PEARSON EDEXCEL GCSE CHEMISTRY · 1CH0

CHEMISTRY



EXAM QUESTION PACK

TOPIC 1: KEY CONCEPTS IN CHEMISTRY (PACK 2)

SCORE	PERCENTAGE
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Q1.

An ion of element **X** can be represented as

$$^{125}X^{2-}$$

This ion of element **X** has 54 electrons.

Calculate the number of protons and the number of neutrons in this ion.

(2)

number of protons .....

number of neutrons .....

(Total for question = 2 marks)

Q2.

The compound phosphorus oxychloride has the formula $POCl_3$.

Calculate the percentage by mass of chlorine in phosphorus oxychloride.

(relative atomic masses: O = 16.0, P = 31.0, Cl = 35.5)

(2)

.....

.....

.....

.....

percentage by mass of chlorine = ...

(Total for question = 2 marks)

Q3.

Calculate the percentage by mass of copper in copper sulfate, $CuSO_4$.

(relative atomic masses: Cu = 63.5
relative formula mass of $CuSO_4$ = 159.5)

Give your answer to the nearest whole number.

(3)

.....

.....

.....

.....

percentage by mass of copper = ...

(Total for question = 3 marks)

Q4.

Some of the elements in the periodic table are metals.

Lithium has two naturally occurring isotopes, lithium-6 and lithium-7.

A sample of lithium contains

7.59 % of lithium-6
92.41% of lithium-7.

Calculate the relative atomic mass of lithium in this sample.

Give your answer to two decimal places.
You must show your working.

(4)

.....

.....

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.....

relative atomic mass of lithium = ...

(Total for question = 4 marks)

Q5.

Titanium and iron are examples of transition metals.

Figure 6 shows the percentage abundance of each isotope in a sample of titanium.

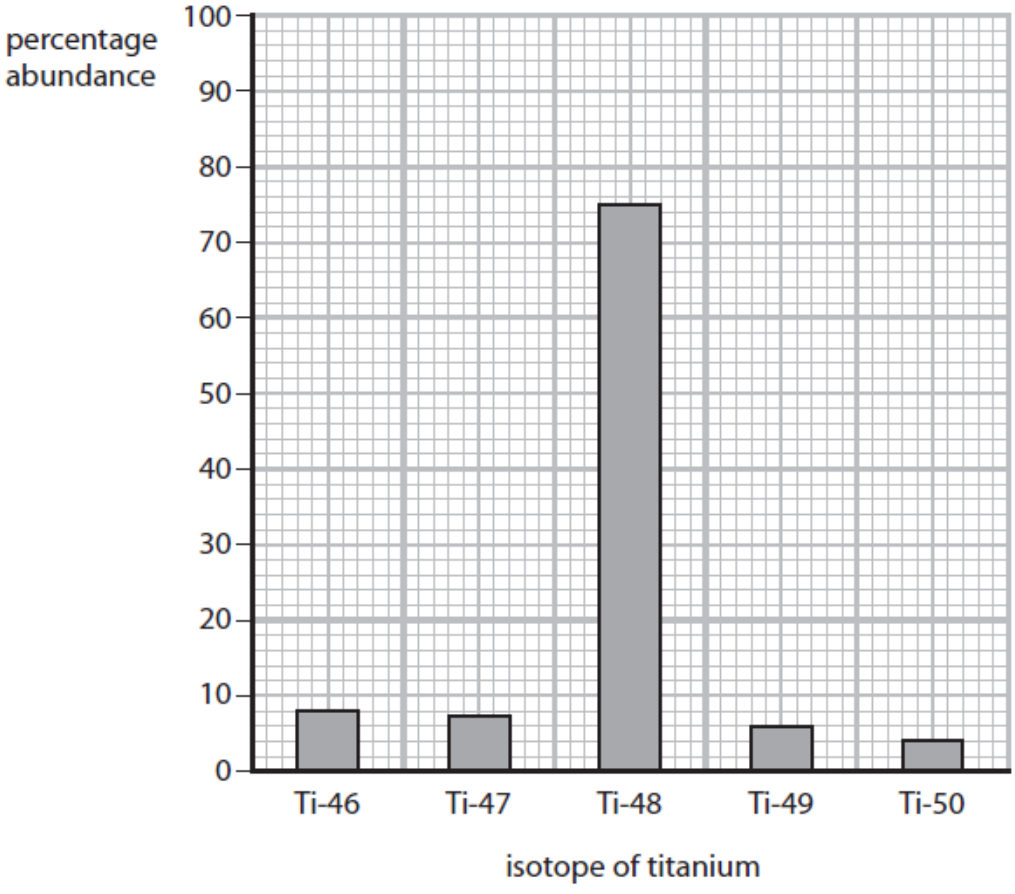


Figure 6

Calculate the relative atomic mass of titanium in this sample.

(3)

.....

.....

.....

.....

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.....

.....

relative atomic mass = ...

(Total for question = 3 marks)

Q6.

Calcium carbonate decomposes on heating to form calcium oxide and carbon dioxide.

$$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$$

(i) Calculate the relative formula mass of calcium carbonate, $CaCO_3$.
(relative atomic masses: C = 12, O = 16, Ca = 40)

(2)

.....

.....

.....

relative formula mass = ...

(ii) Calculate the atom economy for the formation of calcium oxide in this reaction.

$$CaCO_3 \rightarrow CaO + CO_2$$

You must show your working.
(relative atomic masses: C = 12, O = 16, Ca = 40;
relative formula mass: calcium oxide = 56)

(2)

.....

.....

.....

atom economy = ... %

(Total for question = 4 marks)

Q7.

Calcium carbonate decomposes on heating to form calcium oxide and carbon dioxide.

$$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$$

(i) Calculate the relative formula mass of calcium carbonate, $CaCO_3$.
(relative atomic masses: C = 12, O = 16, Ca = 40)

(2)

.....

.....

.....

relative formula mass = ...

(ii) Calculate the atom economy for the formation of calcium oxide in this reaction.

$$CaCO_3 \rightarrow CaO + CO_2$$

You must show your working.
(relative atomic masses: C = 12, O = 16, Ca = 40;
relative formula mass: calcium oxide = 56)

(2)

.....

.....

.....

atom economy = ... %

(Total for question = 4 marks)

Q8.

Calculate the total number of atoms in 10.0 g of sucrose, $C_{12}H_{22}O_{11}$.

(relative formula mass: $C_{12}H_{22}O_{11}$ = 342; Avogadro constant = 6.02×10^{23})

(2)

.....

.....

.....

number of atoms = ...

(Total for question = 2 marks)

Q9.

Propene can be produced by the cracking of some hydrocarbons obtained from crude oil.

The equation shows the cracking of one molecule of decane to produce one molecule of butene and one molecule of another product.

$$\underset{\text{decane}}{C_{10}H_{22}} \rightarrow \underset{\text{butene}}{C_4H_8} + C_xH_y$$

(i) Calculate the values of x and y in C_xH_y.

