Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
Winter 2005

ASSESSMENT and QUALIFICATIONS ALLIANCE

CHEMISTRY A (MODULAR) 346021
Aqueous and Organic Chemistry (Module 21)

Thursday 24 November 2005 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
○	●	○	○

- 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
○	✗	○	●

- 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
○	⊗	○	✗

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.

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You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.

The Higher Tier starts on page 14 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 burning.

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

carbon

carbon dioxide

carbon monoxide

hydrogen

All organic compounds burn, if there is plenty of air, to produce . . . . . **1** . . . . . .

If there is insufficient air, then poisonous . . . . . **2** . . . . . is produced.

Sometimes solid particles of . . . . . **3** . . . . . are formed.

Some organic compounds produce water when they burn because they contain . . . . . **4** . . . . . .

QUESTION TWO

This question is about ions.

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

calcium ions (Ca^{2+})

hydrogen ions (H^{+})

hydroxide ions (OH^{-})

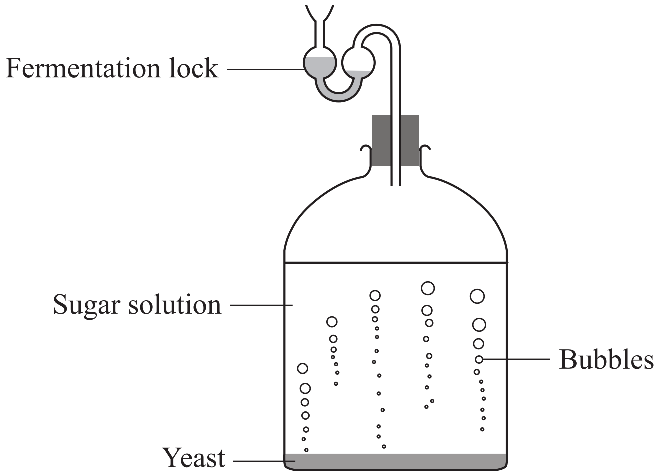
nitrate ions (NO_3^{-})

Ions	What we can say about the ions
1	they can come from artificial fertilisers
2	they help to reduce heart illnesses
3	they make solutions acid
4	they make solutions alkaline

TURN OVER FOR THE NEXT QUESTION

QUESTION THREE

The diagram shows some sugar solution being fermented.



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

air

enzymes

ethanol

sugar

The yeast cells contain biological catalysts called . . . . . **1** . . . . . .

These catalysts help to break down the . . . . . **2** . . . . . .

The products of the breakdown are carbon dioxide and . . . . . **3** . . . . . .

The fermentation lock prevents . . . . . **4** . . . . . from entering the fermentation vessel.

QUESTION FOUR

This question is about acids and alkalis.

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

ammonia solution

citric acid solution

nitric acid solution

sodium hydroxide solution

Acid or alkali	What we can say about the substance
1	it is a strong alkali
2	it is a weak acid
3	it is only partially ionised in water and has a pH of 11
4	it reacts vigorously with many metals, forming nitrates

TURN OVER FOR THE NEXT QUESTION

QUESTION FIVE

The diagram shows stages in the preparation of the salt, magnesium sulphate.

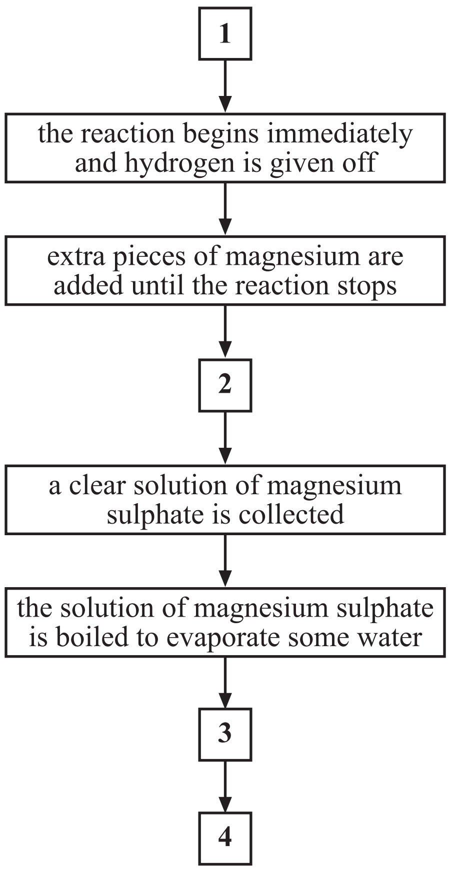
Match statements, **P**, **Q**, **R** and **S**, with the numbers **1–4** in the sequence.

