Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Wednesday 12 June 2019

Morning (Time: 1 hour 45 minutes) | Paper Reference **1CH0/2F**

Chemistry

Paper 2

Foundation Tier

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.
- A periodic table is printed on the back cover of this paper.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 5 6 4 2 8 A 0 1 3 2

Pearson

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 (a) Plants release oxygen into the atmosphere.

What is the name of the process that releases oxygen into the atmosphere?

(1)

☒ **A** combustion

☒ **B** oxidation

☒ **C** photosynthesis

☒ **D** polymerisation

(b) The atmosphere contains 21% of oxygen.

(i) Figure 1 shows an incomplete bar chart of the main gases in the atmosphere.

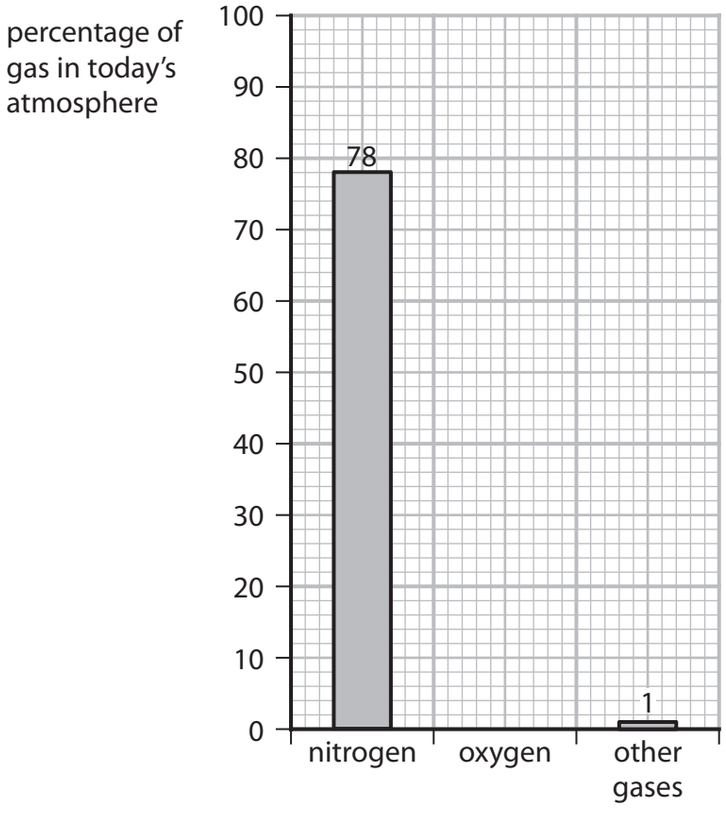


Figure 1

Complete the bar chart by showing the percentage of oxygen in the atmosphere.

(1)

(ii) Calculate the volume of oxygen present in 300 cm^3 of air.

(volumes are measured under the same conditions of temperature and pressure)

(2)

.....

.....

volume of oxygen = ... cm^3

(c) An atom of an element has an atomic number and a mass number.

Draw one straight line from each of these to the numbers of subatomic particles it shows to be present in an atom.

(2)

	number of subatomic particles in an atom
	number of protons
atomic number	number of neutrons
	total number of protons and electrons
mass number	total number of protons and neutrons
	total number of protons, neutrons and electrons

(d) Which test shows a gas is oxygen?

(1)

☒ **A** a few drops of limewater will turn cloudy when shaken with the gas

☒ **B** a glowing splint will relight when placed in the gas

☒ **C** a lighted splint placed in the gas will cause a pop

☒ **D** a piece of damp red litmus paper will turn blue when placed in the gas

(Total for Question 1 = 7 marks)

2 (a) Complete the following sentences.

(i) The name given to group 7 in the periodic table is .....

(1)

(ii) The name given to group 0 in the periodic table is .....

(1)

(b) Which of the following rows gives the colours of the group 7 elements chlorine and bromine at room temperature?

(1)

		chlorine	bromine
☒	**A**	red-brown	purple
☒	**B**	yellow-green	grey
☒	**C**	yellow-green	red-brown
☒	**D**	grey	red-brown

(c) Figure 2 shows the melting and boiling points of bromine and iodine.

element	melting point in °C	boiling point in °C
bromine	–7	59
iodine	114	184

Figure 2

Using the information in Figure 2, which row shows the physical states of these elements at 50 °C?

