AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.2.1.4

Covalent bonding

Past-paper questions

Tier	**Foundation**
Question groups	**32**
Available paper years	**2008–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

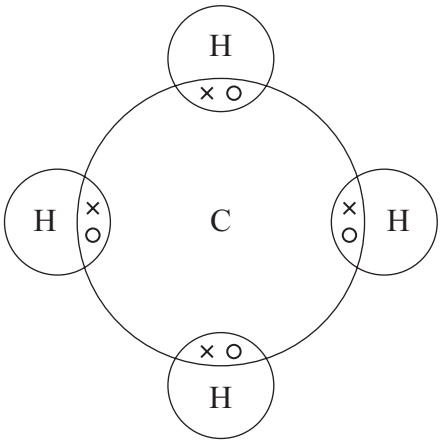
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.2.1.4 Covalent bonding

Question 01

January 2008 | CHY2F | Original Q1 | Legacy

1 The diagram represents a particle of methane.



(a) What is the formula of methane? .....

(1 mark)

(b) Choose a word from the box to answer the question.

atom	ion	molecule

Which of the words best describes the methane particle shown in the diagram?

.....

(1 mark)

(c) Choose a word from the box to answer the question.

covalent	ionic	metallic

What is the type of bonding shown in the diagram?

.....

(1 mark)

3

4.2.1.4 Covalent bonding

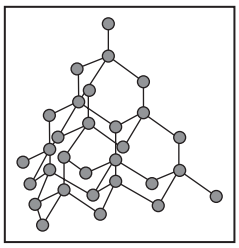
Question 02

January 2008 | CHY2F | Original Q2 | Legacy

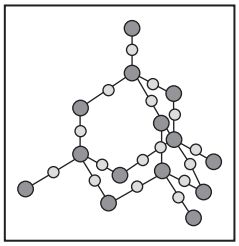
2 This question is about giant structures. Diamond, graphite and silicon dioxide all have giant structures.

(a) The diagrams show the structures of these three substances.

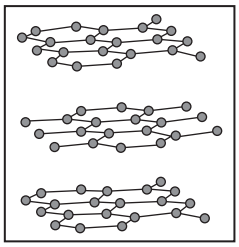
Draw a line from each structure to its name.



Silicon dioxide



Graphite



Diamond

(2 marks)

4.2.1.4 Covalent bonding

Question 02 · continued

BLANK

(b) Complete the sentences using words from the box.

covalent	**four**	**hard**	**ionic**
shiny	**soft**	**three**	**two**

(i) Diamond, graphite and silicon dioxide have high melting points because all the atoms in their structures are joined by strong ..... bonds.
(1 mark)

(ii) In diamond each atom is joined to ..... other atoms.
(1 mark)

(iii) Diamond can be used to make cutting tools because it has a rigid structure which makes it very ..... .
(1 mark)

(iv) In graphite each atom is joined to ..... other atoms.
(1 mark)

(v) Graphite can be used to make pencils because it has a structure which makes it ..... .
(1 mark)

(c) When a diamond is heated to a high temperature and then placed in pure oxygen it burns. Carbon dioxide is the only product.

Name the element in diamond. .....
(1 mark)

8

4.2.1.4 Covalent bonding

Question 03

January 2008 | CHY2F | Original Q4 | Legacy

4 The electrolysis of sodium chloride solution produces useful substances.

(a) (i) Choose a word from the box to complete the sentence.

covalent	**ionic**	**non-metallic**

Electrolysis takes place when electricity passes through ..... compounds when they are molten or in solution.

(1 mark)

(ii) Choose a word from the box to complete the sentence.

alkenes	**elements**	**salts**

During electrolysis the compound is broken down to form ..... .

(1 mark)

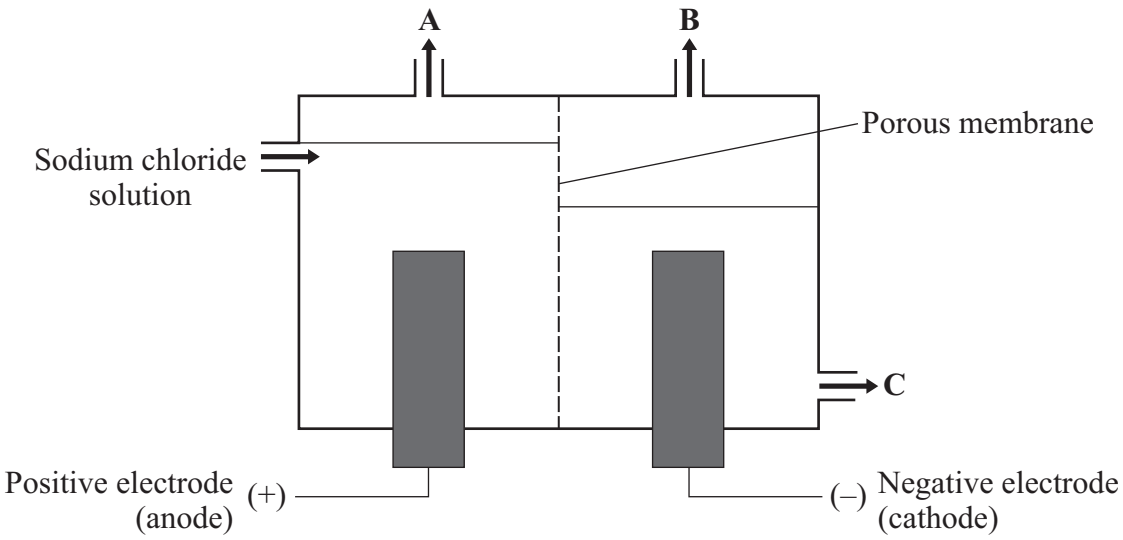
4.2.1.4 Covalent bonding

Question 03 · continued

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(b) The table of ions on the Data Sheet may help you to answer this question.

The diagram shows an apparatus used for the electrolysis of sodium chloride solution.



Identify the products **A**, **B** and **C** on the diagram using substances from the box.

chlorine gas	**hydrogen gas**	**oxygen gas**
sodium hydroxide solution		**sodium metal**

(i) **A** is ..... .
(1 mark)

(ii) **B** is ..... .
(1 mark)

(iii) **C** is ..... .
(1 mark)

5

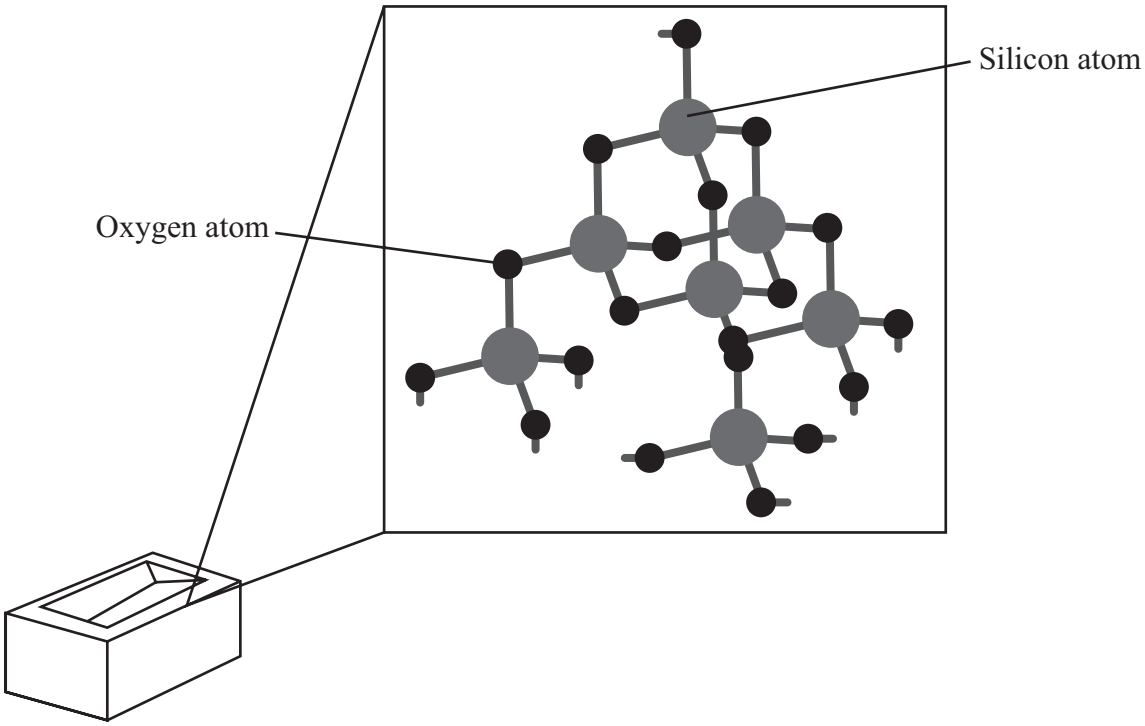
4.2.1.4 Covalent bonding

Question 04

June 2008 | CHY2F | Original Q3 | Legacy

3 Bricks made from silica (silicon dioxide) are used to line furnaces that operate at high temperatures.

Part of the structure of silica is shown in the diagram.



Use words from the box to complete the sentences.

covalent	**giant**	**low**	**small**
four	**high**	**six**	**weak**

One reason for using silica to make bricks for high-temperature furnaces is that silica has a ..... melting point.

Silica has this property because it is a ..... structure in which each silicon atom is joined to ..... oxygen atoms by ..... bonds.

(4 marks)

4

4.2.1.4 Covalent bonding

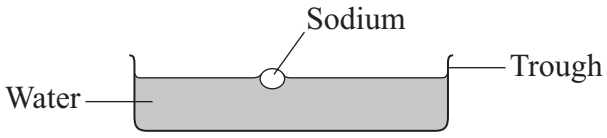
Question 05

June 2008 | CHY3F | Original Q2 | Legacy

2 (a) Read a student's report about the reaction between sodium and water.

The reaction between sodium and water

A small piece of sodium was added to some water in a trough.



The sodium floated and started to react.

The sodium moved along the surface of the water and melted to give a ball of molten metal.

The ball became smaller and smaller until it had all gone.

A gas was given off and a colourless solution was left.

The word equation for this reaction is:

sodium + water → sodium hydroxide + hydrogen

Use the information from the student's report to answer these questions.

2 (a) (i) Which information shows that sodium has a low density?

.....

(1 mark)

2 (a) (ii) Which information shows that the reaction is exothermic?

.....

(1 mark)

2 (a) (iii) Name the gas given off.

.....

(1 mark)

2 (b) The periodic table on the Data Sheet may help you to answer these questions.

2 (b) (i) Sodium is in Group 1.

Name a Group 1 element that is more reactive than sodium.

.....

(1 mark)

4.2.1.4 Covalent bonding

Question 05 · continued

for mark

2 (b) (ii) Here are some statements about Group 1 elements.
Only **two** of these statements are correct.
Put a tick (✓) next to the **two** correct statements.

Statement	(✓)
They are halogens	
They are metals	
They form covalent compounds	
They form ions with a +1 charge	

(2 marks)

2 (c) Dimitri Mendeleev put forward his periodic table in 1869.

Complete these sentences by drawing a ring around the correct answer.

2 (c) (i) Mendeleev arranged the elements in order of their [atomic weight / density / reactivity] .

(1 mark)

2 (c) (ii) The table is called a periodic table because elements with [identical / the same / similar] properties occur at regular intervals.

(1 mark)

2 (c) (iii) The vertical columns are known as [groups / periods / rows] .

(1 mark)

2 (d) How did Mendeleev overcome the problem of undiscovered elements when he designed his table?

.....