P **a concentrated solution of magnesium sulphate is left to cool in a basin**

Q **crystals of magnesium sulphate form in the basin**

R **excess magnesium is filtered off**

S **pieces of magnesium are added to dilute sulphuric acid**



SECTION B

Questions **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 gases dissolved in water.

Which **two** statements are correct?

animals and plants that live in water need dissolved oxygen

carbon dioxide is insoluble in water

carbon monoxide dissolves in water to make carbonated water

chlorine dissolved in water kills bacteria

oxygen dissolves better in warm water than in cold water

QUESTION SEVEN

This question is about the water cycle.

Which **two** statements are correct?

rain water contains dissolved oxygen and carbon dioxide

rain water contains dissolved solids which can make it hard

rain water dissolves most covalent compounds

rain water is always soft

rising water vapour condenses because the temperature rises

SECTION C

Questions **EIGHT** to **TEN**.

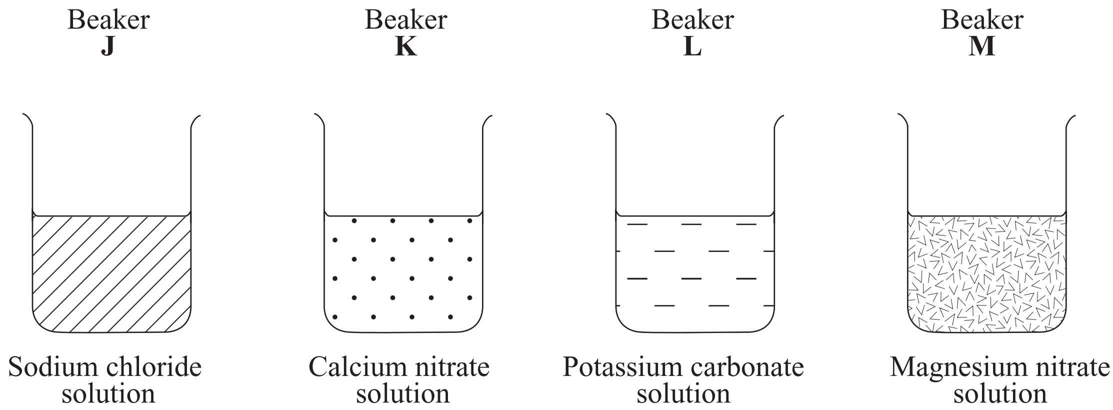
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION EIGHT

The beakers contain dilute solutions of four different substances in water.



8.1 A sample of the solution from each beaker in turn is shaken with a few drops of soap solution.

A lather will be produced by the solutions from . . . . .

A beakers **J** and **K**.

B beakers **J** and **L**.

C beakers **K** and **M**.

D beaker **M** only.

8.2 Sodium carbonate solution is added to a sample of the solution from beaker **K**.

What would you expect to see?

A A lather

B A scum

C A white precipitate

D Bubbles of gas released

8.3 A reaction takes place when sodium carbonate solution is added to a sample of solution from beaker **M**.

sodium carbonate + magnesium nitrate → substance **X** + substance **Y**

What are substances **X** and **Y**?

	Substance X	**Substance Y**
A	magnesium carbonate	sodium nitrate
B	magnesium carbonate	sodium chloride
C	magnesium carbonate	water
D	magnesium chloride	sodium hydroxide

8.4 A sample of solution from beaker **M** is shaken with a few drops of soap solution.

What would you expect to see?

