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)

Tuesday 11 June 2024

Morning (Time: 1 hour 45 minutes)

Paper reference **1CH0/2F**

Chemistry
PAPER 2

Foundation Tier

You must have:
Calculator, ruler, Periodic table (enclosed)

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.

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 7 4 4 2 5 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) Figure 1 shows a metal spoon.

Figure 1

This spoon is made of silver.

(i) Give a reason why silver is a suitable material to use for making a spoon.

(1)

.....

.....

(ii) Some spoons are made of wood or plastic, not metal.

The raw material for wooden spoons is trees and the raw material for plastic spoons is crude oil.

Explain an advantage, other than cost, of using wood rather than plastic.

(2)

.....

.....

.....

.....

(b) Some people wear spectacles so that they can see more clearly.

(i) Which property of glass makes it suitable for use in spectacles?

(1)

- ☒ **A** glass does not conduct electricity
- ☒ **B** glass is a poor conductor of heat
- ☒ **C** glass is transparent
- ☒ **D** glass shatters when dropped

(ii) Some spectacles have a coating made of nanoparticles on the glass.

Which statement describes nanoparticles?

(1)

- ☒ **A** nanoparticles are larger than small molecules
- ☒ **B** nanoparticles are a type of atom
- ☒ **C** nanoparticles are very small molecules
- ☒ **D** nanoparticles are the monomers in DNA

(c) One nanoparticle has a cube shape that is shown in Figure 2.

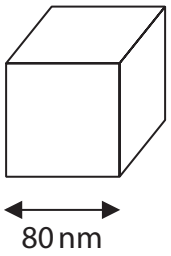

Figure 2

Calculate the surface area of this nanoparticle.

surface area = area of one face × number of faces

(2)

.....

.....

.....

.....

surface area = ... nm^2

(Total for Question 1 = 7 marks)

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2 This question is about the metals and non-metals in period 3 of the periodic table.

(a) Figure 3 shows some data about some of the elements in period 3.

symbol	atomic number	melting point in °C
Na	11	98
Mg	12	650
Al	13	660
Si	14	1410
P	15	44
Cl	17	–101
Ar	18	–189

Figure 3

Use the periodic table to answer these questions.

(i) Give the **name** of the element in period 3 that is not shown in Figure 3.

(1)

.....

(ii) Give the relative atomic mass of silicon.

(1)

.....

(iii) State which metal and which non-metal in Figure 3 have the lowest melting points.

(2)

metal with lowest melting point

.....

non-metal with lowest melting point

.....

(b) Alkali metals react with water to produce an alkaline solution and hydrogen gas.

A test tube of gas can be tested to see if the gas is hydrogen by putting a lighted splint at the top of the test tube.

A student suggests the following method to show that an alkaline solution and hydrogen gas are produced in this reaction.

step 1 pour 150 cm^3 water into the container shown in Figure 4

step 2 add a small piece of lithium to the water in the container shown in Figure 4

step 3 hold a lighted splint above the container

step 4 hold some damp red litmus paper above the mixture in the container.

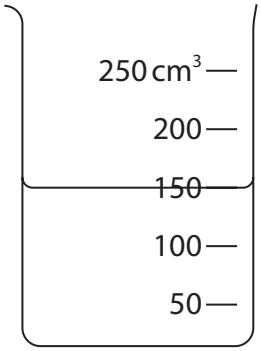

Figure 4

(i) Give the name of the container shown in Figure 4.

(1)

.....

(ii) A teacher says that step 3 and step 4 will **not** work to show that hydrogen gas and an alkaline solution are produced in the reaction.

Explain **one** change that could be made in each step to make the method work.

(3)

step 3 .....

.....

.....

step 4 .....

.....

.....

(Total for Question 2 = 8 marks)

3 Compound **A** contains either aluminium ions or copper ions or iron(II) ions.

Figure 5 is a flow chart of the method for the test to identify the ions in compound **A**.

