

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
June 2004



CHEMISTRY (MODULAR)
Aqueous and Organic Chemistry (Module 21)

346021

Tuesday 29 June 2004 Morning Session

In addition to this paper you will require:

- a black ball-point pen;
 - an answer sheet.
- You may use a calculator.

Time allowed: 30 minutes

Instructions

- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title “Aqueous and Organic Chemistry” printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only. Rough work may be done on the question paper.

Instructions for recording answers

- Use a **black ball-point pen**.

- For each answer **completely fill in the circle** as shown:

1	2	3	4
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

- Do **not** extend beyond the circles.

- If you want to change your answer, **you must** cross out your original answer, as shown:

1	2	3	4
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown:

1	2	3	4
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

Information

- The maximum mark for this paper is 36.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Higher Tier starts on page 12 of this booklet.

FOUNDATION TIER

SECTION A

Questions **ONE** to **FIVE**.

In these questions match the words in the list with the numbers.

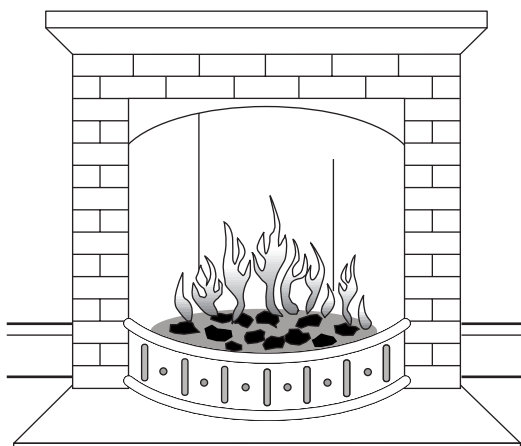
Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

This question is about a gas fire.

The fuel burned in the gas fire is natural gas.



Match words from the list with the numbers **1–4** in the sentences.

carbon

carbon dioxide

carbon monoxide

water (vapour)

When natural gas burns, the hydrogen is oxidised to **1**

If the natural gas burns in a plentiful supply of air, the **2** is oxidised to **3**

If the natural gas burns in a limited supply of air, the poisonous gas **4** is formed.

QUESTION TWO

This question is about four chemical compounds and how we use them.

Match words from the list with the numbers **1–4** in the table.

ammonium nitrate

chlorine

ethanol

water

Chemical compound	How we use the compound
1	as a solvent and coolant
2	as a bleach
3	as a fuel and a solvent
4	as an artificial fertiliser

QUESTION THREE

This question is about four processes.

Match words from the list with the numbers **1–4** in the sentences.

condense

crystallise

dissolve

evaporate

Copper sulphate will **1** from a saturated solution if the solution is cooled.

Most covalent compounds are insoluble but most ionic compounds will **2** in water.

Water in seas and lakes will **3** when heated by the Sun.

When water vapour is cooled, it will **4** to form liquid water.

Turn over ►

QUESTION FOUR

The diagram shows stages in obtaining drinking water to make fizzy drinks.

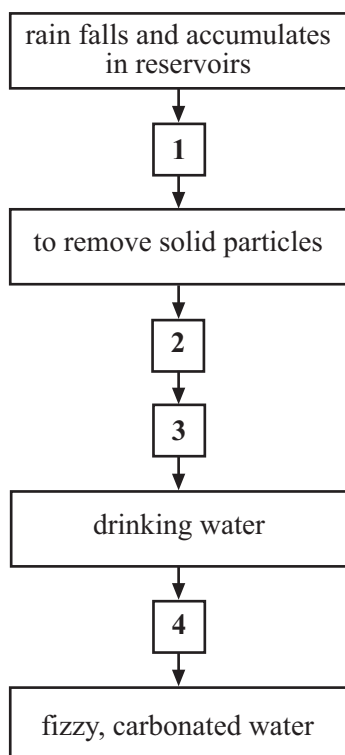
Match words from the list with the numbers 1–4, to explain how this is done.

carbon dioxide is added under pressure

chlorine is added

to kill any bacteria

water is passed through filter beds

**QUESTION FIVE**

This question is about making salts.