(1 mark)

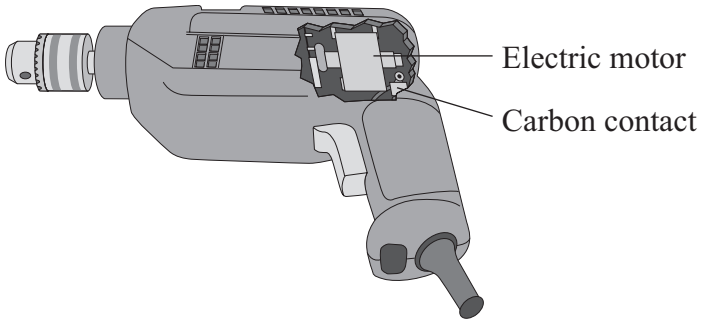
10

4.2.1.4 Covalent bonding

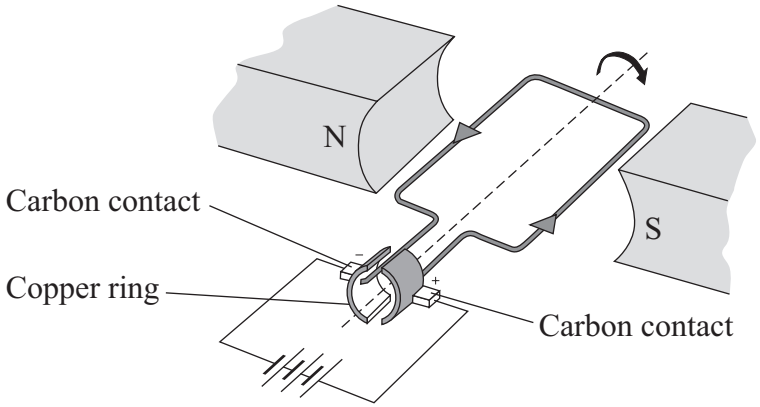
Question 06

June 2009 | CHY2F | Original Q5 | Legacy

5 This drill contains an electric motor.



The diagram below shows the main parts of an electric motor.



The carbon contacts are made of graphite. Springs push the contacts against the copper ring. The carbon contacts conduct electricity to the copper ring. The copper ring rotates rapidly but does not stick or become worn because the graphite is soft and slippery.

5 (a) Using this information give **two** properties that make graphite suitable for making the carbon contacts.

1 .....

.....

2 .....

.....

(2 marks)

4.2.1.4 Covalent bonding

Question 06 · continued

for mark

5 (b) (i) Draw a ring around the correct word in each box to complete the sentence.

Each carbon atom in graphite is joined to

two three four	other carbon atoms by	covalent ionic metallic	bonds.

(2 marks)

5 (b) (ii) Tick (✓) the statement which explains why graphite is soft and slippery.

Statement	Tick (✓)
It is made of layers of atoms.	
It is made of small molecules.	
It is an ionic compound.	

(1 mark)

5

4.2.1.4 Covalent bonding

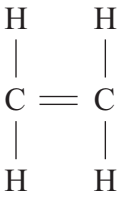
Question 07

November 2009 | CHY1BP | Original Q9 | Legacy

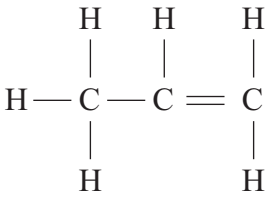
QUESTION NINE

The diagram shows three compounds.

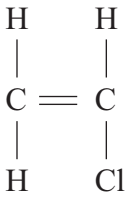
Compound W



Compound X



Compound Y



9A Which of the compounds are hydrocarbons?

1 **W** and **X**

2 **W** and **Y**

3 **X** and **Y**

4 **W**, **X** and **Y**

9B Which row in the table correctly describes the bonding in Compound **X**?

	Number of bonds to each carbon atom	Number of bonds to each hydrogen atom
1	1	1
2	1	4
3	4	1
4	4	4

9C All three compounds can form polymers because . . .

1 they have saturated molecules.

2 their molecules contain two or more carbon atoms.

3 their molecules have a double carbon carbon bond.

4 they have small molecules.

4.2.1.4 Covalent bonding

9D Disposal of polymer waste can be a problem.

The main reason that it causes problems in a landfill site is that . . .

1 it is very light.

2 it is not easily broken down by microorganisms.

3 it is difficult to bury.

4 it burns easily, releasing toxic gases.

END OF TEST

4.2.1.4 Covalent bonding

Question 08

January 2019 | CHY1F | Original Q4 | Legacy

4 Natural gas is mainly a hydrocarbon called methane.

4 (a) Use **one** word from the box to complete the sentence.

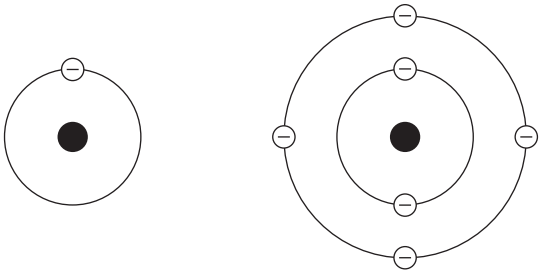
compounds	**elements**	**molecules**

Hydrocarbons contain hydrogen and carbon only.

Hydrogen and carbon are ..... .

(1 mark)

4 (b) The diagrams represent atoms of hydrogen and carbon.



Hydrogen Carbon

Draw a ring around the correct answer to complete the sentences.

4 (b) (i) The centre of each atom is called the

bond.
nucleus.
symbol.

(1 mark)

4 (b) (ii) The hydrogen atom has one electron and the carbon atom has

three
four
six

electrons.

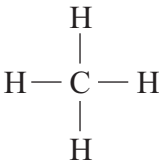
(1 mark)

4.2.1.4 Covalent bonding

Question 08 · continued

for mark

4 (c) A molecule of methane can be represented as



Draw a ring around the correct answer to complete the sentences.

4 (c) (i) The formula of methane is

CH

CH_4

C_4H_4

(1 mark)

4 (c) (ii) The line between C—H is called a

bond.

molecule.

nucleus.

(1 mark)

4 (d) Methane burns to produce carbon dioxide (CO_2) and water (H_2O).

4 (d) (i) Draw a ring around the correct answer to complete the sentence.

When methane burns it reacts with

carbon.

nitrogen.

oxygen.

(1 mark)

4 (d) (ii) Hydrogen (H_2) can be used as a fuel.

Suggest why burning hydrogen would be less harmful to the environment than burning methane.

.....

.....

(1 mark)

7

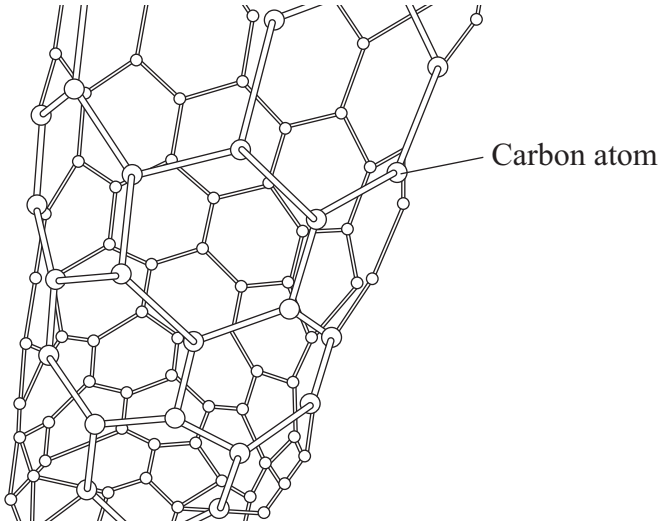
4.2.1.4 Covalent bonding

Question 09

4 Lightweight handlebars for bicycles are made from materials containing carbon nanotubes.

Carbon nanotubes are lightweight but very strong.

The diagram shows the structure of a carbon nanotube.



4 (a) What does the term 'nano' tell you about the diameter of carbon nanotubes?

Tick (✓) the correct answer in the table.

Answer	Tick (✓)
The diameter of the tube is very small.	
The diameter of the tube is large.	
The diameter of the tube is very large	

(1 mark)

4.2.1.4 Covalent bonding

Question 09 · continued

for mark

4 (b) Look at the diagram and then draw a ring around the correct word to complete each sentence.

4 (b) (i) Carbon nanotubes are similar to graphite because each carbon atom is joined to

two
three
four

other carbon atoms.

(1 mark)

4 (b) (ii) The carbon atoms are joined by

covalent
ionic
metallic

bonds.

(1 mark)

4 (b) (iii) Carbon nanotubes are very strong because the

atoms
bonds
electrons

are hard to break.

(1 mark)

4

4.2.1.4 Covalent bonding

Question 10

January 2010 | CHY2F | Original Q6 | Legacy

6 Hydrogen fluoride is used to make hydrofluoric acid.

6 (a) A company makes hydrogen fluoride by reacting solid calcium fluoride with sulfuric acid. The reaction takes place in a rotating kiln.

calcium fluoride + sulfuric acid → calcium sulfate + hydrogen fluoride

The company want this reaction to take place quickly.

6 (a) (i) Rotating the kiln makes the reaction take place faster.

Suggest why.

.....

.....

(1 mark)

6 (a) (ii) Draw a ring around the correct word in each box.

To make the reaction take place **faster**:

the temperature should be [higher / lower] so that the particles have [less / more] energy

the solid calcium fluoride should be [powder / lumps] to give a [small / big] surface area

the sulfuric acid solution should be [dilute / concentrated] to give [less / more] collisions between the particles each second.

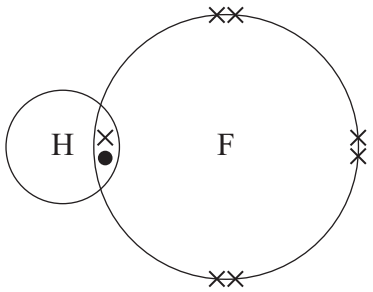
(3 marks)

4.2.1.4 Covalent bonding

Question 10 · continued

for mark

6 (b) The diagram represents a molecule of hydrogen fluoride.



The hydrogen and fluorine atoms are joined by a covalent bond.

Use the correct word from the box to complete the sentence.

electrons	**neutrons**	**protons**

In a covalent bond the atoms share ..... .

(1 mark)

6 (c) Hydrogen fluoride is dissolved in water to make an acidic solution of hydrofluoric acid.

Draw a ring around the symbol of the ion that makes the solution acidic.

$\mathbf{H^+}$ $\mathbf{OH^-}$ $\mathbf{F^-}$

(1 mark)

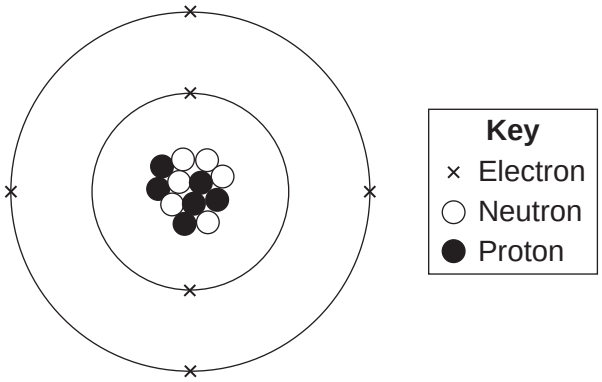
6

4.2.1.4 Covalent bonding

Question 11

June 2010 | CHY2F | Original Q2 | Legacy

2 The diagram represents a carbon atom.



2 (a) Use words from the box to answer the questions.

electron	**neutron**	**nucleus**	**proton**

2 (a) (i) What is the name of the central part of the atom?

.....

(1 mark)

2 (a) (ii) What is the name of the particle with no charge?

.....

(1 mark)

2 (a) (iii) What is the name of the particle with a negative charge?

.....

(1 mark)

2 (b) Use the diagram above to help you to answer these questions.

2 (b) (i) Draw a ring around the atomic (proton) number of this carbon atom.

6 **12** **18**

(1 mark)

2 (b) (ii) Draw a ring around the mass number of this carbon atom.

6 **12** **18**

(1 mark)

4.2.1.4 Covalent bonding

Question 11 · continued

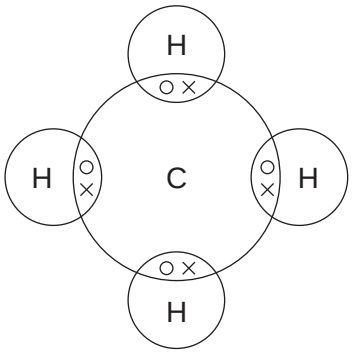
2 (c) A different carbon atom has 6 protons and 8 neutrons.

Draw a ring around the symbol that represents this atom.

