

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

B642/01

GATEWAY SCIENCE

CHEMISTRY B

**UNIT 2 Modules C4 C5 C6
(Foundation Tier)**

WEDNESDAY 26 JANUARY 2011: Afternoon

DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

**Candidates answer on the question paper.
A calculator may be used for this paper.**

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Pencil

Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully. Make sure you know what you have to do before starting your answer.**
- **Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).**
- **Answer ALL the questions.**

INFORMATION FOR CANDIDATES

- **The number of marks is given in brackets [] at the end of each question or part question.**
- **The Periodic Table is provided.**
- **The total number of marks for this paper is 60.**

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Answer ALL the questions.

SECTION A – MODULE C4

1 Ethanoic acid is an important industrial chemical.

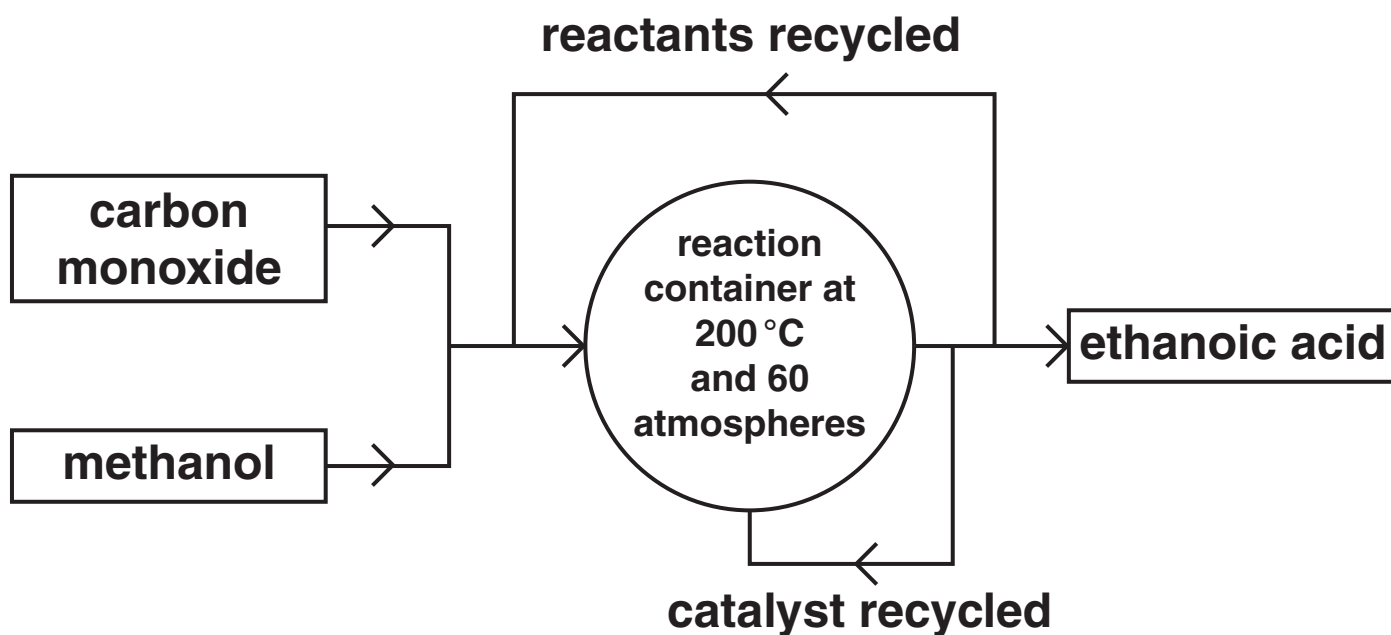
Large amounts of ethanoic acid are needed every day.

Ethanoic acid is made by a CONTINUOUS process.

(a) What is meant by a continuous process?

[1]

(b) Look at the flow chart. It shows how ethanoic acid is manufactured.



(i) Write down the WORD equation for the manufacture of ethanoic acid.

_____ [1]

(ii) Write about the costs of manufacturing ethanoic acid.

_____ [3]

(c) Kritica is a research chemist.

She investigates the percentage yield of ethanoic acid as the conditions change.

The conditions she changes are the TEMPERATURE and the PRESSURE.

Look at the table. It shows the results of her investigation.

pressure in atmospheres	percentage yield at 100 °C	percentage yield at 300 °C	percentage yield at 500 °C	percentage yield at 700 °C
20	50	43	32	19
40	80	76	68	56
60	94	92	89	85
80	98	97	95	92
100	99	99	98	97

(i) Look at the column for 100 °C.

How does increasing the PRESSURE change the percentage yield?