Match words from the list with the numbers 1–4 in the table.

anhydrous iron chloride

insoluble lead sulphate

soluble sodium nitrate

soluble zinc sulphate

Salt	The best way to make the salt
1	by direct combination of elements
2	by precipitation
3	by the reaction of a metal with an acid
4	by the reaction between an acid and an alkali

SECTION BQuestions **SIX** and **SEVEN**.In these questions choose the best **two** answers.Do **not** choose more than two.Mark your choices on the answer sheet.

QUESTION SIX

This question is about oxygen.

Which **two** of the following statements are correct?**fish only survive if the water contains sufficient dissolved oxygen****oxygen is carried around the body by the blood****oxygen is more soluble in hot water than in cold water****oxygen will escape from a saturated solution as it is cooled****the solubility of oxygen in water is increased at lower pressures****QUESTION SEVEN**

This question is about acids and alkalis.

Which **two** of the following statements are correct?**ammonia, in aqueous solution, produces $\text{H}^+(\text{aq})$ ions****ethanoic acid is a weak acid****nitric acid is a weak acid****sodium hydroxide is fully ionised in water****sulphuric acid is a proton acceptor****TURN OVER FOR THE NEXT QUESTION****Turn over ►**

SECTION CQuestions **EIGHT** to **TEN**.

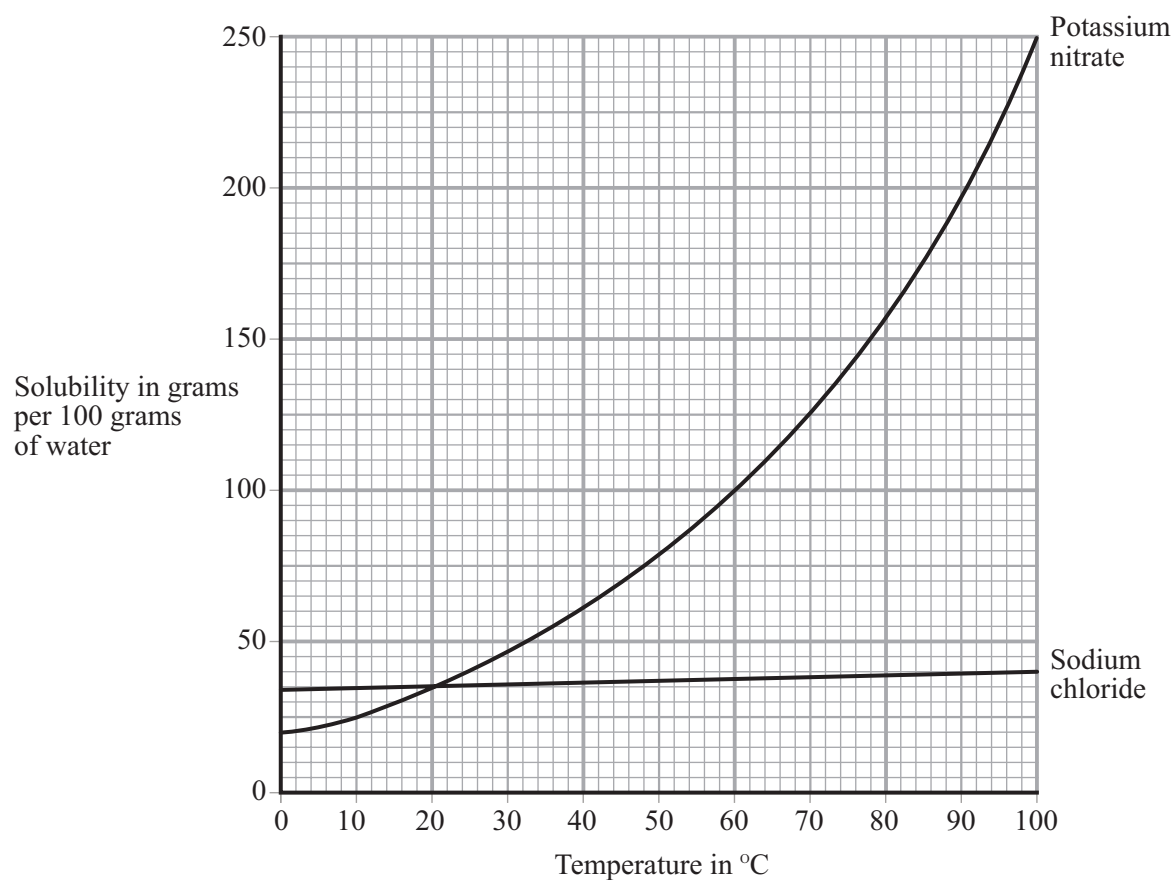
Each of these questions has four parts.