(2)

x = ... , y = ...

(ii) State the total mass of products formed if 25 g of decane is cracked in this way.

(1)

.....

(Total for question = 3 marks)

Q10.

A student poured 50 cm^3 water into a beaker and measured the water's temperature.

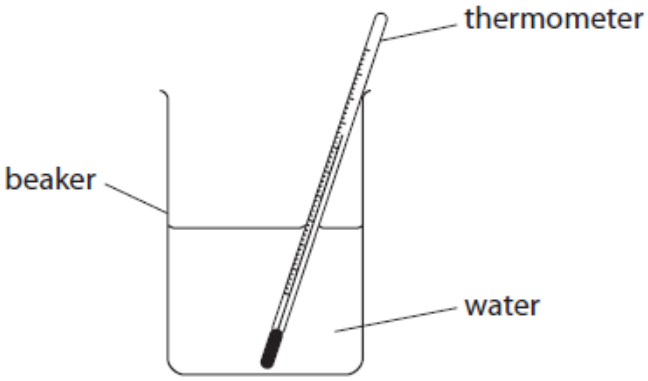


Figure 7

The student added 1.00 g calcium chloride to the water, stirred the mixture and then recorded the temperature.

The concentration of a calcium chloride solution is 12 g dm^{-3}.

Calculate the volume of this solution, in cm^3, that contains 9.0 g of calcium chloride.

You must show your working.

(3)

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.....

.....

.....

.....

volume of solution = ... cm^3

(Total for question = 3 marks)

Q11.

Copper sulfate solution was mixed with sodium hydroxide solution.

A precipitate of copper hydroxide and a solution of sodium sulfate were formed.

The mass of the copper sulfate solution used = 10.32 g.
The mass of the sodium hydroxide solution used = 5.12 g.

Calculate the total mass of the mixture after the precipitate has formed when these two solutions are mixed together.

(1)

..... g

(Total for question = 1 mark)

Q12.

Lithium, sodium and potassium are reactive metals in group 1 of the periodic table.

Sodium metal tarnishes in air to form a layer of sodium oxide on its surface.
0.92 g of sodium combined with 0.32 g of oxygen in this oxide.

Calculate the empirical formula of this sodium oxide.
(relative atomic masses: O = 16, Na = 23)

You must show your working.

(3)

.....

.....

.....

.....

.....

.....

empirical formula of sodium oxide = ...

(Total for question = 3 marks)

Q13.

Lithium, sodium and potassium are reactive metals in group 1 of the periodic table.

Sodium metal tarnishes in air to form a layer of sodium oxide on its surface.
0.92 g of sodium combined with 0.32 g of oxygen in this oxide.

Calculate the empirical formula of this sodium oxide.
(relative atomic masses: O = 16, Na = 23)

You must show your working.

(3)

.....

.....

.....

.....

.....

.....

empirical formula of sodium oxide = ...

(Total for question = 3 marks)

Q14.

When solid ammonium chloride is added to water a colourless solution is formed.

0.25 g of ammonium chloride is mixed with water to make 25 cm^3 of solution.

Calculate the mass of ammonium chloride present in 10 cm^3 of solution.

(2)

.....

.....

.....

.....

mass = ... g

(Total for question = 2 marks)

Q15.

Hydrogen reacts with chlorine to form hydrogen chloride.

In an experiment some hydrogen molecules, H_2, are mixed with chlorine molecules, Cl_2, and reacted to form hydrogen chloride molecules, HCl.

Figure 1 shows the mixture of gases before they have reacted and then after the reaction is complete.

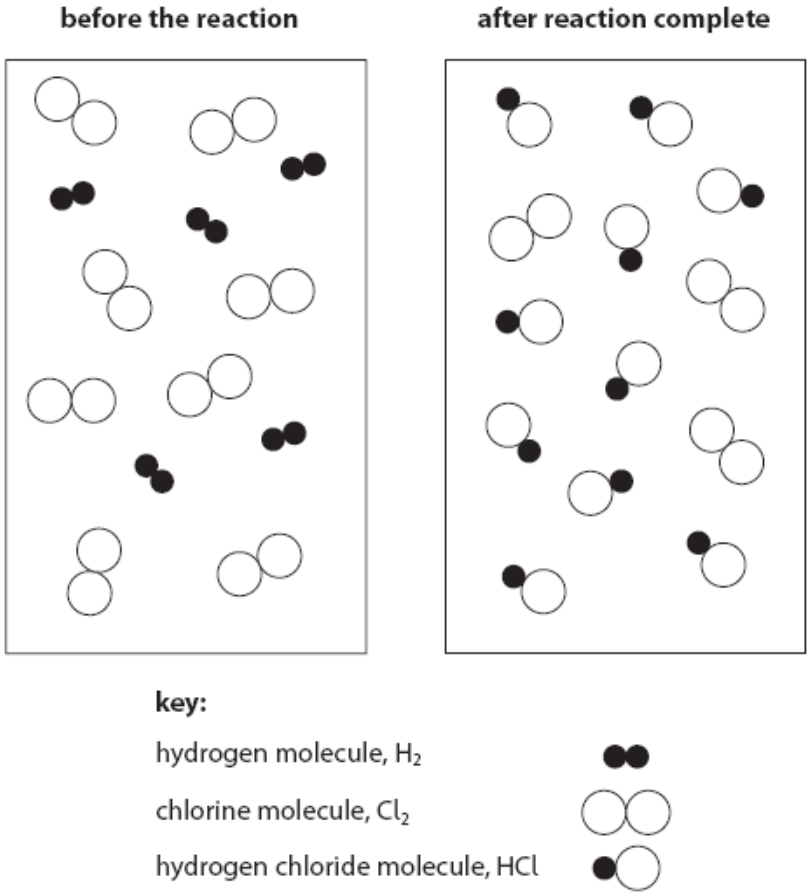


Figure 1

(i) For this sample, calculate the simplest ratio of hydrogen molecules that have reacted to chlorine molecules that have **reacted**.

You must show your working.

(2)

.....

.....

.....

.....

ratio of hydrogen molecules reacted : chlorine molecules reacted =

.....

(ii) Which is the balanced equation for the reaction of hydrogen with chlorine to form hydrogen chloride?

(1)

☒ **A** $H + Cl \rightarrow HCl$

☒ **B** $H_2 + 2Cl \rightarrow H2Cl$

☒ **C** $H_2 + Cl_2 \rightarrow 2HCl$

☒ **D** $5H_2 + 8Cl_2 \rightarrow 10HCl$

(Total for question = 3 marks)

Q16.

Calculate the relative formula mass of water, H_2O.

(Relative atomic masses: H = 1.0, O = 16)

(1)

.....