_____ [1]

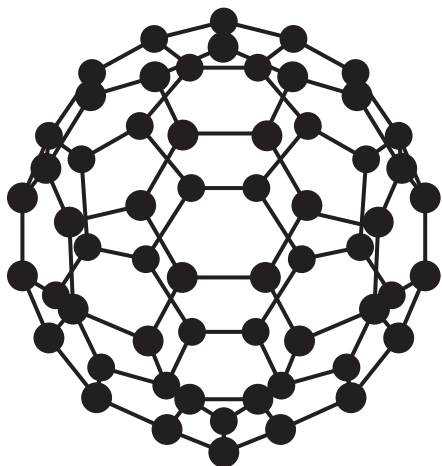
(ii) How does increasing the TEMPERATURE change the percentage yield?

_____ [1]

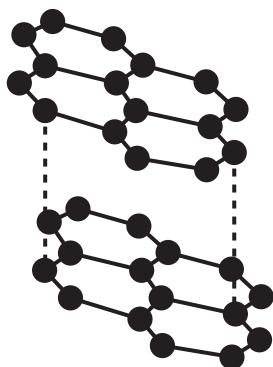
[Total: 7]

2 Three forms of carbon are buckminster fullerene, graphite and diamond.

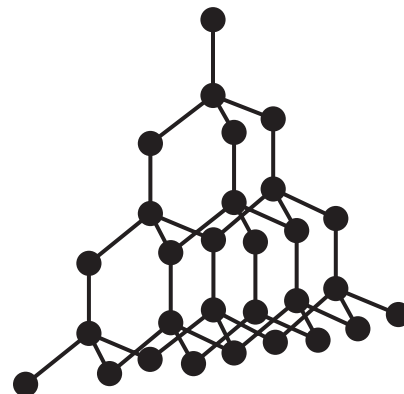
Look at the diagrams. They show the structures of these three forms of carbon.



**buckminster
fullerene**



graphite



diamond

(a) Which form of carbon is used to make the lead in pencils?

_____ [1]

(b) Which form of carbon is used to make nanotubes?

_____ [1]

(c) Match each FORM OF CARBON with its correct PROPERTIES.

Draw three straight lines only.

**FORM OF
CARBON**

**buckminster
fullerene**

diamond

graphite

PROPERTIES

**grey-black solid,
conducts electricity
and has a high
melting point**

**transparent solid,
does not conduct
electricity and has a
high melting point**

**black solid, dissolves
in petrol to make a red
solution**

[2]

[Total: 4]

- 3 Luke uses the internet to find information about some salts.

Look at the table. It shows the information Luke finds.

name of salt	formula of salt	ions present in salt
ammonium sulfate	$(\text{NH}_4)_2\text{SO}_4$	ammonium and sulfate
barium sulfate	BaSO_4	barium and sulfate
lead(II) nitrate	$\text{Pb}(\text{NO}_3)_2$	lead and nitrate
potassium iodide	KI	potassium and iodide
potassium nitrate	KNO_3	potassium and nitrate

- (a) How many ATOMS are there in the formula for lead(II) nitrate?

_____ [1]

- (b) One substance reacts with silver nitrate solution to give a pale yellow precipitate.

Which substance?

Choose from the table.

_____ [1]

(c) The three essential elements for plant growth are:

- nitrogen
- phosphorus
- potassium.

Write down which of these ESSENTIAL elements are in potassium nitrate.

_____ [1]

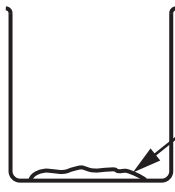
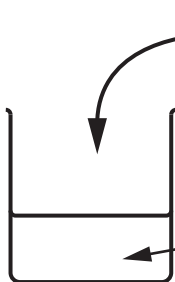
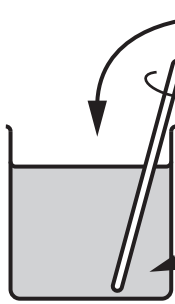
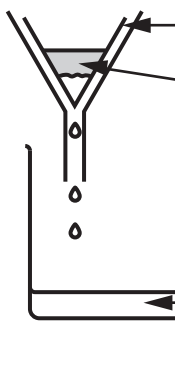
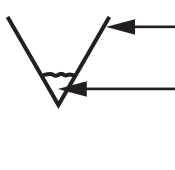
(d) What is the relative formula mass, M_r , of potassium nitrate?

The relative atomic mass, A_r , of K = 39, of N = 14 and of O = 16.

relative formula mass, M_r , = _____ [1]

(e) Luke decides to make barium sulfate.

Look at the diagrams. They show how Luke makes barium sulfate.

