

1. The element bromine exists as a mixture of two isotopes.
 a) i) Complete the table to show the number of protons and neutrons in the nuclei of the two isotopes of bromine.

Examination technique - Points to look for;
 The examiner has chosen isotopes for a reason.
 Use your knowledge of isotopes to answer the Qu.

Answer -	35 protons (twice);	Isotopes have the same no of protons	1
	44 neutrons;		1
	46 neutrons;	Isotopes differ only in their number of neutrons	1

- ii) The relative atomic mass of bromine is 80.
 Deduce the percentage abundance of the two isotopes in bromine.

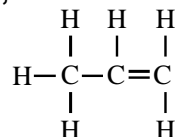
Examination technique - Points to look for;
Deduce is the command word for – The answer must be worked out based on the data supplied in the question.
 The answer is only worth [1] so it must be fairly simple to deduce.

Answer –	each isotope 50%	(RAM 80 is half way between 81 and 79 the RAM's of the isotopes).	1
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- b) Bromine water is used as a test to distinguish alkenes from alkanes.
 i) Give the name and structure, showing all covalent bonds, of the alkene containing three carbon atoms.

Examination technique - Points to look for;
 Read the Qu carefully. Name, structure showing all bonds, alkene, three carbon atoms.

Answer – propene;



[Allow 3 carbon atoms with 1 double bond for 1 mark] **3**

- ii) State the colour change when bromine water is shaken with an alkene.

Answer –	Initial colour	orange/yellow/brown;	
	Final colour	to colourless;	
		[Reject clear]	2

- iii) Predict what you would **see** if bromine water were added to a sample of poly(ethene).
 Explain your answer in terms of the bonding in poly(ethene).

Examination technique - Points to look for;
Explain is the command word for including some scientific basis for your answer.

Answer –	Prediction	-	no colour change;	[Reject no reaction]	
	Explanation	-	poly(ethene) has no double bonds / is saturated;		2

(Total 11 marks)

- 2 a) i) explain why lithium is malleable.

Examination technique - Points to look for;
Explain is the command word for including some scientific basis for your answer.

Answer –	Layers or similar (of ions/ atoms), atoms or ions can slide or move / ions can move in sea of electrons;	
	[Reject any answer involving molecules or covalent bonding]	1

- ii) explain how lithium conducts an electric current.

Examination technique - Points to look for;
Explain is the command word for including some scientific basis for your answer.

Answer –	sea/ delocalised/ free electrons can move;	
	[Reject spare electrons or ion movement / covalent bonding]	1

b) The carbon atoms in graphite are joined by covalent bonds.

i) Describe how a covalent bond is formed between two carbon atoms.

Examination technique - Points to look for;

For [3] marks you must give an answer worthy of three marks.

Answer – 1. Electrostatic attraction between the protons in the nuclei of the bonding atoms
2. and a shared pair of electrons; 2

ii) Describe the structure of graphite and explain how it is able to conduct an electric current.

Examination technique - Points to look for;

For [3] marks you must give an answer worthy of three marks.

Answer – 1. layers/ sheets/ plates (of carbon atoms);
2. arranged in hexagons/ each carbon forms 3 bonds;
3. delocalised electrons/ sea of electrons / free electrons or electrons can move;
[Marks could be scored from diagram] 3

iii) Explain why diamond and graphite have extremely high sublimation temperatures.

Examination technique - Points to look for;

For [3] marks you must give an answer worthy of three marks.

Explain is the command word for including some scientific basis for your answer.

Answer – Giant structures / lots of strong bonds. 1
Covalently bonded. 1
Lots of energy needed to break the bonds. 1

(Total 10 marks)

3. a) Calcium oxide is held together by ionic bonds.

Draw a dot and cross diagram to show the bonding in calcium oxide.

You need only show the outer electrons.

Examination technique

When drawing IONIC dot and cross diagrams make sure that;

You draw separate ions that have full outer shells.

You include the charges on the ions that form.

Answer - Diagram shows 8 electrons in outer shell of Ca 1
Diagram shows 8 electrons in outer shell of O (Two from Ca) 1
Separate ions drawn with correct 2+ and 2- charges 1

b) Water is held together by covalent bonds.

