

**Mearns Castle High School**

**Chemistry Department**



**Intermediate 2**

**Easter Revision Exercise**

<b>Pupil Score</b>	<b>/100</b>
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## SECTION 1

This section contains 25 multiple choice questions and 2 grid questions.

- Which gas is an element?  
A Ammonia  
B Carbon dioxide  
 C Fluorine  
D Methane
- Which change is **not** an example of a chemical reaction?  
A Iron rusting  
 B Ice melting  
C Methane burning  
D Neutralising acid
- Vinegar can be made by dissolving ethanoic acid in water.  
Which term describes the water used in making the vinegar?  
A Solute  
B Saturated  
 C Solvent  
D Solution
- Many chemical processes involve catalysts.  
Identify the process in which the catalyst could be an enzyme.  
A Hydration of ethene  
B Hydrolysis of starch  
C Cracking of hydrocarbons  
 D Formation of alkenes from alkanes
- Which is the formula for magnesium sulphate?  
A MgS  
B MgSO<sub>3</sub>  
C MgSO<sub>4</sub>  
 D Mg(HSO<sub>4</sub>)<sub>2</sub>
- The element boron contains two types of atoms, of mass numbers 10 and 11.  
This tells us that  
 A the relative atomic mass of boron will be between 10 and 11  
B the relative atomic mass of boron will be less than 10  
C the boron atom of mass number 10 will be more reactive than that of mass number 11  
D the boron atom of mass number 11 will have more electrons in the atom than that of mass number 10.
- In which compound do **both** ions have the same electron arrangement as argon?  
A Magnesium oxide  
 B Sodium sulphide  
C Calcium bromide  
D Calcium sulphide
- Copper is a good conductor of electricity because  
A the atoms are free to vibrate  
B the atoms are in close contact  
C the atoms have the electron arrangement 2, 8, 18, 1  
 D electrons can move readily from one atom to the next.

9. An atom is neutral because

- A the number of electrons equals the sum of the numbers of protons and neutrons
- B the number of neutrons equals the sum of the numbers of electrons and protons
- C the number of protons equals the number of neutrons
- D the number of electrons equals the number of protons.

10. Which molecule has the smallest gram formula mass?

- A Methane
- B Nitrogen
- C Carbon monoxide
- D Carbon dioxide

11. When methane burns in a plentiful supply of air, the products are

- A carbon monoxide and water vapour
- B carbon and water vapour
- C carbon dioxide and hydrogen
- D carbon dioxide and water vapour.

12. Glycerol can be obtained from a fat by

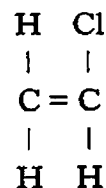
- A hydrolysis
- B electrolysis
- C condensation
- D esterification.

13.  $C_6H_{12}O_6$                    $C_{12}H_{22}O_{11}$

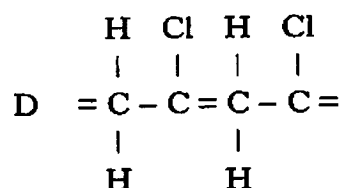
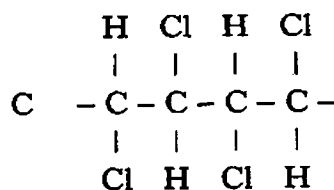
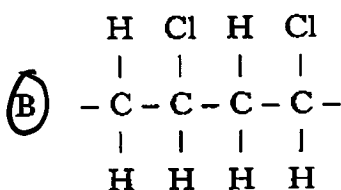
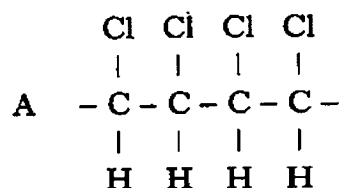
The above formulae represent two different

- A isomers
- B hydrocarbons
- C alkanols
- D carbohydrates.

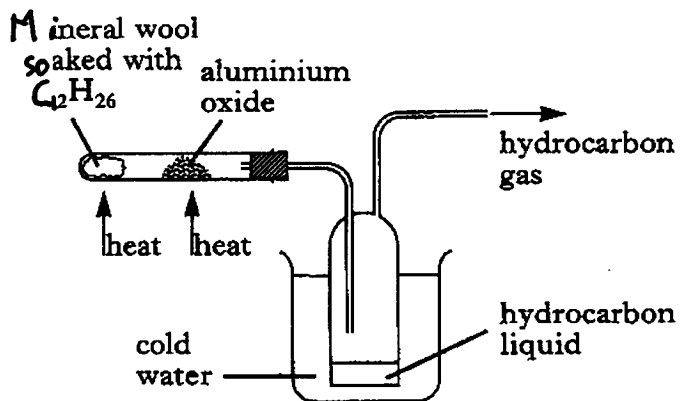
14. The structural formula for the monomer used to make PVC is



Which of the following is part of the PVC chain?



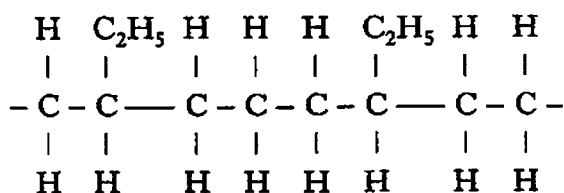
15.



Which of the following best represents the composition of the hydrocarbon liquid which is produced by cracking  $C_{12}H_{26}$ ?

- A A mixture of hydrocarbons from  $C_1$  to  $C_4$
- B A mixture of hydrocarbons from  $C_5$  to  $C_{11}$
- C A mixture of hydrocarbons from  $C_{13}$  to  $C_{24}$
- D  $C_6H_{14}$

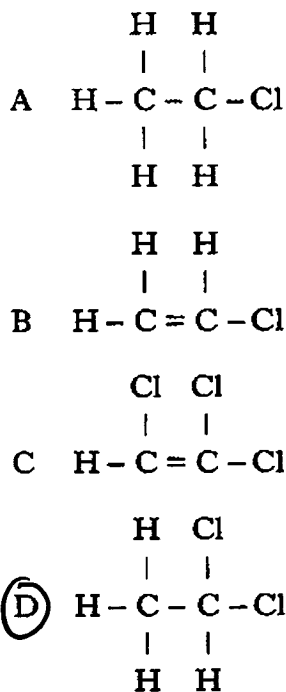
16. Part of a polymer is shown.