Step 1 	2.00 g of barium chloride	Luke puts 2.00 g of barium chloride into a beaker.
Step 2 	20 cm ³ of water barium chloride solution	Luke adds water to the barium chloride to make a solution.
Step 3 	20 cm ³ of ammonium sulfate solution reaction mixture	Luke puts ammonium sulfate solution into the beaker. He stirs the mixture with a glass rod.
Step 4 	filter paper reaction mixture filtrate (not needed)	Luke filters the reaction mixture.
Step 5 	filter paper dry barium sulfate	Luke dries the filter paper containing barium sulfate.

- (i) Luke mixes barium chloride solution with ammonium sulfate solution.

A precipitate is made.

What is the colour of the precipitate?

_____ [1]

- (ii) Luke starts with 2.00 g of barium chloride.

He does not get a 100% yield of barium sulfate.

He predicts he should make 2.24 g of barium sulfate.

He actually makes 1.68 g of barium sulfate.

What is his percentage yield of barium sulfate?

percentage yield = _____% [2]

(iii) Suggest TWO reasons why Luke does not get a 100% yield.

1 _____

2 _____

_____ **[2]**

[Total: 9]

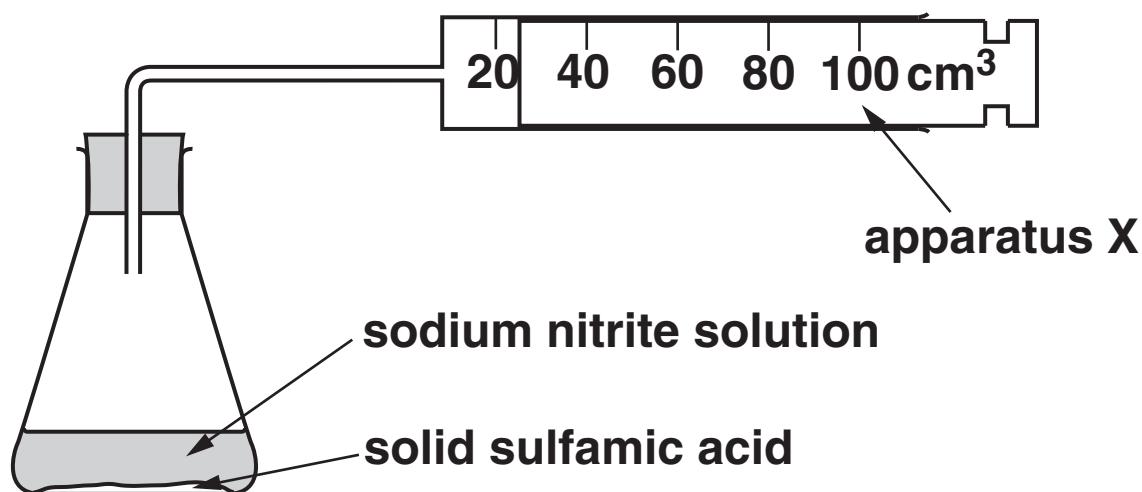
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SECTION B – MODULE C5

- 4 Jenny investigates the reaction between sulfamic acid and sodium nitrite solution.

Solid sulfamic acid reacts with sodium nitrite solution to make nitrogen.

Look at the apparatus she uses.



Jenny measures the total volume of gas in apparatus X every 30 seconds.

- (a) Write down the name of apparatus X.

_____ [1]

She plots the results on a graph opposite.

(b) Look at the graph.

(i) How long does it take to collect a total volume of 40 cm^3 of nitrogen?

_____ seconds [1]

(ii) What is the total volume of nitrogen formed at the end of the reaction?

_____ cm^3 [1]

(iii) In which time interval was the reaction fastest?

Choose from the list.