Draw a dot and cross diagram to show the bonding in water.

You need only show the outer electrons.

Examination technique

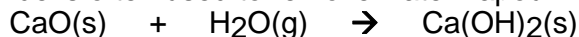
When drawing COVALENT dot and cross diagrams make sure that;

You clearly show shared pairs of electrons.

The atoms have full outer shells of electrons.

Answer - Diagram shows 8 electrons in outer shell of Oxygen 1
Diagram showing two hydrogen atoms. 1
Diagram showing two covalent bonds / two shared pairs of electrons. 1

c) In industry calcium oxide is often used to remove water vapour from gas mixtures.



i) Calculate the relative formula masses of calcium oxide and water.

(Relative atomic masses: H = 1.0; O = 16; Ca = 40)

Examination technique - Points to look for;

Calculate is the command word for - Use the numbers given. Show your working.

Answer - calcium oxide $\text{CaO} = 40 + 16 = 56$ 1
water $\text{H}_2\text{O} = (2 \times 1) + 16$ 1

- ii) Use your answers to part (i) to calculate the minimum mass of water vapour needed to react with 100g of calcium oxide.

Examination technique - Points to look for;

Calculate is the command word for - Use the numbers given. Show your working.

Do as the examiner asks and use your answer from part i)

If you struggle with moles just convert a mass into moles – you will at least get one mark.

Answer - Moles of calcium oxide = mass / RFM = 100 / 56 = 1.786 moles 1
 Moles of water needed = same number of moles (1:1 ratio) = 1.786 moles 1
 Mass of water needed = moles x RFM = 1.786 x 18 = 32.1 g 1

Carbon dioxide vapour can also be removed from gas mixtures by passing them over calcium oxide. The carbon dioxide forms calcium carbonate.

- d) Write the balanced equation for the reaction between calcium oxide and carbon dioxide.

Examination technique - Points to look for;

Read the question carefully – it tells you the equation in words.

Answer - $\text{CaO} + \text{CO}_2 \rightarrow \text{CaCO}_3$ Formulae 1 mark
 Balancing 1 mark

(Total 13 marks)

- 4 a) What is meant by a 'hydrocarbon'?

Answer - Compound of hydrogen and carbon (only) 1

- b) What is meant by 'cracking'?

Answer - Large molecules broken down to smaller ones. 1
 Using heat or catalyst. 1

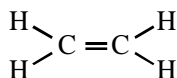
Poly(ethene) can be made from ethane, a common product from cracking.

- c) i) Draw the structure of a molecule of ethene, showing all bonds.

Examination technique - Points to look for;

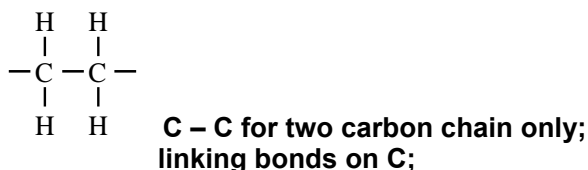
Read the question carefully – draw the structure of ethene.

Answer - One C=C double bond 1
 four H's bonded 1



- ii) Draw the repeating unit of a poly(ethene) molecule, showing all bonds.

Answer -



- iv) Explain how molecules of ethene combine to form a poly(ethene) molecule.

Examination technique - Points to look for;

For [2] marks you must give an answer worthy of two marks.

Explain is the command word for including some scientific basis for your answer.

Answer - An explanation to include:

1. double bonds break open;
 2. monomers link;
- 2

(Total 9 marks)

5. a) An alkali metal (**X**) reacts violently with water. A gas (**Y**) and a solution (**Z**) are formed during this reaction. A lilac-coloured flame is seen.

i) Name the substances **X**, **Y** and **Z**.

Answer -	alkali metal X	- rubidium/potassium;	1
	gas Y	- hydrogen;	1
	solution Z	- potassium/X hydroxide;	1

ii) State what you SEE when Universal indicator is added to solution **Z**.
Give a reason for your answer.