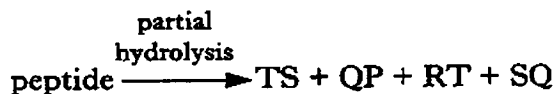
Which pair of alkenes was used as monomers?

- A Ethene and propene
- B Ethene and but-1-ene
- C Propene and but-1-ene
- D Ethene and but-2-ene

17. Which compound has an isomer?



18. On complete hydrolysis, a peptide produced 5 amino acids represented by the letters P, Q, R, S and T. The following fragments were produced on partial hydrolysis:



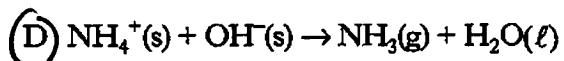
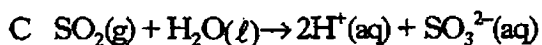
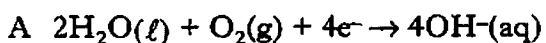
Which sequence could be the correct arrangement of amino acids in the peptide?

- A P-T-S-Q-R
- B R-T-S-P-Q
- C Q-P-T-S-R
- D R-T-S-Q-P

19. Which substance dissolves in water to give a solution with a pH greater than 7?

- A Sulphur dioxide
- B Ammonia
- C Sodium chloride
- D Hydrogen chloride

20. Reactions can be represented using ionic equations. Which ionic equation shows a neutralisation reaction?



21. Which of the following pairs of solutions, when mixed, produce a precipitate?

A Copper(II) sulphate and sodium nitrate

**(B)** Barium chloride and sodium sulphate

C Calcium hydroxide and potassium chloride

D Sodium sulphate and dilute nitric acid

22. Excess of zinc oxide, zinc carbonate and zinc hydroxide all react with dilute hydrochloric acid. Which of the following does **not** occur in all three reactions?

A Water is formed.

B Zinc chloride solution is formed.

**(C)** A gas is evolved.

D The acid is neutralised.

23. Which metal reacts with hydrochloric acid to give hydrogen gas?

A Copper

B Gold

C Silver

**(D)** Zinc

24. Which metal can only be obtained by electrolysis of its molten ore?

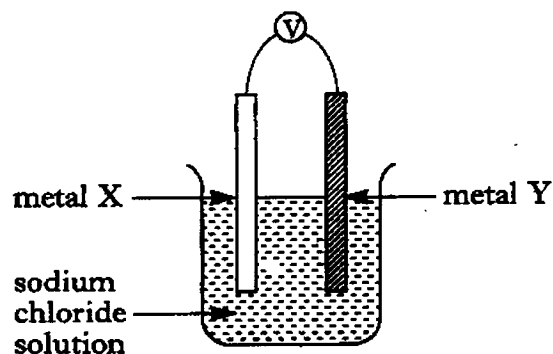
A Copper

**(B)** Iron

C Sodium

D Tin

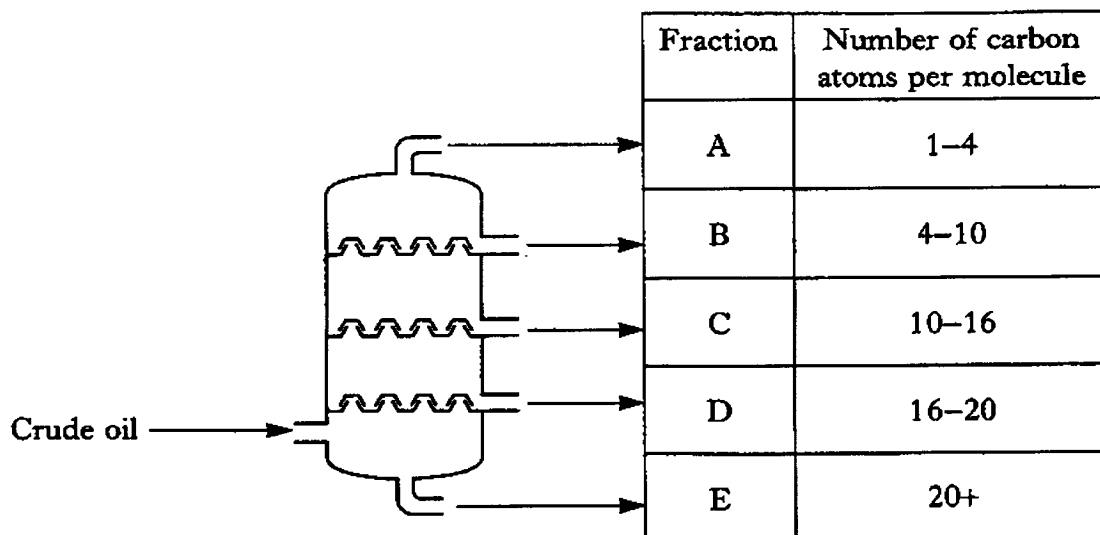
25. The apparatus below was set up.



Which of the following pairs of metals would give the highest reading on the voltmeter?

	Metal X	Metal Y
A	Iron	Zinc
<b>(B)</b>	Magnesium	Silver
C	Zinc	Copper
D	Zinc	Silver

26. Distillation of crude oil produces several fractions.



(a) Identify the fraction which is used as a fuel for jet aircraft.

