO		
hydrogen chloride, HCl		
water, H_2O		

Table 6.1

(b) Element X is in Group I of the Periodic Table. Element Y is in Group VII. State the type of bonding in the compound formed between X and Y, and give its formula. **[2]**

type of bonding .....

formula .....

END OF PAPER **Total for this question: _____ / 4**