



IGCSE CHEMISTRY

0620 IGCSE

CHEMICAL BONDING

MCQS

2026 EDITION

SECTION A: IONIC BONDING

Q1 0620/22/F/M/21/Q6

Ionic Bonding

- 6 Lithium and fluorine react to form lithium fluoride.

A student writes three statements about the reaction.

- 1 Lithium atoms lose an electron when they react.
- 2 Each fluoride ion has one more electron than a fluorine atom.
- 3 Lithium fluoride is a mixture of elements.

Which statements are correct?

- A** 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

Q2 0620/22/F/M/21/Q8

Ionic Bonding

- 8 Magnesium oxide has a high melting point.

Carbon dioxide has a low melting point.

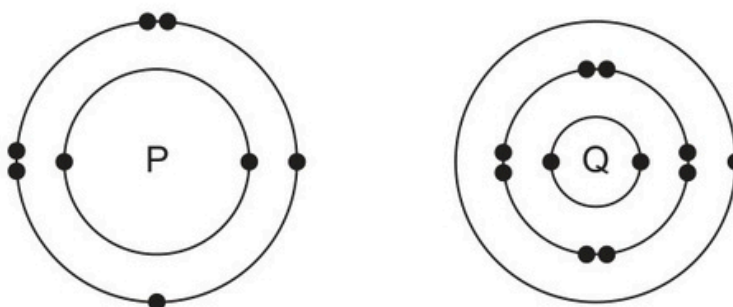
Which row identifies the attractive forces that are broken when these compounds are melted?

	magnesium oxide	carbon dioxide
A	strong attractions between molecules	weak attractions between atoms
B	strong attractions between molecules	weak attractions between molecules
C	strong attractions between ions	weak attractions between atoms
D	strong attractions between ions	weak attractions between molecules

Q3 0620/22/F/M/22/Q4

Ionic Bonding

- 4 The electronic structures of atoms P and Q are shown.



P and Q form an ionic compound.

What is the formula of the compound?

- A** PQ **B** P₂Q **C** P₂Q₃ **D** PQ₂

SECTION A - IONIC BONDING

Q4 0620/22/F/M/28/01/10/M/J/21/Q27

Ionic Bonding

10 Caesium fluoride is an ionic compound.

Which statements about caesium fluoride are correct?

- 1 It conducts electricity when solid.
- 2 It has a high melting point.
- 3 It is soluble in water.
- 4 It is highly volatile.

A 1 and 2

B 1 and 4

C 2 and 3

D 3 and 4

Q5 **0620/22/F/M/23/Q4**

Ionic Bonding

4 Which statement about ions and ionic bonds is correct?

- A** Bromine atoms form negatively charged bromide ions.
- B** Ionic bonds form between elements in Group VII of the Periodic Table.
- C** Positive ions are formed when atoms lose protons.
- D** Potassium iodide contains negatively charged potassium ions.

Q6 **0620/22/F/M/23/Q5**

Ionic Bonding

5 Part of the Periodic Table is shown.

A 10x10 grid with a watermark 'KEMBRIDGE' diagonally across it. The grid is divided into three sections: a 2x2 square on the top left, a 2x2 square on the top right, and a 2x2 square on the top center. The bottom 6x10 area is a single continuous grid.

Which type of chemical bonding is present in the oxide of F and in the oxide of G?

	oxide of F	oxide of G
A	covalent	covalent
B	covalent	ionic
C	ionic	covalent
D	ionic	ionic

Q7 0620/22/F/M/23/Q6

Ionic Bonding

- 6 Elements X and Y react to form a compound.

Element X loses two electrons and element Y gains one electron.

What is the charge on the ions of elements X and Y and what is the formula of the compound?

	charge on X	charge on Y	formula of compound
A	2+	–	X ₂ Y
B	2+	–	XY ₂
C	2–	+	X ₂ Y
D	2–	+	XY ₂

Q8 0620/22/F/M/24/Q5

Ionic Bonding

- 5 Which statement describes a property of potassium iodide?

- A** It is insoluble in water.
- B** It is a volatile substance.
- C** It has a low melting point.
- D** It conducts electricity when molten.

Q9 0620/22/F/M/25/Q6

Ionic Bonding

- 6 Lithium is in Group I of the Periodic Table. Nitrogen is in Group V of the Periodic Table.

Lithium reacts with nitrogen to form the ionic compound lithium nitride, Li₃N.

What happens to the electrons when lithium atoms and nitrogen atoms form ions?

	lithium	nitrogen
A	each lithium atom loses one electron to form an Li ⁺ ion	each nitrogen atom gains three electrons to form an N ^{3–} ion
B	each lithium atom loses one electron to form an Li ⁺ ion	each nitrogen atom gains five electrons to form an N ^{5–} ion
C	each lithium atom gains one electron to form an Li [–] ion	each nitrogen atom loses three electrons to form an N ³⁺ ion
D	each lithium atom gains one electron to form an Li [–] ion	each nitrogen atom loses five electrons to form an N ⁵⁺ ion

Q10 0620/22/M/J/21/Q7

Ionic Bonding

- 7 Chemical compounds formed from a Group I element and a Group VII element contain ionic bonds.

How are the ionic bonds formed?

- A Electrons are transferred from Group VII atoms to Group I atoms.
- B Electrons are shared between Group I atoms and Group VII atoms.
- C Electrons are lost by Group I atoms and Group VII atoms.
- D Electrons are transferred from Group I atoms to Group VII atoms.

Q11 0620/23/M/J/21/Q9

Ionic Bonding

- 9 Three ionic compounds of vanadium have the formulae V_2O , VCl_2 and V_2O_3 .

What is the charge on the vanadium ion in each compound?

	V_2O	VCl_2	V_2O_3
A	+1	-2	+2
B	+1	+2	+3
C	+2	-2	+2
D	+2	+2	+3

Q12 0620/21/M/J/22/Q5

Ionic Bonding

- 5 Metals and ionic compounds have similarities and differences in their structure and properties.

Which row about metals and ionic compounds is correct?

	similarity	difference
A	both contain positive ions	only ionic compounds contain anions
B	both contain positive ions	ionic compounds conduct using a 'sea of electrons'
C	both are malleable	only ionic compounds contain anions
D	both are malleable	ionic compounds conduct using a 'sea of electrons'

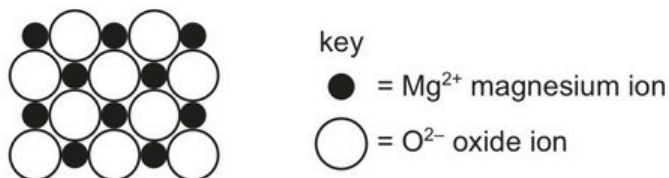
Q13

0620/23/M/J/23/Q5

Ionic Bonding

5 Magnesium oxide is a white solid at room temperature and pressure.

Part of the structure of solid magnesium oxide is shown.