- A
- B
- C**
- D
- E

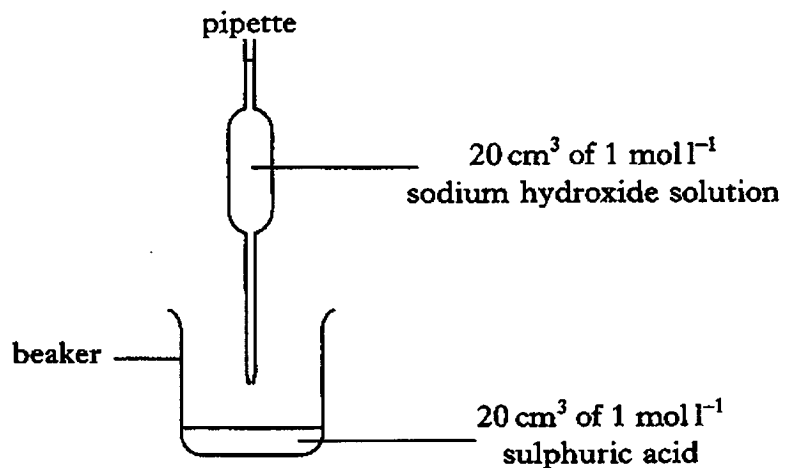
(b) Identify the fraction with the lowest boiling point.

- A**
- B
- C
- D
- E

(c) Which fraction contains pentane?

- A
- B**
- C
- D
- E

27. Ann added  $20\text{ cm}^3$  of  $1\text{ mol l}^{-1}$  sodium hydroxide solution to  $20\text{ cm}^3$  of  $1\text{ mol l}^{-1}$  sulphuric acid.



Identify the statement(s) which can be applied to this experiment.

<input checked="" type="radio"/> A	The number of $\text{H}^+(\text{aq})$ ions in the beaker decreased.
<input type="radio"/> B	The pH of the solution decreased.
<input type="radio"/> C	The number of $\text{SO}_4^{2-}(\text{aq})$ ions in the beaker decreased.
<input checked="" type="radio"/> D	Water molecules formed during the reaction.
<input type="radio"/> E	A precipitate formed during the reaction.
<input type="radio"/> F	The final solution contained equal numbers of $\text{H}^+(\text{aq})$ and $\text{OH}^-(\text{aq})$ ions.

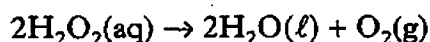
A
B
C
D
E
F

SECTION 2

50 marks are available in this section of the paper

28. Hydrogen peroxide can be used to clean contact lenses. In this process, the enzyme catalase is added to break down hydrogen peroxide.

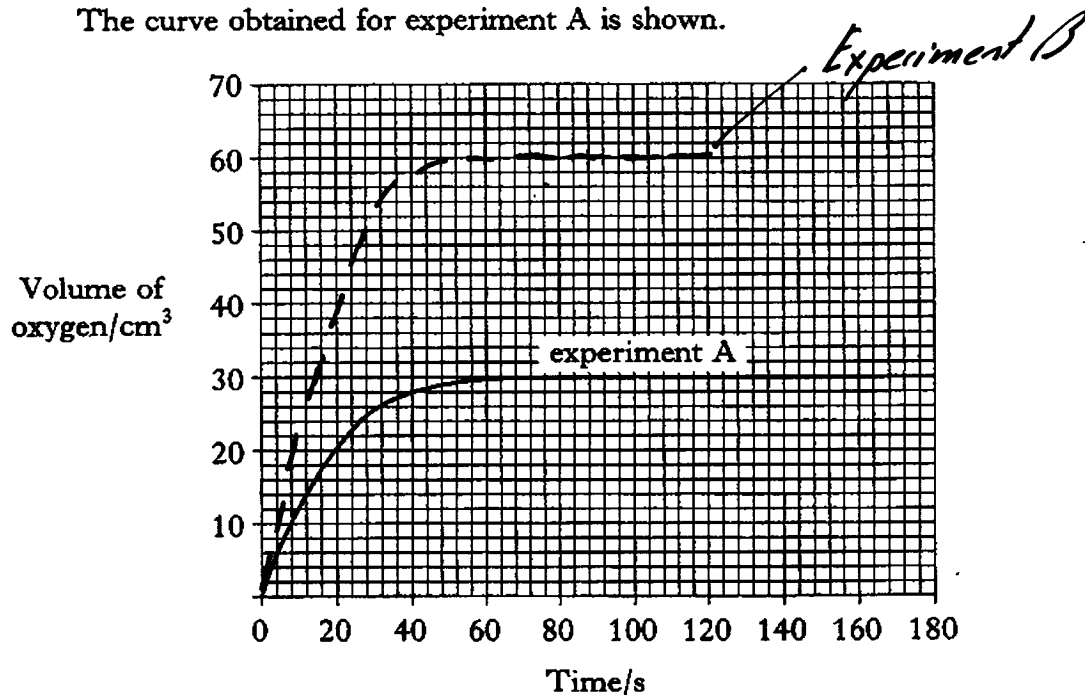
The equation for the reaction is:



The rate at which oxygen gas was given off was measured in two laboratory experiments. The same volume of hydrogen peroxide at the same temperature was used in each experiment.

Experiment	Concentration of $\text{H}_2\text{O}_2$ /moles per litre	Catalyst used
A	0.2	yes
B	0.4	yes

The curve obtained for experiment A is shown.



- (a) Calculate the average rate of the reaction in  $\text{cm}^3$  per second ( $\text{cm}^3\text{s}^{-1}$ ) over the first 40 s.

$0.7\text{cm}^3\text{s}^{-1}$



Question 28 (continued)

Marks

- (b) Add a curve to the graph to show the result of experiment B.  
 (c) State another way in which the rate of the reaction could be increased.

