

Past-paper walk-through

Ions and ionic bonds ■ 2.4

eXercise

Questions in this set

- 0620/21 N25 Q6 ■ 1 mark
- 0620/22 N25 Q7 ■ 1 mark
- 0620/23 N25 Q5 ■ 1 mark
- 0620/43 N25 Q2 ■ 8 marks
- 0620/23 J25 Q6 ■ 1 mark
- 0620/42 M25 Q2 ■ 16 marks

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

Question 6

0620/21 N25 ■ Q6 ■ 1 mark

- 6** Which statement describes the formation of bonds in lithium bromide?
- A** A lithium atom donates one electron to a bromine atom.
 - B** A bromine atom donates one electron to a lithium atom.
 - C** A lithium atom shares a pair of electrons with a bromine atom.
 - D** A bromine atom donates a pair of electrons to a lithium atom.

Solution 6

Answer: **A**

Why

- Lithium is in Group I, so it has one outer electron to lose.
- Bromine is in Group VII, so it needs one electron to complete its shell.
- The lithium atom donates its electron to the bromine atom, giving Li^+ and Br^- .

Question 7

0620/22 N25 ■ Q7 ■ 1 mark

- 7 Which statement describes the structure of sodium chloride?
- A** a lattice of alternating positive and negative ions
 - B** a lattice of positive ions surrounded by a 'sea' of delocalised electrons
 - C** a mixture of sodium and chlorine atoms
 - D** a regular lattice of sodium and chlorine atoms

Solution 7

Answer: **A**

Why

- Sodium chloride is ionic, so it is built from ions and not from molecules.
- The Na^+ and Cl^- ions alternate in a regular three-dimensional lattice.
- A sea of delocalised electrons describes a *metal*, not an ionic solid.

Question 5

0620/23 N25 ■ Q5 ■ 1 mark

- 5** Which statement describes all positive ions?
- A** Positive ions have more electrons than neutrons.
 - B** Positive ions have more protons than neutrons.
 - C** Positive ions have more electrons than protons.
 - D** Positive ions have more protons than electrons.

Solution 5

Answer: **D**

Why

- A positive ion has been formed by *losing* electrons.
- So it must have more protons than electrons.
- Neutron number has nothing to do with the charge.

Question 2

0620/43 N25 ■ Q2 ■ 8 marks

- 2 Table 2.1 shows the melting points, boiling points and electrical conductivities of seven substances, **A**, **B**, **C**, **D**, **E**, **F** and **G**.

Table 2.1

substance	melting point /°C	boiling point /°C	electrical conductivity when solid	electrical conductivity when molten
A	1600	2230	poor	poor
B	−219	−183	poor	poor
C	770	1420	poor	good
D	−39	357	good	good
E	−7	58	poor	poor
F	44	280	poor	poor
G	1085	2562	good	good

Question 2

A	B	C	D	E	F	G
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(a) Identify which substance, **A**, **B**, **C**, **D**, **E**, **F** or **G**, is:

(i) a gas at 25°C

Question 2

(ii) a solid consisting of simple molecules at 25°C

Question 2

(iii) a metal which is liquid at 25°C.

Question 2

(b) (i) Identify which substance, **A**, **B**, **C**, **D**, **E**, **F** or **G**, has a giant covalent structure.

Use the information in Table 2.1 to give **two** reasons for your choice.

Question 2

[3]

(ii) Identify which substance, **A**, **B**, **C**, **D**, **E**, **F** or **G**, is an ionic compound.

Use the information in Table 2.1 to give **one** reason for your choice.

Question 2

[2]

[Total: 8]

Solution 2

(a)(i)

Mark scheme

- B
- 1

(a)(ii)

Mark scheme

- F
- 1

Solution 2

(a)(iii)

Mark scheme

- D
- 1

Solution 2

(b)(i)

Mark scheme

- M1 A (M2)
- high melting point AND/OR high boiling point (M3)
- poor conductor of electricity when solid AND molten
- 3
- 0620/43
- October/November 2025

Solution 2

(b)(ii)

Mark scheme

- M1 C M2
- only conducts electricity when molten
- 2

Question 6

0620/23 J25 ■ Q6 ■ 1 mark

- 6** Which statement about ionic compounds is correct?
- A** Giant lattices are formed when ionic compounds crystallise from solution.
 - B** In all ionic compounds, the metal ions have fewer electrons than the non-metal ions.
 - C** In a giant lattice, ions of the same charge are closer together than ions of opposite charge.
 - D** When ionic compounds melt, strong intermolecular forces are broken.