$^{8}_{6}C$ $^{14}_{6}C$ $^{14}_{8}C$

(1 mark)

2 (d) The diagram shows the bonding in a methane molecule.



2 (d) (i) Draw a ring around the chemical formula of a methane molecule.

CH_4 **CH^4** **C_4H**

(1 mark)

2 (d) (ii) Draw a ring around the word that describes methane.

compound **element** **mixture**

(1 mark)

2 (d) (iii) Draw a ring around the type of bonding in a methane molecule.

covalent **ionic** **metallic**

(1 mark)

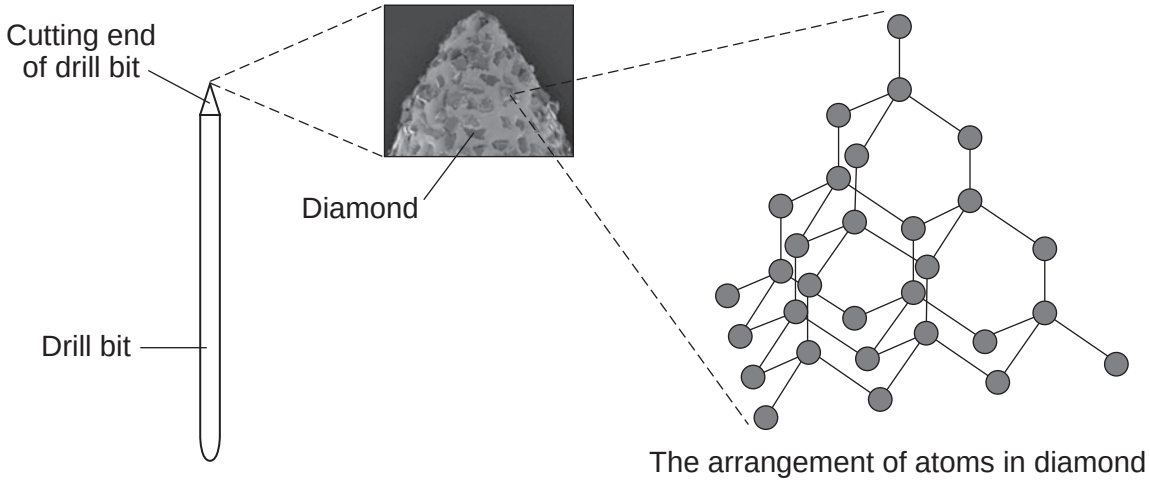
9

4.2.1.4 Covalent bonding

Question 12

June 2010 | CHY2F | Original Q4 | Legacy

4 A drill bit is used to cut holes through materials. The cutting end of this drill bit is covered with very small diamonds.



The arrangement of atoms in diamond

Draw a ring around the correct word in each box.

4 (a) Diamond is made from [carbon / nitrogen / oxygen] atoms.

(1 mark)

4 (b) Diamond has a giant structure in which [none / some / all] of the atoms are joined together.

(1 mark)

4 (c) The atoms in diamond are joined together by [covalent / ionic / metallic] bonds.

(1 mark)

4.2.1.4 Covalent bonding

Question 12 · continued

4 (d) In diamond each atom is joined to [two / three / four] other atoms.

(1 mark)

4 (e) Diamond is suitable for the cutting end of a drill bit because it is [hard. / shiny. / soft.]

(1 mark)

5

Turn over for the next question

4.2.1.4 Covalent bonding

Question 13

January 2011 | CHY2F | Original Q2 | Legacy

2 The picture shows a wooden bowl.
The pieces of wood used for this bowl were dyed different colours.



The artist who made the bowl explained why he dissolved the coloured dyes in methanol.

> I use different coloured dyes dissolved in methanol.
> I use methanol because with dyes dissolved in water the wood needs to be soaked for a longer time.
> The bowl dries more quickly if I use methanol instead of water.

2 (a) The artist uses methanol instead of water.

Give **two** reasons why.

1 .....

.....

2 .....

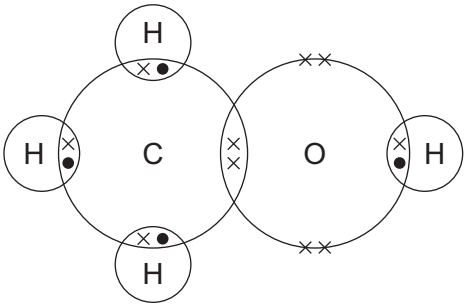
.....

(2 marks)

4.2.1.4 Covalent bonding

Question 13 · continued

2 (b) The diagram shows how the atoms are bonded in methanol.



Draw a ring around:

2 (b) (i) the formula of methanol

CH_4O **CH^4O** **CHO_4**

(1 mark)

2 (b) (ii) the type of bonding in methanol.

covalent **ionic** **metallic**

(1 mark)

2 (c) Methanol has a low boiling point.

Tick (✓) the reason why.

Reason why	Tick (✓)
It has a giant covalent structure.	
It is made of small molecules.	
It has a giant metallic structure.	

(1 mark)

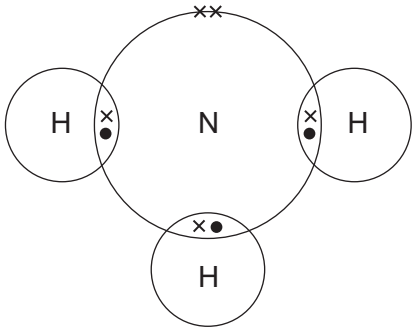
5

4.2.1.4 Covalent bonding

Question 14

June 2011 | CHY2F | Original Q1 | Legacy

1 The diagram shows how the atoms are bonded in ammonia.



1 (a) Draw a ring around the correct answer.

1 (a) (i) The formula of an ammonia molecule is

NH^3 **N_3H** **NH_3**

(1 mark)

1 (a) (ii) The particles represented by the dots (•) and crosses (×) in the diagram are

electrons **neutrons** **protons**

(1 mark)

1 (a) (iii) The bonds between the nitrogen and hydrogen atoms in ammonia are

covalent **ionic** **metallic**

(1 mark)

4.2.1.4 Covalent bonding

Question 14 · continued

1 (b) Ammonia is made by reacting nitrogen with hydrogen in the Haber process.
The equation for this reaction is shown below.

nitrogen + hydrogen $\rightleftharpoons$ ammonia

1 (b) (i) Use words from the box to complete the sentences.

air	limestone	iron ore	natural gas

Nitrogen is obtained from ..... .

Hydrogen is obtained from ..... .

(2 marks)

1 (b) (ii) Draw a ring around the correct answer to complete the sentence.

The symbol $\rightleftharpoons$ means that the reaction is

exothermic.
endothermic.
reversible.

(1 mark)

1 (b) (iii) A catalyst is used in the Haber process.

Draw a ring around the name of this catalyst.

iron **magnesium** **sodium**

(1 mark)

1 (c) Ammonium nitrate is a fertiliser that can be made by reacting ammonia with an acid.

Draw a ring around the name of the acid used in this reaction.

hydrochloric acid **nitric acid** **sulfuric acid**

(1 mark)

Question 1 continues on the next page

4.2.1.4 Covalent bonding

Question 14 · continued

1 (d) Humberstone was a town in the desert of Northern Chile in South America. It was built for the people who worked in the nearby sodium nitrate mines.

The sodium nitrate was used as a fertiliser.

The sodium nitrate was exported by ship to countries all around the world.

Today the mines have closed and nobody lives in Humberstone.



One of the reasons for the mines closing was the invention of the Haber process.

Haber process factories can be built anywhere in the world.

1 (d) (i) How did the invention of the Haber process affect the people of Humberstone?

.....

.....

(1 mark)

1 (d) (ii) Suggest **two** advantages of making ammonium nitrate in the UK rather than importing sodium nitrate from Chile.

1 .....

.....

2 .....

.....

(2 marks)

11

4.2.1.4 Covalent bonding

Question 15

June 2012 | CH2FP | Original Q1 | Legacy

1 (a) The symbol equation for the decomposition of hydrogen peroxide is:

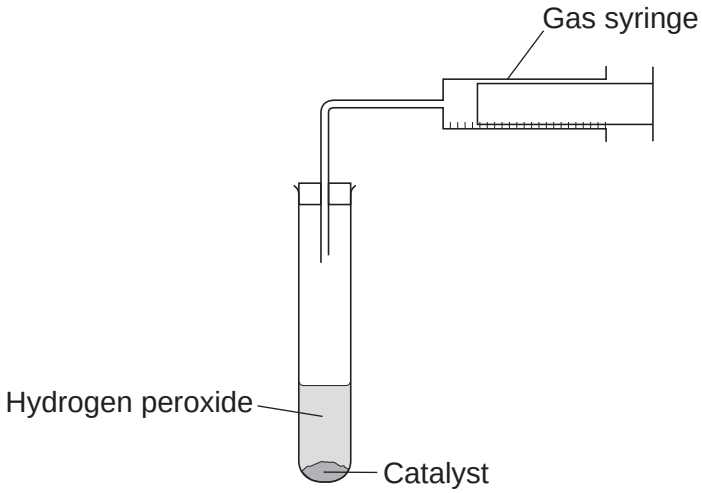
$$2H_2O_2 \rightarrow 2H_2O + O_2$$

Complete the word equation for the decomposition of hydrogen peroxide.

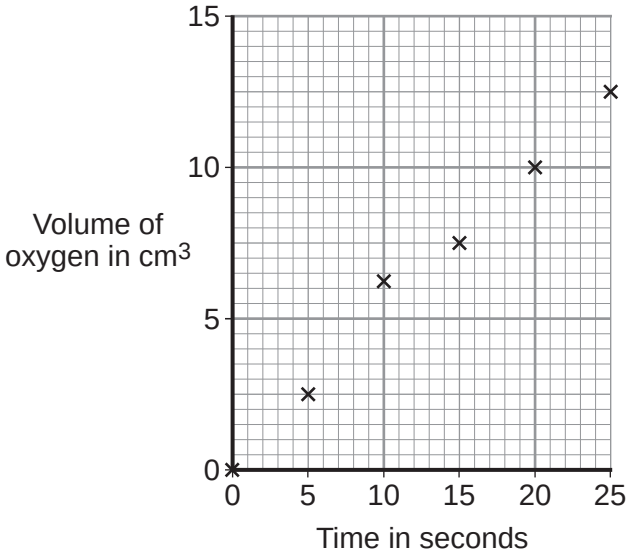
Hydrogen peroxide → ..... + ...

(1 mark)

1 (b) A student did an experiment to see how quickly hydrogen peroxide decomposes.
The student used the apparatus shown below to measure the volume of oxygen.



1 (b) (i) Draw a straight line of best fit to complete the graph.



(1 mark)

4.2.1.4 Covalent bonding

Question 15 · continued

1 (b) (ii) Draw a circle around the anomalous point on the graph.

(1 mark)

1 (b) (iii) What is the volume of oxygen given off after 15 seconds? ..... cm^3

(1 mark)

1 (b) (iv) How did the volume of oxygen change between 0 and 25 seconds?

.....

(1 mark)

1 (c) The student wanted to make the reaction faster.

Draw a ring around the correct answer to complete each sentence.

1 (c) (i) To make the reaction faster, the temperature should be

higher.

lower.

the same.

(1 mark)

1 (c) (ii) To make the reaction faster, the hydrogen peroxide should be

more dilute.

more concentrated.

the same.

(1 mark)

Question 1 continues on the next page

4.2.1.4 Covalent bonding

Question 15 · continued

1 (d) The diagram represents the bonding in oxygen.

O=O

Draw a ring around the correct answer to complete each sentence.

1 (d) (i) When two oxygen atoms bond, the atoms [share / transfer / delocalise] electrons.

(1 mark)

1 (d) (ii) The oxygen atoms are joined by [ionic / metallic / covalent] bonds.

(1 mark)

1 (d) (iii) Oxygen is made of [simple molecules. / a giant lattice. / macromolecules.]

(1 mark)

1 (e) When hydrogen peroxide decomposes water is produced.
Which **two** statements in the table explain why water is a liquid at room temperature?

Tick (✓) the **two** statements.

Statement	Tick (✓)
Water has a boiling point of 100 °C.	
Water is made of ions.	
Water has a melting point lower than room temperature.	
Water has a giant covalent structure.	