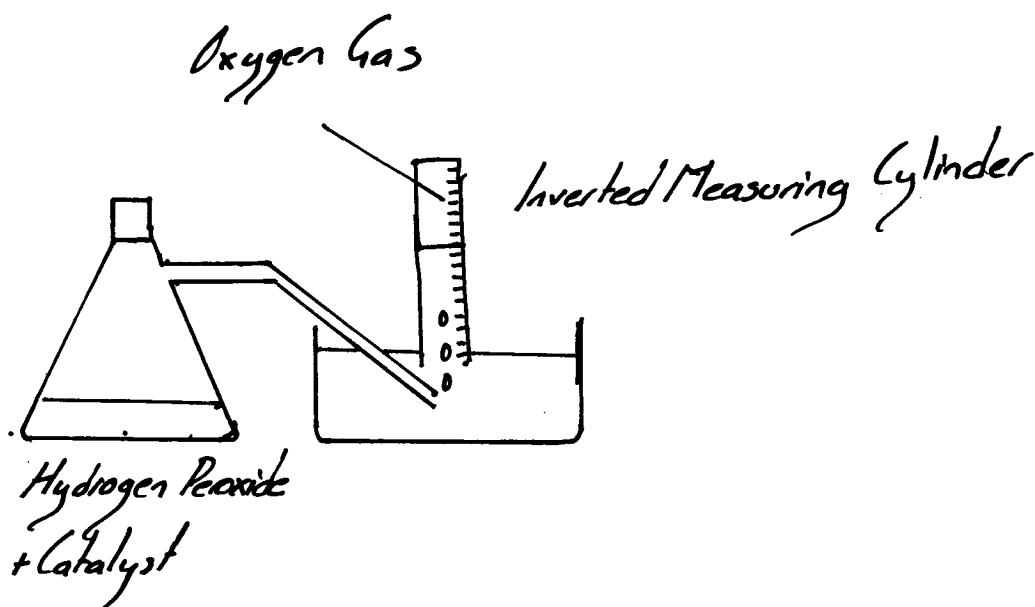
*Increasing the temperature*

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- (d) Draw a labelled diagram of the apparatus which you could use to carry out this experiment.



2  
(5)

29. There are two different types of lithium atom,  ${}^6_3\text{Li}$  and  ${}^7_3\text{Li}$ .

Marks

(a) What name is used to describe the different types of lithium atom?

Isomers

1

(b) Complete the table to show the numbers of protons, neutrons and electrons in an atom of  ${}^7_3\text{Li}$ .

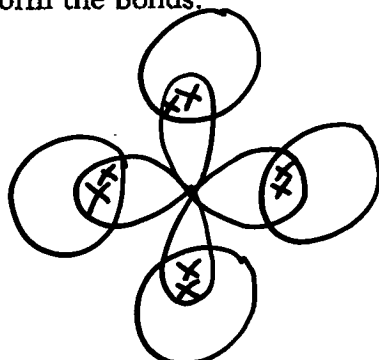
Particle	Number
protons	3
neutrons	4
electrons	3

1

(2)

30. Silicon forms compounds with chlorine and with oxygen.

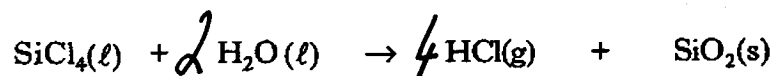
- (a) (i) The formula for a molecule of silicon chloride is  $\text{SiCl}_4$ .  
Show how the outer electrons of the silicon and chlorine atoms are shared to form the bonds.



- (ii) What name is given to this shape of molecule?

Tetrahedral

- (b) Silicon chloride reacts with water as shown in the equation



Balance this equation.

- (c) Why does silicon oxide have a high melting point?

It is an ionic lattice

1

1

1

1

(4)