Examination technique

State is the command word for recall and write a fact.

You are asked for a reason.

Answer -	turns purple/blue;	1
	Z is alkali/alkaline/pH > 7/basic;	1

b) Find lithium (atomic number 3) in the periodic table.

i) Name a non-metal **in the same period** as lithium.

Examination technique

Do as the examiner asks and use the periodic table.

Answer -	boron/carbon/nitrogen/oxygen/fluorine/neon;	1
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ii) Name another metal **in the same period** as lithium.

Examination technique

Do as the examiner asks and use the periodic table.

Read the question carefully – still in the same period!

Answer -	beryllium;	1
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(Total 7 marks)

6. Name the gas which

a) relights a glowing splint	Answer -	oxygen	1
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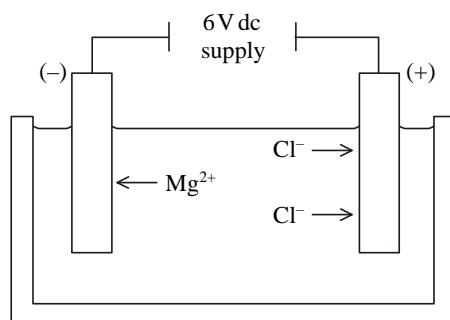
b) turns damp red litmus paper blue	Answer -	ammonia	1
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c) turns blue cobalt chloride pink	Answer -	water / steam	1
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d) gives a squeaky pop when ignited	Answer -	hydrogen	1
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(Total 4 marks)

7. Magnesium is extracted by the electrolysis of molten magnesium chloride. A simplified diagram of the electrolysis of molten magnesium chloride is shown.



- a) Write the balanced half-equation for the reaction at the negative electrode.

Examination technique

Look at the diagram – Mg^{2+} is the ion attracted to the negative electrode.

Answer - $Mg^{2+} + 2 e^{-} \rightarrow Mg$

2

Mg^{2+} and e on left, Mg on right
balancing correct species

1 mark

1 mark

- b) Why must solid magnesium chloride be melted for electrolysis to occur?

Answer - ions/particles free to move;

[Reject atoms/molecules free to move]

1

Aluminium is also extracted from its ore using molten electrolysis. Cryolite is added to the aluminium oxide before electrolysis takes place.

- c) i) What is the chemical formula of aluminium oxide?

Answer - Al_2O_3

1

- ii) Explain why Cryolite is added to the alumina before electrolysis takes place.

Examination technique - Points to look for;

For [2] marks you must give an answer worthy of two marks.

Explain is the command word for including some scientific basis for your answer.

Answer - Cryolite is a solvent / dissolves the aluminium oxide.

1

Mixture melts at a lower temperature

/ Less energy needed to melt aluminium oxide.

1

Oxide ions are discharged at the anode to form oxygen gas $2O^{2-}(g) \rightarrow O_2(g) + 4e^{-}$

- iii) Why is the reaction at the anode classified as oxidation?

Answer - Electrons are lost

1

- iv) Explain why the anodes have to be replaced on a regular basis.

Examination technique - Points to look for;

For [2] marks you must give an answer worthy of two marks.

Explain is the command word for including some scientific basis for your answer.

Answer - They corrode / react with oxygen gas

1

To form carbon dioxide gas

1

Balanced equation scores 2

- d) Explain why aluminium cannot be extracted from bauxite using carbon reduction.

Examination technique - Points to look for;

For [2] marks you must give an answer worthy of two marks.

Explain is the command word for including some scientific basis for your answer.

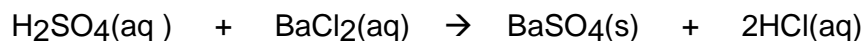
Answer - Aluminium is more reactive than Carbon

1

(Total 10 marks)

8. a) Dilute sulphuric acid and barium chloride solution react to form barium sulphate.

The equation for this reaction is



When an excess of barium chloride solution was added to 100 cm³ of dilute sulphuric acid, 2.80 g of barium sulphate was formed.

i) Calculate the number of moles of barium sulphate, BaSO₄, present in the 2.80 g.
Relative atomic masses: O = 16; S = 32; Ba = 137)

Examination technique - Points to look for;

Calculate is the command word for - Use the numbers given. Show your working.