Three statements are listed.

- 1 Magnesium ions are smaller than oxide ions because they contain fewer electrons.
- 2 Magnesium oxide has good electrical conductivity when molten because the ions are mobile.
- 3 Magnesium oxide has a high melting point because of the strong electrostatic attraction between the ions and delocalised electrons in the giant lattice.

Which statements are correct?

- A** 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 2 only

Q14

0620/21/M/J/25/Q5

Ionic Bonding

5 Which statement about potassium chloride is correct?

- A** It has a high melting point because it is a giant structure with strong covalent bonds.
- B** It conducts electricity when solid because of its oppositely charged ions.
- C** It conducts electricity when molten because its ions can move.
- D** It is insoluble in water because of its strong bonding.

Q15

0620/23/M/J/25/Q5

Ionic Bonding

5 The diagram shows the positions of elements P and Q in the Periodic Table.

The diagram shows a 10x4 grid with the following structure:

- Columns 1-2: A 2x2 block of cells.
- Column 3: A single cell.
- Columns 4-9: A single row of 6 cells.
- Column 10: A single cell.
- Columns 11-14: A 2x4 block of cells.

Labels and positions:

- 'P' is in the cell at row 2, column 2.
- 'Q' is in the cell at row 2, column 10.
- A single square is positioned above the middle bar, centered between columns 4 and 5.

What is the formula of the compound that is formed between P and Q?

- A** PQ **B** P₂Q **C** PQ₂ **D** P₂Q₇

Q16 0620/23/M/J/25/Q6

Ionic Bonding

- 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.

Q17 0620/23/O/N/21/Q6

Ionic Bonding

- 6 A Group I element combines with a Group VII element and forms an ionic bond.

Which row shows how the electronic structures change?

	Group I element		Group VII element	
	before bonding	after bonding	before bonding	after bonding
A	2,8,1	2,8,2	2,7	2,6
B	2,8	2,7	2,8	2,8,1
C	2,8,1	2,8	2,7	2,8
D	2,8	2,8,1	2,8	2,7

Q18 0620/23/O/N/21/Q9

Ionic Bonding

- 9 Aluminium oxide is an ionic compound containing Al^{3+} ions and O^{2-} ions.
- Aluminium hydroxide is an ionic compound containing Al^{3+} ions and OH^- ions.

In which row are the formulae for aluminium oxide and aluminium hydroxide correct?

	aluminium oxide	aluminium hydroxide
A	Al_2O_3	$\text{Al}(\text{OH})_3$
B	Al_3O_2	AlOH_3
C	Al_2O_3	AlOH_3
D	Al_3O_2	$\text{Al}(\text{OH})_3$

Q19

0620/21/O/N/22/Q6

Ionic Bonding

6 Which statements about potassium bromide are correct?

- 1 It has a high melting point.
- 2 It dissolves in water.
- 3 It conducts electricity when solid.

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 only

Q20

0620/22/O/N/22/Q5

Ionic Bonding

5 Which statement about solid magnesium oxide is correct?

- A** It is a giant structure made up of magnesium and oxygen atoms bonded covalently.
- B** It is an electrical conductor with mobile magnesium ions and oxygen ions.
- C** Magnesium loses electrons and these electrons move freely through a lattice.
- D** Oxygen ions and magnesium ions are attracted to each other in a giant lattice.

Q21

0620/21/O/N/23/Q5

Ionic Bonding

5 Lithium chloride is an ionic compound and silicon(IV) oxide is a covalent compound.

Which statement about **both** compounds is correct?

- A** They are not soluble in water.
- B** They conduct electricity when melted.
- C** They do not conduct electricity in solid form.
- D** They have low melting points.

Q22

0620/21/O/N/23/Q7

Ionic Bonding

7 Which row shows the formulae of sodium carbonate, zinc nitrate and ammonium sulfate?

	sodium carbonate	zinc nitrate	ammonium sulfate
A	Na_2CO_3	ZnNO_3	$(\text{NH}_4)_2\text{SO}_4$
B	Na_2CO_3	$\text{Zn}(\text{NO}_3)_2$	$(\text{NH}_4)_2\text{SO}_4$
C	NaCO_3	ZnNO_3	$(\text{NH}_3)_2\text{SO}_4$
D	NaCO_3	$\text{Zn}(\text{NO}_3)_2$	$(\text{NH}_3)_2\text{SO}_4$

Q23

0620/22/O/N/23/Q5

Ionic Bonding

5 Potassium reacts with iodine to form potassium iodide.

Which statement about potassium iodide is correct?

- A Each potassium atom shares a pair of electrons with an iodine atom.
- B In potassium iodide, the particles of potassium have more protons than electrons.
- C Potassium iodide has a high melting point because it is a covalent compound.
- D Potassium iodide has a low melting point because it is an ionic compound.

Q24

0620/23/O/N/23/Q5

Ionic Bonding

5 Magnesium reacts with oxygen to form magnesium oxide.

What happens to magnesium atoms and oxygen atoms during this reaction?

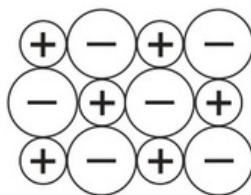
- A Magnesium and oxygen share two electrons.
- B Magnesium gains two electrons and oxygen loses two electrons.
- C Magnesium loses one electron and oxygen gains one electron.
- D Magnesium loses two electrons and oxygen gains two electrons.

Q25

0620/21/O/N/24/Q4

Ionic Bonding

- 4 The diagram shows part of an ionic lattice structure.



Which compound does the diagram represent?

- A potassium bromide
- B sodium oxide
- C magnesium chloride
- D carbon monoxide

Q26

0620/22/O/N/24/Q4

Ionic Bonding

- 4 Which pair of elements react to form a compound with a strong attraction between oppositely charged ions?
- A carbon and bromine
 - B carbon and nitrogen
 - C sodium and oxygen
 - D sodium and potassium

Q27

0620/22/O/N/24/Q7

Ionic Bonding

- 7 The bonding, structure and melting point of sodium chloride and sulfur dichloride are shown.

compound	bonding	structure	melting point/°C
sodium chloride	ionic	giant lattice	801
sulfur dichloride	covalent	simple molecular	-121

Why does sulfur dichloride have a lower melting point than sodium chloride?