In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION EIGHT

The graph shows the solubility curves for potassium nitrate and sodium chloride.

**8.1** What mass of potassium nitrate will dissolve in 100 grams of water at 70 °C?

- A 44 g
- B 60 g
- C 120 g
- D 125 g

8.2 Above what temperature does potassium nitrate become more soluble than sodium chloride?

- A 15 °C
- B 20 °C
- C 32 °C
- D 35 °C

8.3 How much more sodium chloride than potassium nitrate will dissolve in 100 grams of water at 10 °C?

- A 5 g
- B 10 g
- C 25 g
- D 35 g

8.4 100 grams of water at 60 °C is saturated with potassium nitrate.

What mass of potassium nitrate will crystallise out as the solution cools to 20 °C?

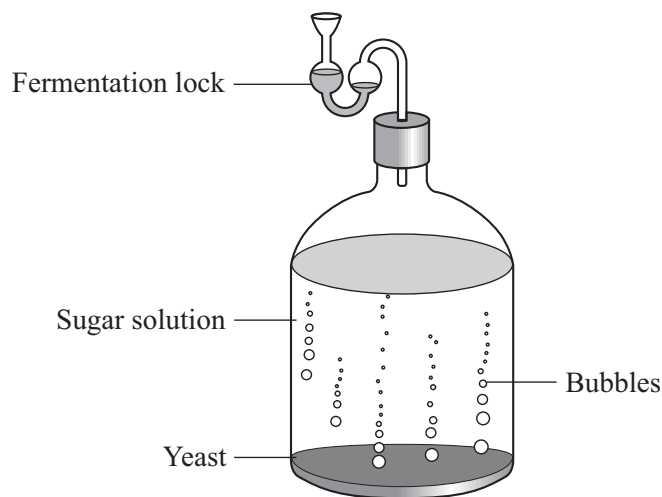
- A 32 g
- B 65 g
- C 70 g
- D 100 g

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION NINE

The diagram shows how we can make ethanol in a reaction vessel.



9.1 The gas produced when the yeast acts on the sugar is

- A carbon dioxide.
- B chlorine.
- C nitrogen.
- D oxygen.

9.2 The yeast causes this reaction because it

- A contains enzymes.
- B increases the temperature and pressure.
- C makes the mixture acid.
- D makes the mixture alkaline.

9.3 One purpose of the fermentation lock is

- A to allow extra sugar to be added.
- B to maintain the correct temperature in the reaction vessel.
- C to stop air entering the reaction vessel.
- D to stop ethanol escaping from the reaction vessel.

9.4 When the reaction has finished, the mixture from the reaction vessel undergoes fractional distillation.

This is done so that

- A** any unused sugar can be collected.
- B** the ethanol can be separated.
- C** the reaction vessel can be sterilised.
- D** the yeast can be recycled.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION TEN

Three samples of water from the same source are treated in different ways.