A A lather

B A scum

C A white precipitate

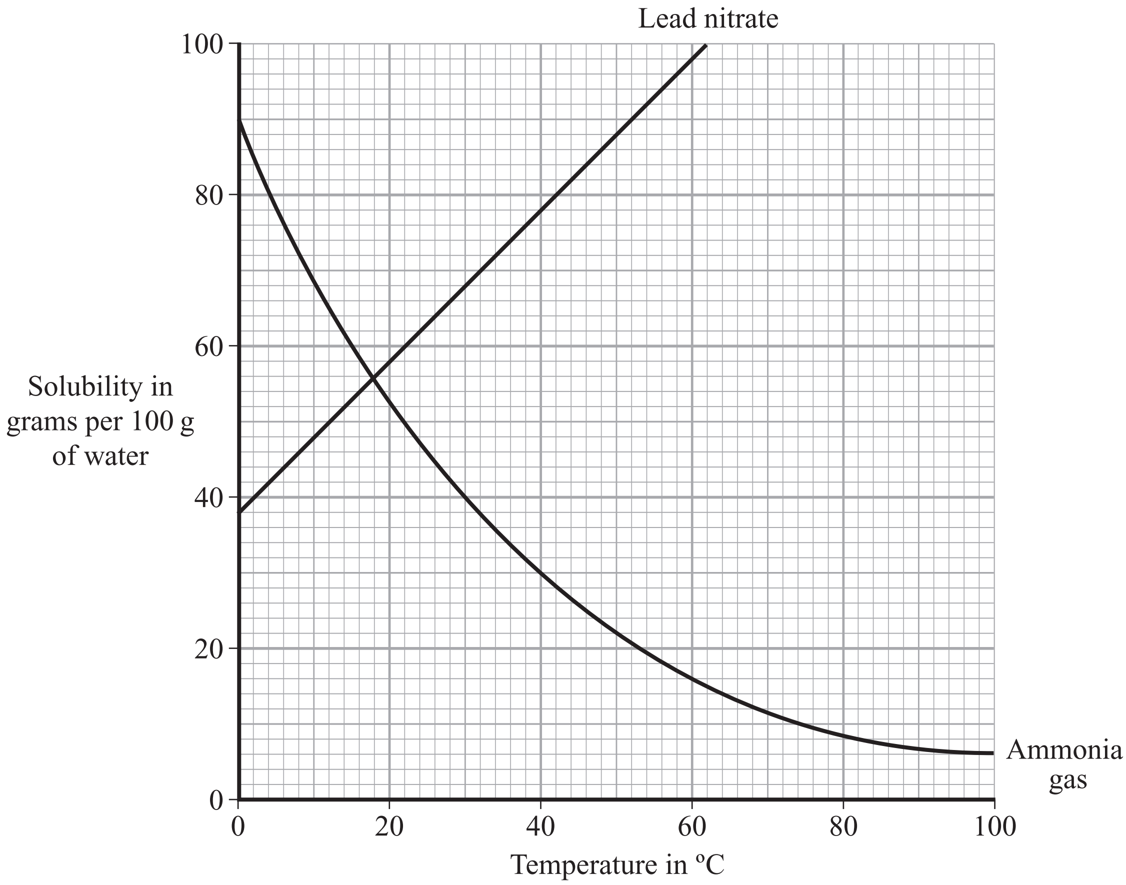
D Scale

TURN OVER FOR THE NEXT QUESTION

Turn over ▶

QUESTION NINE

The graph shows the solubility curves of two substances, lead nitrate and ammonia gas.