31. This first step in the industrial extraction of aluminium is to obtain aluminium oxide from the ore called bauxite.

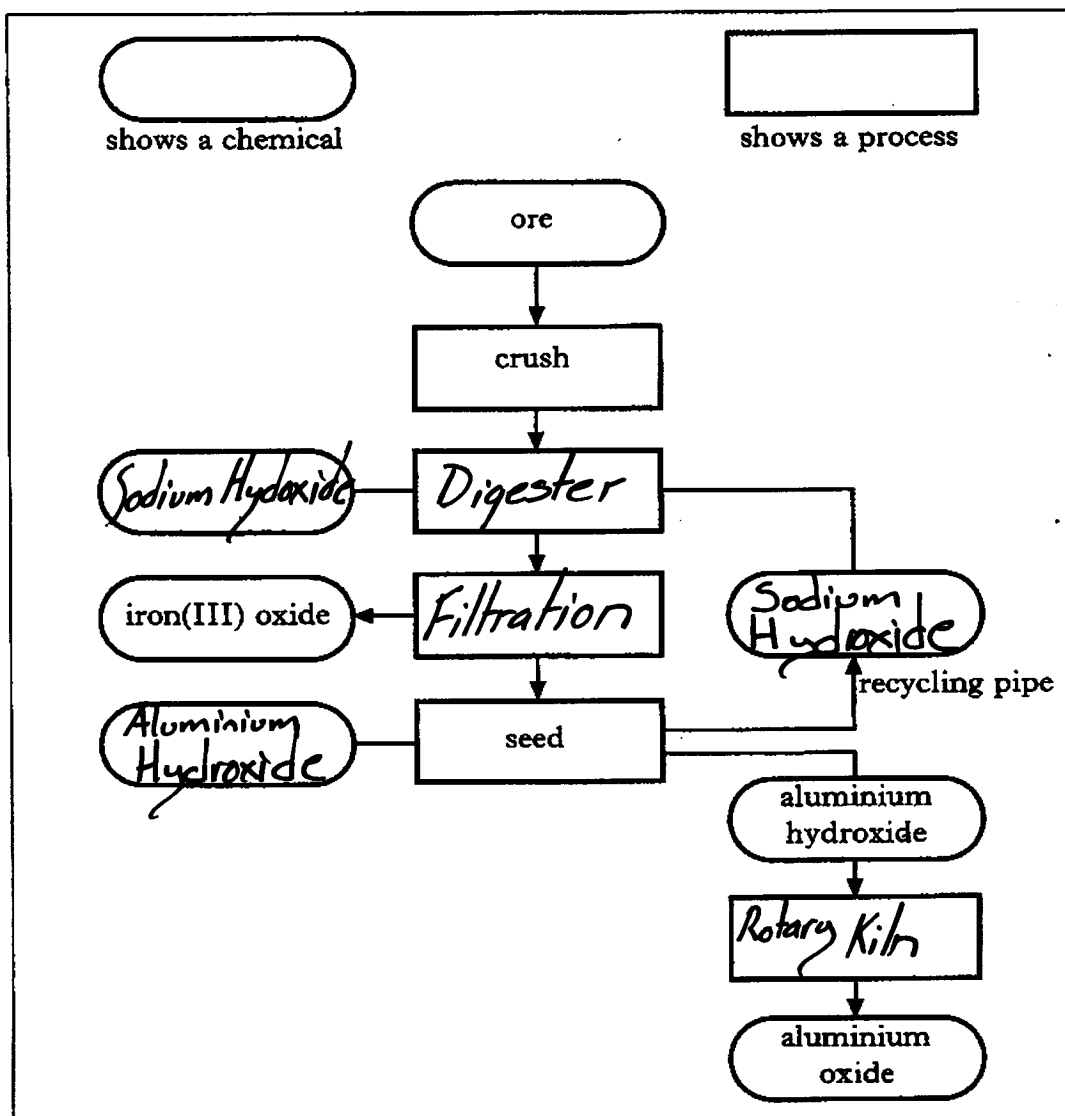
Marks

The ore is crushed. It is then digested, under pressure, with sodium hydroxide solution. The resulting mixture is filtered and the residue (containing large amounts of iron(III) oxide) is removed.

The filtrate is seeded with a little aluminium hydroxide in order to produce large amounts of aluminium hydroxide. Sodium hydroxide solution is also formed.

The aluminium hydroxide passes to a rotary kiln where it is roasted to form pure aluminium oxide.

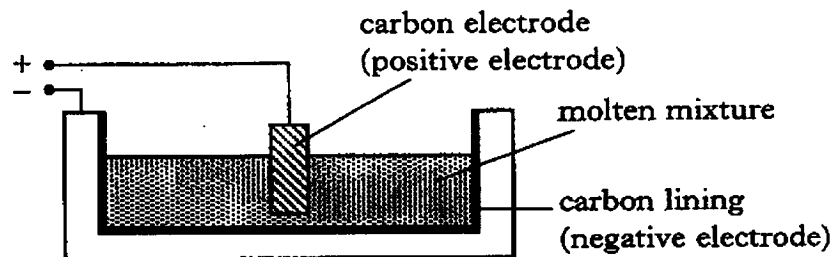
(a) Complete the following flow chart, in order to summarise the production of aluminium oxide.



2

## Question 31 (continued)

- (b) Electricity is then used to obtain aluminium from a molten mixture containing the aluminium oxide.



- (i) Why does the mixture need to be kept molten?

*So the electrons can move*

1

- (ii) Why is aluminium formed at the negative electrode?

*Aluminium ions have a positive charge and are attracted to the negative electrode*

1

- (iii) Aluminium oxide has a gram formula mass of 102 g.

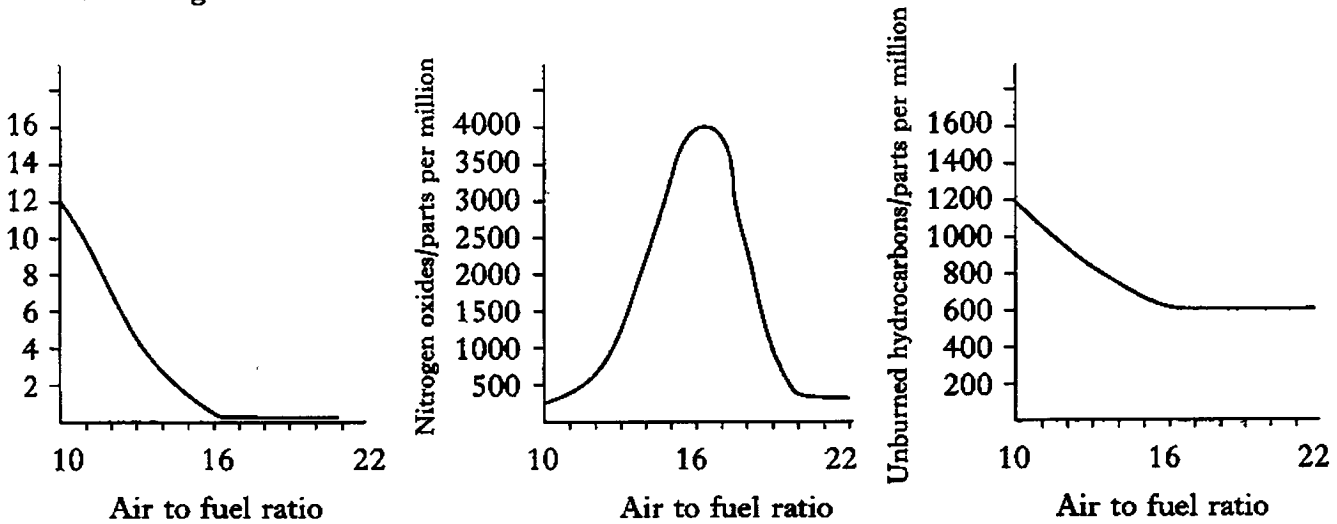
What term is used to describe the gram formula mass of a substance?

*Relative Atomic Mass*

1

(5)

32. The following graphs show how the concentrations of some gases in car exhaust fumes vary with the air to fuel ratio of the mixture which is burned in the engine.



Candidate must not write in this margin

(a) Suggest why the carbon monoxide concentration approaches zero as the air to fuel ratio increases.

*More oxygen helps ensure of complete combustion.*

Marks

1

(b) Many car engines use an air to fuel ratio of 13. Which of the gases has the highest concentration in car exhaust fumes using this air to fuel ratio?

*Unburned Hydrocarbons*

1

(c) Use the information from the graphs to give the advantage of increasing the air to fuel ratio from 18 to 20.