- A The covalent bonds in sulfur dichloride are weaker than the attractive forces between molecules in sodium chloride.
- B The covalent bonds in sulfur dichloride are weaker than the ionic bonds in sodium chloride.
- C The attractive forces between molecules in sulfur dichloride are weaker than the attractive forces between molecules in sodium chloride.
- D The attractive forces between molecules in sulfur dichloride are weaker than the ionic bonds in sodium chloride.

Q28

0620/23/O/N/24/Q4

Ionic Bonding

4 The table shows some properties of four substances.

substance	melting point	electrical conductivity when solid	electrical conductivity when molten
1	high	poor	poor
2	high	poor	good
3	low	poor	poor
4	high	good	good

Which substances are ionic?

- A** 1, 3 and 4 **B** 1 and 3 only **C** 2 and 4 **D** 2 only

Q29

0620/23/O/N/24/Q7

Ionic Bonding

7 Ammonium iron(III) citrate contains in its formula:

- more than one ammonium ion
- one iron ion
- two $\text{C}_6\text{H}_4\text{O}_7^{4-}$ ions.

What is the formula of ammonium iron(III) citrate?

- A** $(\text{NH}_4)_4\text{Fe}(\text{C}_6\text{H}_4\text{O}_7)_2$
B $(\text{NH}_4)_5\text{Fe}(\text{C}_6\text{H}_4\text{O}_7)_2$
C $(\text{NH}_4)_6\text{Fe}(\text{C}_6\text{H}_4\text{O}_7)_2$
D $(\text{NH}_4)_7\text{Fe}(\text{C}_6\text{H}_4\text{O}_7)_2$

Q30

0620/21/O/N/25/Q6

Ionic Bonding

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.

Q31

0620/22/O/N/25/Q7

Ionic Bonding

- 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



SECTION B: COVALENT BONDING

SECTION B - COVALENT BONDING

Q32

0620/22/F/M/21/Q7

Covalent Bonding

7 How many electrons are used to form covalent bonds in a molecule of methanol, CH_3OH ?

- A 5 B 6 C 8 D 10

Q33

0620/22/F/M/24/Q6

Covalent Bonding

6 Methanal, CH_2O , has a boiling point of -19°C .

At -20°C , the liquid methanal is a non-conductor of electricity.

In a sample of methanal, each atom of carbon, hydrogen and oxygen has noble gas electronic configuration. Each atom has achieved this electronic configuration in one of three ways:

- gaining electrons
- losing electrons
- sharing electrons.

Which statement describes the bonding between the carbon atom and the oxygen atom in methanal?

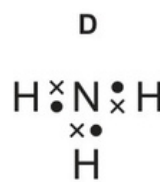
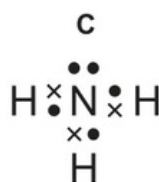
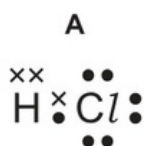
- A The carbon atom and the oxygen atom share four electrons.
 B The carbon atom and the oxygen atom share two electrons.
 C Carbon is a negative ion and oxygen is a positive ion. These two ions attract each other.
 D Carbon is a positive ion and oxygen is a negative ion. These two ions attract each other.

Q34

0620/22/F/M/25/Q7

Covalent Bonding

7 For which covalent compound does the dot-and-cross diagram correctly show the outer shell electrons?



Q35

0620/21/M/J/21/Q5

Covalent Bonding

- 5 A covalent molecule Q contains only six shared electrons.

What is Q?

- A ammonia, NH_3
- B chlorine, Cl_2
- C methane, CH_4
- D water, H_2O

Q36

0620/21/M/J/21/Q24

Covalent Bonding

- 24 Element R forms a covalent compound R_2Si with silicon.

Which row describes R?

	metallic or non-metallic character	group number in the Periodic Table
A	metallic	II
B	metallic	VI
C	non-metallic	II
D	non-metallic	VI

Q37

0620/22/M/J/21/Q5

Covalent Bonding

- 5 A covalent molecule Q contains only six shared electrons.

What is Q?

- A ammonia, NH_3
- B chlorine, Cl_2
- C methane, CH_4
- D water, H_2O

Q38

0620/23/M/J/21/Q5

Covalent Bonding

- 5 A covalent molecule Q contains only six shared electrons.

What is Q?

- A ammonia, NH_3
- B chlorine, Cl_2
- C methane, CH_4
- D water, H_2O

Q39

0620/21/M/J/22/Q6

Covalent Bonding

- 6 Which diagram represents the outer-shell electron arrangement in a nitrogen molecule?



Q40

0620/22/M/J/22/Q6

Covalent Bonding

- 6 Which dot-and-cross diagram shows the arrangement of outer shell electrons in a molecule of hydrogen chloride?