(1)

		bromine	iodine
☒	**A**	liquid	gas
☒	**B**	solid	liquid
☒	**C**	gas	solid
☒	**D**	liquid	solid

(d) The densities of some elements in group 0 are shown in Figure 3.

name	density in g cm^{-3}
helium	0.15
neon	1.2
argon	1.4
krypton	
xenon	3.5

Figure 3

Use the information in Figure 3 to suggest the density of krypton.

(1)

density of krypton = ... g cm^{-3}

(e) For many years, argon was used to fill filament light bulbs.

A filament light bulb is shown in Figure 4.

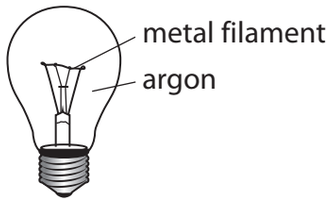


Figure 4

When the bulb is in use the metal filament becomes extremely hot.

Explain why argon, rather than air, was used to fill filament light bulbs.

(2)

.....

.....

.....

.....

.....

(Total for Question 2 = 7 marks)

3 Polymer molecules can be made by joining together large numbers of small molecules called monomers.

(a) Figure 5 shows the names and structures of some polymers and the monomers used to make them.

Complete the table using the information given.

(3)

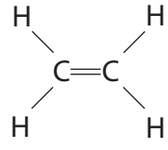
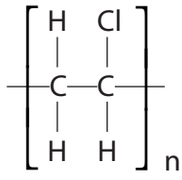
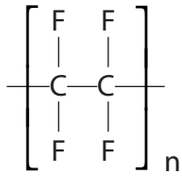
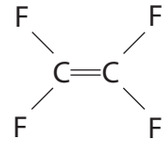
name of polymer	structure of polymer molecule	name of monomer	structure of monomer molecule
poly(ethene)		ethene	
poly(chloroethene)		chloroethene	
		tetrafluoroethene	

Figure 5

(b) Plastics are polymers.

State **two** problems caused by the disposal of polymers.

(2)

1 .....

.....

2 .....

.....

(c) A molecule of propene has the structure shown in Figure 6.

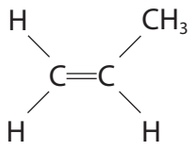
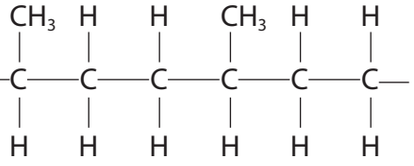


Figure 6

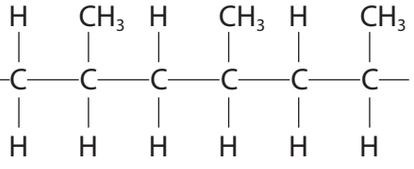
Which of the following shows the structure of part of a poly(propene) molecule?

(1)

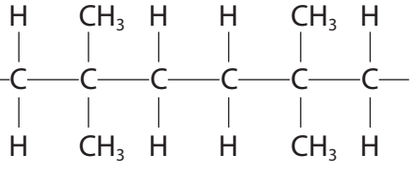
☒ **A**



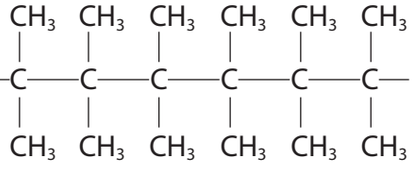
☒ **B**



☒ **C**



☒ **D**



(d) Calculate the relative formula mass of the poly(propene) molecule made from joining together 24 600 molecules of propene, C_3H_6.
(relative formula mass: $C_3H_6 = 42.0$)

Give your answer to three significant figures.

(2)

.....

.....

.....

relative formula mass = ...

(Total for Question 3 = 8 marks)

4 A student poured 50 cm^3 water into a beaker and measured the water's temperature.

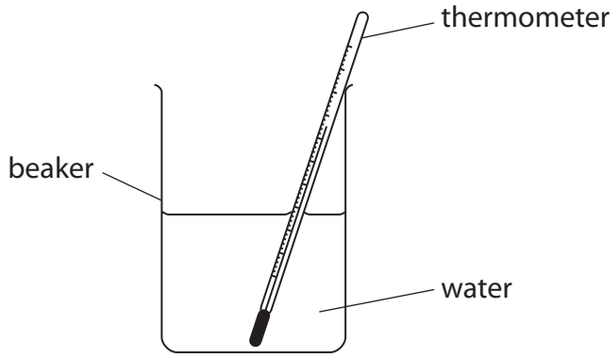


Figure 7

The student added 1.00 g calcium chloride to the water, stirred the mixture and then recorded the temperature.