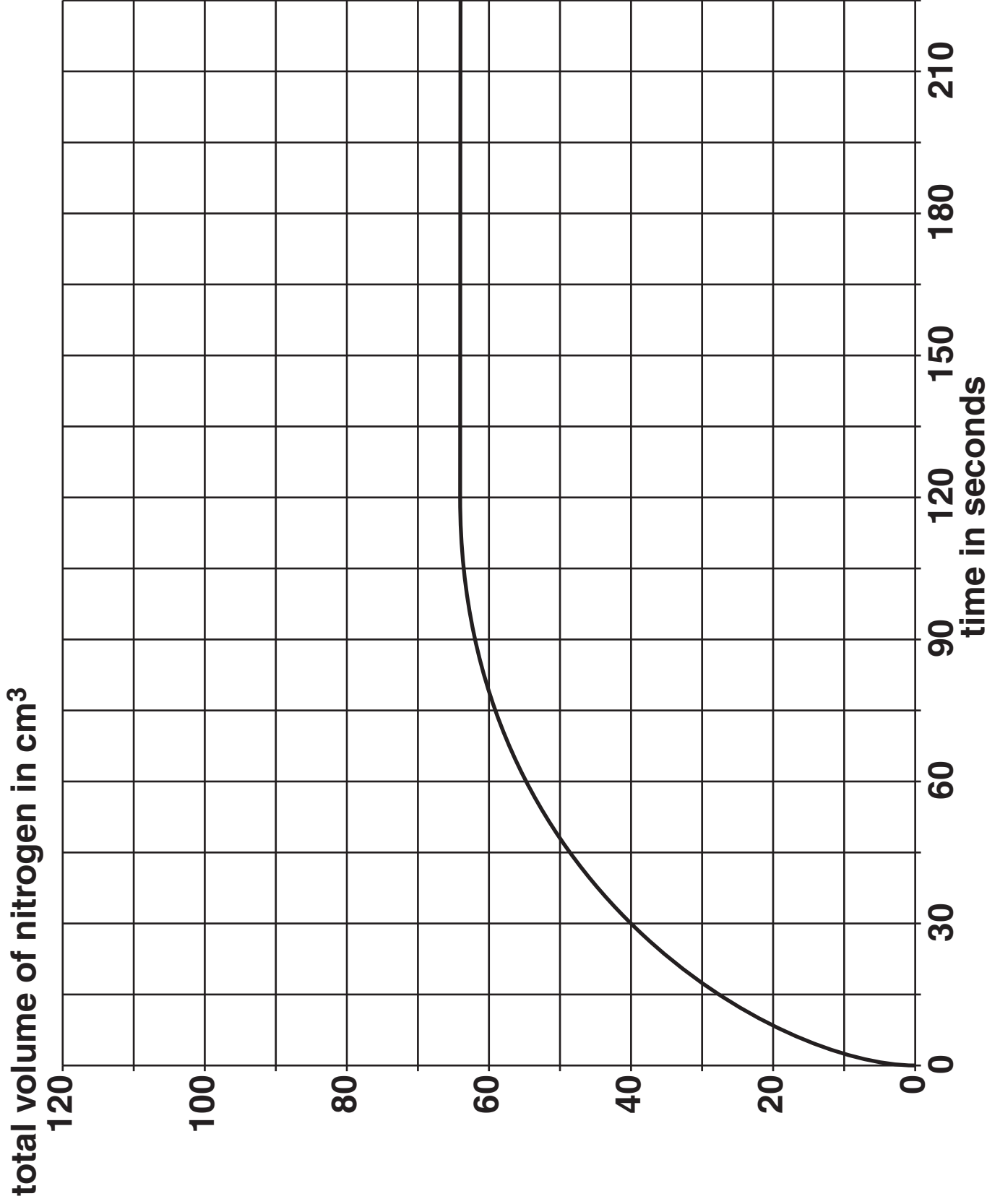
0 TO 3 SECONDS

30 TO 33 SECONDS

60 TO 63 SECONDS

90 TO 93 SECONDS

answer _____ [1]



(c) Suggest why the reaction eventually stops.

[1]

(d) Sulfamic acid is a WEAK ACID.

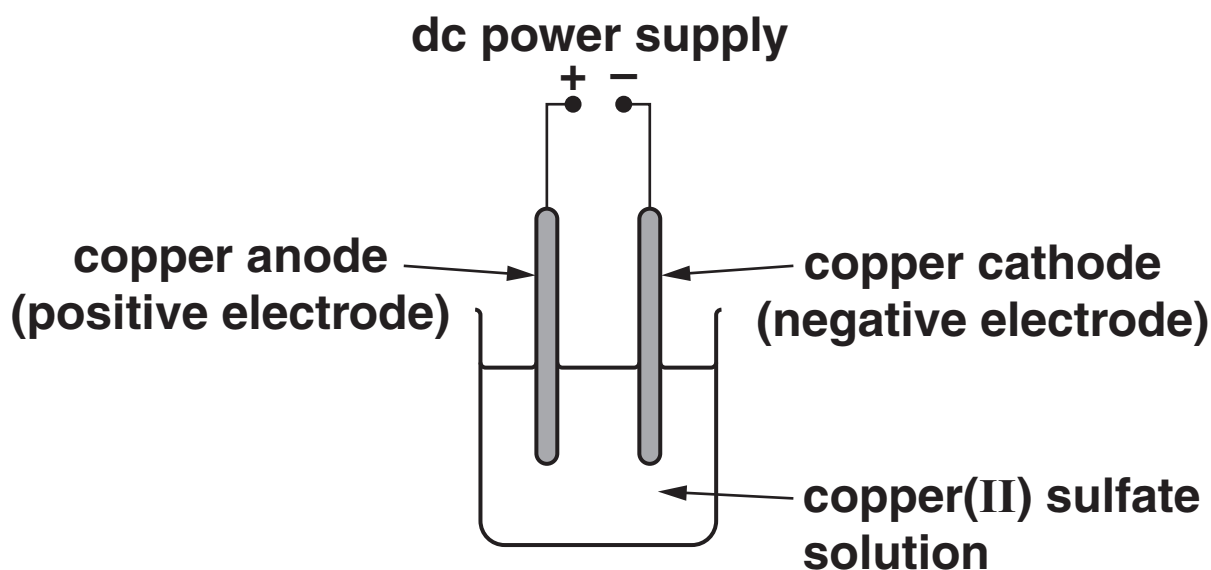
What is a weak acid?