9.1 How much lead nitrate will dissolve in 100 grams of water at 40 °C?

A 2 g

B 30 g

C 31 g

D 78 g

9.2 Which line best describes the changes in solubility as the temperature of the solution increases?

	Lead nitrate	**Ammonia**
A	increases	increases
B	increases	decreases
C	decreases	decreases
D	decreases	increases

9.3 Above what temperature does lead nitrate become more soluble than ammonia?

A 18 °C

B 56 °C

C 62 °C

D 90 °C

9.4 How much more ammonia gas dissolves at 0 °C than at 100 °C in each 100 g of water?

A 10 g

B 84 g

C 90 g

D 94 g

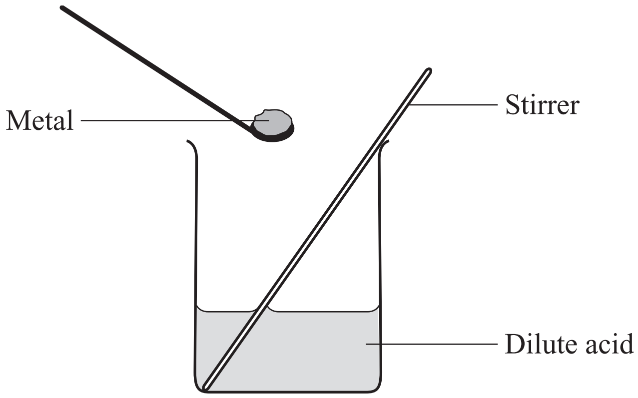
TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

This question is about salts called chlorides.

10.1 A student is making a solution of the salt, zinc chloride, from a metal and a dilute acid.

The student begins by adding the metal to the dilute acid a little at a time.

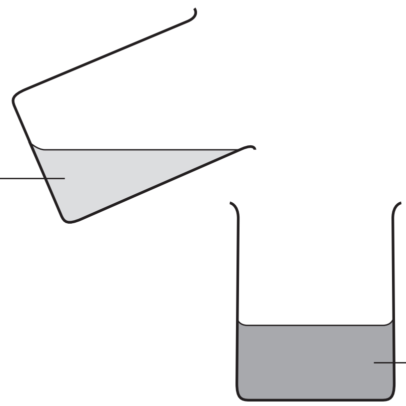


Which metal and dilute acid should the student use?

	Metal	**Dilute acid**
A	iron	hydrochloric
B	iron	sulphuric
C	zinc	hydrochloric
D	zinc	sulphuric

Lead chloride is an insoluble salt.

The student prepares this salt by adding a solution of sodium chloride to a solution of lead nitrate.



10.2 What will the student see when the two solutions are mixed?

A A clear solution of lead chloride

B A white precipitate of lead chloride

C A white precipitate of sodium nitrate

D Bubbles of hydrogen gas

10.3 The student can separate and collect the insoluble lead chloride by . . . . .

A condensation.

B distillation.

C evaporation.

D filtration.

10.4 Which two substances could the student use to make the salt, anhydrous iron chloride?

A Iron + chlorine

B Iron + hydrochloric acid

C Iron hydroxide + hydrochloric acid

D Iron oxide + hydrochloric acid

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.

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

Mark your choices on the answer sheet.

QUESTION ONE

The diagram shows stages in the preparation of the salt, magnesium sulphate.

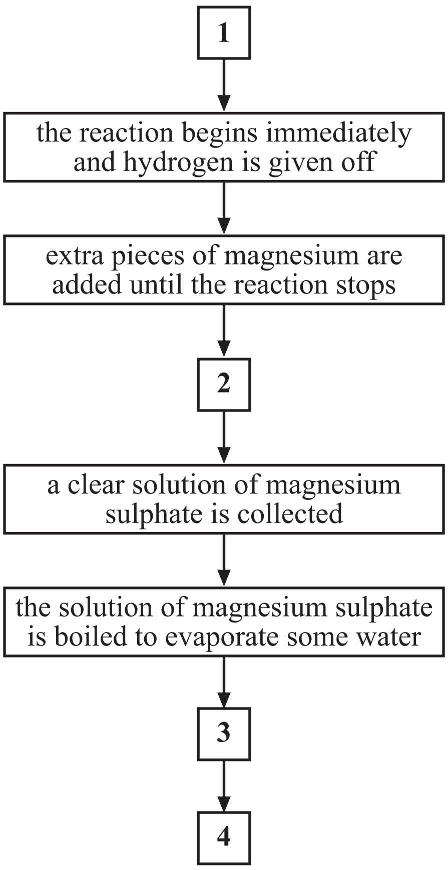
Match statements, **P**, **Q**, **R** and **S**, with the numbers **1–4** in the sequence.