(a) Give the name of the apparatus that could be used to measure 1.00 g of calcium chloride.

(1)

.....

(b) The student's results were

temperature of water at start	= 21 °C
temperature of mixture after stirring	= 32 °C

Explain, using these results, the type of heat energy change that occurs when calcium chloride dissolves in water.

(2)

.....

.....

.....

.....

(c) Calcium chloride is hazardous to health.

(i) Which hazard symbol would be expected to be seen on a container of calcium chloride?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(ii) Give a safety precaution that the student should take during the experiment.

(1)

.....

.....

(d) State **one** way in which the apparatus could be changed to reduce the amount of heat energy lost during the experiment.

(1)

.....

.....

(e) The concentration of a calcium chloride solution is 12 g dm^{-3}.

Calculate the volume of this solution, in cm^3, that contains 9.0 g of calcium chloride.

You must show your working.

(3)

volume of solution = ... cm^3

(Total for Question 4 = 9 marks)

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5 (a) Propene can be produced by the cracking of some hydrocarbons obtained from crude oil.

The equation shows the cracking of one molecule of decane to produce one molecule of butene and one molecule of another product.

$$\underset{\text{decane}}{C_{10}H_{22}} \rightarrow \underset{\text{butene}}{C_4H_8} + C_xH_y$$

(i) Calculate the values of x and y in C_xH_y.

(2)

x = ... y = ...

(ii) State the total mass of products formed if 25 g of decane is cracked in this way.

(1)

.....

(b) The structure of a molecule of ethene is shown in Figure 8.

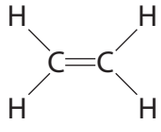


Figure 8

(i) Figure 9 shows the incomplete dot and cross diagram for a molecule of ethene.

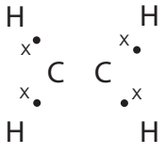


Figure 9

Complete Figure 9 to show the electrons of the C═C double bond.

(1)

(ii) The incomplete combustion of ethene in air produces water as one of the products.

Give the name of another product of the incomplete combustion of ethene.

(1)

.....

(c) Substance X is an unsaturated hydrocarbon.
The structure of a molecule of substance X is shown in Figure 10.

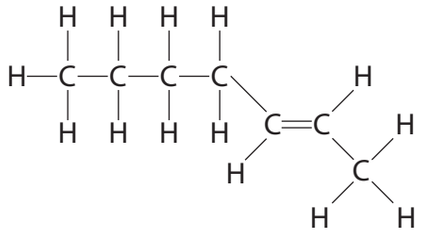


Figure 10

Explain how the structure of substance X shows that it is an **unsaturated hydrocarbon**.

(2)

(d) Two liquid hydrocarbons, **A** and **B**, were tested with bromine water.
One hydrocarbon was known to be an alkane.
The other hydrocarbon was known to be an alkene.

Each hydrocarbon was shaken with a few drops of bromine water.

The results of the tests were
hydrocarbon A + bromine water: the mixture turned from orange to colourless.
hydrocarbon B + bromine water: the orange colour remained.

Explain these results.

(2)

(Total for Question 5 = 9 marks)

6 The word equation for the reaction between magnesium and dilute hydrochloric acid is

magnesium + hydrochloric acid → magnesium chloride + hydrogen

The reaction was carried out using the apparatus shown in Figure 11.

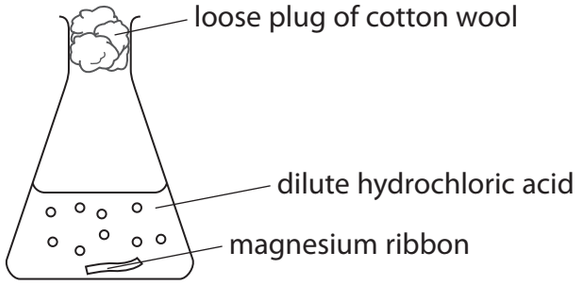


Figure 11

A strip of magnesium ribbon was placed in the conical flask.
100 cm^3 of dilute hydrochloric acid was added to the conical flask.

The mass of the flask and contents was measured at regular intervals.
The loss in mass was calculated.
Figure 12 shows a graph of the results.