Sample 1 Shake with soap flakes → Scum forms → Shake with more soap flakes → Lather forms

Sample 2 Add sodium carbonate solution → Precipitate forms

Sample 3 Boil

10.1 With **Sample 1**, the scum forms because the water contains

- A ammonium nitrate.
- B calcium compounds.
- C carbonic acid.
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10.2 With **Sample 1**, a lather forms only after the removal of

- A calcium ions as scum.
- B dissolved chlorine.
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10.3 With **Sample 2**, the precipitate could be

- A ammonium nitrate.
- B calcium carbonate.
- C carbonic acid.
- D sodium chloride.

10.4 What would you expect to see when **Sample 3** is boiled?

- A** A lather
- B** A precipitate
- C** A scum
- D** A yellow gas

END OF TEST

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

HIGHER TIER

SECTION A

Questions **ONE** and **TWO**.

In these questions match the words in the list with the numbers.

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Mark your choices on the answer sheet.

QUESTION ONE

This question is about making salts.

Match words from the list with the numbers **1–4** in the table.

anhydrous iron chloride

insoluble lead sulphate

soluble sodium nitrate

soluble zinc sulphate

Salt	The best way to make the salt
1	by direct combination of elements
2	by precipitation
3	by the reaction of a metal with an acid
4	by the reaction between an acid and an alkali

QUESTION TWO

This question is about acids.

Match words from the list with the numbers 1–4 in the table.

citric acid

ethanoic acid

methanoic acid

phosphoric acid

Acid	What we can say about the acid
1	it is found in oranges and lemons
2	it has only one carbon atom in each molecule
3	it is used to speed up the reaction between ethene and steam
4	it is used in the manufacture of acetate rayon

TURN OVER FOR THE NEXT QUESTION

Turn over ►

SECTION BQuestions **THREE** and **FOUR**.In these questions choose the best **two** answers.Do **not** choose more than two.

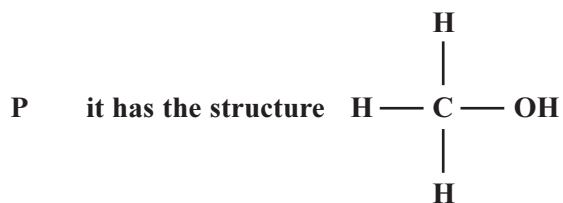
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QUESTION THREE

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This question is about methanol.

Which **two** statements about methanol, **P**, **Q**, **R**, **S** and **T**, are correct?**Q** it burns to produce carbon dioxide and water**R** it reacts with ethanoic acid to produce ethyl ethanoate**S** it reacts with oxygen to form ethanoic acid**T** it reacts with sodium to form carbon dioxide

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

Turn over ►

SECTION CQuestions **FIVE** to **TEN**.