.....

relative formula mass = ...

Q17.

Calculate the relative formula mass of water, H_2O.

(Relative atomic masses: H = 1.0, O = 16)

(1)

.....

.....

relative formula mass = ...

Q18.

100 g of strontium nitrate is dissolved in water to make 400 cm^3 of solution.

Calculate the concentration of this solution in g dm^{-3}.

(3)

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.....

concentration = ... g dm^{-3}

(Total for question = 3 marks)

Q19.

Samples of tap water from city A and city B were investigated.

Each sample of water was treated as follows.
The mass of an empty evaporating basin was determined.
500 cm^3 of tap water was added and evaporated to dryness.
The mass of the evaporating basin and remaining solid was determined.

Here are the results.

	city A	city B
mass of evaporating basin / g	261.500	258.450
mass of evaporating basin + solid / g	261.611	258.515
mass of solid / g	0.111	
concentration of dissolved solid in tap water / g dm^{-3}	0.222	

Calculate the concentration, in g dm–3, of dissolved solid in the tap water from city B.

(2)

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.....

.....

.....

.....

.....

concentration of solid = ... g dm^{-3}

Q20.

Samples of tap water from city A and city B were investigated.

Each sample of water was treated as follows.
The mass of an empty evaporating basin was determined.
500 cm^3 of tap water was added and evaporated to dryness.
The mass of the evaporating basin and remaining solid was determined.

Here are the results.

	city A	city B
mass of evaporating basin / g	261.500	258.450
mass of evaporating basin + solid / g	261.611	258.515
mass of solid / g	0.111	
concentration of dissolved solid in tap water / g dm^{-3}	0.222	

Calculate the concentration, in g dm–3, of dissolved solid in the tap water from city B.

(2)

.....

.....

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.....

concentration of solid = ... g dm^{-3}

Q21.

Calculate the mass, in g, of a hydrogen atom, using the data below.

(relative atomic mass: H = 1.00;

Avogadro constant = 6.02×10^{23})

(3)

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.....

mass of hydrogen atom = ... g

(Total for question = 3 marks)

Q22.

In industry sodium carbonate is made from sodium chloride solution and calcium carbonate in

the Solvay Process.

The overall equation for the Solvay Process is

$$2NaCl + CaCO_3 \rightarrow Na_2CO_3 + CaC_2$$

Calculate the maximum mass of sodium carbonate that could be formed by reacting 40 kg of calcium carbonate with an excess of sodium chloride solution.
(Relative formula masses: $CaCO_3 = 100$; $Na_2CO_3 = 106$)

(2)

.....

.....

.....

.....

.....

mass of sodium carbonate = ... kg

Q23.

In industry sodium carbonate is made from sodium chloride solution and calcium carbonate in the Solvay Process.

The overall equation for the Solvay Process is

$$2NaCl + CaCO_3 \rightarrow Na_2CO_3 + CaC_2$$

Calculate the maximum mass of sodium carbonate that could be formed by reacting 40 kg of calcium carbonate with an excess of sodium chloride solution.
(Relative formula masses: $CaCO_3 = 100$; $Na_2CO_3 = 106$)

(2)

.....

.....

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.....

.....

mass of sodium carbonate = ... kg

Q24.

48.0 g of sulfur dioxide is provided.

Calculate the number of sulfur dioxide molecules, SO_2, in this sample.

(relative atomic masses: O = 16.0, S = 32.0;
Avogadro constant = 6.02×10^{23} mol^{-1})

(3)

.....

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.....

.....

.....

number of molecules = ...

(Total for question = 3 marks)

Q25.

The elements beryllium, magnesium, calcium, strontium and barium are in group 2 of the periodic table.

There are three common isotopes of magnesium.

(i) These isotopes are shown in Figure 6.

Complete Figure 6 to show the number of protons and neutrons in an atom of each of the other two isotopes.

(2)

isotope	mass number	number of protons in an atom	number of neutrons in an atom
magnesium-24	24	12	12
magnesium-25	25		
magnesium-26	26		

Figure 6

(ii) A sample of magnesium contains 78.60% magnesium-24, 10.11% magnesium-25 and 11.29% magnesium-26.

Use this information to calculate the relative atomic mass of magnesium in this sample.
Give your answer to 3 significant figures.

(4)

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relative atomic mass = ...

(Total for question = 6 marks)

Q26.

In industry sodium carbonate is made from sodium chloride solution and calcium carbonate in the Solvay Process.

Another product of the Solvay Process is calcium chloride.

Calculate the relative formula mass of calcium chloride, $CaCl_2$.
(Relative atomic masses: Ca = 40; Cl = 35.5)

(1)

.....

relative formula mass = ...

Q27.

In industry sodium carbonate is made from sodium chloride solution and calcium carbonate in the Solvay Process.

Another product of the Solvay Process is calcium chloride.

Calculate the relative formula mass of calcium chloride, $CaCl_2$.
(Relative atomic masses: Ca = 40; Cl = 35.5)

(1)

.....

relative formula mass = ...

Q28.

Calculate the relative formula mass of strontium nitrate, $Sr(NO_3)_2$.

(relative atomic masses: N = 14, O = 16, Sr = 88)

(2)

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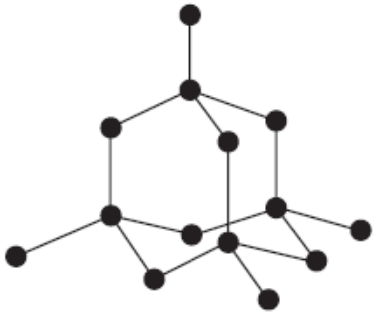
.....

relative formula mass = ...

(Total for question = 2 marks)

Q29.

The arrangement of carbon atoms in diamond is shown.



diamond

Explain why diamond has a very high melting point.

(2)

.....

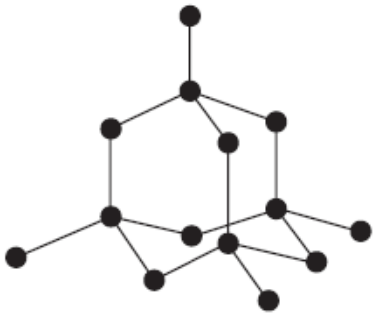
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Q30.

The arrangement of carbon atoms in diamond is shown.



diamond

Explain why diamond has a very high melting point.

(2)

.....

.....

.....

.....

Q31.

Chlorine and carbon

(a) Chlorine has an atomic number of 17.
Chlorine-35 and chlorine-37 are two isotopes of chlorine.

(i) Complete the table to show the numbers of protons, neutrons and electrons in each of the isotopes.

(2)

	chlorine-35	chlorine-37
number of protons		
number of neutrons		
number of electrons		

(ii) A normal sample of chlorine contains only chlorine-35 and chlorine-37 atoms.

Explain why the relative atomic mass of chlorine is 35.5

(2)

.....