(2 marks)

12

4.2.1.4 Covalent bonding

Question 16

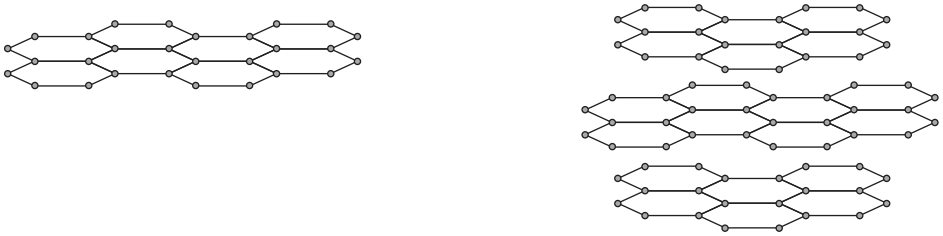
June 2012 | CH2FP | Original Q5 | Legacy

5 Read the information.

Graphene

Scientists have made a new substance called graphene.
The bonding and structure of graphene are similar to graphite.

Graphene is made of a single layer of the same atoms as graphite.



Graphene **Graphite**

Use the information above and your knowledge of graphite to answer the questions.

5 (a) This part of the question is about graphene.

Choose the correct answer to complete each sentence.

5 (a) (i)

ionic	covalent	metallic

The bonds between the atoms in graphene are ..... .

(1 mark)

5 (a) (ii)

chromium	carbon	chlorine

Graphene is made of ..... atoms.

(1 mark)

5 (a) (iii)

2	3	4

In graphene each atom bonds to ..... other atoms.

(1 mark)

4.2.1.4 Covalent bonding

Question 16 · continued

5 (b) This part of the question is about graphite.

Graphite is used in pencils.

Explain why. Use the diagrams to help you.

.....

.....

.....

.....

(2 marks)

5

Turn over for the next question

4.2.1.4 Covalent bonding

Question 17

January 2013 | CH2FP | Original Q1 | Legacy

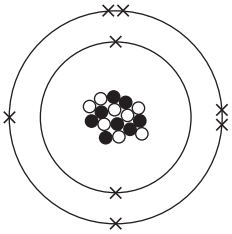
1 This question is about atoms and molecules.

1 (a) Complete the table to show the relative masses of the particles in atoms.

Name of particle	Relative mass
Proton	.....
Neutron	1
Electron	.....

(2 marks)

1 (b) The diagram shows an oxygen atom.



Key
- ● Proton
- ○ Neutron
- × Electron

Use the correct number to complete each sentence.

8	**16**	**18**	**24**

The atomic (proton) number of the oxygen atom shown above is ..... .

The mass number of the oxygen atom shown above is ..... .

(2 marks)

1 (c) (i) Draw a ring around the correct answer to complete the sentence.

Oxygen atoms with different numbers of neutrons are called

isotopes.

molecules.

polymers.

(1 mark)

4.2.1.4 Covalent bonding

Question 17 · continued

1 (c) (ii) An oxygen atom with a different number of neutrons has 10 neutrons.

Draw a ring around the symbol which represents this atom.

$^{16}_{8}O$ $^{18}_{10}O$ $^{18}_{8}O$

(1 mark)

1 (d) A water molecule contains hydrogen and oxygen atoms.

1 (d) (i) Use the correct answer to complete the sentence.

a compound	an element	a mixture

Water is ..... .

(1 mark)

1 (d) (ii) Draw a ring around the correct structure of a water molecule.

H — O — H **O — H — H** **O — H — O**

(1 mark)

1 (d) (iii) Draw a ring around the type of bonding in a water molecule.

covalent **ionic** **metallic**

(1 mark)

1 (d) (iv) Draw a ring around the correct answer to complete the sentence.

The bonds in a water molecule are formed by [gaining / losing / sharing] electrons.

(1 mark)

10

4.2.1.4 Covalent bonding

Question 18

June 2013 | CH2FP | Original Q1 | Legacy

1 This question is about lithium and sodium.

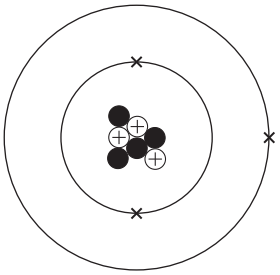
1 (a) Use the Chemistry Data Sheet to help you to answer this question.

In which group of the periodic table are lithium and sodium? Group ☐

(1 mark)

1 (b) A lithium atom can be represented as $^{7}_{3}Li$

The diagram represents the lithium atom.



1 (b) (i) Some particles in the nucleus have a positive charge.

What is the name of these particles? .....

(1 mark)

1 (b) (ii) Some particles in the nucleus have no charge.

What is the name of these particles? .....

(1 mark)

1 (b) (iii) Use the correct answer from the box to complete the sentence.

3	4	7

The mass number of this atom of lithium is ☐

(1 mark)

Question 1 continues on the next page

4.2.1.4 Covalent bonding

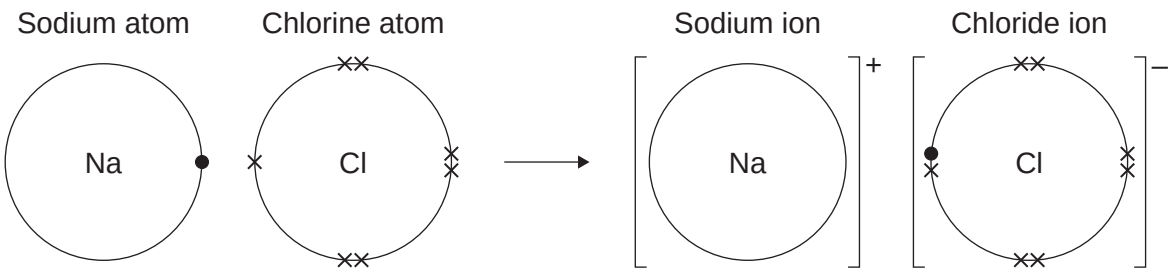
Question 18 · continued

1 (c) Sodium reacts with chlorine to produce sodium chloride.

sodium + chlorine ⟶ sodium chloride

The diagram shows how the reaction happens.

Only the outer electrons are shown.



Draw a ring around the correct answer to complete each sentence.

1 (c) (i) A sodium atom changes into a sodium ion by [gaining / losing / sharing] an electron.

(1 mark)

1 (c) (ii) A sodium ion has [a negative / no / a positive] charge.

(1 mark)

1 (c) (iii) The ions in sodium chloride are held together by strong [covalent / electrostatic / magnetic] forces.

(1 mark)

4.2.1.4 Covalent bonding

Question 18 · continued

1 (d) Sodium chloride is an ionic compound.

Tick (✓) **two** properties of ionic compounds.

Property	Tick (✓)
Do **not** dissolve in water	
High melting points	
Low boiling points	
Strong bonds	

(2 marks)

1 (e) (i) The formula of sodium chloride is NaCl

Calculate the relative formula mass of sodium chloride.

Relative atomic masses: Na = 23; Cl = 35.5

.....

.....

Relative formula mass = ...

(1 mark)

1 (e) (ii) Draw a ring around the correct answer to complete the sentence.

The relative formula mass of a substance, in grams, is one ion / isotope / mole of the substance.

(1 mark)

1 (f) Nanoparticles of sodium chloride (salt) are used to flavour crisps.

What are nanoparticles?

.....

.....

(1 mark)

12

4.2.1.4 Covalent bonding

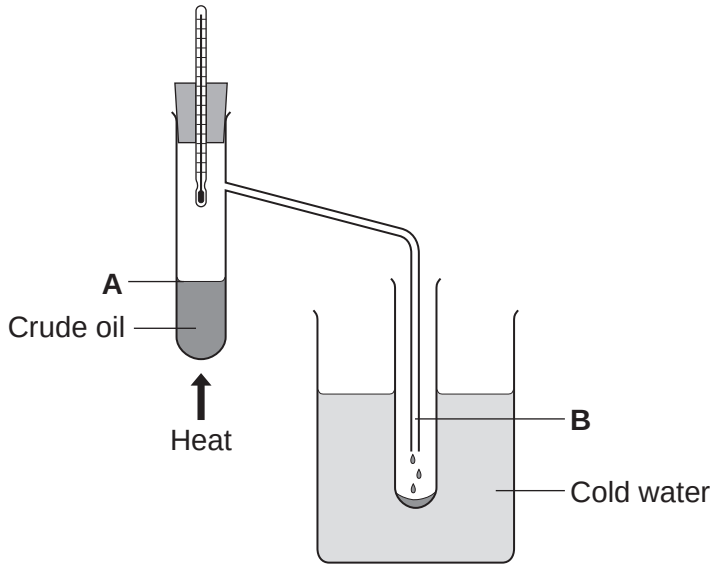
Question 19

June 2014 | CH1FP | Original Q4 | Legacy

4 Crude oil is a mixture of a very large number of compounds.

Figure 4 shows a laboratory experiment to separate crude oil.

Figure 4



4 (a) Complete the sentence.

[1 mark]

The name for compounds that contain only hydrogen and carbon is ..... .

4 (b) Use the correct word from the box to complete each sentence.

condensation	**decomposition**	**distillation**
evaporation	**reduction**	

4 (b) (i) The process of separating crude oil is fractional ..... .

[1 mark]

4 (b) (ii) The process taking place at **A** is ..... .

[1 mark]

4 (b) (iii) The process taking place at **B** is ..... .

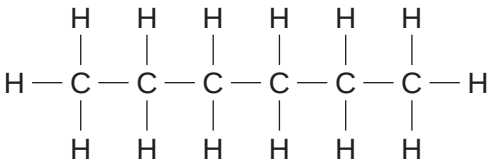
[1 mark]

4.2.1.4 Covalent bonding

Question 19 · continued

4 (c) One of the compounds in crude oil is hexane. The displayed structure of hexane is shown in **Figure 5**.

Figure 5



Complete the sentences.

4 (c) (i) Each line between the atoms in hexane represents a covalent ..... .

[1 mark]

4 (c) (ii) Complete the chemical formula for hexane.

[1 mark]

C_6H.....

4 (c) (iii) Hexane can be broken down into smaller molecules by a process called ..... .

[1 mark]

4 (d) Small molecules, called alkenes, are used to make polymers.

4 (d) (i) Name the polymer made from butene.

[1 mark]

.....

4 (d) (ii) Incinerators are used to burn waste polymers, such as plastic bags.

Tick (✓) **one** advantage and tick (✓) **one** disadvantage of burning plastic bags.

[2 marks]

	Advantage Tick (✓)	Disadvantage Tick (✓)
Energy is released.		
More recycling is needed.		
Carbon dioxide is produced.		

10

4.2.1.4 Covalent bonding

Question 20

June 2014 | CH2FP | Original Q1 | Legacy

1 This question is about diamonds.

Draw a ring around the correct answer to complete each sentence.

1 (a) Diamonds are found in meteorites.

1 (a) (i) Meteorites get very hot when they pass through the Earth's atmosphere, but the diamonds do not melt.

Diamond has a (high / low / very low) melting point.

[1 mark]

1 (a) (ii) Most diamonds found in meteorites are nanodiamonds.

A nanodiamond contains a few (hundred / thousand / million) atoms.

[1 mark]

1 (b) Diamonds are used for the cutting end of drill bits.

Diamonds can be used for drill bits because they are (hard. / shiny. / soft.)

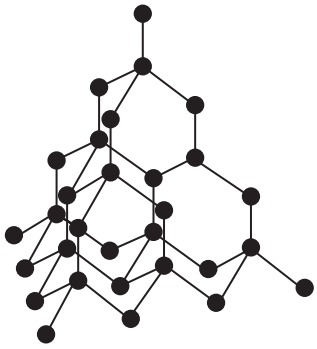
[1 mark]

4.2.1.4 Covalent bonding

Question 20 · continued

1 (c) **Figure 1** shows the arrangement of atoms in diamond.

Figure 1



1 (c) (i) Diamond is made from [carbon / nitrogen / oxygen] atoms.

[1 mark]

1 (c) (ii) Each atom in diamond is bonded to [three / four / five] other atoms.