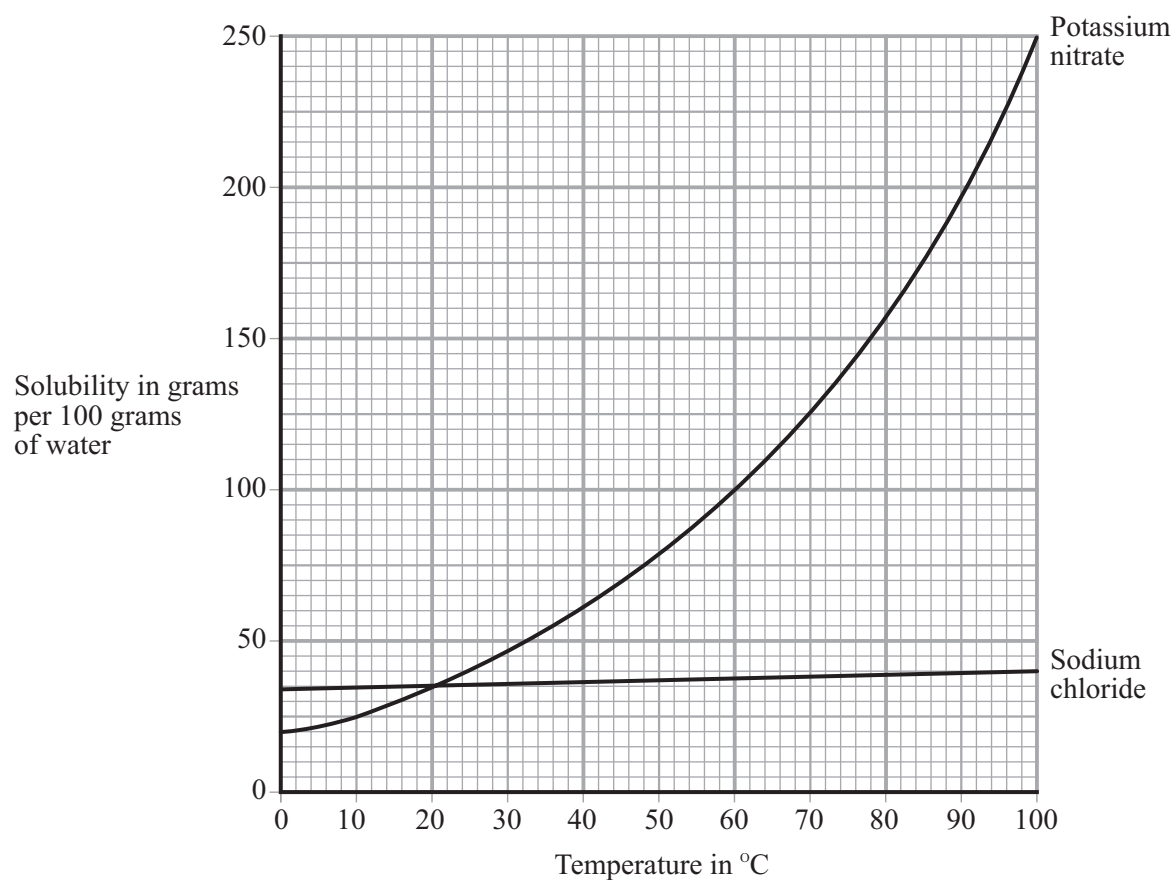
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QUESTION FIVE

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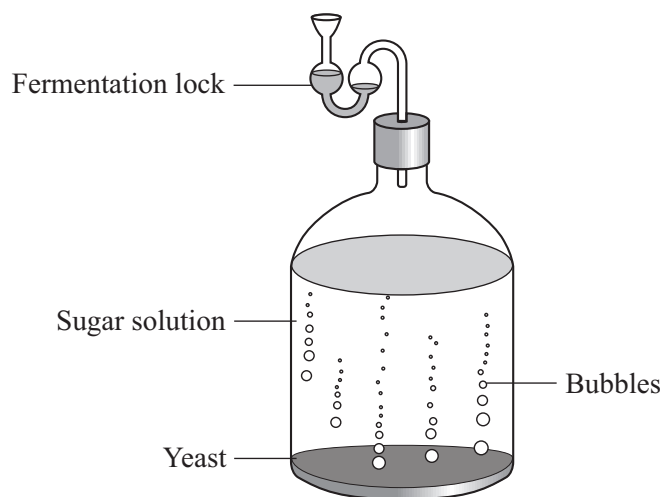
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QUESTION SIX

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 - B chlorine.
 - C nitrogen.
 - D oxygen.
- 6.2** The yeast causes this reaction because it
- A contains enzymes.
 - B increases the temperature and pressure.
 - C makes the mixture acid.
 - D makes the mixture alkaline.
- 6.3** One purpose of the fermentation lock is
- A to allow extra sugar to be added.
 - B to maintain the correct temperature in the reaction vessel.
 - C to stop air entering the reaction vessel.
 - D to stop ethanol escaping from the reaction vessel.