.....

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.....

(b) Tetrachloromethane is a simple molecular, covalent compound. The formula of its molecule is CCl_4.

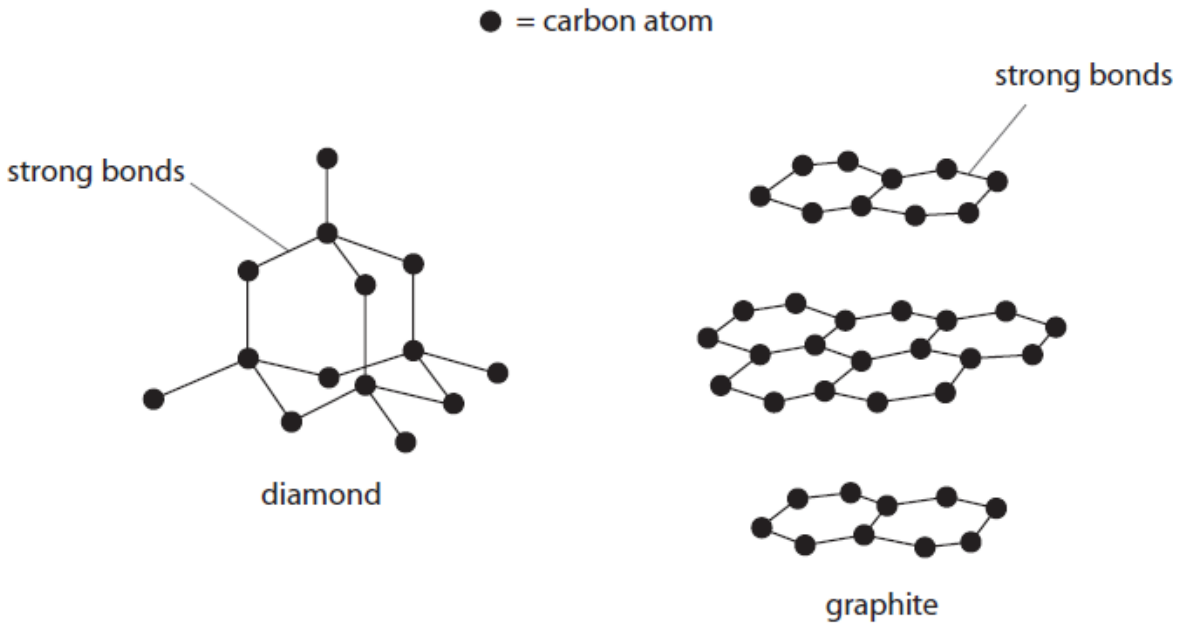
There are four electrons in the outer shell of a carbon atom.
There are seven electrons in the outer shell of a chlorine atom.

Draw a dot and cross diagram to show the bonding in a molecule of tetrachloromethane, CCl_4.

Show outer shell electrons only.

(2)

*(c) The diagrams show the arrangements of carbon atoms in diamond and in graphite.



Compare a use of diamond with a use of graphite, explaining each use in terms of the bonding and structure. In your answer you should use information from the diagrams.

(6)

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(Total for question = 12 marks)

Q32.

Chlorine and carbon

(a) Chlorine has an atomic number of 17.
Chlorine-35 and chlorine-37 are two isotopes of chlorine.

(i) Complete the table to show the numbers of protons, neutrons and electrons in each of the isotopes.

(2)

	chlorine-35	chlorine-37
number of protons		
number of neutrons		
number of electrons		

(ii) A normal sample of chlorine contains only chlorine-35 and chlorine-37 atoms.

Explain why the relative atomic mass of chlorine is 35.5

(2)

.....

.....

.....

.....

(b) Tetrachloromethane is a simple molecular, covalent compound. The formula of its molecule is CCl_4.

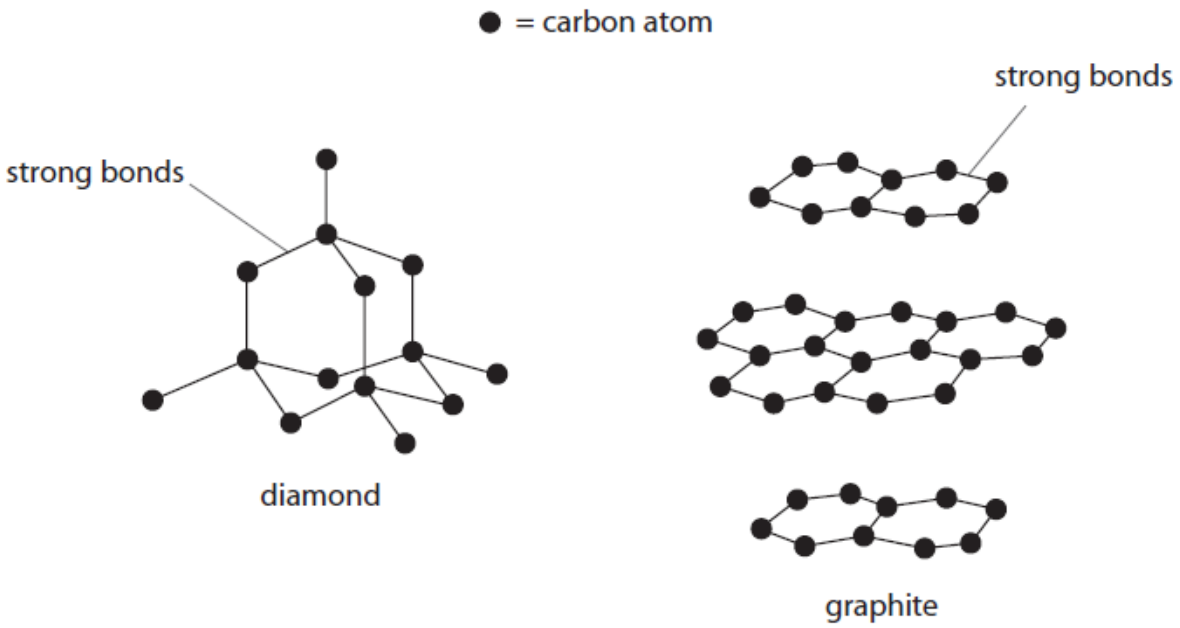
There are four electrons in the outer shell of a carbon atom.
There are seven electrons in the outer shell of a chlorine atom.

Draw a dot and cross diagram to show the bonding in a molecule of tetrachloromethane, CCl_4.

Show outer shell electrons only.

(2)

*(c) The diagrams show the arrangements of carbon atoms in diamond and in graphite.



Compare a use of diamond with a use of graphite, explaining each use in terms of the bonding and structure. In your answer you should use information from the diagrams.

(6)

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(Total for question = 12 marks)

Q33.

Figure 10 shows the electron arrangement for an atom of hydrogen and an atom of oxygen.