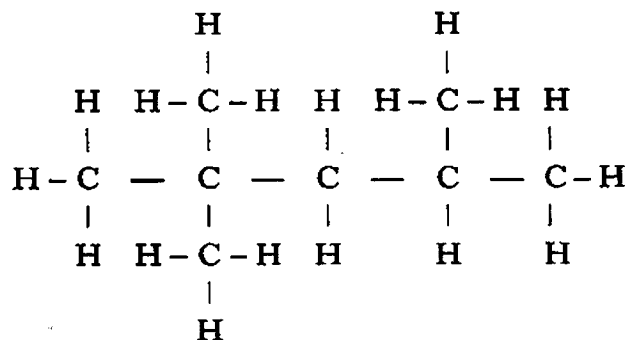
*It reduces the nitrogen oxide concentration.*

1

## Question 32 (continued)

Marks

- (d) In petrol-engined cars, one of the hydrocarbons found in the fuels has the structural formula shown.



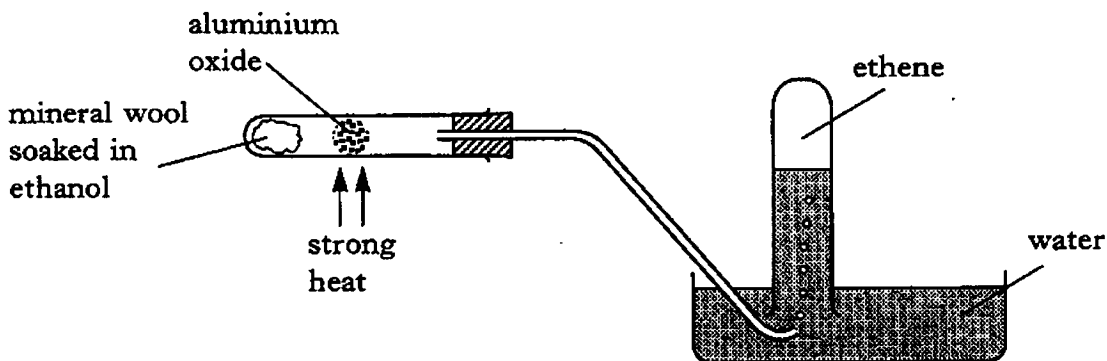
State the systematic name for this hydrocarbon.

2,4,4-trimethylpentane

1  
(4)

33. The diagram below shows how ethene can be prepared in the laboratory.

Marks

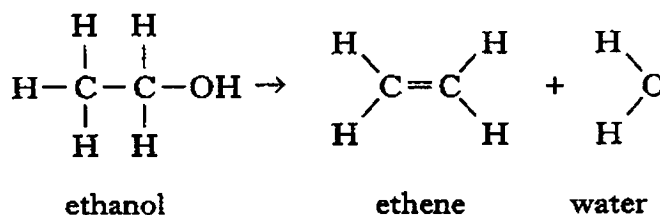


- (a) Explain why it is necessary to remove the delivery tube from the water before heating is stopped.

*To prevent suck back*

1

- (b) The equation for the reaction is



What is the maximum mass of ethene which can be produced from 4.6 g of ethanol?

(Show your working clearly.)

2

*1 mole ethanol gives 1 mole ethene  
46g ethanol gives 28g ethene  
4.6g ethanol gives 2.8g*



Question 33 (continued)

Marks

- (c) (i) In industry, ethene is used to make a plastic.  
Name this plastic.

Polyethene

1

- (ii) Many plastics are not biodegradable.  
What does this mean?

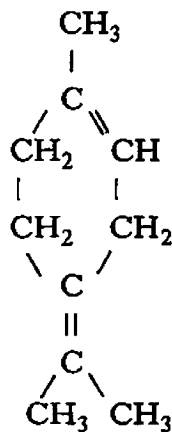
They will not rot or break up naturally

1

(5)

34. Terpenes are important in the perfume industry. One example is called terpinolene, an unsaturated hydrocarbon with the molecular formula  $C_{10}H_{16}$ .

The structural formula is shown.



Marks

- (a) What is meant by an unsaturated hydrocarbon?

Contains a carbon to carbon  
double bond.

1

- (b) Experimentally, you can show that terpinolene is unsaturated by testing it with bromine water.

What safety precaution should be taken while carrying out this reaction?

Use bromine in the fume  
cupboard

1

(2)

Marks

35. The label shows the ingredients found in a plum jam.

<p style="text-align: center;"><b>PLUM JAM</b></p> <p style="text-align: center;">plums—flavour glucose and sucrose—sweeteners citric acid—fruit acid sodium citrate—acidity regulator water—solvent</p>
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(a) Describe a chemical test which could be used to distinguish between glucose and sucrose.

Add benedict's reagent to both

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2

(b) Citric acid is a weak acid.  
What is meant by a weak acid?

one that only partially ionises in solution

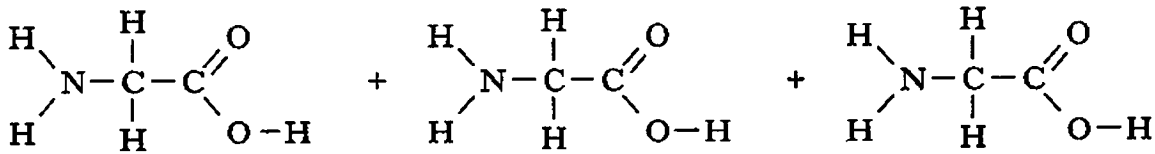
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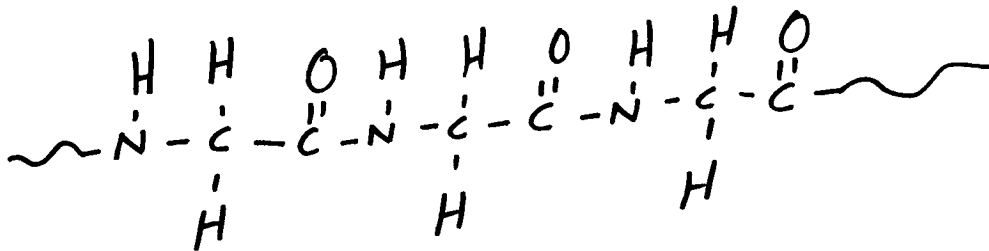
(3)

36. Proteins are polymers formed when amino acids react. Glycine is an Marks  
example of an amino acid.

(a) Draw the part of the protein molecule which is formed by the three  
glycine molecules linking together.