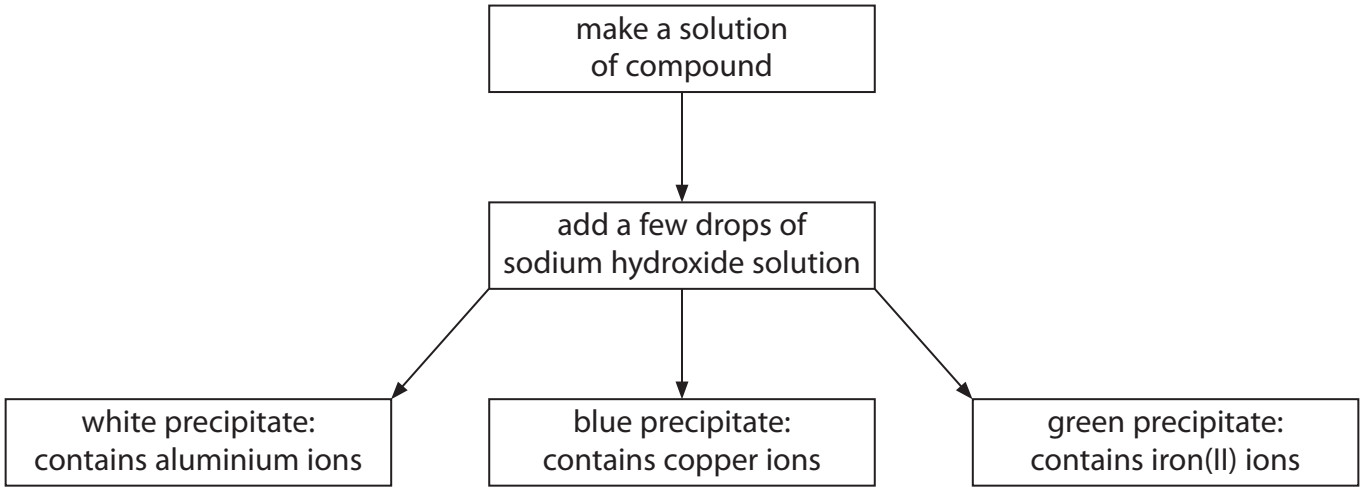

Figure 5

(a) The precipitates formed in this test are solids.

Which state symbol is used for precipitates in equations?

(1)

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

(b) A student is given a container of solid **A** and a bottle of dilute sodium hydroxide solution.

Describe how the student should carry out the test in Figure 5.

Include the names of the apparatus needed.

(3)

.....

.....

.....

.....

.....

.....

(c) Iron(II) chloride is tested using the method in Figure 5.

(i) State what would be **seen** when iron(II) chloride is tested.

(1)

.....

.....

(ii) What is the formula of an iron(II) ion?

(1)

☒ **A** Fe_2

☒ **B** Fe_2^+

☒ **C** $2Fe^+$

☒ **D** Fe^{2+}

(d) A different compound is tested using the method in Figure 5.

(i) When the sodium hydroxide solution is added, no precipitate forms.

State what can be concluded from this result.

(1)

.....

.....

.....

.....

(ii) In an experiment, the height of the precipitate formed in a reaction is measured using a 10 cm ruler.

The apparatus is shown in Figure 6.

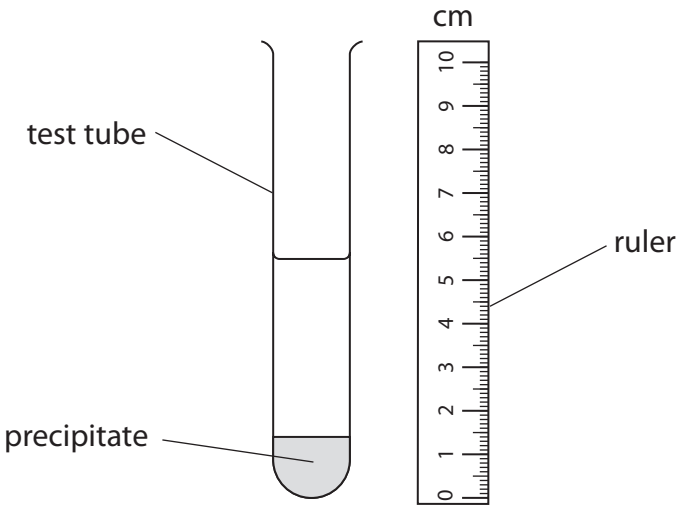

Figure 6

Give the height of the precipitate in mm.

(2)

.....

height = ... mm

(Total for Question 3 = 9 marks)

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4 (a) In one reaction the temperature of the reaction mixture decreases.

Which word describes this type of reaction?

(1)

- ☒ **A** displacement
- ☒ **B** endothermic
- ☒ **C** exothermic
- ☒ **D** neutralisation

(b) In an experiment, a salt is dissolved in water.

The temperature change is measured.

Figure 7 shows the apparatus that is used.