Q41

0620/23/M/J/23/Q6

Covalent Bonding

6 In which molecule are all the outer-shell electrons involved in covalent bonding?

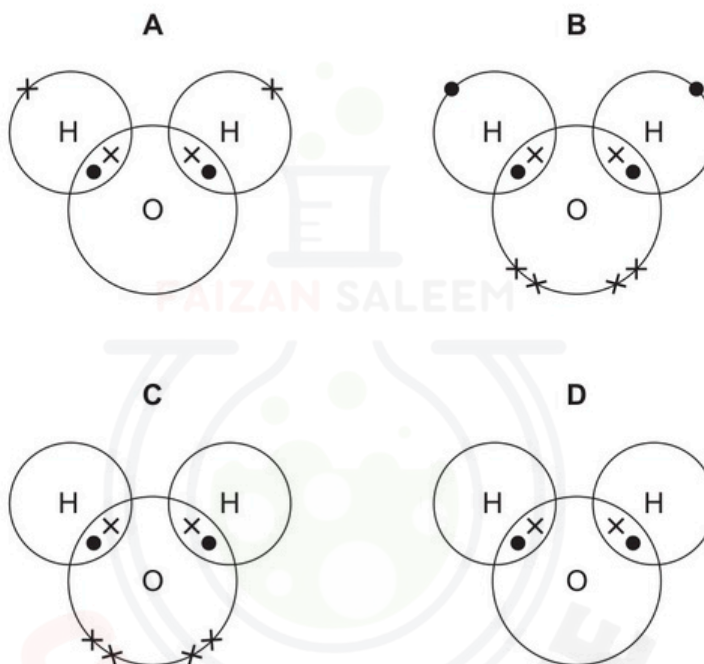


Q42

0620/22/M/J/24/Q4

Covalent Bonding

4 Which diagram shows the arrangement of the outer shell electrons in a molecule of water?

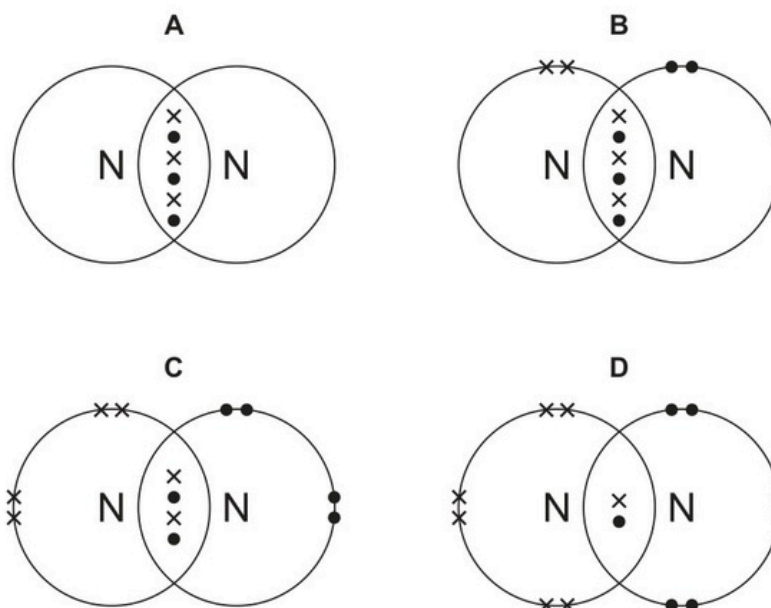


Q43

0620/21/M/J/25/Q6

Covalent Bonding

6 Which dot-and-cross diagram shows the outer shell electron arrangement in a molecule of nitrogen?



Q44

0620/21/O/N/21/Q7

Covalent Bonding

- 7 Which statement describes the attractive forces between molecules?
- A They are strong covalent bonds which hold molecules together.
- B They are strong ionic bonds which hold molecules together.
- C They are weak forces formed between covalently-bonded molecules.
- D They are weak forces which hold ions together in a lattice.

Q45

0620/22/O/N/21/Q7

Covalent Bonding

- 7 Which statement describes the attractive forces between molecules?
- A They are strong covalent bonds which hold molecules together.
- B They are strong ionic bonds which hold molecules together.
- C They are weak forces formed between covalently-bonded molecules.
- D They are weak forces which hold ions together in a lattice.

Q46

0620/23/O/N/21/Q8

Covalent Bonding

- 8 Which diagram shows the outer electron arrangement in a molecule of carbon dioxide?



Q47

0620/22/O/N/22/Q6

Covalent Bonding

6 Which molecule contains only three shared pairs of electrons?

A CH_3OH **B** Cl_2 **C** H_2O **D** N_2 **Q48**

0620/23/O/N/22/Q6

Covalent Bonding

6 What is the total number of shared electrons in a molecule of methanol, CH_3OH ?

A 4**B** 5**C** 8**D** 10**Q49**

0620/22/O/N/23/Q6

Covalent Bonding

6 Which substance has the lowest melting point?

A graphite**B** methanol**C** silicon(IV) oxide**D** sodium chloride

Q50

0620/21/O/N/24/Q5

Covalent Bonding

- 5 Which statement about nitrogen molecules and ethene molecules is correct?
- A A nitrogen molecule has 2 more shared electrons than an ethene molecule.
- B An ethene molecule has 3 more shared electrons than a nitrogen molecule.
- C A nitrogen molecule has 4 more shared electrons than an ethene molecule.
- D An ethene molecule has 6 more shared electrons than a nitrogen molecule.

Q51

0620/21/O/N/24/Q6

Covalent Bonding

- 6 Sulfur is a simple molecule with the formula S_8 .

Which row describes and explains the melting point of sulfur?

	melting point	explanation
A	high	the covalent bonds between sulfur atoms are strong
B	high	the covalent bonds between sulfur molecules are strong
C	low	the forces of attraction between sulfur atoms are weak
D	low	the forces of attraction between sulfur molecules are weak

Q52

0620/22/O/N/24/Q6

Covalent Bonding

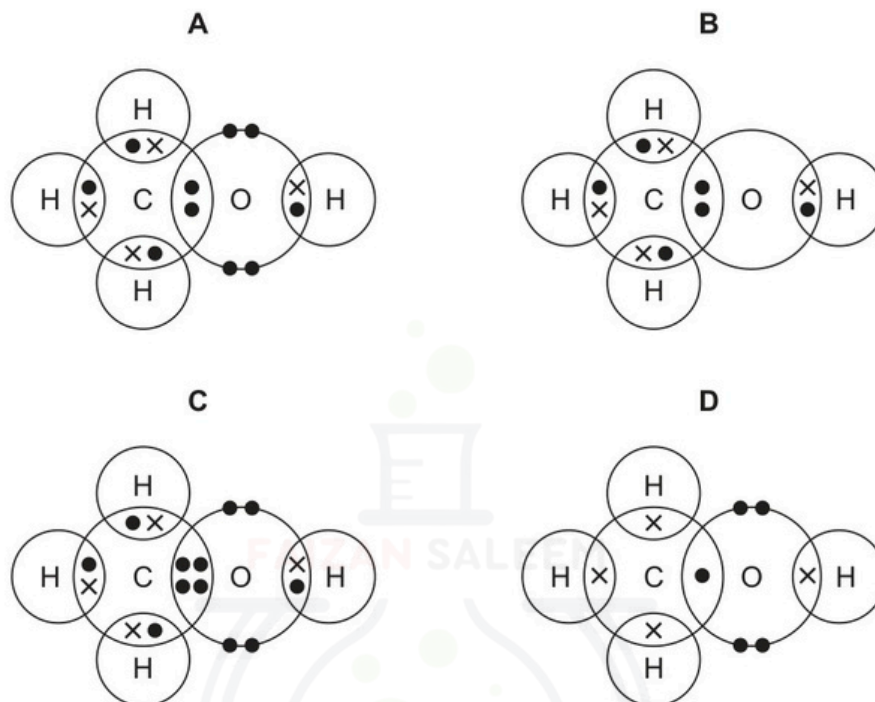
- 6 Which diagram shows the covalent bonding in a molecule of carbon dioxide?
- A $O-C-O$ B $O=C-O$ C $O=C=O$ D $O\equiv C\equiv O$