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This is done so that

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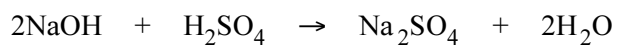
TURN OVER FOR THE NEXT QUESTION

Turn over ►

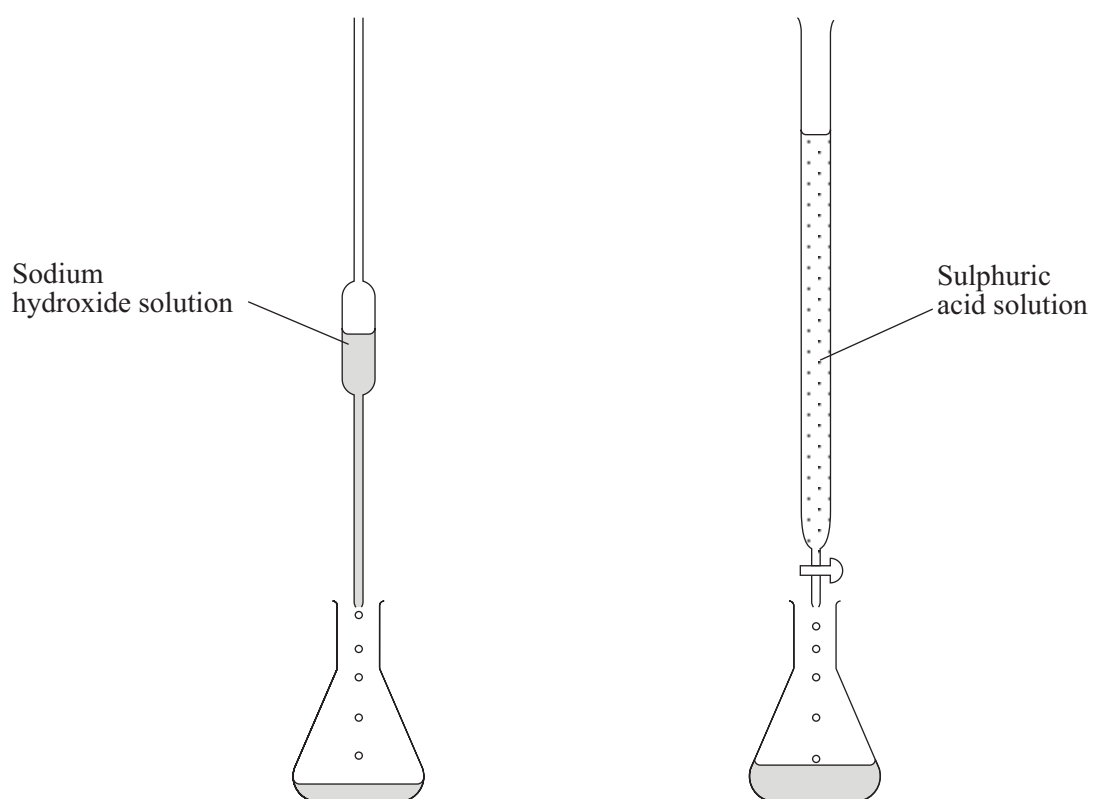
QUESTION EIGHT

Use the following information to help you answer parts of this question

Relative atomic masses: H = 1; O = 16; Na = 23; S = 32



The diagram shows the apparatus that a student uses to carry out a titration.



The student finds that 25.0 cm^3 of a $0.040 \text{ mol dm}^{-3}$ solution of sodium hydroxide is exactly neutralised by 25.0 cm^3 of a solution of sulphuric acid.

8.1 What are the pieces of apparatus used to measure out the volumes of alkali and acid accurately?

	Alkali	Acid
A	burette	pipette
B	conical flask	burette
C	measuring cylinder	burette
D	pipette	burette

8.2 What mass of sodium hydroxide is dissolved in 25.0 cm^3 of a $0.040 \text{ mol dm}^{-3}$ solution?

- A 0.04 g
- B 0.40 g
- C 2.40 g
- D 4.00 g

8.3 The concentration of the sulphuric acid solution is

- A $0.0125 \text{ mol dm}^{-3}$
- B $0.020 \text{ mol dm}^{-3}$
- C $0.040 \text{ mol dm}^{-3}$
- D $0.125 \text{ mol dm}^{-3}$

8.4 A solution containing 0.4 grams of sodium hydroxide was reacted with sulphuric acid.

What mass of sodium sulphate was produced?