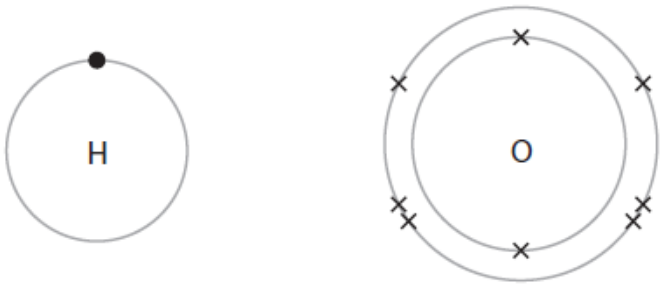


Figure 10

Complete the dot and cross diagram in Figure 11 for a molecule of water, H_2O.

Draw outer shell electrons only.

(2)

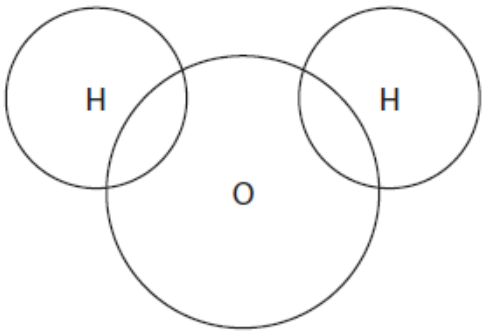


Figure 11

(Total for question = 2 marks)

Q34.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

The word equation for the reaction between copper carbonate and dilute sulfuric acid is

$$\text{copper carbonate} + \text{sulfuric acid} \rightarrow \text{copper sulfate} + \text{carbon dioxide} + \text{water}$$

(i) Complete the balanced equation for this reaction.

(2)

$$CuCO_3 + \text{.....} \rightarrow \text{.....} + CO_2 + H_2O$$

(ii) Calculate the relative formula mass of copper carbonate, $CuCO_3$.
(relative atomic masses: C = 12.0, O = 16.0, Cu = 63.5)

(2)

.....

.....

.....

relative formula mass of $CuCO_3$ = ...

(iii) What is the chemical test to show that a gas is carbon dioxide?

(1)

☒ **A** bubble the gas through limewater, limewater turns cloudy

☒ **B** put damp blue litmus paper in the gas, litmus paper turns red

☒ **C** put a lighted splint into the gas, splint is extinguished

☒ **D** measure the pH of the gas, pH = 4

(Total for question = 5 marks)

Q35.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

The word equation for the reaction between copper carbonate and dilute sulfuric acid is

$$\text{copper carbonate} + \text{sulfuric acid} \rightarrow \text{copper sulfate} + \text{carbon dioxide} + \text{water}$$

(i) Complete the balanced equation for this reaction.

(2)

$$CuCO_3 + \text{.....} \rightarrow \text{.....} + CO_2 + H_2O$$

(ii) Calculate the relative formula mass of copper carbonate, $CuCO_3$.
(relative atomic masses: C = 12.0, O = 16.0, Cu = 63.5)

(2)

.....

.....

.....

relative formula mass of $CuCO_3$ = ...

(iii) What is the chemical test to show that a gas is carbon dioxide?

(1)

☒ **A** bubble the gas through limewater, limewater turns cloudy

☒ **B** put damp blue litmus paper in the gas, litmus paper turns red

☒ **C** put a lighted splint into the gas, the splint is extinguished

☒ **D** measure the pH of the gas, pH = 4

(Total for question = 5 marks)

Q36.

The structure of a molecule of ethene is shown in Figure 8.

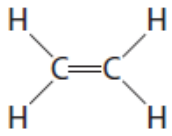


Figure 8

(i) Figure 9 shows the incomplete dot and cross diagram for a molecule of ethene.

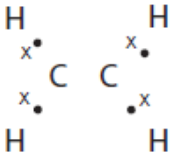


Figure 9

Complete Figure 9 to show the electrons of the C=C double bond.

(1)

(ii) The incomplete combustion of ethene in air produces water as one of the products.

Give the name of another product of the incomplete combustion of ethene.

(1)

.....

(Total for question = 2 marks)

Q37.

In Figure 8, the letters **A**, **E**, **G**, **J**, **X** and **Z** show the positions of six elements in the periodic table.

These letters are not the symbols of the atoms of these elements.

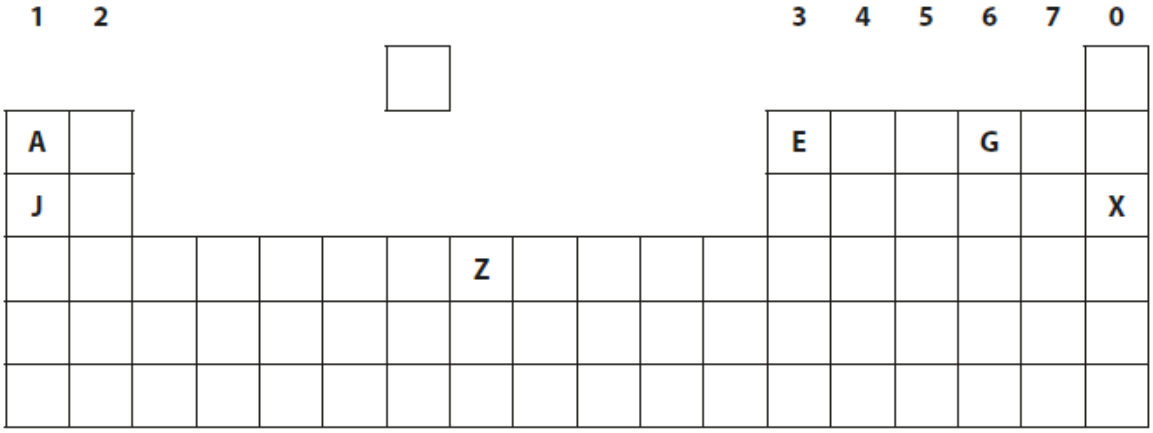


Figure 8

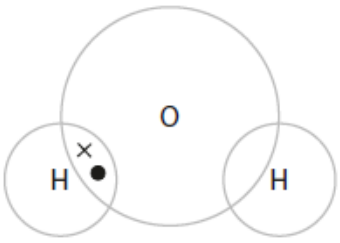
An oxygen atom has six electrons in its outer shell.

A hydrogen atom has one electron in its outer shell.

Complete the dot and cross diagram of a molecule of water, H_2O.

Show outer shell electrons only.

(2)



(Total for question = 2 marks)

Q38.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Ethanol is present in alcoholic drinks, such as wine.

When a bottle of wine is left open some of the ethanol reacts with the oxygen in the air to form ethanoic acid, CH_3COOH, and water.

(i) Complete the equation for this reaction.