Q53

0620/23/O/N/25/Q7

Covalent Bonding

7 Which diagram shows the outer shell electron arrangement for a molecule of methanol, CH_3OH ?



SECTION C: METALLIC BONDING

Q54

0620/22/F/M/22/Q6

Metallic Bonding

6 Which row explains why copper is a good conductor of electricity at room temperature?

	copper ions move freely	electrons move freely
A	no	no
B	no	yes
C	yes	no
D	yes	yes

Q55

0620/22/F/M/24/Q8

Metallic Bonding

8 Which row contains a description of metallic bonding and a property that is explained by reference to metallic bonding?

	description of metallic bonding	property explained by reference to metallic bonding
A	a lattice of negative ions in a sea of delocalised electrons	a metal will react with an acid, producing hydrogen
B	a lattice of negative ions in a sea of delocalised electrons	a piece of a metal can be moulded into different shapes
C	a lattice of positive ions in a sea of delocalised electrons	a metal will react with an acid, producing hydrogen
D	a lattice of positive ions in a sea of delocalised electrons	a piece of a metal can be moulded into different shapes

Q56

0620/22/F/M/25/Q8

Metallic Bonding

8 Which row identifies the positive and the negative particles present in a giant metallic lattice?

	positive particles	negative particles
A	anions	cations
B	anions	delocalised electrons
C	cations	anions
D	cations	delocalised electrons

Q57

0620/21/M/J/21/Q7

Metallic Bonding

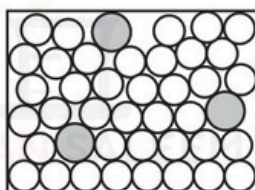
- 7 Which statement about metals is correct?
- A Metals conduct electricity when molten because negative ions are free to move.
- B Metals conduct electricity when solid because positive ions are free to move.
- C Metals are malleable because the bonds between the atoms are weak.
- D Metals are malleable because the layers of ions can slide over each other.

Q58

0620/21/M/J/23/Q24

Metallic Bonding

- 24 The diagram represents the structure of a solid.



Which solids does the diagram represent?

	brass	graphite	sodium chloride
A	✓	✓	x
B	✓	x	x
C	x	✓	✓
D	x	x	✓

Q59

0620/22/M/J/23/Q5

Metallic Bonding

- 5 Substance P conducts electricity when solid.
- Which particles move in solid P so that it can conduct electricity?

- 1 anions
- 2 cations
- 3 electrons

- A 1 and 2 B 1 only C 2 and 3 D 3 only

Q60

0620/23/M/J/23/Q8

Metallic Bonding

8 Which row describes the structure of a solid metal and explains the property?

	structure of solid metal	property of solid metal
A	lattice of negative ions in a sea of electrons	conducts electricity because the electrons are free to move
B	lattice of negative ions in a sea of electrons	is malleable because the layers of ions can slide over each other
C	lattice of positive ions in a sea of electrons	conducts electricity because the ions are free to move
D	lattice of positive ions in a sea of electrons	is malleable because the layers of ions can slide over each other

Q61

0620/22/O/N/21/Q25

Metallic Bonding

25 Which statement is correct for **all** metals?

- A They conduct electricity when molten.
- B They gain electrons when they form ions.
- C They have a low density.
- D They have a low melting point.

Q62

0620/22/O/N/22/Q7

Metallic Bonding

7 Which particles are present in the structure of metals?

- 1 positive ions
- 2 negative ions
- 3 shared pairs of electrons
- 4 mobile electrons

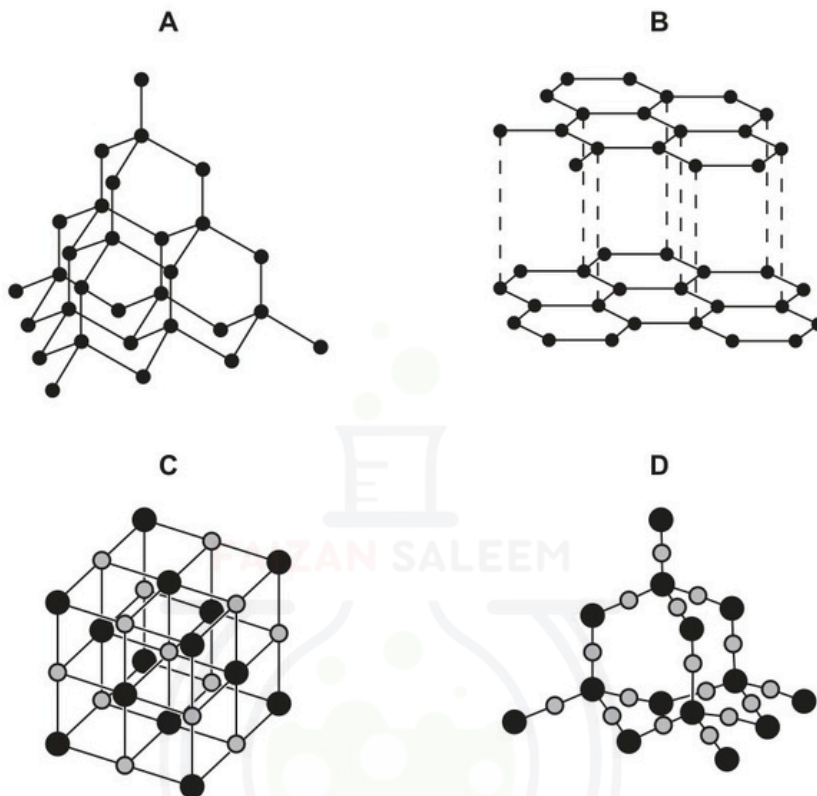
- A 1 and 2 B 1 and 4 C 2 and 3 D 2 and 4