P **a concentrated solution of magnesium sulphate is left to cool in a basin**

Q **crystals of magnesium sulphate form in the basin**

R **excess magnesium is filtered off**

S **pieces of magnesium are added to dilute sulphuric acid**



QUESTION TWO

This question is about polymers.

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

chloroethene

melamine

poly(ethene)

polyvinylchloride

. . . . .**1** . . . . . molecules can be joined together by addition polymerisation.

The product is called . . . . . **2** . . . . . .

. . . . . **3** . . . . . is a polymer which contains only carbon and hydrogen atoms and which softens when it is heated.

. . . . **4** . . . . . does not soften when heated, because cross links form between adjacent molecular chains.

TURN OVER FOR THE NEXT QUESTION

Turn over

SECTION B

Questions **THREE** and **FOUR**.

In these questions choose the best **two** answers.

Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION THREE

This question is about the water cycle.

Which **two** statements are correct?

rain water contains dissolved oxygen and carbon dioxide

rain water contains dissolved solids which can make it hard

rain water dissolves most covalent compounds

rain water is always soft

rising water vapour condenses because the temperature rises

QUESTION FOUR

This question is about alkenes.

Which **two** statements are correct?

ethene has double bonds between carbon and hydrogen atoms

ethene will react with steam to produce ethanol

the alkenes are unsaturated hydrocarbons

the alkenes react with carboxylic acids to produce esters

the alkenes will not decolourise bromine water

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

SECTION C

Questions **FIVE** to **TEN**.

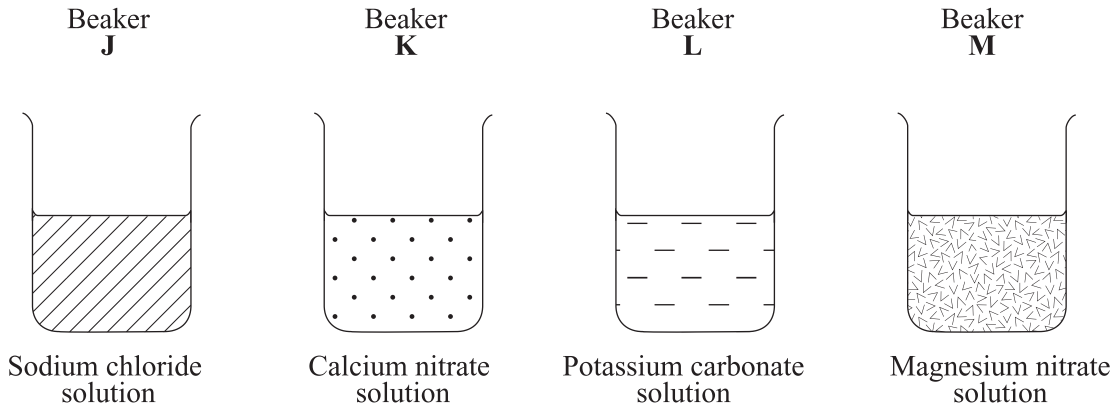
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION FIVE

The beakers contain dilute solutions of four different substances in water.



5.1 A sample of the solution from each beaker in turn is shaken with a few drops of soap solution.

A lather will be produced by the solutions from . . . . .

A beakers **J** and **K**.

B beakers **J** and **L**.

C beakers **K** and **M**.

D beaker **M** only.

5.2 Sodium carbonate solution is added to a sample of the solution from beaker **K**.

What would you expect to see?

A A lather

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C A white precipitate

D Bubbles of gas released

5.3 A reaction takes place when sodium carbonate solution is added to a sample of solution from beaker **M**.

sodium carbonate + magnesium nitrate → substance **X** + substance **Y**

What are substances **X** and **Y**?