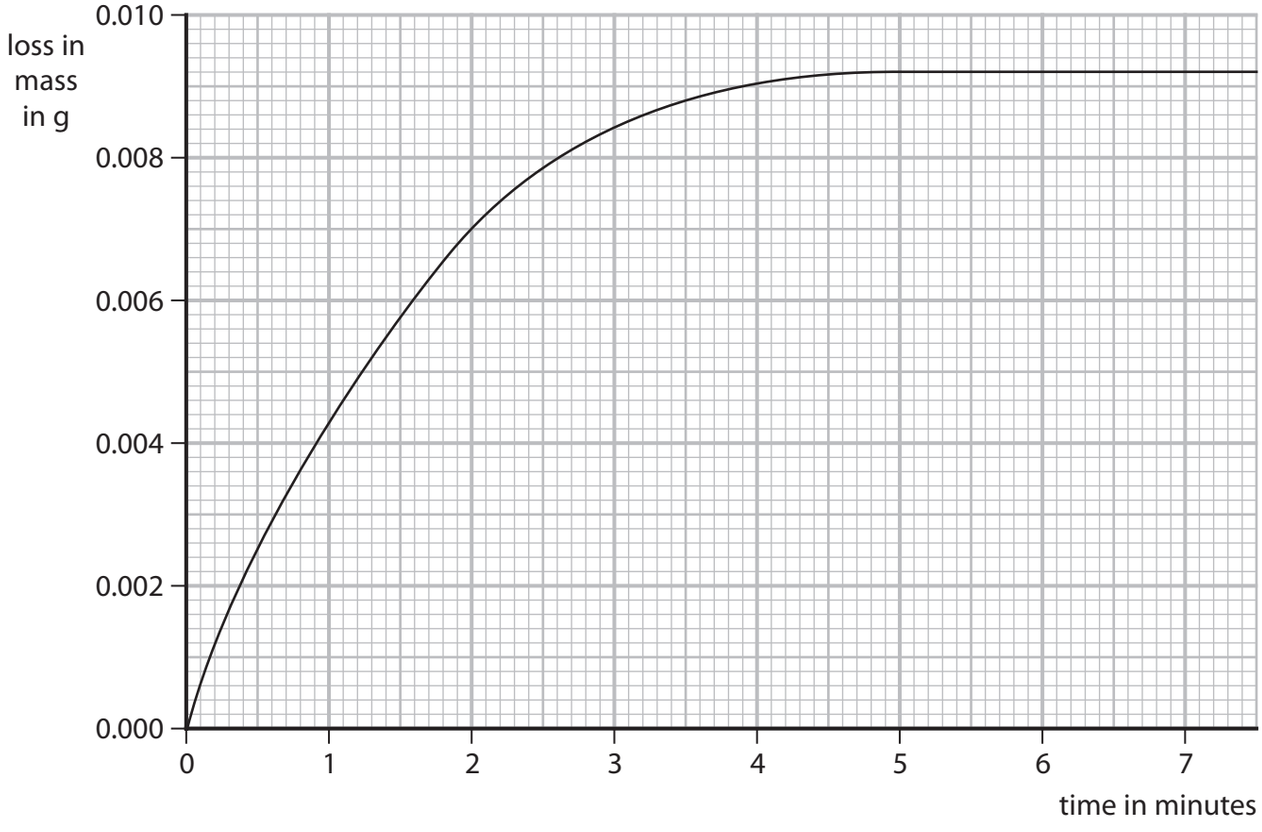


Figure 12

(a) Name the apparatus that could be used to measure out 100 cm^3 of dilute hydrochloric acid.

(1)

.....

(b) Explain why there is a loss in mass of the flask and contents.

(2)

.....

.....

.....

.....

(c) The graph shows that the rate of reaction slows as the reaction takes place.

Explain, in terms of particles, why the rate of reaction between magnesium ribbon and dilute hydrochloric acid slows as the reaction takes place.

(3)

.....

.....

.....

.....

.....

.....

(d) The experiment was repeated using the acid at a higher temperature.
All other conditions were kept the same.

State the effect of the higher temperature on the mass loss after two minutes.

(1)

.....

.....

(e) The original experiment was repeated using the same mass of magnesium powder instead of the magnesium ribbon.
All other conditions were kept the same.

Sketch, on the graph in Figure 12, the line you would expect for this experiment.