Solution 6

Answer: **A**

Why

- When an ionic compound crystallises the ions pack into a regular giant lattice.
- The number of electrons in each ion depends on the element, not on whether it is a metal.
- Ionic compounds conduct only when molten or dissolved, because only then can the ions move.

Question 2

0620/42 M25 ■ Q2 ■ 16 marks

2 This question is about ionic compounds.

(a) State what is meant by the term ionic bond.

Question 2

(b) Potassium sulfide, K_2S , is an ionic compound.

Complete the dot-and-cross diagram in Fig. 2.1 of the ions in potassium sulfide.

Show the charges on the ions.

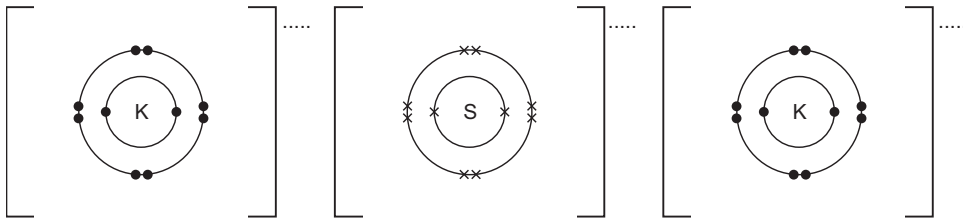


Fig. 2.1

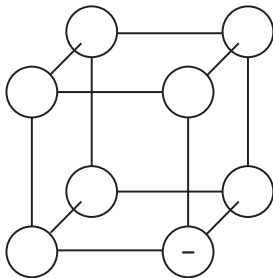
[3]

Question 2

(c) Ionic compounds form giant ionic lattices.

(i) Fig. 2.2 shows part of the giant ionic lattice structure of sodium chloride.

Complete the diagram in Fig. 2.2 to show the ions present. Use '+' for sodium ions and '-' for chloride ions. One chloride ion has been completed for you.



Question 2

File 2.2

Question 2

Fig. 2.2

[2]

- (ii) State the name given to any positive ion.

Question 2

- (d) Ionic compounds can be decomposed by the passage of an electric current using inert electrodes.
- (i) State the name of this process.

Question 2

- (ii) Write the ionic half-equation for the reaction which takes place at the anode when **molten** potassium bromide, KBr, is decomposed by the passage of an electric current.

Question 2

- (iii) Name the products and state the observations at the negative and positive electrodes when **dilute aqueous** potassium bromide, KBr, is decomposed by the passage of an electric current.

product at the negative electrode

Question 2

observations at the negative electrode

Question 2

products at the positive electrode

Question 2

observations at the positive electrode

Question 2

[5]

[Total: 16] -

Solution 2

(a)

Mark scheme

- M1 (strong) (electrostatic) attraction between ions **M2**
- ions have opposite charges
- 2

Solution 2

(b)

Mark scheme

- M1 8 dots in third shell of each K M2
- 6 crosses and 2 dots in third shell of S M3
- '+' charge on each K ion on correct answer line
- and '2-' charge on S ion on correct answer line
- 3

Solution 2

(c)(i)

Mark scheme

- M1 3 correctly positioned positive ions next to given negative **M2**
- all ions correct
- 2

Solution 2

(c)(ii)

Mark scheme

- cation(s)
- 1

Solution 2

(d)(i)

Mark scheme

- electrolysis
- 1

Solution 2

(d)(ii)

Mark scheme

- $2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$ (M1)
- any negative Br species losing electron(s) (M2)
- correct ionic half equation
- 2
- 0620/42
- February/March 2025

Solution 2

(d)(iii)

Mark scheme

- M1 hydrogen M2
- bubbles M3
- oxygen M4 water M5
- bubbles
- 5