SECTION D: GIANT COVALENT STRUCTURES

Q63 0620/22/F/M/21/Q5

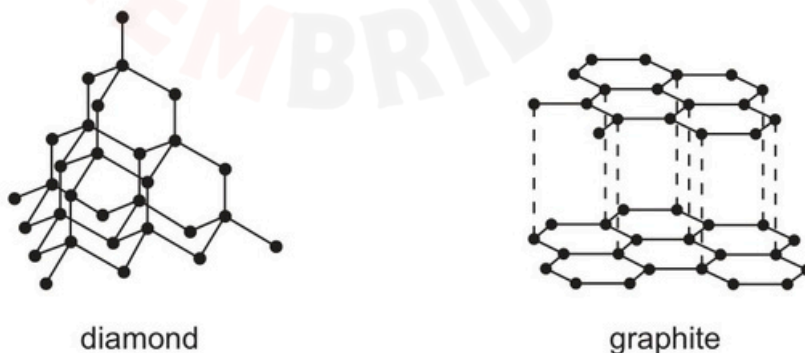
Giant Covalent Structures

5 Which diagram represents the structure of silicon(IV) oxide?

**Q64** 0620/22/F/M/22/Q7

Giant Covalent Structures

7 Which pair of statements about diamond and graphite is correct?



- A Diamond and graphite are both pure carbon. They are both macromolecules.
- B Diamond and graphite can both be used as electrodes. Graphite is also used as a lubricant.
- C Diamond has covalent bonds. Graphite has ionic bonds.
- D Diamond is hard with a high melting point. Graphite is soft with a low melting point.

Q65 0620/22/F/M/23/Q7

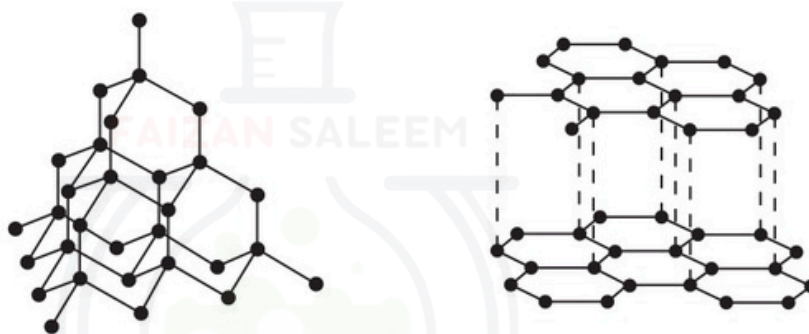
Giant Covalent Structures

- 7 Which statement about graphite explains why it is used as an electrode?
- A It contains ions.
 - B It has a giant covalent structure.
 - C It is a metal.
 - D It has mobile electrons.

Q66 0620/22/F/M/24/Q7

Giant Covalent Structures

- 7 The structures of diamond and graphite are shown.



Which statement about diamond and graphite is correct?

- A Diamond and graphite contain strong covalent bonds between carbon atoms.
- B Diamond and graphite have delocalised electrons.
- C Diamond and graphite have layered structures.
- D Diamond and graphite have low melting points.

Q67

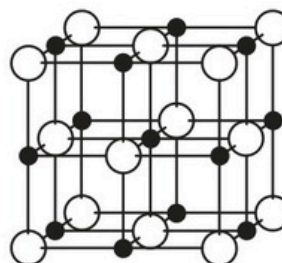
0620/21/M/J/21/Q6

Giant Covalent Structures

- 6 The arrangement of particles in each of two solids, S and T, are shown.



S



T

What are S and T?

	S	T
A	diamond	silicon(IV) oxide
B	diamond	sodium chloride
C	graphite	silicon(IV) oxide
D	graphite	sodium chloride

Q68

0620/23/M/J/21/Q8

Giant Covalent Structures

- 8 The element silicon has the same structure as diamond.

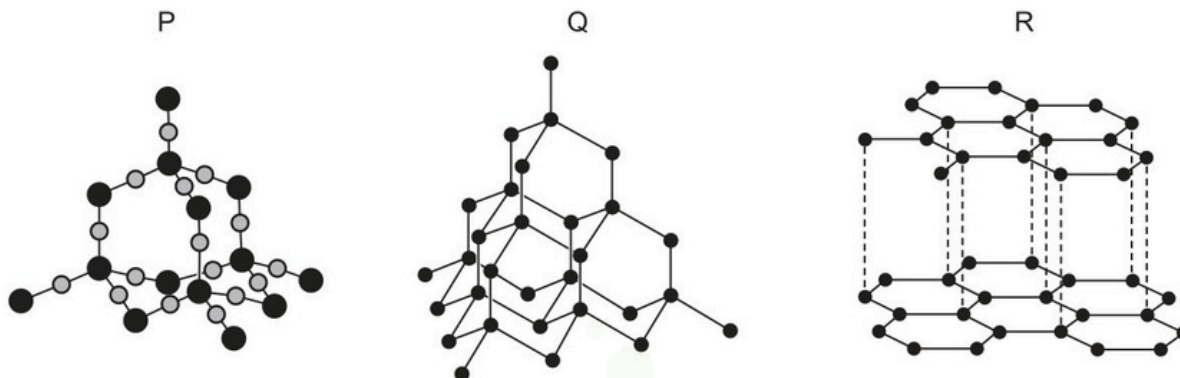
Which statement about silicon is correct?

- A Every silicon atom is bonded to three other atoms only.
- B Silicon has a high melting point.
- C Silicon is a good conductor of electricity.
- D Silicon is used as a lubricant.

Q69 0620/22/M/J/22/Q5

Giant Covalent Structures

5 The diagrams show the structures of three macromolecules P, Q and R.



What are P, Q and R?

	P	Q	R
A	diamond	silicon(IV) oxide	graphite
B	graphite	diamond	silicon(IV) oxide
C	silicon(IV) oxide	diamond	graphite
D	silicon(IV) oxide	graphite	diamond

Q70 0620/23/M/J/22/Q3

Giant Covalent Structures

- 3 Which statement describes the properties of both diamond and silicon(IV) oxide?
- A They are brittle, with a low melting point, and are insoluble in water.
 - B They are hard, with a high melting point, and are electrical insulators.
 - C They are malleable, with a high melting point, and are electrical conductors.
 - D They are soft, with a low melting point, and are electrical insulators.