[1 mark]

1 (c) (iii) Diamond has a giant [covalent / ionic / metallic] structure.

[1 mark]

1 (c) (iv) In diamond [all / none / some] of the atoms are bonded together.

[1 mark]

7

4.2.1.4 Covalent bonding

Question 21

June 2015 | CH2FP | Original Q4 | Legacy

4 This question is about electrolysis.

4 (a) Metal spoons can be coated with silver.
This is called electroplating.

Suggest **one** reason why spoons are electroplated.

[1 mark]

.....

.....

4 (b) When sodium chloride solution is electrolysed the products are hydrogen and chlorine.

4 (b) (i) What is made from chlorine?

[1 mark]

Tick (✓) **one** box.

Bleach ☐

Fertiliser ☐

Soap ☐

4 (b) (ii) Sodium chloride solution contains two types of positive ions, hydrogen ions (H^+) and sodium ions (Na^+).

Why is hydrogen produced at the negative electrode and **not** sodium?

[1 mark]

Tick (✓) **one** box.

Hydrogen is a gas. ☐

Hydrogen is less reactive than sodium. ☐

Hydrogen ions move faster than sodium ions. ☐

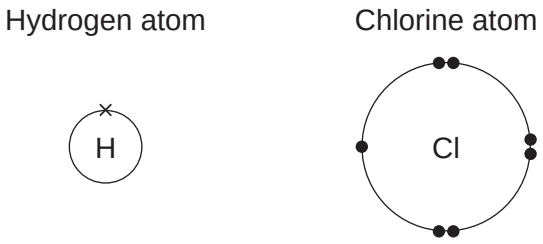
4.2.1.4 Covalent bonding

Question 21 · continued

4 (b) (iii) Hydrogen and chlorine can be used to produce hydrogen chloride.

The diagrams in **Figure 4** show how the outer electrons are arranged in an atom of hydrogen and an atom of chlorine.

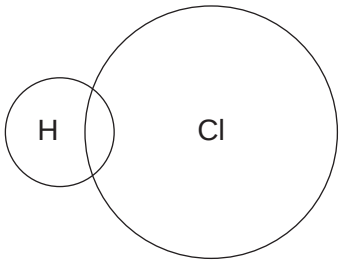
Figure 4



Complete **Figure 5** to show how the outer electrons are arranged in a molecule of hydrogen chloride (HCl).

[1 mark]

Figure 5



4 (b) (iv) What is the type of bond in a molecule of hydrogen chloride?

[1 mark]

Tick (✓) **one** box.

Covalent ☐

Ionic ☐

Metallic ☐

Question 4 continues on the next page

4.2.1.4 Covalent bonding

Question 21 · continued

4 (b) (v) Why is hydrogen chloride a gas at room temperature (20 °C)?

[2 marks]

Tick (✓) **two** boxes.

Hydrogen chloride has a low boiling point. ☐

Hydrogen chloride has a high melting point. ☐

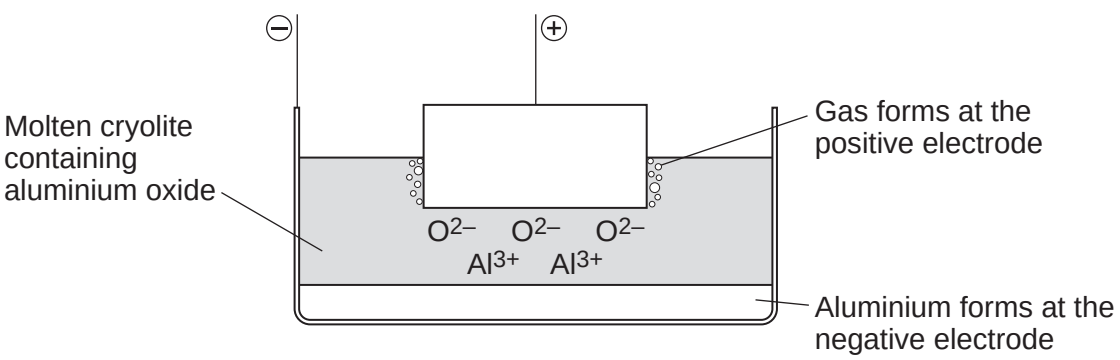
Hydrogen chloride is made of simple molecules. ☐

Hydrogen chloride does not conduct electricity. ☐

Hydrogen chloride has a giant structure. ☐

4 (c) Aluminium is produced by electrolysis of a molten mixture of aluminium oxide and cryolite.
This is shown in **Figure 6**.

Figure 6



4 (c) (i) Name a gas produced at the positive electrode.

[1 mark]

.....

4.2.1.4 Covalent bonding

Question 21 · continued

4 (c) (ii) Aluminium ions move to the negative electrode.

Explain why.

[2 marks]

.....

.....

.....

.....

4 (c) (iii) At the negative electrode, the aluminium ions gain electrons to produce aluminium.

What is this type of reaction called?

[1 mark]

Tick (✓) **one** box.

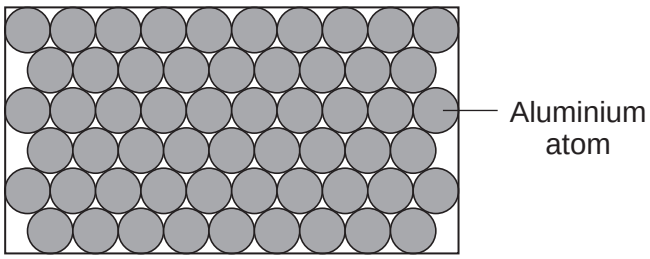
Combustion ☐

Oxidation ☐

Reduction ☐

4 (c) (iv) Aluminium has layers of atoms, as shown in **Figure 7**.

Figure 7



Complete the sentence.

[1 mark]

Metals can be bent and shaped because the layers of atoms can ..... .

Question 4 continues on the next page

4.2.1.4 Covalent bonding

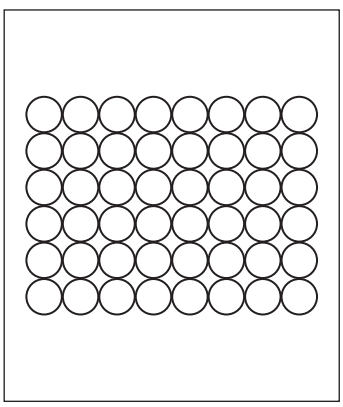
Question 21 · continued

4 (d) Electrodes used in the production of aluminium are made from graphite.

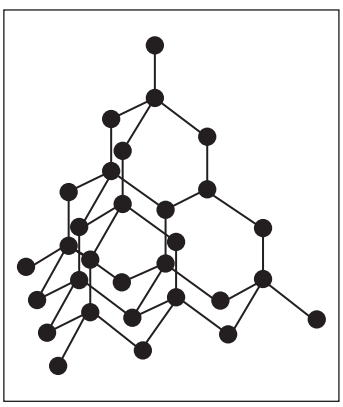
4 (d) (i) Which diagram, **A**, **B** or **C**, shows the structure of graphite?

[1 mark]

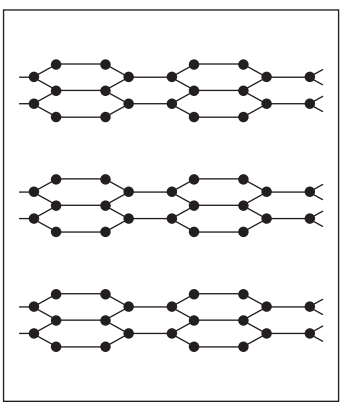
A



B



C



The structure of graphite is shown in diagram ☐.

4 (d) (ii) The temperature for the electrolysis is 950 °C.

Use the correct answer from the box to complete the sentence.

[1 mark]

cross links	**a giant ionic lattice**	**strong covalent bonds**

The graphite does not melt at 950 °C because

graphite has ..... .

14

4.2.1.4 Covalent bonding

Question 22

June 2017 | CH2FP | Original Q3 | Legacy

3 This question is about oxygen and substances containing oxygen.

3 (a) Oxygen is a gas at room temperature.

3 (a) (i) What type of bonding holds the atoms together in oxygen?

[1 mark]

Tick (✓) **one** box.

Covalent ☐

Ionic ☐

Metallic ☐

3 (a) (ii) Which **two** statements about oxygen are true?

[2 marks]

Tick (✓) **two** boxes.

Oxygen consists of a giant lattice. ☐

Oxygen consists of small molecules. ☐

Oxygen conducts electricity. ☐

Oxygen is an alloy. ☐

Oxygen has a low boiling point. ☐

Question 3 continues on the next page

4.2.1.4 Covalent bonding

Question 22 · continued

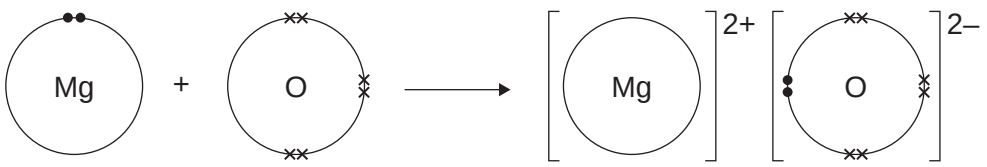
3 (b) Magnesium oxide is produced when magnesium reacts with oxygen.

3 (b) (i) **Figure 6** shows what happens to the electrons in the outer shells when a magnesium atom reacts with an oxygen atom.

The dots (•) and crosses (×) represent electrons.

Only the outer electrons are shown.

Figure 6



Describe, in terms of electrons, what happens when a magnesium atom reacts with an oxygen atom to produce magnesium oxide.

[4 marks]

4.2.1.4 Covalent bonding

Question 22 · continued

3 (b) (ii) Nanoparticles of magnesium oxide can be made.

Which **two** statements about nanoparticles are true?

[2 marks]

Tick (✓) **two** boxes.

Nanoparticles are very small atoms. ☐

Nanoparticles can return to their original shape after being deformed. ☐

Nanoparticles contain a few hundred atoms. ☐

Nanoparticles contain millions of molecules. ☐

Nanoparticles have a high surface area to volume ratio. ☐

3 (c) Silicon dioxide has a very high melting point.

Silicon dioxide does not conduct electricity when molten.

Use the correct answer from the box to complete the sentence.

[1 mark]

giant covalent	giant ionic	metallic

The structure of silicon dioxide is _____ .

10

4.2.1.4 Covalent bonding

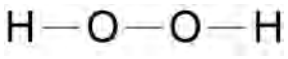
Question 23

June 2019 | 8462/1F | Original Q2

0 2 This question is about compounds of oxygen and hydrogen.

Figure 2 represents the structure of hydrogen peroxide.

Figure 2



0 2 . 1 What is the correct formula of hydrogen peroxide?

[1 mark]

Tick (✓) **one** box.

- H2O2 ☐
- HO_2 ☐
- H^2O^2 ☐
- H_2O_2 ☐

0 2 . 2 Which type of bonding is shown in **Figure 2**?

[1 mark]

Tick (✓) **one** box.

- Covalent ☐
- Ionic ☐
- Metallic ☐

4.2.1.4 Covalent bonding

Question 23 · continued

0 2 . 3 Hydrogen peroxide decomposes in the presence of a catalyst.

Which elements are often used as catalysts?

[1 mark]

Tick (✓) **one** box.

Alkali metals ☐

Halogens ☐

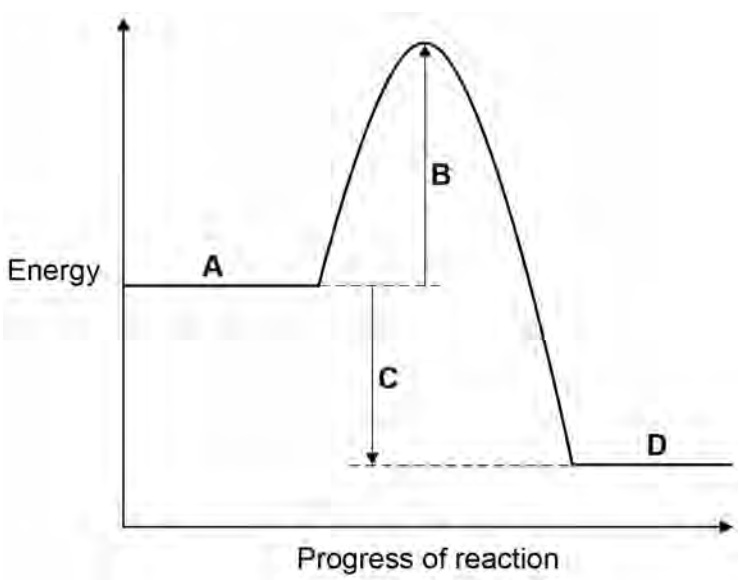
Transition metals ☐

Figure 3 shows the reaction profile for the decomposition of hydrogen peroxide.