	Substance X	Substance Y
A	magnesium carbonate	sodium nitrate
B	magnesium carbonate	sodium chloride
C	magnesium carbonate	water
D	magnesium chloride	sodium hydroxide

5.4 A sample of solution from Beaker **M** is shaken with a few drops of soap solution.

What would you expect to see?

A A lather

B A scum

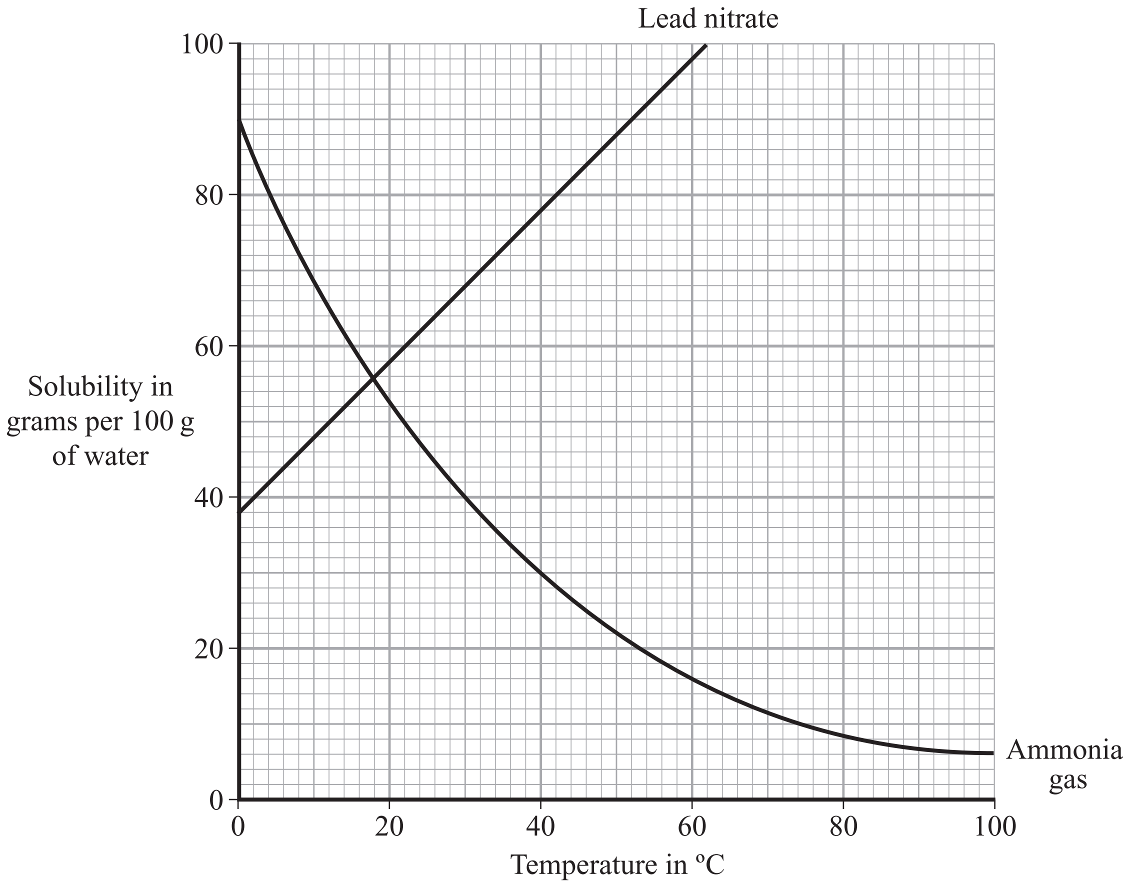
C A white precipitate

D Scale

TURN OVER FOR THE NEXT QUESTION

QUESTION SIX

The graph shows the solubility curves of two substances, lead nitrate and ammonia gas.



6.1 How much lead nitrate will dissolve in 100 grams of water at 40 °C?

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C 31 g

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	Lead nitrate	**Ammonia**
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6.3 Above what temperature does lead nitrate become more soluble than ammonia?