Q71 0620/22/M/J/23/Q4

Giant Covalent Structures

- 4 Which structure does silicon(IV) oxide most closely resemble?
- A carbon dioxide
 - B diamond
 - C graphite
 - D sodium chloride

Q72 0620/23/M/J/23/Q7

Giant Covalent Structures

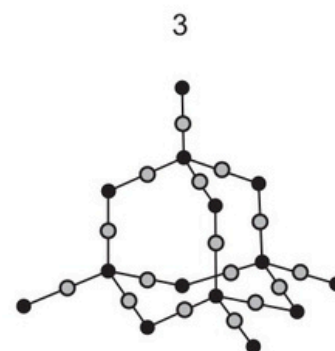
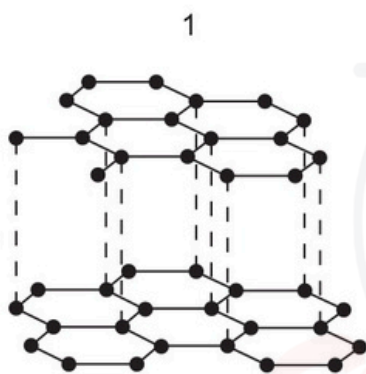
7 Which row describes the properties of silicon(IV) oxide?

	giant covalent structure	melting point
A	no	high
B	no	low
C	yes	high
D	yes	low

Q73 0620/22/M/J/24/Q5

Giant Covalent Structures

5 The structures of three substances are shown.



Which substances are hard and have a high melting point?

- A** 1, 2 and 3 **B** 1 only **C** 2 only **D** 2 and 3 only

Q74 0620/22/M/J/24/Q6

Giant Covalent Structures

6 Information about four substances, W, X, Y and Z, is shown.

	melting point / °C	electrical conductivity
W	1710	does not conduct when solid
X	3500	conducts when solid
Y	120	does not conduct
Z	801	conducts when molten

W, X, Y and Z are graphite, poly(ethene), sodium chloride and silicon(IV) oxide but not in that order.

What are W, X, Y and Z?

	W	X	Y	Z
A	graphite	poly(ethene)	silicon(IV) oxide	sodium chloride
B	sodium chloride	graphite	poly(ethene)	silicon(IV) oxide
C	poly(ethene)	sodium chloride	graphite	silicon(IV) oxide
D	silicon(IV) oxide	graphite	poly(ethene)	sodium chloride

Q75 0620/23/M/J/24/Q6

Giant Covalent Structures

6 Silicon(IV) oxide is a covalently bonded compound.

Which statements are correct?

- 1 Silicon atoms form four single bonds in silicon(IV) oxide.
- 2 Oxygen atoms form two double bonds in silicon(IV) oxide.
- 3 Silicon(IV) oxide has a high melting point.
- 4 Silicon(IV) oxide contains one silicon atom and four oxygen atoms.

A 1 and 2

B 1 and 3

C 2 and 3

D 3 and 4

Q76 0620/21/M/J/25/Q7

Giant Covalent Structures

7 Which statement about silicon(IV) oxide is correct?

- A It contains silicon ions and oxide ions arranged in a giant lattice.
- B It is used in electrical circuits because it can conduct electricity.
- C Its bonds each contain one shared pair of electrons.
- D Its atoms are arranged in the same way as the atoms in graphite.

SECTION D - GIANT COVALENT STRUCTURES

Q77 0620/22/M/J/25/Q6

Giant Covalent Structures

- 6 Which statement about silicon(IV) oxide, SiO_2 , is correct?
- A It conducts electricity because it contains delocalised electrons.
 - B It has a giant covalent structure with each silicon atom bonded to four oxygen atoms.
 - C It is a simple covalent molecule.
 - D Its structure is similar to that of graphite.

Q78 0620/21/O/N/21/Q8

Giant Covalent Structures

- 8 Which statement about carbon is correct?
- A Diamond and graphite both have simple molecular structures.
 - B Diamond and graphite are both used to make cutting tools.
 - C Each carbon atom in diamond is bonded to three other carbon atoms.
 - D Graphite conducts electricity and has a giant covalent structure.

Q79 0620/22/O/N/21/Q6

Giant Covalent Structures

- 6 Some properties of diamond are shown.
- 1 It is very hard.
 - 2 Every atom forms four bonds.
 - 3 It does not conduct electricity.

Which properties are also shown by silicon(IV) oxide?

- A 1 only B 1 and 2 C 1 and 3 D 2 and 3

SECTION D - GIANT COVALENT STRUCTURES

Q80 0620/22/O/N/21/Q8

Giant Covalent Structures

8 Which substance is described as a macromolecule?

- A ammonia
- B graphite
- C iron
- D sodium chloride

Q81 0620/21/O/N/22/Q7

Giant Covalent Structures

7 Which substance has a similar structure to silicon(IV) oxide?

- A carbon dioxide
- B diamond
- C graphite
- D sodium oxide

Q82 0620/23/O/N/22/Q7

Giant Covalent Structures

7 Which row about the structures and uses of diamond and graphite is correct?

	structure	use
A	diamond has a giant covalent structure	diamond is used to make electrodes
B	diamond has a simple covalent structure	diamond is used to make cutting tools
C	graphite has a giant covalent structure	graphite is used as a lubricant
D	graphite has a simple covalent structure	graphite is used to make cutting tools

Q83 0620/21/O/N/23/Q9

Giant Covalent Structures

9 Graphite has a giant covalent structure.

Which statements about graphite are correct?

- 1 Carbon atoms form four covalent bonds with neighbouring atoms.
- 2 There are delocalised electrons between layers of carbon atoms.
- 3 Graphite is a useful lubricant.
- 4 Graphite is a good conductor of electricity.

A 1 and 2 **B** 1, 3 and 4 **C** 2, 3 and 4 **D** 3 and 4 only

Q84 0620/23/O/N/23/Q6

Giant Covalent Structures

6 Which row about the properties of both diamond and silicon(IV) oxide is correct?

	conductor of electricity	type of molecule
A	yes	giant covalent
B	yes	simple covalent
C	no	giant covalent
D	no	simple covalent

Q85 0620/21/O/N/24/Q7

Giant Covalent Structures

7 Which row identifies a property and an explanation of the property for both diamond and silicon(IV) oxide?

	property	explanation of property
A	very hard	diamond has a giant covalent structure and silicon(IV) oxide has a giant ionic structure
B	high melting point	both have giant covalent structures with many strong bonds between the atoms
C	good lubricant	both have layers of atoms, which can slide over each other
D	poor conductor	both contain only non-metal elements and are simple molecules

Q86 0620/22/O/N/24/Q8

Giant Covalent Structures

- 8 Diamond and graphite have giant covalent structures of carbon atoms.

Which statement describes graphite?

- A It has a strong, rigid three-dimensional structure.
- B It has four strong covalent bonds between each carbon atom.
- C It has layers, which can slide over each other.
- D It has no delocalised electrons so does **not** conduct electricity.

Q87 0620/21/O/N/25/Q4

Giant Covalent Structures

- 4 Substances with giant covalent structures can be used as lubricants and as cutting tools for hard materials.