(2)

$$CH_3CH_2OH + \text{.....} \rightarrow CH_3COOH + \text{.....}$$

(ii) Which calculation shows the percentage by mass of hydrogen in ethanoic acid?

(relative atomic mass of hydrogen, H = 1, relative formula mass of ethanoic acid, CH_3COOH = 60)

(1)

☒ **A** $\frac{1}{60} \times 100$

☒ **B** $\frac{3}{60} \times 100$

☒ **C** $\frac{4}{60} \times 100$

☒ **D** $\frac{60}{1} \times 100$

(Total for question = 3 marks)

Q39.

Calcium oxide is an ionic solid.

Figure 5 shows the arrangement of electrons in a calcium atom and in an oxygen atom.

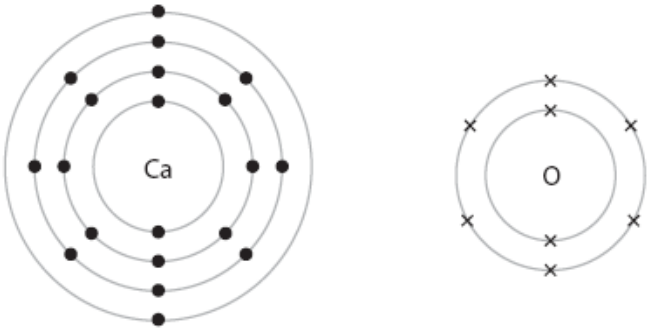
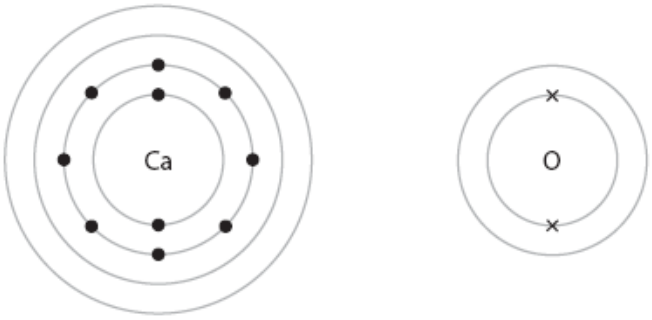


Figure 5

Complete Figure 6 to show the electronic configurations and charges of the calcium ion and the oxide ion.

Use dots to show the electrons originally in the calcium atom and crosses to show the electrons originally in the oxygen atom.

(3)



charge on ion ..... charge on ion .....

Figure 6

(Total for question = 3 marks)

Q40.

When copper sulfate solution reacts with sodium hydroxide solution, a precipitate of copper hydroxide and a solution of sodium sulfate are formed.

The equation is

$$CuSO_4 + 2NaOH \rightarrow Cu(OH)_2 + Na_2SO_4$$

10 cm^3 samples of copper sulfate solution were placed in five test tubes. Different volumes of sodium hydroxide solution were added to these test tubes. The volumes of sodium hydroxide

solution added were 1 cm^3, 2 cm^3, 3 cm^3, 4 cm^3 and 5 cm^3.

In each test tube a precipitate of copper hydroxide was formed. The precipitate was allowed to settle and the height of the precipitate was measured with a ruler as shown in Figure 1.

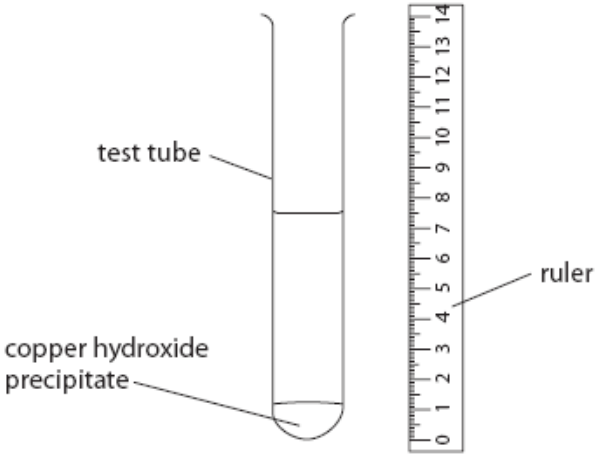


Figure 1

The results are shown in Figure 2.

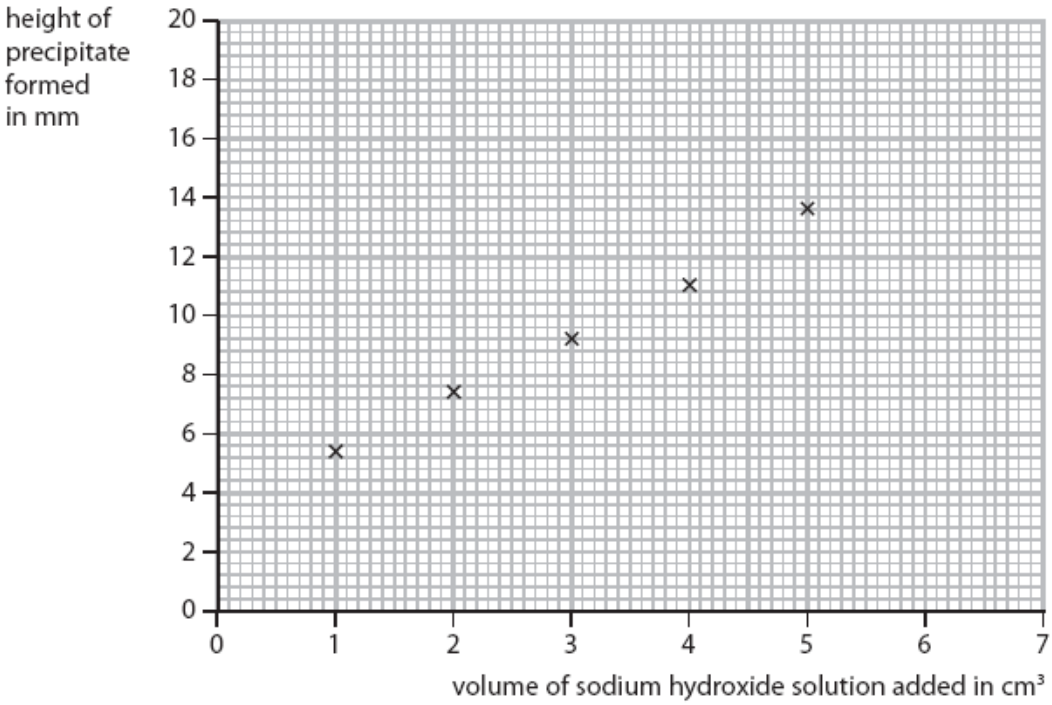


Figure 2

(i) Draw the line of best fit to complete the graph.

(1)

(ii) Predict the height of precipitate that would be formed if 6 cm^3 of sodium hydroxide solution was added to 10 cm^3 of copper sulfate solution.

This mixture would contain excess copper sulfate solution.