If you struggle with moles just calculate the RFM of BaSO₄ – you will at least get one mark.

Answer - RFM BaSO₄ = 137 + 32 + (16 x 4) = 233 **1**
Moles = mas / RFM = 2.8 / 233 = 0.012 moles **1**

ii) Use your answer to part i) to find the number of moles of sulphuric acid, H₂SO₄, present in 100 cm³ of the acid.

Examination technique - Points to look for;

Do as asked and use the answer from part i)

Answer - moles H₂SO₄ = 0.012 (1:1 ratio) **1**

iii) Calculate the concentration of dilute sulphuric acid (H₂SO₄) in mol dm⁻³.

Examination technique - Points to look for;

Calculate is the command word for - Use the numbers given. Show your working.

Answer - conc H₂SO₄ = moles / volume in dm³
= 0.012 / 100/1000 = 0.12 mol dm⁻³ **2**

b) The concentration of the dilute sulphuric acid could also be found by titration.

The first step is to pipette 25.0 cm³ of sodium hydroxide solution of known concentration into a conical flask.

Describe how the titration is carried out.

Examination technique - Points to look for;

When asked to describe procedures it is best to answer in bullet points.

Answer -

- **add named indicator** e.g. Phenolphthalein **1**
- **and acid from burette** **1**
- **give indicator colour change** e.g. pink to colourless **1**

c) Suggest one advantage of the titration method over the method in part a) for finding the concentration of the sulphuric acid.

Examination technique - Points to look for;

When suggest is the command word, you are not expected to know the answer,

but to be able to work it out based on knowledge and understanding of material you have been taught.

Answer - Any one of;
more convenient / quicker result / more accurate result / accurate equipment used **1**
(Total 9 marks)

9. a) Describe **one** safety precaution which the students should take during this experiment.

Examination technique - Points to look for;

When you are asked for safety precautions it is often assumed that you will be wearing gloves. Lab coats are optional. You must therefore think about a precaution specific to the experiment in the question.

Answer - avoid contact with lead compounds / acid wear gloves 1

b) i) Which acid was added to lead nitrate solution to make lead sulphate?

Answer - C/sulphuric acid; 1

ii) Draw, and name, the piece of apparatus that should be used to measure 25 cm³ of the acid.

Answer - diagram of measuring cylinder / pipette / burette label; 2

c) Label the diagram below which shows the mixture being filtered to obtain solid lead sulphate.

Answer - top left: filter paper;
top right: lead sulphate/residue;
bottom left: filtrate/(nitric) acid;
bottom right: (filter) funnel; 1 each = 4
(Total 8 marks)

10 a) Tests on the solution of X

Examination technique - Points to look for;

Make sure you re-read questions with lots of information at the start. Each piece of information may be important later.

i) Name the gas given off when the solution of X was heated with sodium hydroxide solution.

Examination technique - Points to look for;

You are asked to name the gas. Name it in words if you are unsure of the chemical formula.

Answer - ammonia / NH₃; 1

ii) Name the cation present in X.

Answer - ammonium ion / NH₄⁺ 1

iii) Name the white precipitate formed when the acidified solution of X reacted with silver nitrate solution.

Answer - silver chloride / AgCl 1

iv) Name the anion present in X.

Answer - chloride ion / Cl⁻ [Reject chlorine (it is wrong!)] 1

b) i) Name the white precipitate.

Answer - barium sulphate / BaSO₄; 1

ii) Give the name of Y.

Answer - potassium sulphate 1 1 [Must be compound to score any marks]

iii) Describe how you would carry out a flame test on a solid.

Examination technique - Points to look for;

When asked to describe procedures it is best to answer in bullet points.

Answer - A description to include two from:

1. wire into (concentrated) hydrochloric acid / clean wire;

2. wire into solid;

3. hold wire in Bunsen / (blue) flame; [Reject burn]

2
(Total 8 marks)

The rest of the questions contain content that will NOT be in the January mock exam.