[2]

[Total: 7]

5 Aimee investigates the electrolysis of copper(II) sulfate solution.

Look at the apparatus she uses.



Aimee finds the mass of the copper anode and of the copper cathode.

Aimee then passes an electric current through the copper sulfate solution for 5 minutes.

She dries the anode and cathode and finds their masses again.

Look at her results table.

	anode	cathode
mass before in g	1.24	1.54
mass after in g	1.01	1.77

(a) What is the change in mass of the cathode?

_____ g

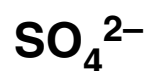
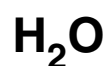
[1]

(b) Write down what happens to each electrode during the electrolysis.

anode _____

cathode _____ [2]

(c) Look at the list of the particles found in copper(II) sulfate solution.



Some particles are attracted to the ANODE. Write down the formula of one of these particles.

Choose from the list.

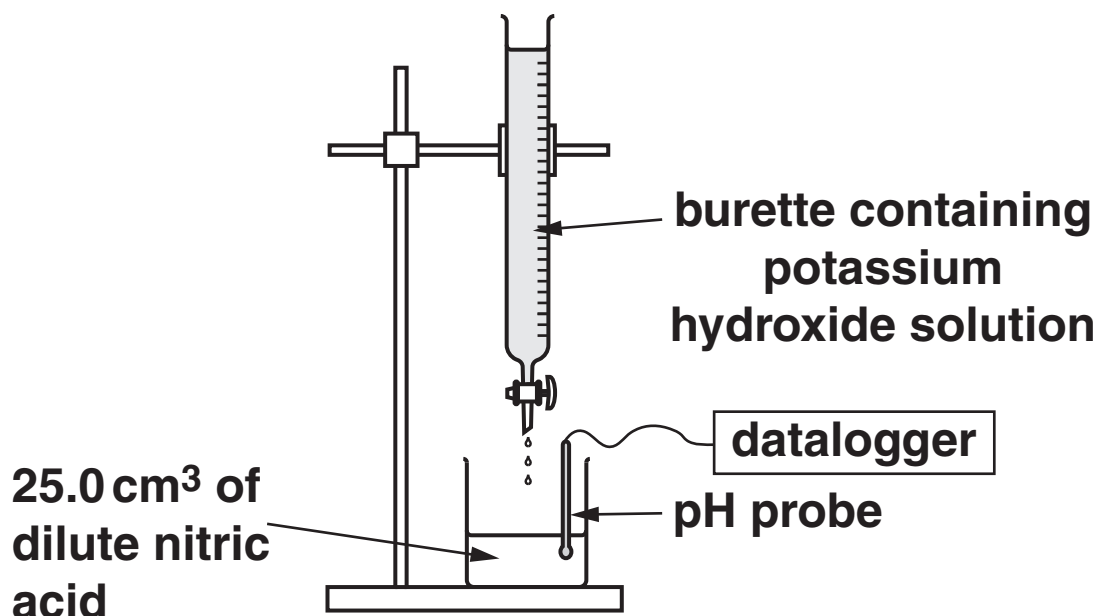
answer _____ [1]

[Total: 4]

6 Zak investigates the neutralisation of dilute nitric acid.

Zak reacts the dilute nitric acid with an alkali, potassium hydroxide solution.

Look at the diagram. It shows the apparatus he uses.



- (a) Zak measures 25.0 cm³ of dilute nitric acid into a beaker.**

What apparatus should he use to measure out this volume of acid?

_____ [1]

- (b) Zak slowly adds the alkali to the dilute nitric acid.**

Describe what happens to the pH of the solution in the beaker as the alkali is slowly added.

_____ [1]

(c) Zak uses a pH probe (pH meter) to find the pH of the solution in the beaker.

Write about ANOTHER method Zak could use to find the pH of a solution.