↓



(b) Name this type of polymerisation.

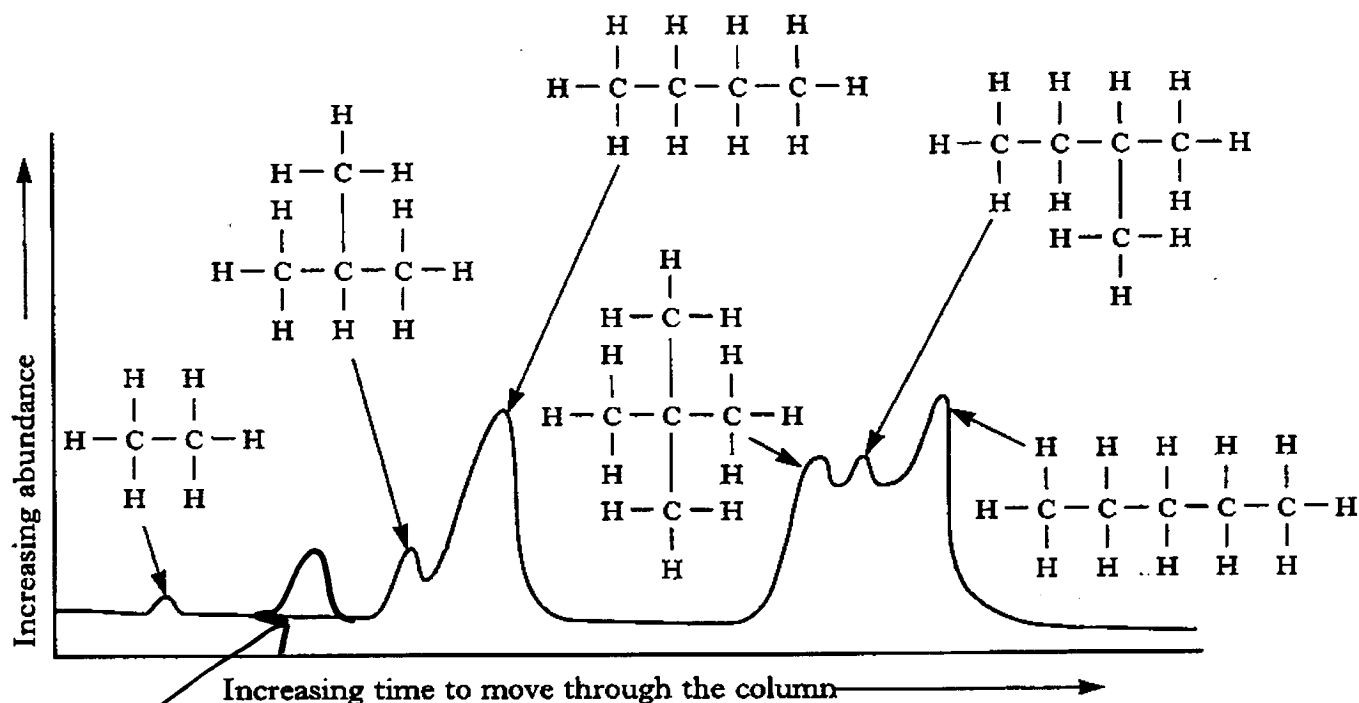
Condensation

1

1  
(2)

37. The hydrocarbons present in a mixture can be separated using chromatography. The mixture is vapourised and is then passed through a special column. Different hydrocarbons move through the column at different speeds.

The following graph was obtained.



Part b.

(a) Make two general statements linking the structure of the hydrocarbon with the length of time taken to pass through the column.

- 1 For hydrocarbons with the same number of carbons, the more branched the hydrocarbon, the shorter the time.
- 2 The greater the number of hydrocarbons, the longer the time to pass through.

(b) Draw an arrow on the graph to show the expected position of the peak for propane.

Candidate must write in margin

Marks

1  
(3)

38. Graeme was comparing the properties of hydrochloric acid (a strong acid) with those of ethanoic acid (a weak acid).  
Equal volumes of acid solutions were used in each test. Graeme's results for hydrochloric acid are shown in the following table.

Test	Hydrochloric	Ethanoic
(i) pH	2	lower same <b>higher</b>
(ii) Conductivity/mA	97	<b>lower</b> same higher
(iii) Speed of reaction with magnesium/cm <sup>3</sup> gas min <sup>-1</sup>	57	<b>lower</b> same higher
(iv) Volume of strong alkali required for neutralisation/cm <sup>3</sup>	50	lower <b>same</b> higher

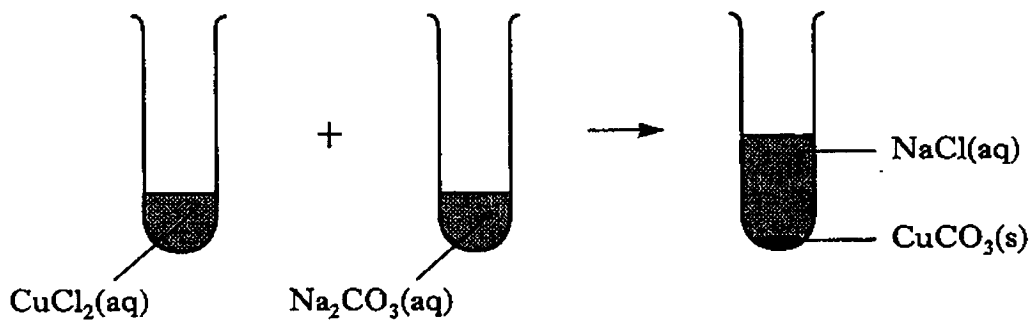
- (a) Circle the appropriate words in the table to show how the test results for ethanoic acid compare with those for hydrochloric acid.
- (b) Apart from keeping the volumes equal, suggest two other factors which Graeme would need to control during his experiment.