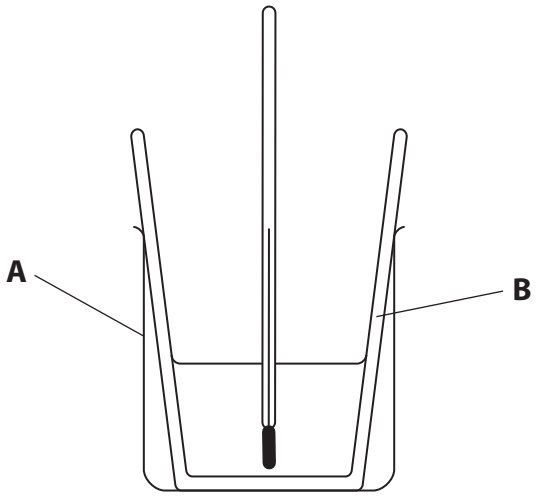


Figure 7

(i) State what is used to measure the temperature change in Figure 7.

(1)

.....

(ii) State **one** reason for using the piece of equipment **A** in Figure 7.

(1)

.....

.....

.....

(iii) A student suggests putting a lid on piece of equipment **B**.

State why this would help to give a more accurate value for the temperature change.

(1)

.....

.....

.....

(iv) Four different salts, **P**, **Q**, **R** and **S**, are dissolved in water.

Figure 8 shows the starting temperature of the water and the final temperature of the solution after the salt dissolves.

	salt P	**salt Q**	**salt R**	**salt S**
starting temperature in °C	20.0	20.0	20.0	20.0
final temperature in °C	22.4	19.5	23.0	18.5
temperature change in °C	+2.4	–0.5	.....	.....
salt that absorbed most heat energy when it dissolved				

Figure 8

Complete the table

- to show the temperature changes when salt **R** and salt **S** dissolve
- by placing a tick (✓) in the box, on the bottom row, for the salt that **absorbs** the most heat energy when it dissolves.

(4)

(v) One of the salts dissolved is barium chloride, $BaCl_2$.

Barium chloride contains the chloride ion, Cl^-.

Give the **formula** of the barium ion in barium chloride.

(1)

.....

(Total for Question 4 = 9 marks)

5 (a) Figure 9 shows the structure of one molecule of three different compounds, **X**, **Y** and **Z**.

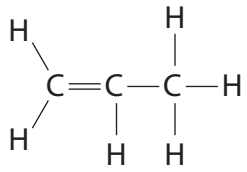
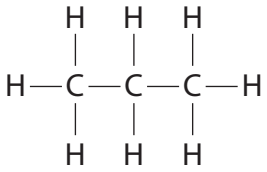
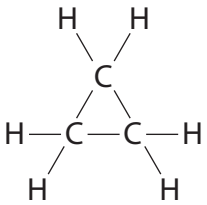
X	Y	Z
		

Figure 9

The molecules of the compounds shown in Figure 9 all contain the same number of carbon atoms.

(i) Give the number of carbon atoms in a molecule of compound **X**.

(1)

.....

(ii) Compound **X** contains carbon and one other element.

Give the **name** of the other element in compound **X**.

(1)

.....

(iii) Which of the compounds in Figure 9 is a hydrocarbon?

(1)

- ☒ **A** **X** only
- ☒ **B** **Y** only
- ☒ **C** **X** and **Y** only
- ☒ **D** **X**, **Y** and **Z**

(iv) Which of the compounds in Figure 9 have the same molecular formula?

(1)

- ☒ **A** none of them
- ☒ **B** **X** and **Y** only
- ☒ **C** **X** and **Z** only
- ☒ **D** **X**, **Y** and **Z**

(b) Figure 10 shows where fractions are produced in the fractional distillation of crude oil.