The word equation for this reaction is:

hydrogen peroxide → water + oxygen

Figure 3



4.2.1.4 Covalent bonding

Question 23 · continued

Labels **A**, **B**, **C** and **D** each represent a different part of the reaction profile.

Use **Figure 3** to answer Questions **02.4** and **02.5**

0 2 . 4 Which label shows the activation energy?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 2 . 5 Which label shows the energy of hydrogen peroxide?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 2 . 6 The decomposition of hydrogen peroxide gives out energy to the surroundings.

What type of reaction is this?

[1 mark]

Tick (✓) **one** box.

Displacement ☐

Endothermic ☐

Exothermic ☐

Neutralisation ☐

Question 2 continues on the next page

4.2.1.4 Covalent bonding

Question 23 · continued

0 2 . 7 Hydrogen and oxygen form water.

A hydrogen atom contains one electron.

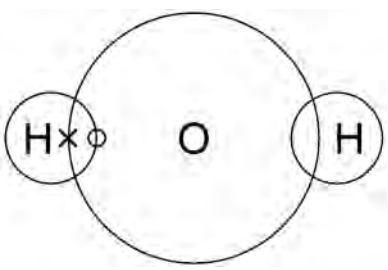
An oxygen atom contains six electrons in the outer shell.

Complete **Figure 4** to show a dot and cross diagram for a water molecule.

Show the outer electrons only.

[2 marks]

Figure 4



8

4.2.1.4 Covalent bonding

Question 24

November 2020 | 8462/1F | Original Q8

0 8 This question is about structure and bonding.

0 8 . 1 Which **two** substances have intermolecular forces between particles?

[2 marks]

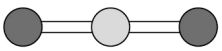
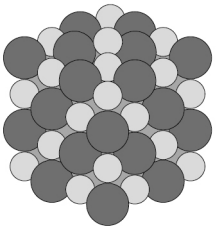
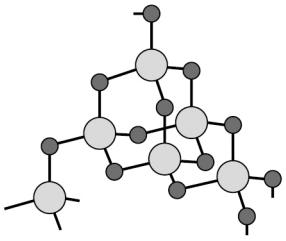
Tick (✓) **two** boxes.

- Diamond ☐
- Magnesium ☐
- Poly(ethene) ☐
- Sodium chloride ☐
- Water ☐

0 8 . 2 **Table 5** shows the structures of three compounds.

Table 5

Diagrams not to scale

Compound	Structure
Carbon dioxide	
Magnesium oxide	
Silicon dioxide	

4.2.1.4 Covalent bonding

Question 24 · continued

Compare the structure and bonding of the three compounds:

- carbon dioxide
- magnesium oxide
- silicon dioxide.

[6 marks]

8

4.2.1.4 Covalent bonding

Question 25

November 2020 | 8462/2F | Original Q10

1 0 This question is about hydrocarbons.

Hexane and hexene are hydrocarbons containing six carbon atoms in each molecule.

Hexane is an alkane and hexene is an alkene.

1 0 . 1 Draw **one** line from each hydrocarbon to the formula of that hydrocarbon.

[2 marks]

Hydrocarbon	Formula
	C_6H_8
Hexane	C_6H_{10}
	C_6H_{12}
Hexene	C_6H_{14}
	C_6H_{16}

1 0 . 2 Bromine water is added to hexane and to hexene.

What would be observed when bromine water is added to hexane and to hexene?

[2 marks]

Hexane _____

_____

Hexene _____

_____

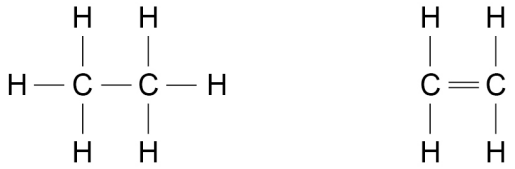
4.2.1.4 Covalent bonding

Question 25 · continued

1 0 . 3 Ethane is an alkane and ethene is an alkene.

Figure 8 shows the displayed structural formulae of ethane and of ethene.

Figure 8



Ethane **Ethene**

Compare ethane with ethene.

You should refer to:

- their structure and bonding
- their reactions.

[6 marks]

10

4.2.1.4 Covalent bonding

Question 26

November 2021 | 8462/1F | Original Q3

0 3 This question is about Group 1 elements.

0 3 . 1 Complete **Table 2** to show the electronic structure of a potassium atom.

[1 mark]

Table 2

Atom	Number of electrons	Electronic structure
Sodium	11	2,8,1
Potassium	19	

0 3 . 2 Why do Group 1 elements have similar chemical properties?

[1 mark]

Tick (✓) **one** box.

- They have the same number of electron shells. ☐
- They have the same number of outer shell electrons. ☐
- They have two electrons in the first shell. ☐

0 3 . 3 What is the type of bonding in sodium?

[1 mark]

Tick (✓) **one** box.

- Covalent ☐
- Ionic ☐
- Metallic ☐

4.2.1.4 Covalent bonding

Question 26 · continued

Table 3 shows observations made when lithium, potassium and rubidium react with water.

Table 3

Element	Observations
Lithium	Bubbles slowly Floats Moves slowly
Sodium	1 _____ 2 _____
Potassium	Bubbles very quickly Melts into a ball Floats Moves very quickly Flame
Rubidium	Sinks Melts into a ball Explodes with a flame

0 3 . 4 Give **two** observations you could make when sodium reacts with water.

Write your answers in **Table 3**.

[2 marks]

4.2.1.4 Covalent bonding

Question 26 · continued

0 3 . 5 How does the reactivity of the elements change going down Group 1?

[1 mark]

0 3 . 6 Give **two** ways in which the observations in **Table 3** show the change in reactivity going down Group 1.

[2 marks]

1

2

0 3 . 7 Which gas is produced when Group 1 elements react with water?

[1 mark]

Tick (✓) **one** box.

- Carbon dioxide ☐
- Hydrogen ☐
- Nitrogen ☐
- Oxygen ☐

4.2.1.4 Covalent bonding

Question 26 · continued

0 3 . 8 Sodium fluoride is an ionic compound.

Figure 5 shows dot and cross diagrams for a sodium atom and a fluorine atom.

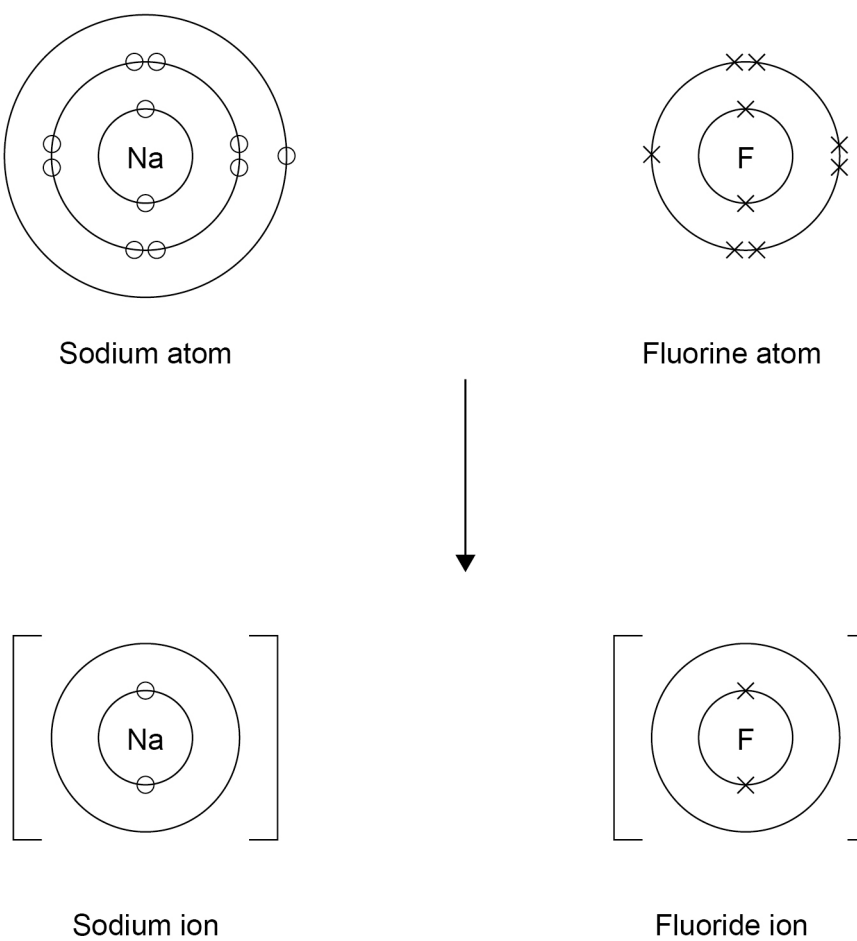
Complete **Figure 5** to show what happens when a sodium atom and a fluorine atom react to produce sodium fluoride.

You should:

- complete the electronic structures of the sodium ion and the fluoride ion
- give the charges on the sodium ion and the fluoride ion.

[3 marks]

Figure 5



12

4.2.1.4 Covalent bonding

Question 27

November 2021 | 8462/1F | Original Q8

0 8 This question is about carbon and its compounds.

Fullerenes are molecules of carbon atoms.

The first fullerene to be discovered was Buckminsterfullerene (C_{60}).

0 8 . 1 What shape is a Buckminsterfullerene molecule?

[1 mark]

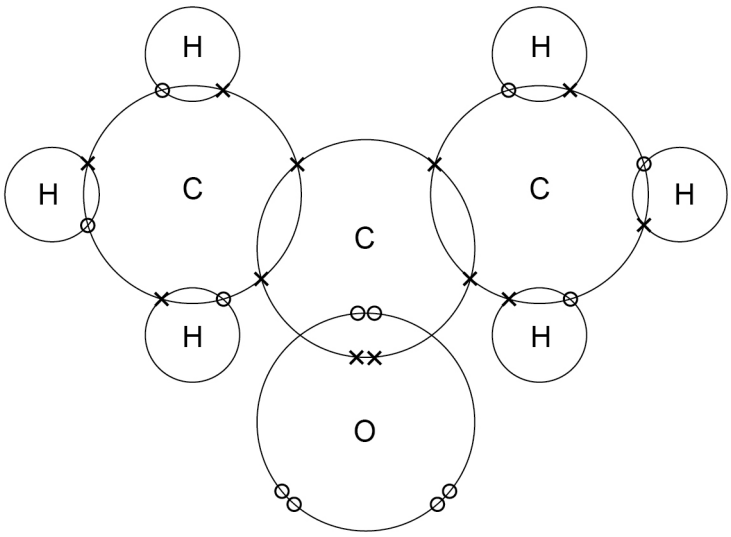
0 8 . 2 Give **one** use of a fullerene.

[1 mark]

Propanone is a compound of carbon, hydrogen and oxygen.

Figure 13 shows the dot and cross diagram for a propanone molecule.

Figure 13



4.2.1.4 Covalent bonding

Question 27 · continued

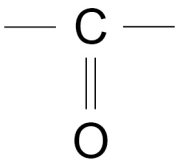
0 8 . 3 Complete **Figure 14** to show a propanone molecule.

Use a line to represent each single bond.

Use **Figure 13**.

[1 mark]

Figure 14



0 8 . 4 Determine the molecular formula of propanone.

Use **Figure 13**.

[1 mark]

Molecular formula = _____

0 8 . 5 Propanone is a liquid with a low boiling point.

Why does propanone have a low boiling point?

[1 mark]

Tick (✓) **one** box.