(2)

..... mm

(Total for question = 3 marks)

Q41.

10 cm^3 samples of copper sulfate solution were placed in five test tubes. Different volumes of sodium hydroxide solution were added to these test tubes. The volumes of sodium hydroxide solution added were 1 cm^3, 2 cm^3, 3 cm^3, 4 cm^3 and 5 cm^3.

In each test tube a precipitate of copper hydroxide was formed. The precipitate was allowed to settle and the height of the precipitate was measured with a ruler as shown in Figure 7.

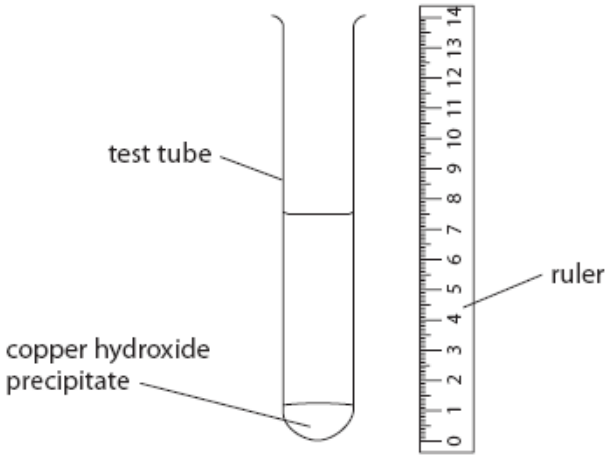


Figure 7

The results are shown in Figure 8.

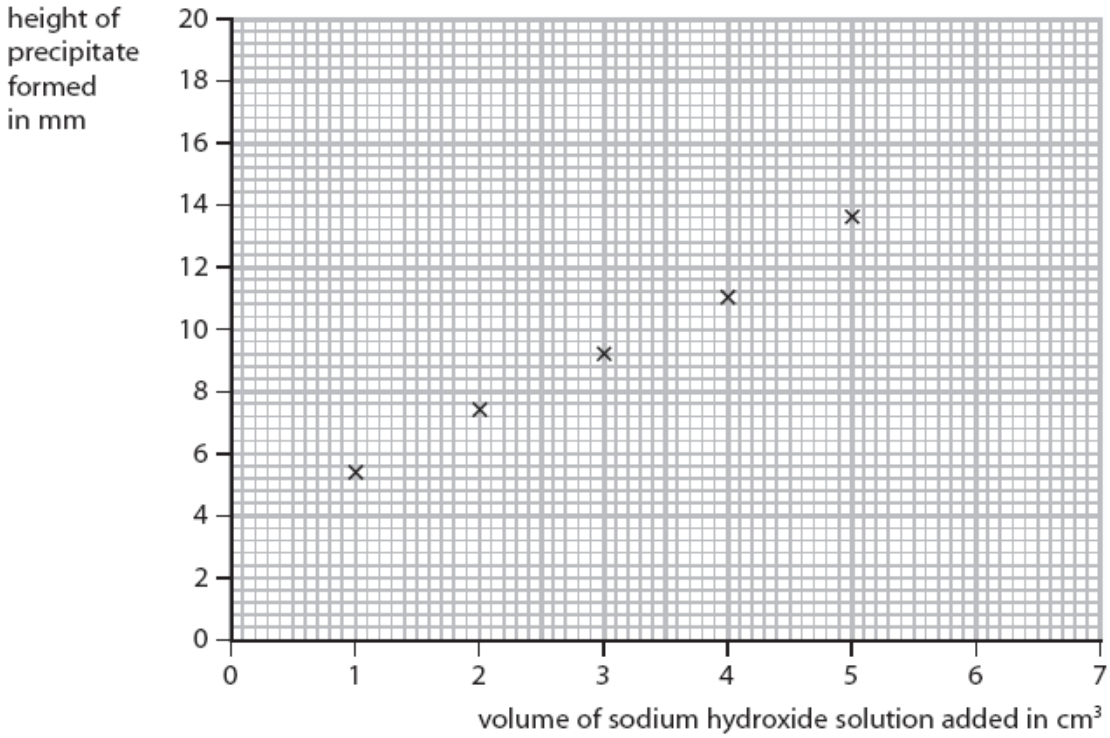


Figure 8

(i) Draw the line of best fit to complete the graph.

(1)

(ii) Predict the height of precipitate that would be formed if 6 cm^3 of sodium hydroxide solution was added to 10 cm^3 of copper sulfate solution.

This mixture would contain excess copper sulfate solution.

(2)

..... mm

(Total for question = 3 marks)

Q42.

Waste water may contain phosphate ions, PO_4^{3-} .

Aluminium ions react with phosphate ions to form aluminium phosphate.

Complete the ionic equation for the formation of aluminium phosphate in this reaction.

(2)

..... + PO_4^{3-} → .....

(Total for question = 2 marks)

Q43.

Compounds

(a) (i) Balance the equation for the reaction between sodium and chlorine to produce sodium chloride by putting numbers in the spaces provided.

(2)

..... Na + Cl_2 → ..... NaCl

(ii) In an experiment to make sodium chloride, the yield is 2.5 g.
The theoretical yield of sodium chloride for this experiment is 4.0 g.

Calculate the percentage yield of sodium chloride in this experiment.

(2)

.....

.....

.....

percentage yield = ... %

(iii) Sodium chloride has a high melting point.
Sodium chloride does not conduct electricity when solid but does conduct electricity when molten.

Complete the sentence by putting a cross (☒) in the box next to your answer.

These properties show that the structure of sodium chloride is

(1)

☒ **A** ionic

☒ **B** giant molecular, covalent

☒ **C** simple molecular, covalent

☒ **D** metallic

(iv) Calculate the relative formula mass of sodium chloride, NaCl. (relative atomic masses: Na = 23, Cl = 35.5)

(1)

.....

relative formula mass = ...

(b) Calculate the percentage by mass of magnesium in magnesium sulfate, $MgSO_4$.

(relative atomic masses: O = 16, Mg = 24, S = 32

relative formula mass: $MgSO_4$ = 120)

(2)

.....

.....

.....

percentage of magnesium = ... %

(c) The formula of a molecule of ethane is C_2H_6.

(i) Give the empirical formula of ethane.

(1)

.....

(ii) Ethane is a simple molecular, covalent compound.

Ethane has a low boiling point.

Explain, in terms of particles it contains, why ethane has a low boiling point.

(2)

.....

.....

.....

.....

(Total for question = 11 marks)

Q44.

Compounds

(a) (i) Balance the equation for the reaction between sodium and chlorine to produce sodium chloride by putting numbers in the spaces provided.

(2)

..... $Na + Cl_2 \rightarrow$ ..... $NaCl$

(ii) In an experiment to make sodium chloride, the yield is 2.5 g.
The theoretical yield of sodium chloride for this experiment is 4.0 g.