(2)

(f) Some reactions are affected by the presence of a catalyst.

(i) State the effect of a catalyst on a reaction.

(1)

(ii) Devise a simple experiment to find out what happens to the mass of a solid catalyst during a reaction.

(3)

(Total for Question 6 = 13 marks)

7 (a) Qualitative tests are carried out on ionic substances to identify the ions present in the substances.

The test for a given ion must be unique to that ion.

(i) Explain why the test for a given ion must be unique to that ion.

(2)

.....

.....

.....

.....

(ii) In the test for the carbonate ion, CO_3^{2-}, dilute hydrochloric acid is added to the solid being tested.

State the name of the gas produced in the test if carbonate ions are present.

(1)

.....

(iii) Tests for three ions are described.

Draw one straight line from the test for each ion to the observation that shows that ion to be present.
Each observation may be correct for one test, more than one test, or for none of the tests.

(3)

description of test	**observation**
test for chloride ion: add dilute nitric acid followed by silver nitrate solution	green precipitate
test for iodide ion: add dilute nitric acid followed by silver nitrate solution	red precipitate
test for sulfate ion: add dilute hydrochloric acid followed by barium chloride solution	white precipitate
	yellow precipitate

*(b) A white solid is known to be a chloride in which the metal ion is sodium, potassium, calcium or aluminium.

A chemist was told to carry out a test for each metal ion that could be present in this white solid.

Describe tests to show the presence of each of these metal ions.

(6)

(Total for Question 7 = 12 marks)

8 Most of the fuels used today are obtained from crude oil.

(a) Which statement about crude oil is correct?

(1)

☒ **A** crude oil is a compound of different hydrocarbons

☒ **B** crude oil is a mixture of hydrocarbons

☒ **C** crude oil contains different hydrocarbons, all with the same molecular formula

☒ **D** crude oil is an unlimited supply of hydrocarbons

(b) Crude oil is separated into several fractions by fractional distillation.
Two of these fractions are kerosene and diesel oil.

(i) State a use for each of these fractions.

(2)

kerosene .....

diesel oil .....

(ii) Figure 13 shows where the fractions kerosene and diesel oil are produced in the fractionating column.

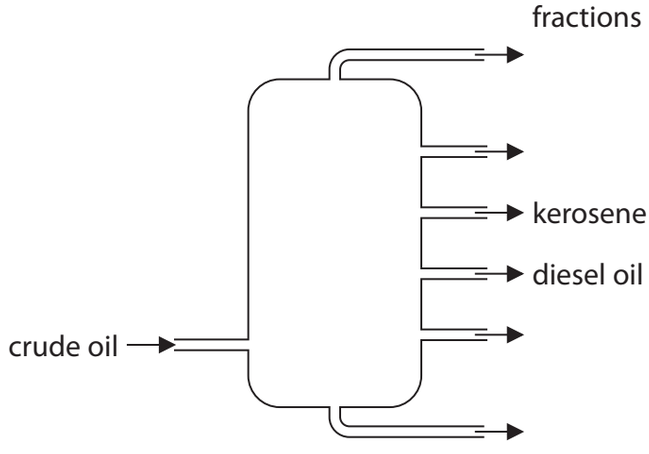


Figure 13

Kerosene is obtained higher up the column than diesel oil.
Kerosene and diesel oil fractions have slightly different properties.

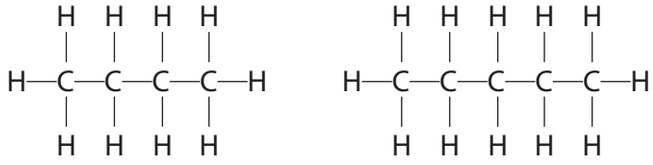
Choose a property.
State how this property for kerosene compares with the property for diesel oil.

(1)

property .....

comparison .....

(c) Figure 14 shows the formulae of a molecule of butane and of a molecule of pentane. Butane and pentane are neighbouring members of the same homologous series.



butane pentane

Figure 14

(i) Explain, using these formulae, why butane and pentane are neighbouring members of the same homologous series.

(2)

(ii) Butane has the formula C_4H_{10}.

Calculate the mass of carbon in 100 g of butane.

Give your answer to three significant figures.

(relative atomic masses: H = 1.00, C = 12.0;
relative formula mass: C_4H_{10} = 58.0)

You must show your working.

(3)

mass of carbon = ... g

(iii) Butane burns completely in air to form carbon dioxide and water.

Write the word equation for this reaction.

(2)

(Total for Question 8 = 11 marks)

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9 (a) An aluminium atom has the atomic number 13 and the mass number 27.

Which row shows the numbers of subatomic particles present in an aluminium ion, Al^{3+}?

(1)

	protons	neutrons	electrons
☒ **A**	13	14	13
☒ **B**	13	14	10
☒ **C**	14	13	10
☒ **D**	14	13	17

(b) Magnesium burns in excess oxygen to form magnesium oxide.
The balanced equation for this reaction is

$$2Mg + O_2 \rightarrow 2MgO$$

Starting with 1.35 g of magnesium, calculate the maximum mass of magnesium oxide that could be formed in this reaction.
(relative atomic masses: O = 16.0, Mg = 24.0)

You must show your working.

(3)

mass of magnesium oxide = ... g

(c) Chlorine reacts with hydrogen to form hydrogen chloride.

Write the balanced equation for this reaction.

(3)

*(d) Sodium chloride is an ionic compound, containing sodium ions, Na^+, and chloride ions, Cl^-.

Figure 15 shows the electronic configuration of sodium and chlorine.

	electron configuration
sodium	2.8.1
chlorine	2.8.7

Figure 15

Explain how sodium and chlorine atoms form the ions in sodium chloride and how the ions are arranged in the solid sodium chloride.

You may wish to use diagrams in your answer.

(6)

(Total for Question 9 = 13 marks)

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10 (a) Ethanol is made by fermentation of a carbohydrate dissolved in water, in the presence of yeast.

The reaction is carried out at 30 °C.

Explain why the reaction is carried out at a temperature of 30 °C rather than at a temperature of 80 °C.

(2)

.....

.....

.....

.....

(b) Ethanol, C_2H_5OH, can be converted into ethanoic acid, CH_3COOH.

(i) In this reaction ethanol is

(1)

☒ **A** hydrated

☒ **B** oxidised

☒ **C** polymerised

☒ **D** reduced

(ii) Draw the structure of a molecule of ethanoic acid, CH_3COOH, showing all covalent bonds.

(2)

(c) (i) The apparatus in Figure 16 can be used to investigate the temperature rise produced in a known mass of water when a sample of ethanol is burned.

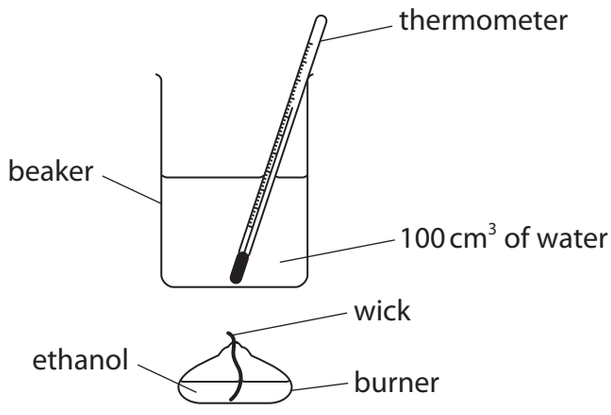

Figure 16

The first steps of the method are

1. put 100 cm^3 of water into a beaker
2. determine the mass of the burner containing ethanol
3. measure the initial temperature of the water
4. place the burner under the beaker of water
5. light the wick

Describe the remaining steps of the method that are needed to determine the mass of ethanol required to raise the temperature of the water by 30 °C.

(3)

(ii) In a different experiment, separate samples of the alcohols methanol, ethanol, propanol, butanol and pentanol were burned to determine the mass of each alcohol that needs to be burned to raise the temperature of 100 cm^3 water by 10 °C.

alcohol	number of carbon atoms in one molecule of alcohol	mass of alcohol burned in g
methanol	1	0.37
ethanol	2	0.28
propanol	3	0.25
butanol	4	0.23
pentanol	5	0.22

Draw a graph of the mass of each alcohol required to raise the temperature of 100 cm^3 of water by 10 °C against the number of carbon atoms in one molecule of that alcohol.

(3)

mass of alcohol burned in g

number of carbon atoms in one molecule of alcohol

(Total for Question 10 = 11 marks)

TOTAL FOR PAPER = 100 MARKS

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The periodic table of the elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The elements with atomic numbers from 58 to 71 are omitted from this part of the periodic table.***

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