Concentrations of the two acids  
Temperature of the two acids

2  
1  
(3)

Marks

39.

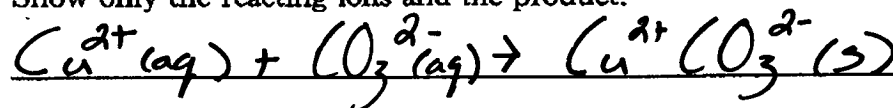


(a) Name the **two** spectator ions in the above reaction.

Sodium and Chloride ions

1

(b) Write an ionic equation for the formation of copper(II) carbonate.  
Show only the reacting ions and the product.



1

(2)

40. Archaeologists found some corroded silver coins and a badly rusted sword.

Marks

- (a) The silver coins were restored by wrapping them in zinc foil in a beaker of salt solution.

What type of reaction took place?

Neutralisation

1

- (b) The iron blade of the sword was attached to its handle by a copper band.

Explain why, although the copper was uncorroded, the iron had rusted badly.

Iron is above copper in the electrochemical series. Electrons flow from iron to the copper.

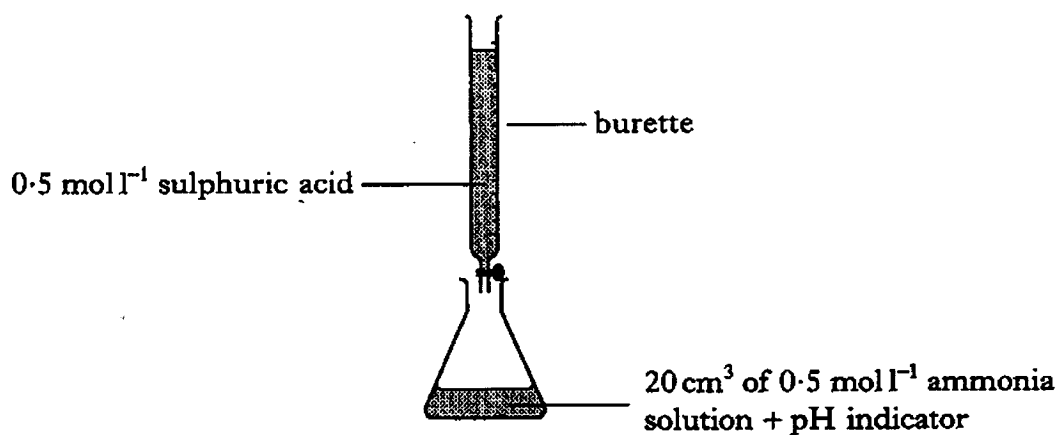
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(3)

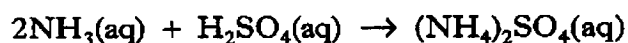


41. Laura wanted to prepare ammonium sulphate.

She carried out a titration using  $0.5 \text{ mol l}^{-1}$  sulphuric acid and  $0.5 \text{ mol l}^{-1}$  ammonia solution.



The equation for the reaction is



(a) Calculate the volume of sulphuric acid Laura used to neutralise the ammonia solution.

$$\text{acid } \frac{C \times V}{n} = \frac{C \times V}{n} \text{ alkali}$$

$$\frac{0.5 \times V}{1} = \frac{0.5 \times 0.02}{2}$$

$$\text{Volume} = 0.01 \text{ litre} \Rightarrow$$

(b) The indicator was removed from the ammonium sulphate solution by filtering the solution through charcoal.

How would Laura then obtain a sample of solid ammonium sulphate from the solution?

*Evaporate the solution until salt crystals have formed.*

(c) State a use for ammonium sulphate.

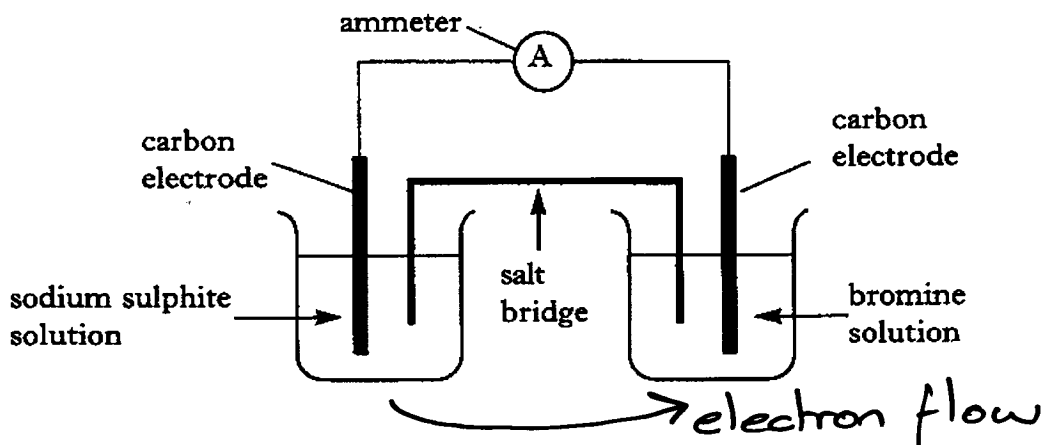
*Fertilizer*

1  
(4)

42. Sodium sulphite solution reacts with bromine solution. The sulphite ions are oxidised. The ion-electron equation for the oxidation reaction is:



This reaction takes place in the cell shown.



- (a) On the diagram, indicate the direction of the flow of electrons through the wire.

1

- (b) The salt bridge completes the circuit.

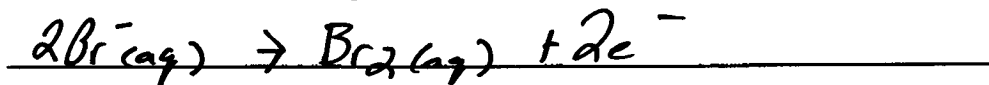
Why is an electric current able to flow through the salt bridge?

ions flow through it

1

- (c) In the reaction, the bromine solution is reduced.

Write the ion-electron equation for this reaction.



1

(3)

[END OF QUESTION PAPER]