Calculate the percentage yield of sodium chloride in this experiment.

(2)

.....

.....

.....

percentage yield = ... %

(iii) Sodium chloride has a high melting point.
Sodium chloride does not conduct electricity when solid but does conduct electricity when molten.

Complete the sentence by putting a cross (☒) in the box next to your answer.

These properties show that the structure of sodium chloride is

(1)

☒ **A** ionic

☒ **B** giant molecular, covalent

☒ **C** simple molecular, covalent

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(iv) Calculate the relative formula mass of sodium chloride, NaCl. (relative atomic masses: Na = 23, Cl = 35.5)

(1)

.....

relative formula mass = ...

(b) Calculate the percentage by mass of magnesium in magnesium sulfate, $MgSO_4$.

(relative atomic masses: O = 16, Mg = 24, S = 32

relative formula mass: $MgSO_4$ = 120)

(2)

.....

.....

.....

percentage of magnesium = ... %

(c) The formula of a molecule of ethane is C_2H_6.

(i) Give the empirical formula of ethane.

(1)

.....

(ii) Ethane is a simple molecular, covalent compound.

Ethane has a low boiling point.

Explain, in terms of particles it contains, why ethane has a low boiling point.

(2)

.....

.....

.....

.....

(Total for question = 11 marks)

Q45.

A nickel sulfate solution is made by dissolving 23.5 g of nickel sulfate to make 250 cm^3 of solution.

Calculate the concentration of the solution in g dm^{-3}.

(2)

.....

.....

.....

.....

.....

concentration = ... g dm^{-3}

(Total for question = 2 marks)

Q46.

A nickel sulfate solution is made by dissolving 23.5 g of nickel sulfate to make 250 cm^3 of solution.

Calculate the concentration of the solution in g dm^{-3}.

(2)

.....

.....

.....

.....

.....

concentration = ... g dm^{-3}

(Total for question = 2 marks)

Q47.

* Figure 6 shows some properties of three substances, **A**, **B** and **C**.

substance	melting point in °C	ability to conduct electricity	
		solid	molten
A	1180	poor	good
B	1538	good	good
C	115	poor	poor

Figure 6

Deduce, using the information in Figure 6, the structure and bonding of substances **A**, **B** and **C**, explaining their properties in terms of their structure and bonding.

(6)

(Total for question = 6 marks)

Q48.

In an experiment to determine the empirical formula of magnesium oxide, the mass of oxygen combined with a known mass of magnesium must be found.

Describe an experiment to determine the mass of oxygen that combines with a known mass of magnesium, in a crucible and lid of known mass.

(3)

.....

.....

.....

.....

.....

.....

.....

(Total for question = 3 marks)

Q49.

In 1871, the Russian chemist Dmitri Mendeleev produced the first version of the periodic table.

Describe how Mendeleev arranged the elements in this first version of the periodic table and why the elements are arranged differently in the modern periodic table.

(3)

.....

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.....

(Total for question = 3 marks)

Q50.

Chlorine, bromine and iodine are elements in group 7 of the periodic table.

Figure 9 shows how the conductivity of one solution changes as its concentration increases.

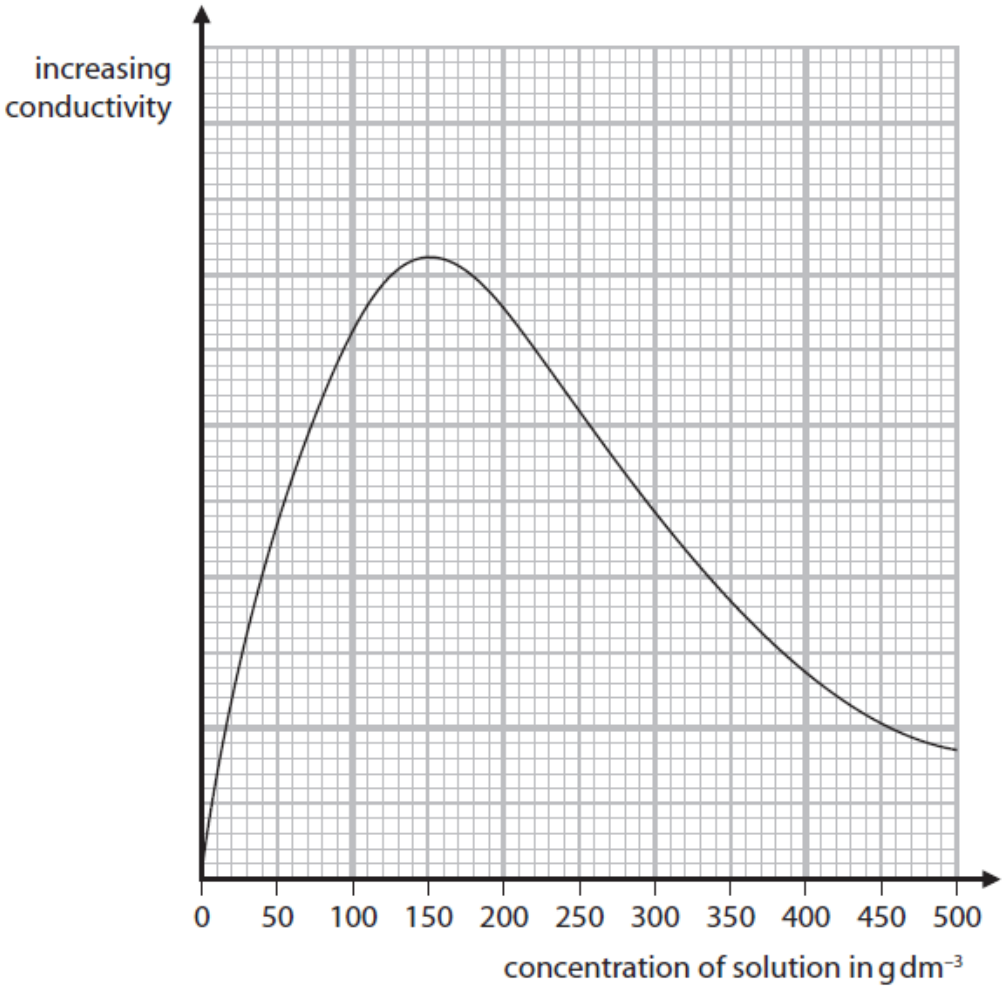


Figure 9

Describe how the conductivity of this solution changes as its concentration increases from 0 to 500 g dm^{-3}.

(2)

.....

.....

.....

.....

(Total for question = 2 marks)

Q51.

The atomic number of magnesium is 12.
Magnesium exists as three isotopes: magnesium-24, magnesium-25 and magnesium-26.

Describe, by referring to the numbers of subatomic particles, the differences between one atom of each of these isotopes.

(2)

.....

.....

.....

(Total for question = 2 marks)