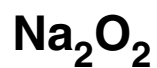
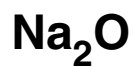
[2]

[Total: 4]

7 Sodium peroxide has the formula Na_2O_2 .

(a) What is the EMPIRICAL formula of sodium peroxide?

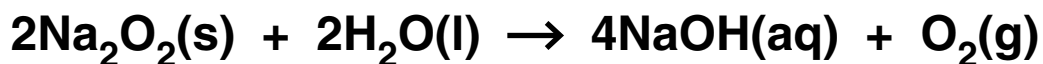
Choose from the list.



answer _____ [1]

(b) Sodium peroxide reacts with water to make oxygen.

Look at the equation for this reaction.



Match each COMPOUND to its PHYSICAL STATE.
Use the state symbols in the equation to help.

Draw only THREE straight lines.

COMPOUND	PHYSICAL STATE
$\text{Na}_2\text{O}_2(\text{s})$	liquid
$\text{H}_2\text{O}(\text{l})$	solid
$\text{NaOH}(\text{aq})$	solution in water

[2]

(c) Chloe finds that 7.80 g of sodium peroxide makes 1.60 g of oxygen.

What mass of oxygen can be made from 1.95 g of sodium peroxide?

mass of oxygen = _____ g [2]

[Total: 5]

SECTION C – MODULE C6

8 This question is about hardness in water.

Hardness of water is caused by chemicals dissolved in the water.

There are two types of hardness, temporary and permanent.

(a) Write down the name of a chemical which causes TEMPORARY hardness.

Choose from the list.

CALCIUM HYDROGENCARBONATE

CALCIUM SULFATE

SODIUM CARBONATE

SODIUM CHLORIDE

answer _____ [1]

(b) Terry buys a new kettle.

She uses the kettle to boil water.

Boiling removes temporary hardness in water.

After a few days the inside of the kettle is coated with a white solid, called limescale.

Write down the CHEMICAL name of limescale.

_____ [1]

[Total: 2]

9 This question is about ethanol.

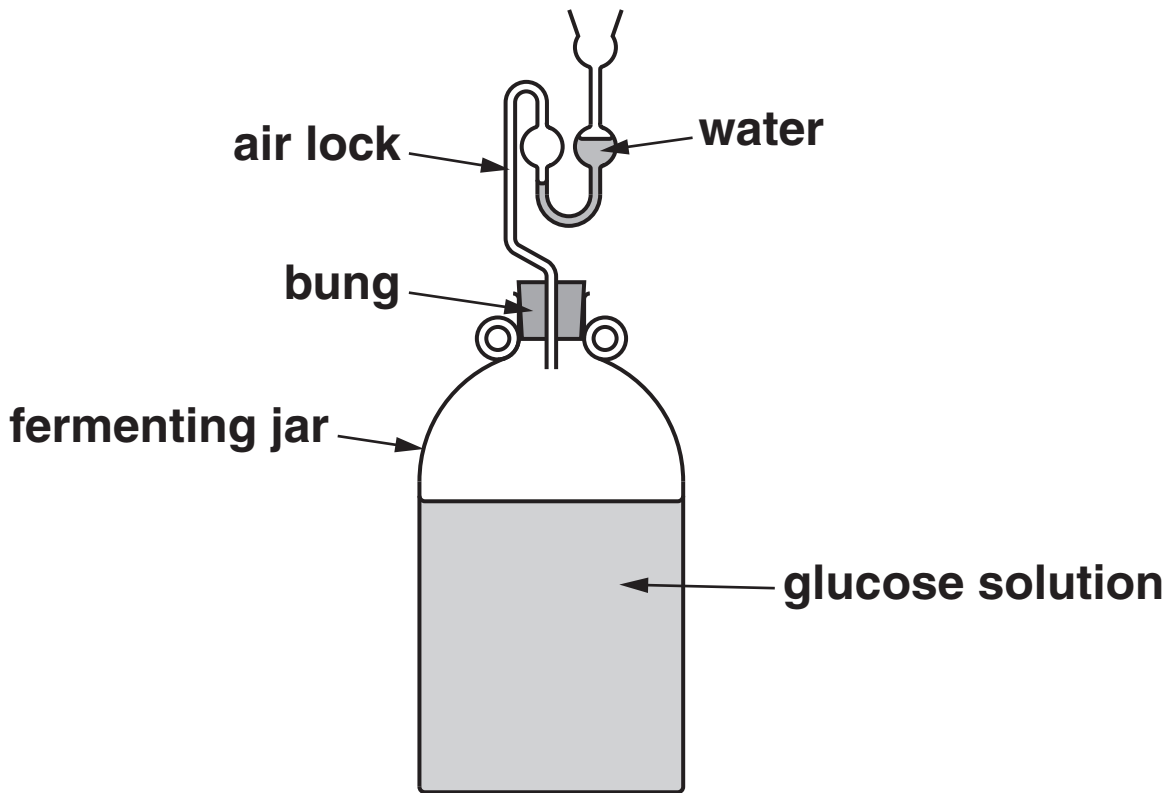
(a) Ethanol is used in alcoholic drinks.