A 18 °C

B 56 °C

C 62 °C

D 90 °C

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A 10 g

B 84 g

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TURN OVER FOR THE NEXT QUESTION

QUESTION SEVEN

This question is about salts called chlorides.

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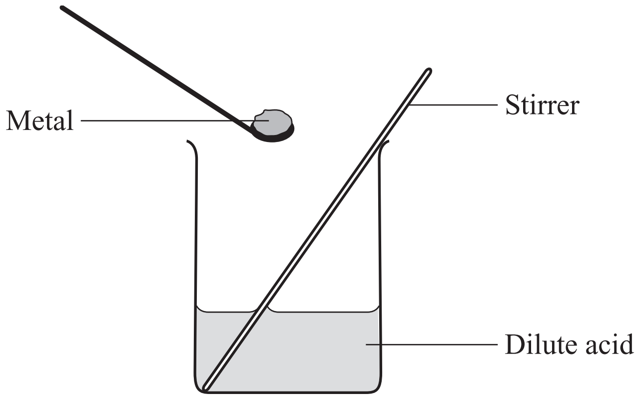
The student begins by adding the metal to the dilute acid a little at a time.

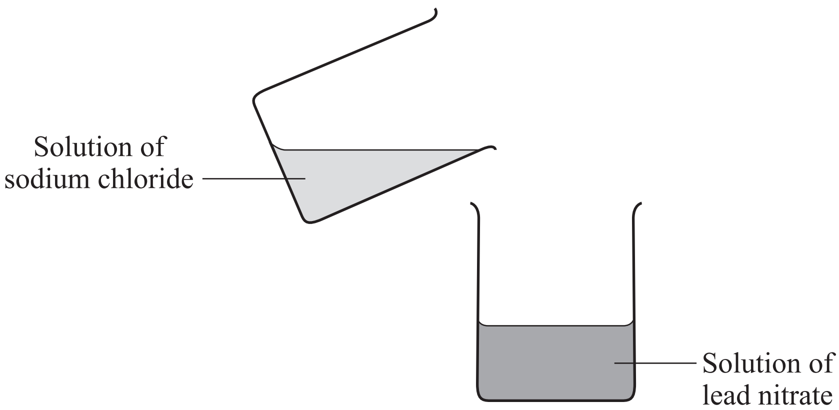


Which metal and dilute acid should the student use?

	Metal	**Dilute acid**
A	iron	hydrochloric
B	iron	sulphuric
C	zinc	hydrochloric
D	zinc	sulphuric

Lead chloride is an insoluble salt.

The student prepares this salt by adding a solution of sodium chloride to a solution of lead nitrate.



7.2 What will the student see when the two solutions are mixed?

A A clear solution of lead chloride

B A white precipitate of lead chloride

C A white precipitate of sodium nitrate

D Bubbles of hydrogen gas

7.3 The student can separate and collect the insoluble lead chloride by . . . . .

A condensation.

B distillation.

C evaporation.

D filtration.

7.4 Which two substances could the student use to make the salt, anhydrous iron chloride?

A Iron + chlorine

B Iron + hydrochloric acid

C Iron hydroxide + hydrochloric acid

D Iron oxide + hydrochloric acid

Turn over ▶

QUESTION EIGHT

The word equation shows how methanol reacts with ethanoic acid.

methanol + ethanoic acid → methyl ethanoate + water

8.1 To which families of organic compounds do methanol and methyl ethanoate belong?

	Methanol	**Methyl ethanoate**
A	alcohols	alkanes
B	alcohols	esters
C	alkanes	esters
D	alkenes	alcohols

8.2 Under what conditions does the reaction to produce methyl ethanoate take place?

A In aqueous solution, on warming

B When an oxidising agent is added

C When heated with sodium hydroxide solution

D With concentrated sulphuric acid catalyst

8.3 Ethanoic acid is a carboxylic acid.

What are the products when it reacts with sodium carbonate?