The diagrams show how the atoms are arranged in two giant covalent substances, P and Q.



Which statement is correct?

- A Only P is used as a cutting tool and only Q is used as a lubricant.
- B Only P is used as a lubricant and only Q is used as a cutting tool.
- C P and Q are both used as cutting tools.
- D P and Q are both used as lubricants.

Q88 0620/22/O/N/25/Q8

Giant Covalent Structures

- 8 Graphite and diamond are both forms of the element carbon.

Which row shows the number of other carbon atoms that each carbon atom is covalently bonded to in graphite and in diamond?

	graphite	diamond
A	3	3
B	3	4
C	4	3
D	4	4

Q89 0620/23/O/N/25/Q8

Giant Covalent Structures

- 8 Rescuers are drilling through fallen rock in order to rescue some people trapped in a cave. The drill needs lubricating from time to time.

Four statements are made about the materials used for the drill tip and the lubricant to explain the reasons for their use.

- 1 Diamond is used for the drill tip as it does **not** conduct electricity.
- 2 Diamond is used for the drill tip as it is very hard.
- 3 Graphite is used as the lubricant as it conducts electricity.
- 4 Graphite is used as the lubricant as it is soft and slippery.

Which statements are correct?

- A** 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

MARKING SCHEME - SECTION A: IONIC BONDING

Q	Answer	Paper reference
Q1	A	0620/22/F/M/21/Q6
Q2	D	0620/22/F/M/21/Q8
Q3	D	0620/22/F/M/22/Q4
Q4	C	0620/22/F/M/22/Q10
Q5	A	0620/22/F/M/23/Q4
Q6	C	0620/22/F/M/23/Q5
Q7	B	0620/22/F/M/23/Q6
Q8	D	0620/22/F/M/24/Q5
Q9	A	0620/22/F/M/25/Q6
Q10	D	0620/22/M/J/21/Q7
Q11	B	0620/23/M/J/21/Q9
Q12	A	0620/21/M/J/22/Q5
Q13	D	0620/23/M/J/23/Q5
Q14	C	0620/21/M/J/25/Q5
Q15	C	0620/23/M/J/25/Q5
Q16	A	0620/23/M/J/25/Q6

Q	Answer	Paper reference
Q17	C	0620/23/O/N/21/Q6
Q18	A	0620/23/O/N/21/Q9
Q19	A	0620/21/O/N/22/Q6
Q20	D	0620/22/O/N/22/Q5
Q21	C	0620/21/O/N/23/Q5
Q22	B	0620/21/O/N/23/Q7
Q23	B	0620/22/O/N/23/Q5
Q24	D	0620/23/O/N/23/Q5
Q25	A	0620/21/O/N/24/Q4
Q26	C	0620/22/O/N/24/Q4
Q27	D	0620/22/O/N/24/Q7
Q28	D	0620/23/O/N/24/Q4
Q29	B	0620/23/O/N/24/Q7
Q30	A	0620/21/O/N/25/Q6
Q31	A	0620/22/O/N/25/Q7

MARKING SCHEME - SECTION B: COVALENT BONDING

Q	Answer	Paper reference
Q32	D	0620/22/F/M/21/Q7
Q33	A	0620/22/F/M/24/Q6
Q34	C	0620/22/F/M/25/Q7
Q35	A	0620/21/M/J/21/Q5
Q36	D	0620/21/M/J/21/Q24
Q37	A	0620/22/M/J/21/Q5
Q38	A	0620/23/M/J/21/Q5
Q39	D	0620/21/M/J/22/Q6
Q40	A	0620/22/M/J/22/Q6
Q41	B	0620/23/M/J/23/Q6
Q42	C	0620/22/M/J/24/Q4

Q	Answer	Paper reference
Q43	B	0620/21/M/J/25/Q6
Q44	C	0620/21/O/N/21/Q7
Q45	C	0620/22/O/N/21/Q7
Q46	A	0620/23/O/N/21/Q8
Q47	D	0620/22/O/N/22/Q6
Q48	D	0620/23/O/N/22/Q6
Q49	B	0620/22/O/N/23/Q6
Q50	D	0620/21/O/N/24/Q5
Q51	D	0620/21/O/N/24/Q6
Q52	C	0620/22/O/N/24/Q6
Q53	A	0620/23/O/N/25/Q7

MARKING SCHEME - SECTION C: METALLIC BONDING

Q	Answer	Paper reference
Q54	B	0620/22/F/M/22/Q6
Q55	D	0620/22/F/M/24/Q8
Q56	D	0620/22/F/M/25/Q8
Q57	D	0620/21/M/J/21/Q7
Q58	B	0620/21/M/J/23/Q24

Q	Answer	Paper reference
Q59	D	0620/22/M/J/23/Q5
Q60	D	0620/23/M/J/23/Q8
Q61	A	0620/22/O/N/21/Q25
Q62	B	0620/22/O/N/22/Q7

MARKING SCHEME - SECTION D: GIANT COVALENT STRUCTURES

Q	Answer	Paper reference
Q63	D	0620/22/F/M/21/Q5
Q64	A	0620/22/F/M/22/Q7
Q65	D	0620/22/F/M/23/Q7
Q66	A	0620/22/F/M/24/Q7
Q67	B	0620/21/M/J/21/Q6
Q68	B	0620/23/M/J/21/Q8
Q69	C	0620/22/M/J/22/Q5
Q70	B	0620/23/M/J/22/Q3
Q71	B	0620/22/M/J/23/Q4
Q72	C	0620/23/M/J/23/Q7
Q73	D	0620/22/M/J/24/Q5
Q74	D	0620/22/M/J/24/Q6
Q75	B	0620/23/M/J/24/Q6
Q76	C	0620/21/M/J/25/Q7

Q	Answer	Paper reference
Q77	B	0620/22/M/J/25/Q6
Q78	D	0620/21/O/N/21/Q8
Q79	C	0620/22/O/N/21/Q6
Q80	B	0620/22/O/N/21/Q8
Q81	B	0620/21/O/N/22/Q7
Q82	C	0620/23/O/N/22/Q7
Q83	C	0620/21/O/N/23/Q9
Q84	C	0620/23/O/N/23/Q6
Q85	B	0620/21/O/N/24/Q7
Q86	C	0620/22/O/N/24/Q8
Q87	B	0620/21/O/N/25/Q4
Q88	B	0620/22/O/N/25/Q8
Q89	D	0620/23/O/N/25/Q8