Write down ONE other use for ethanol.

_____ **[1]**

(b) Look at the diagram.

It shows how ethanol can be made by fermentation.



Which three of the following conditions are suitable for fermentation?

Put ticks (✓) next to the THREE correct conditions.

- oxygen present
- oxygen absent
- temperature of 0 °C
- temperature of 35 °C
- dry conditions
- enzyme found in yeast present

[2]

(c) Ethanol can also be made by reacting ethene with water (steam).

(i) Write down the WORD equation for this reaction.

_____ [1]

(ii) Write down the name given to this type of reaction.

Choose from the list.

DEHYDRATION

DISPLACEMENT

FERMENTATION

HYDRATION

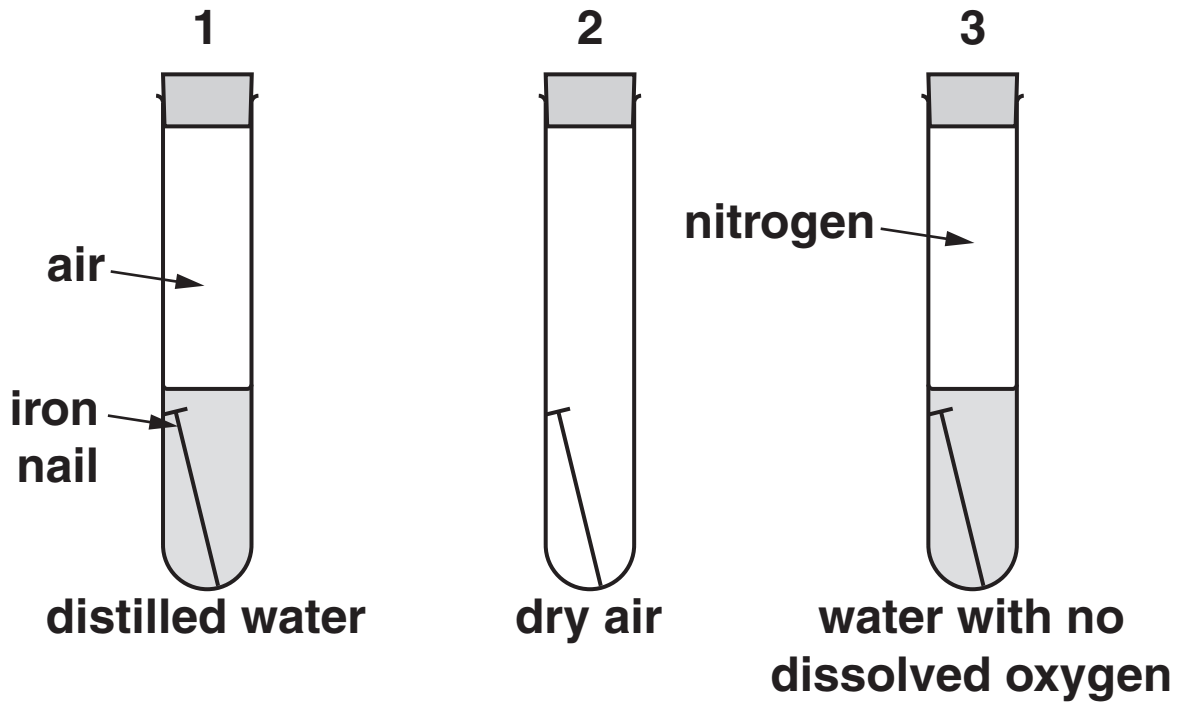
answer _____ [1]

[Total: 5]

10 This question is about rusting.

Gemma investigates the rusting of iron.

Look at the diagram. It shows how she sets up her experiment.



After 2 weeks the nail in tube 1 was rusty.

The nails in tubes 2 and 3 were not rusty.

(a) Explain why the nails in tubes 2 and 3 were not rusty.

tube 2 _____

tube 3 _____

_____ [2]

(b) Gemma leaves a piece of iron outside.

She paints it to stop it rusting.

Write about TWO OTHER ways she could stop iron rusting.

[2]

(c) The rusting of iron involves both oxidation and reduction.

Write down the name of this type of reaction.

[1]

[Total: 5]

11 This question is about analgesics.

(a) Look at the table opposite. It shows some displayed and molecular formulas.