A Sodium hydroxide + carbon dioxide + water

B Sodium hydroxide + water

C Sodium salt + carbon dioxide + water

D Sodium salt + water

8.4 Which is the main carboxylic acid found in oranges and lemons?

A Citric acid

B Ethanoic acid

C Methanoic acid

D Propanoic acid

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

A chemist uses a 0.5 mol per dm^3 solution of sodium hydroxide to find the concentration of an aqueous solution of hydrochloric acid. In a titration, 25 cm^3 of the sodium hydroxide solution needs 20 cm^3 of the hydrochloric acid for neutralisation.

This is the equation for the reaction

$$NaOH + HCl \rightarrow NaCl + H_2O$$

Relative atomic masses: H = 1; O = 16; Na = 23; Cl = 35.5

9.1 What mass of sodium hydroxide must be dissolved in 1 dm^3 of water to produce the 0.5 mol per dm^3 solution?

A 10 g

B 20 g

C 40 g

D 80 g

9.2 The concentration of the hydrochloric acid solution is . . . . .

A 0.400 mol per dm^3

B 0.500 mol per dm^3

C 0.625 mol per dm^3

D 0.725 mol per dm^3

9.3 In another experiment, a 1.0 mol per dm^3 solution of hydrochloric acid was used to neutralise 25 cm^3 of a 0.5 mol per dm^3 solution of sodium hydroxide.

What volume of the acid was needed?

A 12.5 cm^3

B 25.0 cm^3

C 37.5 cm^3

D 50.0 cm^3

9.4 What mass of hydrochloric acid is contained in 500 cm^3 of a 1.0 mol per dm^3 solution?

A 18.25 g

B 36.50 g

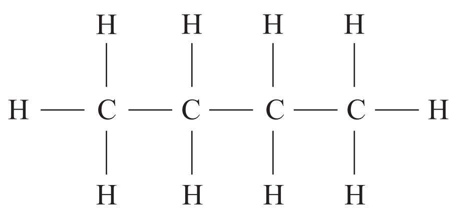
C 50.00 g

D 68.25 g

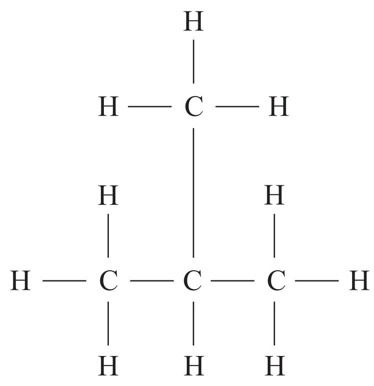
TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

The diagram shows the two isomers of butane.



Butane



2-methylpropane

10.1 Which isomer will have the higher boiling point and why?

	Isomer	**Reason**
A	butane	longer chain length
B	butane	shorter chain length
C	2-methylpropane	longer chain length
D	2-methylpropane	shorter chain length

10.2 How many isomers does pentane have?

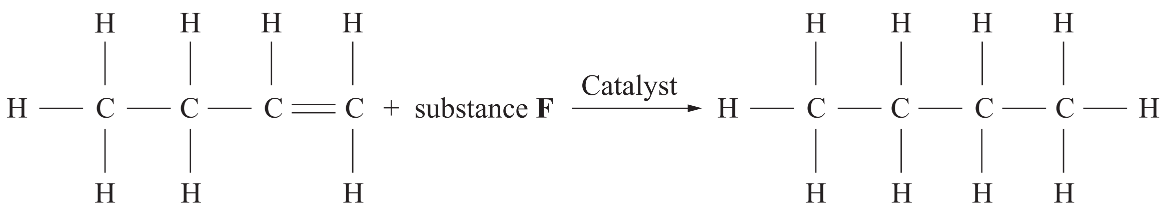
A 2

B 3

C 4

D 5

10.3 Butane can be made in the reaction shown below.



(an alkene)

Substance **F** is . . . . .

A hydrogen.

B oxygen.

C sulphuric acid.

D water.

10.4 Butane **cannot** undergo addition reactions because . . . . .

A it does not have a carbon carbon double bond.

B its carbon carbon bonds are too strong.

C its carbon hydrogen bonds are too strong.

D its intermolecular forces are too strong.

END OF TEST

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE

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