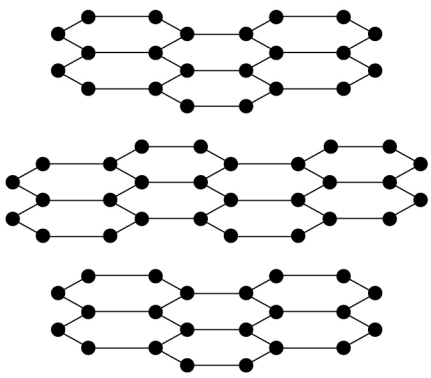
- The covalent bonds are strong. ☐
- The covalent bonds are weak. ☐
- The intermolecular forces are strong. ☐
- The intermolecular forces are weak. ☐

4.2.1.4 Covalent bonding

Question 27 · continued

0 8 . 6 **Figure 15** represents the structure of graphite.

Figure 15



Explain why graphite is:

- a good electrical conductor
- soft and slippery.

You should answer in terms of structure and bonding.

[6 marks]

11

4.2.1.4 Covalent bonding

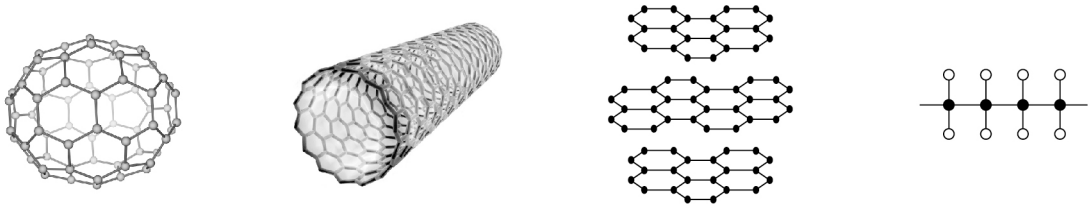
Question 28

June 2022 | 8462/1F | Original Q6

0 6 This question is about carbon and compounds of carbon.

Figure 9 shows diagrams that represent different structures.

Figure 9



A **B** **C** **D**

Use **Figure 9** to answer questions **06.1** and **06.2**.

0 6 . 1 Which diagram represents graphite?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 6 . 2 Which diagram represents poly(ethene)?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

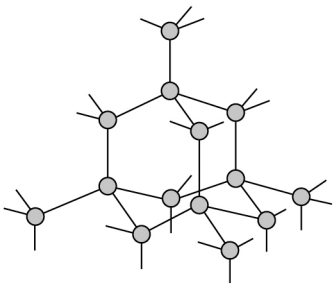
4.2.1.4 Covalent bonding

Question 28 · continued

June 2022 | 8462/1F | Original Q6

Figure 10 represents the structure of diamond.

Figure 10



0 6 . 3 How many covalent bonds does each carbon atom form in diamond?

[1 mark]

0 6 . 4 Which is a property of diamond?

[1 mark]

Tick (✓) **one** box.

- Conducts electricity ☐
- Low melting point ☐
- Very hard ☐

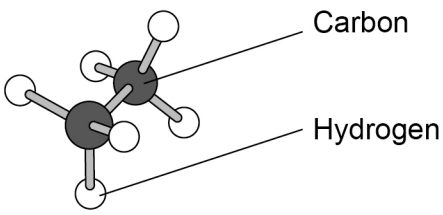
Question 6 continues on the next page

4.2.1.4 Covalent bonding

Question 28 · continued

0 6 . 5 **Figure 11** shows a model of a molecule.

Figure 11



Complete the molecular formula of the molecule.

[1 mark]

Molecular formula = C__ H__

Carbonic acid is a compound of carbon.

The formula of carbonic acid is H_2CO_3

0 6 . 6 Which ion is produced by carbonic acid in aqueous solution?

[1 mark]

Tick (✓) **one** box.

H^+ ☐ OH^- ☐ O^{2-} ☐

0 6 . 7 Calculate the relative formula mass (M_r) of carbonic acid (H_2CO_3).

Relative atomic masses (A_r): H = 1 C = 12 O = 16

[2 marks]

Relative formula mass (M_r) = _____

8

4.2.1.4 Covalent bonding

Question 29

June 2023 | 8462/1F | Original Q3

0 3 This question is about carbon.

0 3 . 1 Which type of substance is carbon?

[1 mark]

Tick (✓) **one** box.

Compound ☐

Element ☐

Mixture ☐

0 3 . 2 Carbon has isotopes with mass numbers 12, 13 and 14.

Complete the sentences.

Choose answers from the box.

[2 marks]

electrons	**ions**	**molecules**	**neutrons**	**protons**

The isotopes of carbon have the same number of _____.

The isotopes of carbon have a different number of _____.

4.2.1.4 Covalent bonding

Question 29 · continued

0 3 . 3 12 g of carbon contains 6.02×10^{23} atoms.

Which expression is used to calculate the mass of one atom of carbon?

[1 mark]

Tick (✓) **one** box.

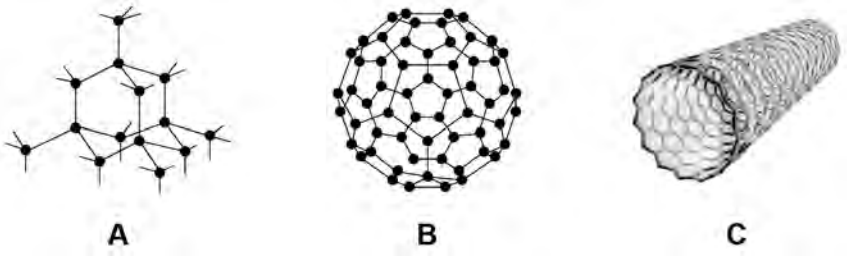
$\frac{12}{6.02 \times 10^{23}}$ ☐

$\frac{6.02 \times 10^{23}}{12}$ ☐

$12 \times 6.02 \times 10^{23}$ ☐

0 3 . 4 **Figure 2** shows diagrams that represent different forms of carbon.

Figure 2



Which diagram in **Figure 2** represents Buckminsterfullerene?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐

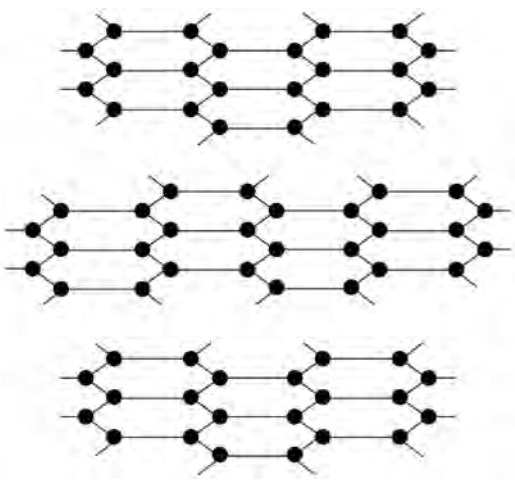
Question 3 continues on the next page

4.2.1.4 Covalent bonding

Question 29 · continued

0 3 . 5 **Figure 3** represents part of the structure of graphite.

Figure 3



Draw **one** line from each property of graphite to the structural feature that is the reason for that property.

[2 marks]

Property	Structural feature
	Graphite has hexagonal rings of carbon atoms.
Graphite conducts electricity.	The bonds between carbon atoms in the layers are strong.
Graphite is soft.	There are no covalent bonds between layers of atoms.
	There are delocalised electrons in graphite.

7

4.2.1.4 Covalent bonding

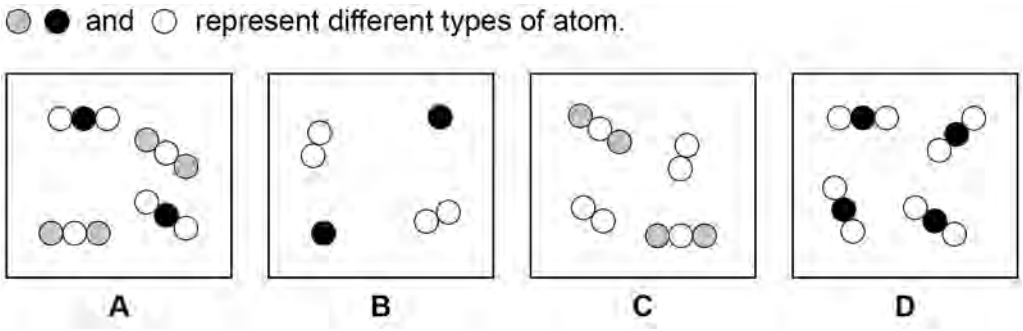
Question 30

June 2024 | 8462/1F | Original Q1

0 1 This question is about elements, compounds and mixtures.

Figure 1 shows diagrams which represent the atoms and molecules in different substances.

Figure 1



0 1 . 1 Which diagram in **Figure 1** represents a pure compound?

[1 mark]

Tick (✓) **one** box.

A ☐ B ☐ C ☐ D ☐

0 1 . 2 Which diagram in **Figure 1** represents a mixture of an element and a compound?

[1 mark]

Tick (✓) **one** box.

A ☐ B ☐ C ☐ D ☐

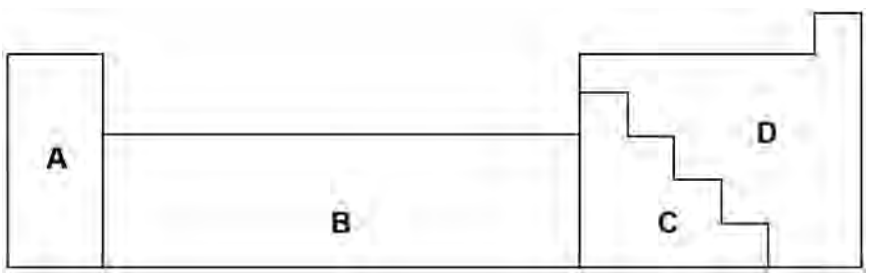
Question 1 continues on the next page

0 1 . 3 Elements are metals or non-metals.

Figure 2 shows an outline of the periodic table.

The periodic table is divided into sections.

Figure 2



Where are metals found in the periodic table?

[1 mark]

Tick (✓) **one** box.

Section **A** only ☐

Sections **A**, **B** and **C** ☐

Sections **B**, **C** and **D** ☐

Section **D** only ☐

4.2.1.4 Covalent bonding

Question 30 · continued

0 1 . 4 Which **two** of the following are typical properties of a transition metal?

[2 marks]

Tick (✓) **two** boxes.

- Can be bent and shaped ☐
- Good conductor of electricity ☐
- Low density ☐
- Low melting point ☐
- Poor conductor of heat ☐

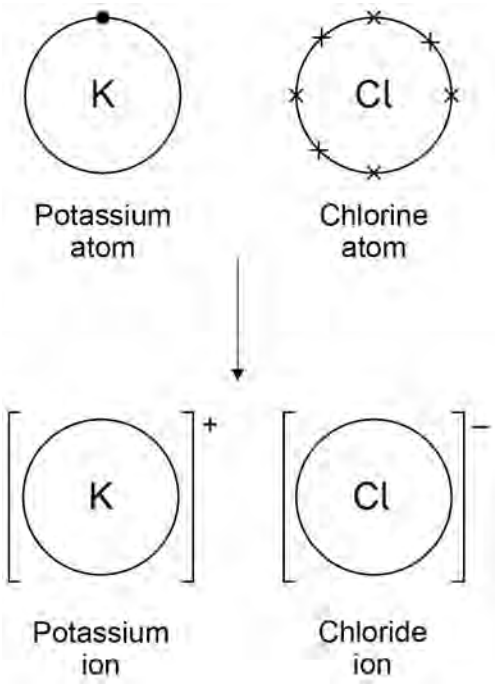
0 1 . 5 Potassium and chlorine react to produce potassium chloride.

An atom of potassium loses an electron to form a potassium ion.

An atom of chlorine gains an electron to form a chloride ion.

Complete the dot and cross diagram.