Complete the table. [3]

(b) (i) Paracetamol is an example of an ANALGESIC drug.

What effect does an analgesic drug have on the body?

Choose from the list.

REDUCES PAIN

LOWERS BODY TEMPERATURE

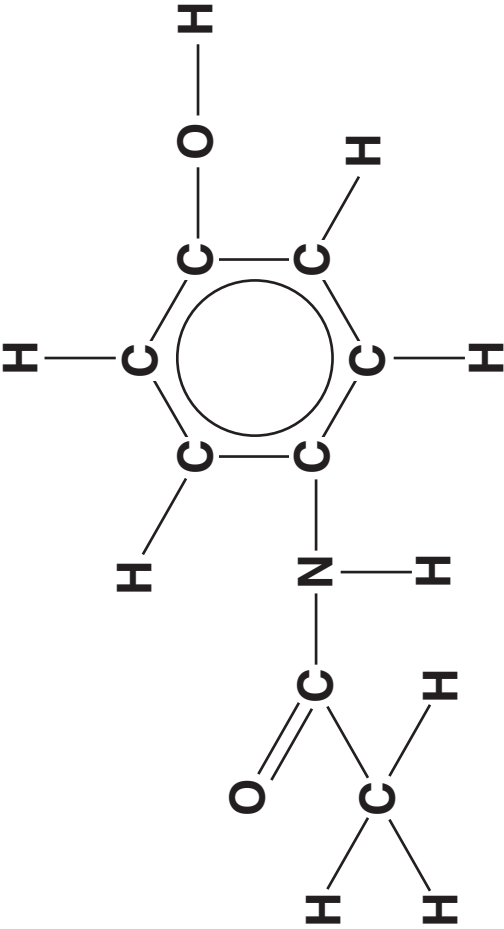
THINS THE BLOOD

answer _____ [1]

(ii) Write down the name of another analgesic drug.

_____ [1]

[Total: 5]

name of compound	molecular formula of compound	displayed formula of compound
ethanol	C_2H_6O	
paracetamol		

12 This question is about chlorofluorocarbons, CFCs.

Most CFCs are banned in the UK.

This is because CFCs damage the ozone layer.

(a) Chlorofluorocarbons contain THREE different elements.

Two of these elements are fluorine and carbon.

Write down the NAME of the OTHER element.

_____ [1]

(b) An oxygen molecule has the formula O_2 .

This means an oxygen molecule contains two atoms.

How many atoms are there in a molecule of ozone, O_3 ?

answer _____ [1]

(c) Damage to the ozone layer allows more ultraviolet light to reach the surface of the Earth.

An increase in ultraviolet light can cause some medical problems.

Write about one of these medical problems.

_____ [1]

[Total: 3]

END OF QUESTION PAPER

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The Periodic Table of the Elements

	1	2	3	4	5	6	7	0										
	7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 C carbon 6	13 Al aluminium 13	14 N nitrogen 7	15 P phosphorus 15	16 O oxygen 8	17 Cl chlorine 17	18 Ar argon 18								
	19 K potassium 19	20 Ca calcium 20	23 Sc scandium 21	24 Ti titanium 22	25 V vanadium 23	26 Cr chromium 24	27 Mn manganese 25	28 Fe iron 26	29 Co cobalt 27	30 Ni nickel 28	31 Cu copper 29	32 Zn zinc 30	33 Ga gallium 31	34 Ge germanium 32	35 As arsenic 33	36 Se selenium 34	37 Br bromine 35	38 Kr krypton 36
	39 Rb rubidium 37	40 Sr strontium 38	45 Y yttrium 39	48 Zr zirconium 40	51 Nb niobium 41	52 Mo molybdenum 42	55 Tc technetium 43	56 Ru ruthenium 44	59 Rh rhodium 45	65 Pd palladium 46	63.5 Ag silver 47	70 Cd cadmium 48	73 In indium 49	75 Sn tin 50	79 Sb antimony 51	80 Te tellurium 52	84 I iodine 53	86 Xe xenon 54
	55 Cs caesium 55	56 Ba barium 56	57 La* lanthanum 57	72 Hf hafnium 72	73 Ta tantalum 73	74 W tungsten 74	75 Re rhenium 75	76 Os osmium 76	77 Ir iridium 77	78 Pt platinum 78	79 Au gold 79	80 Hg mercury 80	81 Tl thallium 81	82 Pb lead 82	83 Bi bismuth 83	84 Po polonium 84	85 At astatine 85	86 Rn radon 86
	[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

1
H
hydrogen
1

Key
relative atomic mass
atomic symbol
name
atomic (proton) number

* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.