- A 0.595 grams
- B 0.71 grams
- C 1.19 grams
- D 1.42 grams

Turn over ►

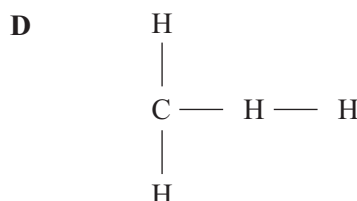
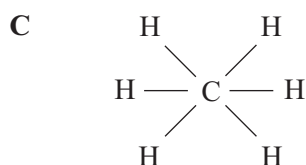
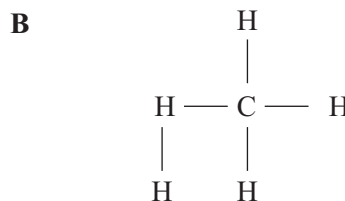
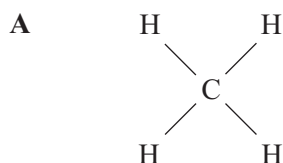
QUESTION NINE

C_nH_{2n+2} is the general formula for a particular homologous series of compounds.

The first member of this homologous series is called methane.

In the formula for methane, $n = 1$.

9.1 Methane can be represented by the structural formula



9.2 Methane burns in a plentiful supply of air to produce

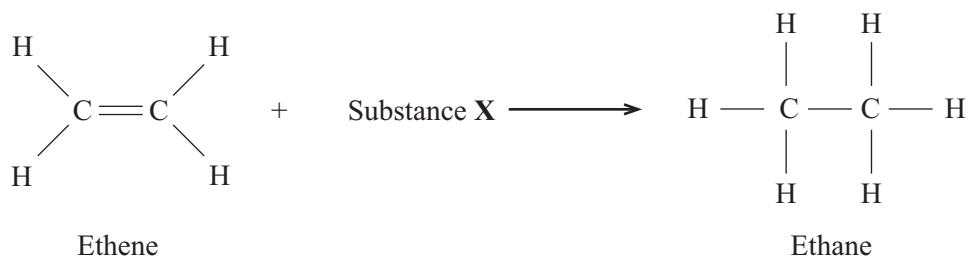
- A carbon dioxide and carbon monoxide.
- B carbon dioxide and hydrogen.
- C carbon dioxide and oxygen.
- D carbon dioxide and water.

9.3 Butane, another member of the series, has two isomers.

How are the two isomers the same and how are they different?

	Same	Different
A	boiling point	chemical formula
B	chemical formula	molecular structure
C	molecular structure	boiling points
D	physical properties	chemical properties

9.4 Ethane, another member of this series, can be made from ethene.



Substance X is

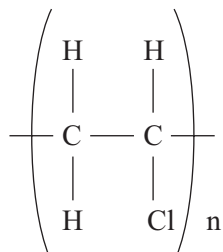
- A carbon.
- B hydrogen.
- C oxygen.
- D water.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION TEN

This question is about polymers.

10.1

The diagram represents a molecule of

- A poly(ethene).
- B poly(propene).
- C poly(styrene).
- D polyvinylchloride.

10.2 Polymers are made by addition polymerisation from compounds which have a

- A C—C bond.
- B C=C bond.
- C C—H bond.
- D C—Cl bond.

10.3 Polymers have very long molecules.

The atoms in these molecules are joined together by

- A strong covalent bonds.
- B strong ionic bonds.
- C weak covalent bonds.
- D weak ionic bonds.

10.4 Thermosetting polymers cannot be remoulded.

This is because, when the plastic is first heated

- A it boils and decomposes.
- B it forms strong links between atoms.
- C its molecules form very long chains.
- D strong links form between molecules.

END OF TEST

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE