Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

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

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.
- There is a periodic table on the back cover of the 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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Q:1/1/1/1/1/

P 6 9 4 8 6 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 Figure 1 shows toothbrushes in a container.

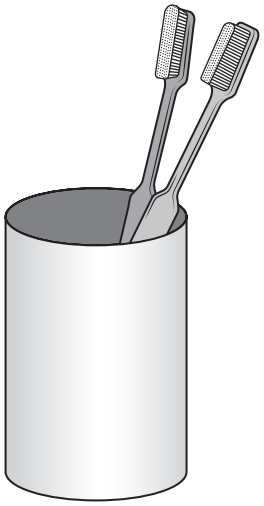

Figure 1

(a) The toothbrush handles are made of plastic (polymer).

(i) Give a reason why plastic is a suitable material to make a toothbrush handle.

(1)

.....

.....

(ii) Some toothbrush handles are made of wood, not plastic.

Explain a disadvantage of using plastics.

(2)

.....

.....

(b) The container is made of a ceramic material.

Which is a property of the ceramic that makes it suitable for the container?

(1)

- ☒ **A** it will break if dropped
- ☒ **B** it does not react with water
- ☒ **C** it melts at over 2 000 °C
- ☒ **D** it is a good conductor of heat

(c) In some countries, toothpastes contain nanoparticles of silver.

Which statement describes the size of a nanoparticle?

(1)

- ☒ **A** the size of an electron
- ☒ **B** the size of an atom
- ☒ **C** the size of a few hundred atoms
- ☒ **D** the size of 1 million molecules

(d) Toothpastes contain abrasives and other substances to make them effective.

Figure 2 is a pie chart of the percentage composition by volume of one toothpaste.

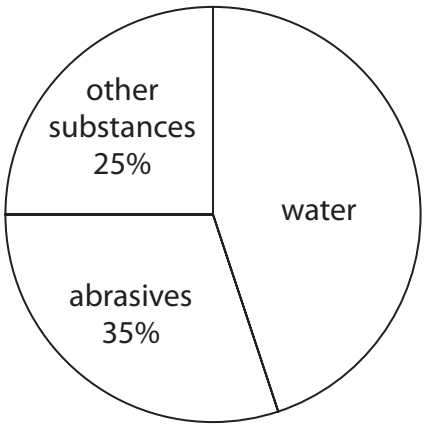

Figure 2

Calculate the volume of water in 150 cm^3 of this toothpaste.

(2)

.....

.....

volume of water = ... cm^3

(Total for Question 1 = 7 marks)

2 This question is about elements in group 1 of the periodic table.

(a) Figure 3 shows the symbols of the first three elements in group 1 of the periodic table and their melting points.

symbol	melting point in °C
Li	181
Na	98
K	64

Figure 3

Use the periodic table to answer these questions.

(i) Give the symbol of **another** element in group 1.

(1)

.....

(ii) Give the atomic number of lithium.

(1)

.....

(iii) Describe the trend in the melting points of the elements in Figure 3.

(2)

.....

.....

(b) The elements in group 1 react very vigorously with water.

A student suggests this method to see what happens when sodium reacts with water.

step 1 put on safety glasses and a laboratory coat

step 2 cut a 2 cm × 2 cm × 2 cm cube of sodium

step 3 put a few drops of water in the container shown in Figure 4

step 4 add the sodium to the water in the container and observe the reaction

(i) Figure 4 shows a diagram of the container the student suggested for step 3.

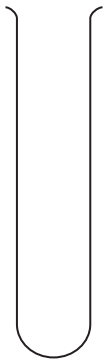

Figure 4

Give the name of the container shown in Figure 4.

(1)

.....

(ii) A teacher says that the method is not safe because the reaction is too vigorous.

Explain changes that could be made to step 2 and to step 3 that would make the method safer.

(3)

step 2: change and explanation

.....

.....

.....

step 3: change and explanation

.....

.....

.....

(Total for Question 2 = 8 marks)

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3 Compounds are tested to see if they contain chloride, bromide or iodide ions.

Figure 5 shows a flow chart of this test.

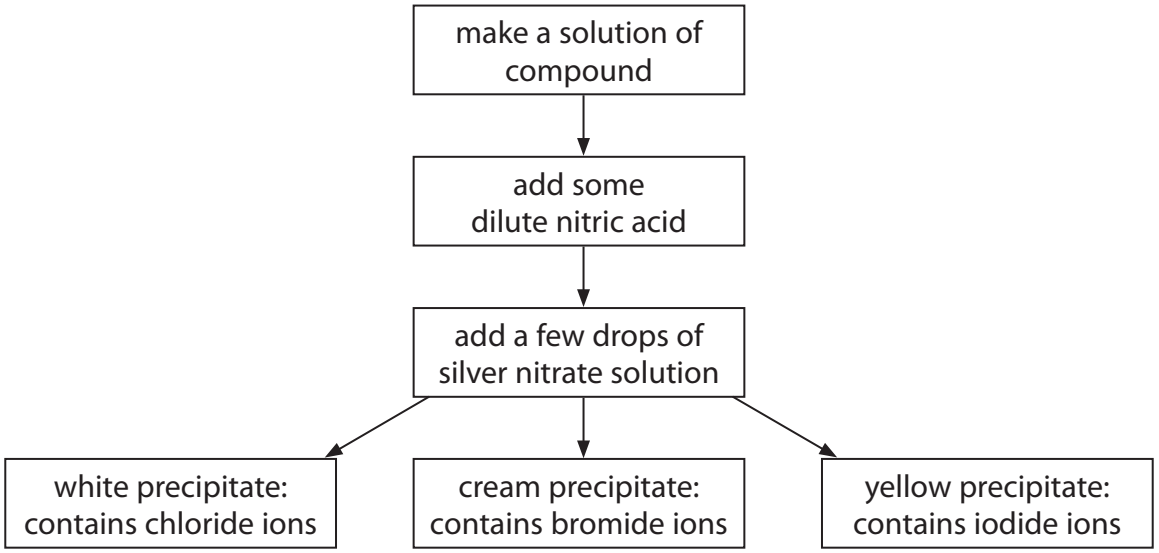

Figure 5

(a) (i) Describe how to make a solution from a solid in a test tube.

(2)

.....

.....

(ii) Give the name of the apparatus that should be used to add a few drops of silver nitrate solution to the test tube.

(1)

.....

(iii) When an equation is written for this reaction, which state symbol is used for the silver nitrate solution?

(1)

- ☒ **A** aq
- ☒ **B** g
- ☒ **C** l
- ☒ **D** s

(b) (i) When one compound is tested, a precipitate is seen.

State what you **see** when a precipitate forms.

(1)

.....

(ii) Using Figure 5, name the ion in the compound that causes a cream precipitate.

(1)

ion .....

(c) A compound of potassium is tested.
It forms a white precipitate.

(i) Using Figure 5, name the compound.

(1)

.....

(ii) 10.0 g of the solution of the compound of potassium are tested.
1.0 g of dilute nitric acid is added.
4 drops of silver nitrate solution are added, each with a mass of 0.2 g.

Calculate the mass of the mixture at the end of the test.

(2)

.....

.....

mass = ... g

(Total for Question 3 = 9 marks)

4 Some reactions are exothermic and some reactions are endothermic.

(a) What does an exothermic reaction always give out?

(1)

- ☒ **A** heat energy
- ☒ **B** light
- ☒ **C** a gas
- ☒ **D** sound

(b) In an experiment, a solid is mixed with a liquid.
The temperature change of the mixture is measured.

Figure 6 shows the apparatus that is used.

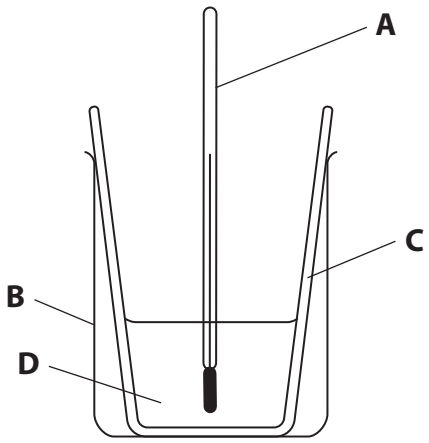

Figure 6

(i) Give the letter of the piece of apparatus, **A**, **B**, **C** or **D**, in Figure 6 that is used to measure the temperature.

(1)

.....

(ii) Give the name of the piece of apparatus **B** shown in Figure 6.

(1)

.....

(iii) The piece of apparatus labelled **C** is made from polystyrene.

State why polystyrene is a better material than glass for this piece of apparatus.

(1)

.....

.....

(iv) The results of the experiment are given in Figure 7.

temperature of liquid at start in °C	18.6
temperature of products at end in °C	16.1

Figure 7

Calculate the change in temperature.

Give a sign and a unit in your answer.

(3)

.....

.....

temperature change = ...

(v) The solid used in this experiment contained only NH_4^+ ions and NO_3^- ions.

Give the formula and the name of the solid.

(2)

formula .....

name .....

(Total for Question 4 = 9 marks)

5 (a) Figure 8 shows one molecule of a compound obtained from crude oil.

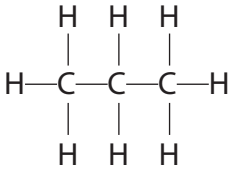

Figure 8

(i) Give the names of the **two** elements in this molecule.

(2)

.....

.....

(ii) What is the molecule in Figure 8?

(1)

☒ **A** an oxide

☒ **B** a chain molecule

☒ **C** a fullerene

☒ **D** a ring molecule

(iii) What is the relative formula mass of the compound in Figure 8?

(relative atomic masses: H = 1.0, C = 12)

(1)

☒ **A** 13

☒ **B** 42

☒ **C** 44

☒ **D** 96

(b) Crude oil can be separated into different fractions.

Draw **one** straight line from each fraction to a use of that fraction.

(3)

fraction	**use**
petrol	fuel for aircraft
kerosene	fuel for ships
bitumen	fuel for cars
	making plastic
	extracting iron
	making road surfaces

(c) Hydrogen chloride gas and sulfur dioxide gas are dissolved in separate test tubes of water.
Blue litmus paper is dipped into each test tube.

State and explain the colour change you would observe in each test tube.

(3)

.....

.....

.....

.....

.....

(Total for Question 5 = 10 marks)

6 This question is about elements in group 7, the halogens.

(a) Which halogen is a green gas at room temperature and pressure?

(1)

- ☒ **A** bromine
- ☒ **B** chlorine
- ☒ **C** fluorine
- ☒ **D** iodine

(b) Bromine, chlorine and iodine all react with heated iron wool.

Figure 9 shows the speed of these reactions.

halogen	description of reaction with heated iron wool
bromine	reacts quickly
chlorine	reacts very quickly
iodine	reacts slowly

Figure 9

(i) When iron wool is heated with chlorine, iron chloride is formed.

Write the word equation for this reaction.

(2)

.....

.....

(ii) Give the name of the halogen in Figure 9 that is the most reactive with iron.

(1)

.....

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(iii) 34.4 % of the mass of iron chloride is iron.

Calculate the mass of iron and the mass of chlorine in 125 g of iron chloride.

(3)

.....

.....

.....

mass of iron = ... g mass of chlorine = ... g

(c) Alkenes react with halogens.

When iron chloride is added to the reaction mixture, the reaction is much faster but the products are the same.

Use words from the box to complete the sentences.

an acid	a catalyst	higher	lower	a reactant	unchanged

(2)

The iron chloride speeds up the reaction because it is .....

After the reaction, the mass of iron chloride is .....

(Total for Question 6 = 9 marks)

7 The structure of one molecule of a compound is shown in Figure 10.

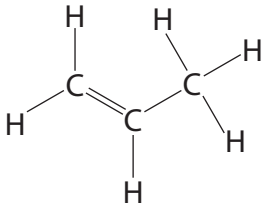

Figure 10

(a) What is the molecular formula of the compound in Figure 10?

(1)

- ☒ **A** CH
- ☒ **B** CH_2
- ☒ **C** 3C6H
- ☒ **D** C_3H_6

(b) The compound in Figure 10 is an unsaturated hydrocarbon.

State why the compound is described as an **unsaturated hydrocarbon**.

(3)

unsaturated .....

.....

.....

hydrocarbon .....

.....

.....

(c) Many molecules of the compound in Figure 10 combine to form substance Y.
Figure 11 shows part of a molecule of substance Y.

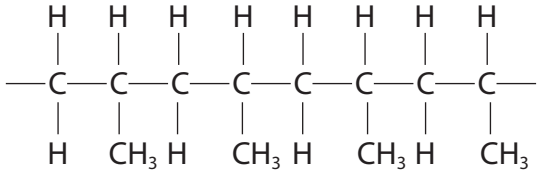

Figure 11

(i) What type of substance is Y?

(1)

- ☒ **A** a composite
- ☒ **B** a nanoparticle
- ☒ **C** a polymer
- ☒ **D** a protein

(ii) One molecule of the compound in Figure 10 has a mass of 6.98×10^{-23} g.

64 800 of these molecules combine to form one molecule of Y.

Calculate the mass of this molecule of Y in g.

(2)

.....

.....

mass of one molecule of Y = ... g

*(d) Alkanes can be burned in air.
Different products can be formed as the combustion of alkanes can be complete or incomplete.

An investigation was carried out to compare the energy released when the first four alkanes in the homologous series were burned.
Equal amounts of these alkanes were burned to heat 100 cm^3 of water.
The temperature change for each alkane is shown in Figure 12.

alkane	temperature change in °C
methane	9
ethane	16
propane	22
butane	29

Figure 12

Discuss the complete and incomplete combustion of these alkanes and the trend in the energy changes they produced.

You should give word equations in your answer.

(6)

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(Total for Question 7 = 13 marks)

8 A student used the apparatus in Figure 13 to investigate the rate of the reaction between a metal and dilute hydrochloric acid.

Pieces of the metal were placed in dilute hydrochloric acid in the flask, and the total volume of gas produced was measured every minute.

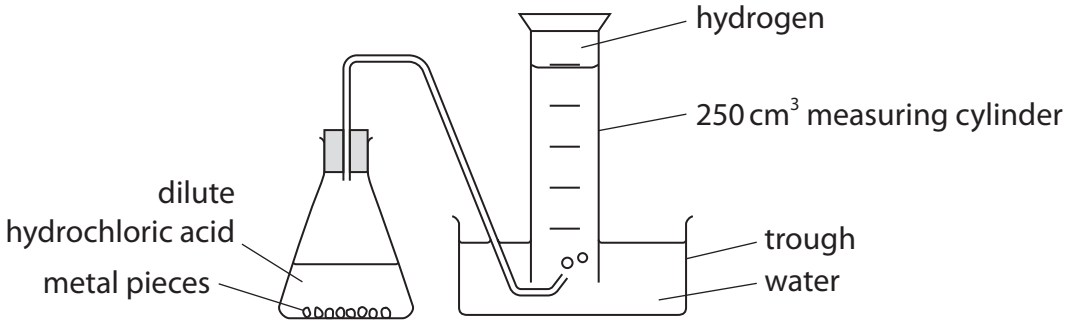

Figure 13

(a) Figure 14 shows a graph of the student's results.

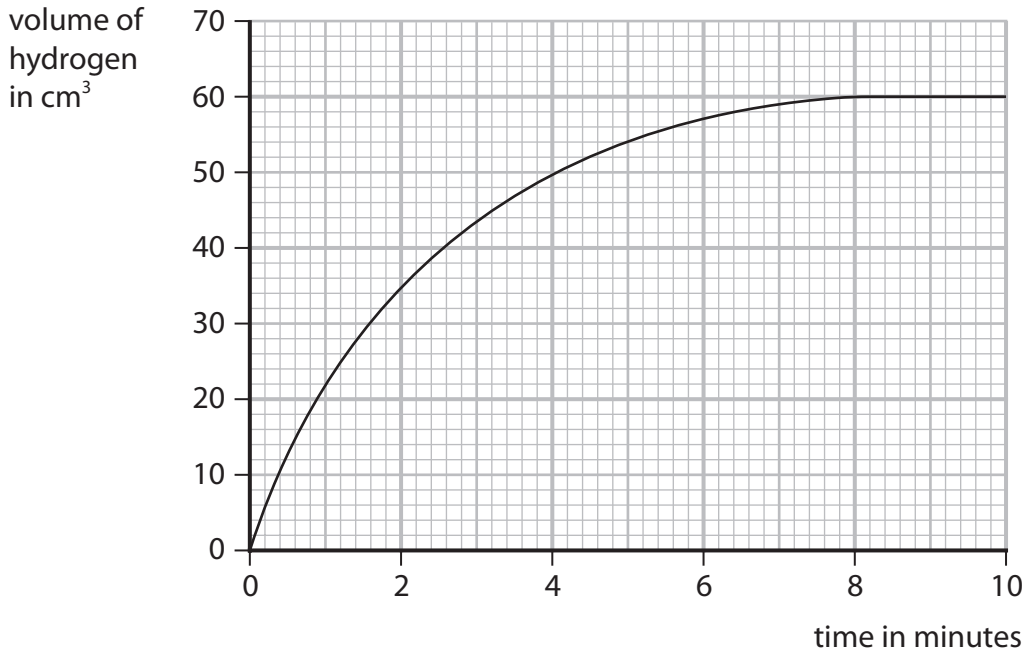

Figure 14

(i) Name a piece of apparatus that would be better to measure the volume of gas produced, instead of the 250 cm^3 measuring cylinder.

Give a reason for your answer.

(2)

name of apparatus

.....

reason

.....

.....

(ii) Calculate the mean rate of production of hydrogen over the first 90 seconds, in cm^3 per second.

(3)

.....

.....

.....

.....

rate = ... cm^3 per second

(iii) The student measured the volume of gas for 10 minutes.

State why the measurements could have been stopped at 9 minutes.

(1)

.....

.....

(b) The experiment was repeated, but with acid of a higher concentration.

The rate of reaction was faster.

(i) Explain why the rate of reaction increases when the concentration of acid is increased.

(2)

.....

.....

.....

(ii) Another student suggests four other ways of increasing the rate of this reaction.

Which one is correct?

(1)

- ☒ **A** use the same acid but at a lower temperature
- ☒ **B** use a larger trough
- ☒ **C** use a smaller flask
- ☒ **D** use the same metal but in a powdered form

(c) The apparatus in Figure 13 can be used to measure the rate of the reaction between marble chips and hydrochloric acid.

The student needs different sized marble chips.

Describe how the student can make small and medium sized marble chips from large chips.

(2)

.....

.....

.....

(Total for Question 8 = 11 marks)

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9 This question is about gases.

(a) When sodium is added to water, hydrogen gas is produced.

Which observation shows that a gas has been produced?

(1)

- ☒ **A** a white precipitate forms
- ☒ **B** effervescence is seen
- ☒ **C** the sodium sinks in the water
- ☒ **D** the water changes to a pink colour

(b) Some damp litmus paper is placed in a gas.
The litmus paper is bleached.

Which gas bleaches damp litmus paper?

(1)

- ☒ **A** carbon dioxide
- ☒ **B** chlorine
- ☒ **C** hydrogen
- ☒ **D** oxygen

(c) When calcium carbonate is heated it decomposes.

$$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$$

When 5.000 g of calcium carbonate is heated, the mass of solid remaining is 2.800 g.

Calculate the mass of carbon dioxide that has been released.

Give your answer to three significant figures.

(2)

.....

.....

mass of carbon dioxide = ... g

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(d) A diagram of an atom of helium is shown in Figure 15.

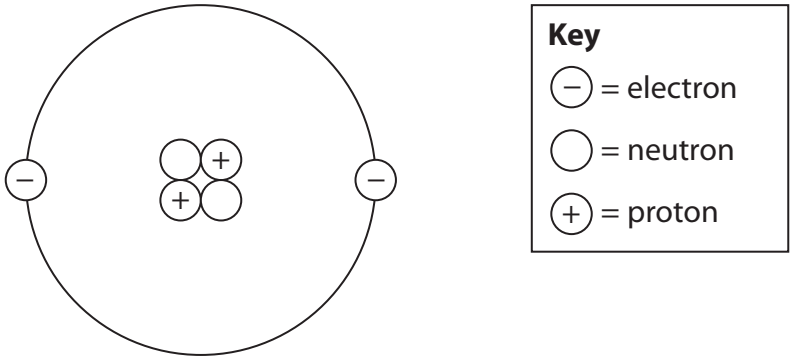

Figure 15

(i) Explain, using Figure 15, why helium is inert.

(2)

.....

.....

.....

(ii) Helium is used to fill balloons.

State one property of helium, apart from it being inert, that makes it suitable for filling balloons.

(1)

.....

*(e) Figure 16 shows the relative amounts of three gases in the early atmosphere compared to the composition of today's atmosphere.

gas	relative amount in early atmosphere	composition of today's atmosphere
water vapour	large amount	0% to 4%
carbon dioxide	large amount	less than 0.5%
oxygen	little or none	21%

Figure 16

Natural processes and human activities have altered the relative amounts of these gases in the atmosphere.

Explain how the relative amount of each of the gases in Figure 16 has increased or decreased over time.

(6)

(Total for Question 9 = 13 marks)

10 (a) Some acids are used in tests for ions.

A bottle of one acid is shown in Figure 17.

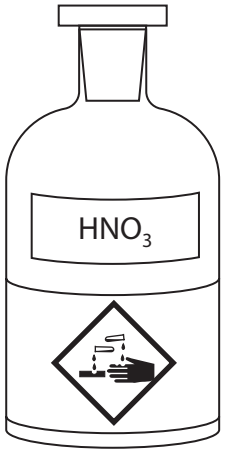

Figure 17

(i) The acid in Figure 17 can be used in the test for carbonate ions.

Explain, giving the name of the hazard symbol shown, what safety precautions should be taken when using this acid.

(2)

.....

.....

.....

.....

(ii) Give the name of the acid shown in Figure 17.

(1)

.....

(iii) State a property of glass that makes it a suitable material to make the container for an acid.

(1)

.....

.....

(b) A teacher conducts a flame test to identify the metal ions in some unknown solids.

step 1 dip a flame test wire into hydrochloric acid

step 2 dip the flame test wire into the unknown solid

step 3 hold the flame test wire above a Bunsen burner flame

(i) This method did not work well.

Explain an improvement that needs to be made to **step 3** to enable a bright flame colour to be produced.

(2)

.....

.....

.....

(ii) Figure 18 shows the results of the flame tests on three compounds, **P**, **Q** and **R**.

compound	flame colour
P	red
Q	lilac
R	blue-green

Figure 18

Use Figure 18 to identify the metal ions in compounds **P**, **Q** and **R**.

(3)

P .....

Q .....

R .....

(c) A flame photometer was used to analyse samples of a solution of metal ions.

Each sample was treated with 5.00 cm^3 of dilute hydrochloric acid.
1.00 dm^3 of the acid contained 219 g of hydrogen chloride.

Calculate the mass of hydrogen chloride in the acid used to test 20 samples.

(2)

.....

.....

.....

.....

mass = ... g

(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.