[2 marks]



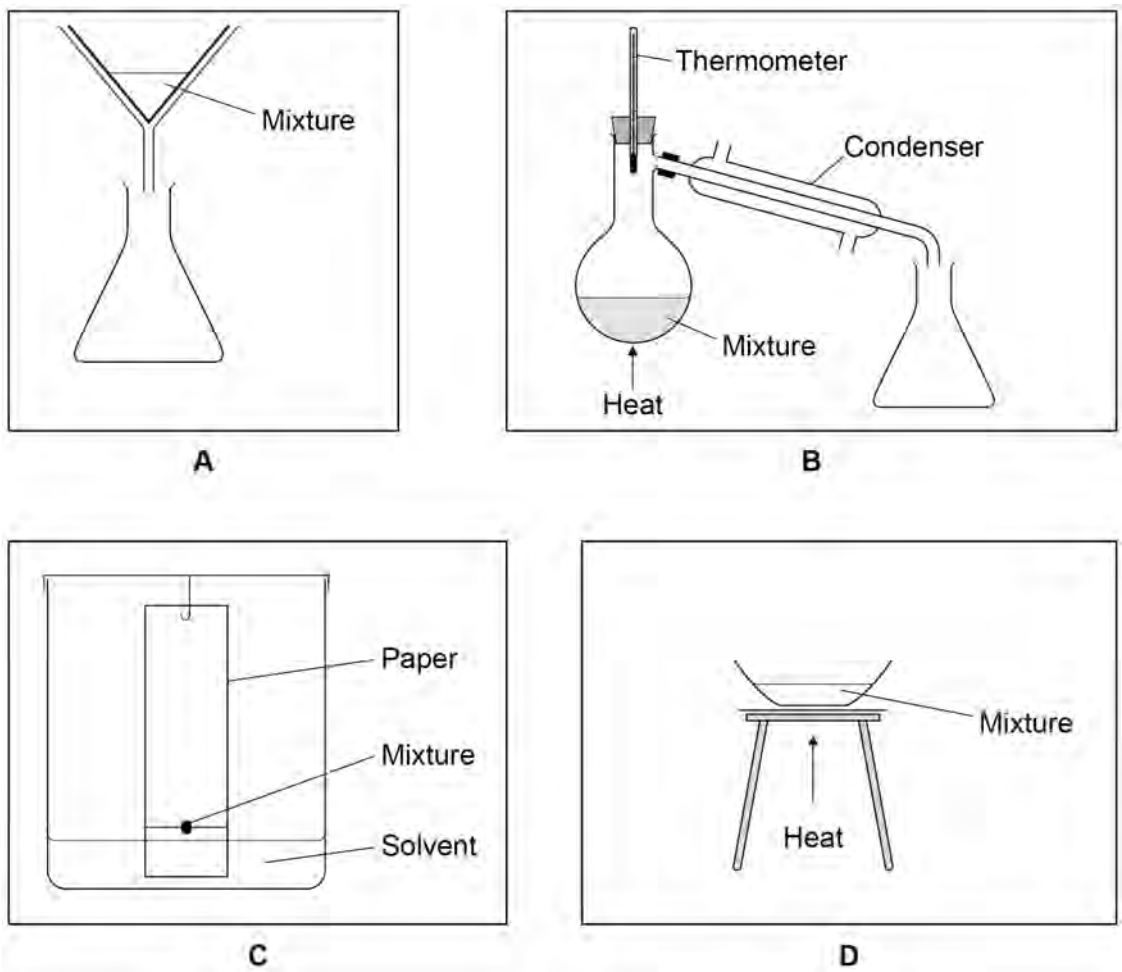
4.2.1.4 Covalent bonding

Question 30 · continued

Mixtures are separated by different methods.

Figure 3 shows the apparatus for separating four different types of mixture.

Figure 3



4.2.1.4 Covalent bonding

Question 30 · continued

0 1 . 6 Which apparatus could be used to collect water from sodium chloride solution?

Use **Figure 3**.

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 1 . 7 Which apparatus shows filtration?

Use **Figure 3**.

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

9

4.2.1.4 Covalent bonding

Question 31

June 2024 | 8462/1F | Original Q5

0 5 This question is about carbon and carbon compounds.

An atom of carbon is represented as:

(Mass number) 13
(Atomic number) 6 C

0 5 . 1 What is the number of protons in this atom of carbon?

Tick (✓) **one** box.

[1 mark]

1 ☐ 6 ☐ 7 ☐ 13 ☐

0 5 . 2 What is the number of neutrons in this atom of carbon?

Tick (✓) **one** box.

[1 mark]

1 ☐ 6 ☐ 7 ☐ 13 ☐

0 5 . 3 What is the number of electrons in this atom of carbon?

Tick (✓) **one** box.

[1 mark]

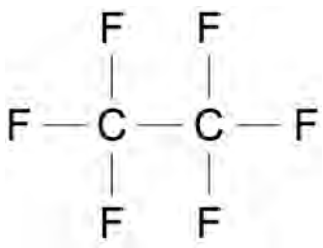
1 ☐ 6 ☐ 7 ☐ 13 ☐

Question 5 continues on the next page

Question 31 · continued

0 5 . 4 **Figure 10** shows the structure of a carbon compound.

Figure 10



Complete the formula of the carbon compound.

[1 mark]

C__ F__

0 5 . 5 Methane:

- is a carbon compound
- exists as small molecules
- has a low boiling point.

What is the reason for the low boiling point of methane?

[1 mark]

Tick (✓) **one** box.

Covalent bonds **and** intermolecular forces are weak. ☐

Only covalent bonds are weak. ☐

Only intermolecular forces are weak. ☐

4.2.1.4 Covalent bonding

Question 31 · continued

June 2024 | 8462/1F | Original Q5

0 5 . 6 Buckminsterfullerene (C_{60}) is a form of carbon.

Buckminsterfullerene was the first fullerene to be discovered.

What is the shape of a buckminsterfullerene molecule?

[1 mark]

Tick (✓) **one** box.

- Cubic ☐
- Cylindrical ☐
- Spherical ☐

Question 5 continues on the next page

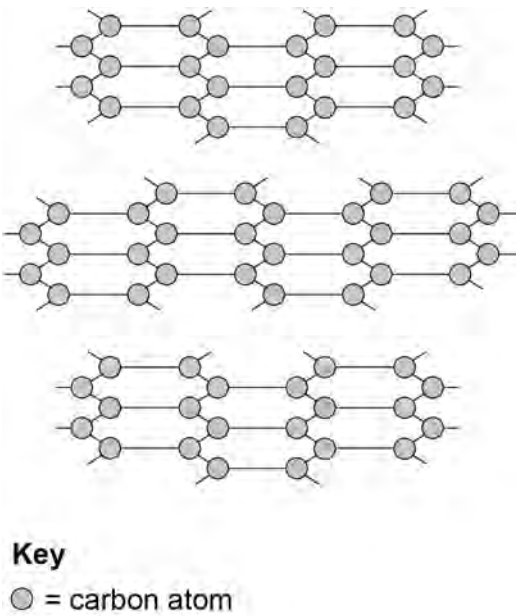
4.2.1.4 Covalent bonding

Question 31 · continued

0 5 . 7 Graphite is a form of carbon.

Figure 11 represents the structure of graphite.

Figure 11



How many covalent bonds does each carbon atom form in graphite?

[1 mark]

Tick (✓) **one** box.

1 ☐

2 ☐

3 ☐

4 ☐

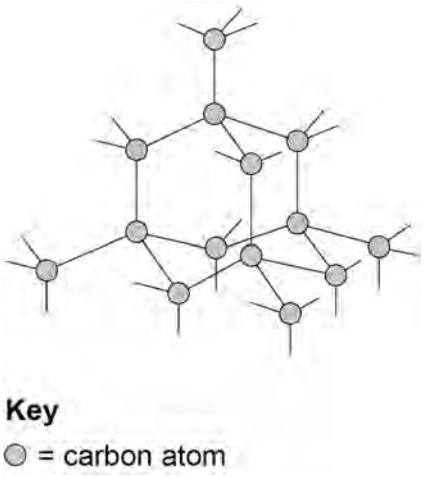
4.2.1.4 Covalent bonding

Question 31 · continued

0 5 . 8 Diamond is another form of carbon.

Figure 12 represents the structure of diamond.

Figure 12



Describe the structure and bonding in diamond.

[3 marks]

10

4.2.1.4 Covalent bonding

Question 32

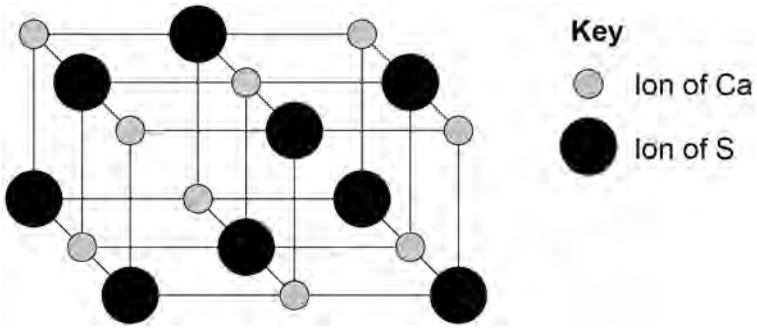
June 2025 | 8462/1F | Original Q9

0 9 This question is about structure and bonding.

Calcium sulfide is an ionic compound.

Figure 13 represents the structure of calcium sulfide.

Figure 13



0 9 . 1 Determine the empirical formula of calcium sulfide.

[1 mark]

Empirical formula _____

Question 9 continues on the next page

4.2.1.4 Covalent bonding

Question 32 · continued

0 9 . 2 Calcium is in Group 2 of the periodic table.

Sulfur is in Group 6 of the periodic table.

Describe what happens when a calcium atom reacts with a sulfur atom.

Answer in terms of electrons and ions.

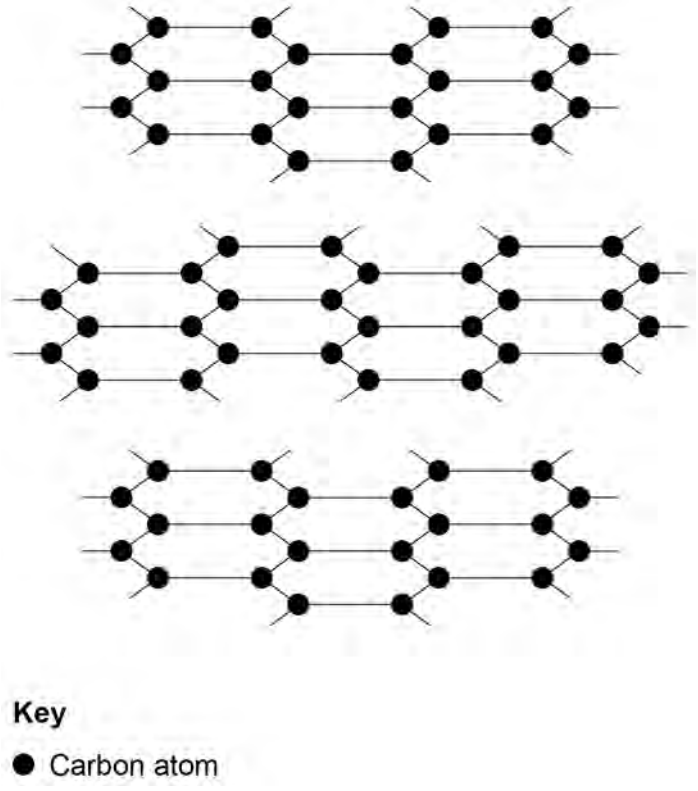
[4 marks]

4.2.1.4 Covalent bonding

Question 32 · continued

Figure 14 shows the structure of graphite.

Figure 14



0 9 . 3 Describe the structure and bonding of graphite.

[4 marks]

Extra space

4.2.1.4 Covalent bonding

Question 32 · continued

0 9 . 4 Substances that consist of small molecules do **not** conduct electricity.

Give **one** reason why.

[1 mark]

0 9 . 5 Methane consists of small molecules.

Poly(ethene) is a polymer.

Why does poly(ethene) have a higher melting point than methane?

[1 mark]

Tick (✓) **one** box.

- Poly(ethene) has more covalent bonds to break than methane. ☐
- Poly(ethene) has no intermolecular forces to overcome. ☐
- Poly(ethene) has stronger covalent bonds to break than methane. ☐
- Poly(ethene) has stronger intermolecular forces to overcome than methane. ☐

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