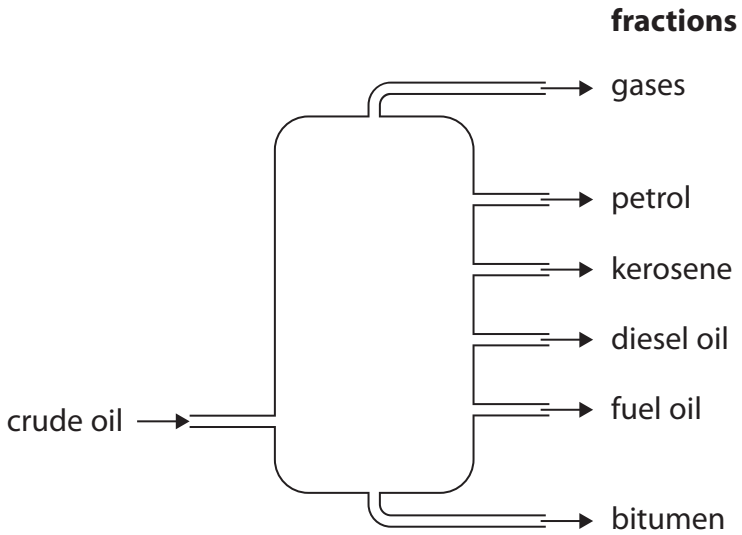


Figure 10

Complete the sentences about fractions obtained from crude oil.

(3)

The fraction with the smallest molecules is called ..... .

Compared to petrol, the boiling point of kerosene is ..... .

When petrol burns, one product is ..... .

(c) When some impure hydrocarbon fuels are burned, sulfur dioxide is one of the products.

Some sulfur dioxide gas is dissolved in water to form solution **W**.

When solution **W** is added to sodium hydroxide solution of pH 12

- the pH changes
- the temperature increases.

Explain how the pH changes and why the temperature increases.

(3)

.....

.....

.....

.....

.....

.....

(Total for Question 5 = 10 marks)

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6 This question is about bromine.

(a) Give the colour and physical state of bromine at room temperature.

(2)

colour .....

physical state .....

(b) Bromine reacts with hydrogen to form hydrogen bromide.

(i) Write the word equation for this reaction.

(2)

..... + ... → .....

(ii) Hydrogen bromide dissolves in water to form a solution.

This solution of hydrogen bromide reacts with alkalis.

State the type of reaction that occurs when a solution of hydrogen bromide reacts with an alkali.

(1)

.....

.....

(c) Bromine and the other halogens react with hot iron wool.

Figure 11 shows the relative speed of some of these reactions.

halogen	relative speed of reaction
fluorine	
chlorine	reacts very quickly
bromine	reacts quickly
iodine	reacts slowly

Figure 11

Fluorine also reacts with hot iron wool.

Use Figure 11 to predict the relative speed of this reaction.

(1)

.....

.....

(d) Potassium bromide contains 32.8% potassium by mass.

Calculate the mass of potassium and the mass of bromine in 500 g potassium bromide.

(3)

.....

.....

.....

.....

mass of potassium = ... g

mass of bromine = ... g

(Total for Question 6 = 9 marks)

7 (a) The structure of one molecule of compound **L** is shown in Figure 12.

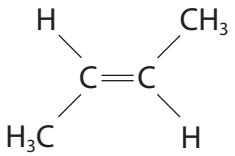

Figure 12

(i) State what the lines between the atom symbols represent in Figure 12.

(1)

.....

.....

(ii) Explain why compound **L** is an alkene.

(2)

.....

.....

.....

.....

(iii) 1 molecule of compound **L** has a mass of 9.302×10^{-23} g.

82,500 molecules of compound **L** combine to form 1 polymer molecule.

Calculate the mass of this polymer molecule.

(2)

.....

.....

.....

mass = ... g

(b) Some naturally occurring molecules are polymers.

Draw **one** straight line from each natural polymer to its monomer.

(2)

natural polymer	**monomer**
DNA	amino acids
proteins	nucleotides
starch	PVC
	sugars

*(c) Figure 13 shows information about four compounds, **E**, **F**, **G** and **H**.

The compounds are in no particular order

- butane
- carbon dioxide
- ethane
- ethene.

compound	boiling point in °C	reaction with limewater	reaction with bromine water	products when burned in oxygen
E	–78	mixture turns milky	no reaction	does not burn
F	–104	no reaction	mixture goes colourless	carbon dioxide and water
G	–89	no reaction	no reaction	carbon dioxide and water
H	–1	no reaction	no reaction	carbon dioxide and water

Figure 13

Use all of the information in Figure 13 to identify which of the four compounds, **E**, **F**, **G** and **H**, is

- butane
- carbon dioxide
- ethane
- ethene.

You must give reasons for your choices.

(6)

(Total for Question 7 = 13 marks)

8 A student investigates the reaction between marble chips and dilute hydrochloric acid.

The student measures the total volume of carbon dioxide gas produced each minute, for 10 minutes.

(a) Figure 14 shows part of the apparatus used in the experiment.

Complete Figure 14 by drawing and labelling apparatus that could be used to collect and measure the volume of the carbon dioxide gas.

(2)

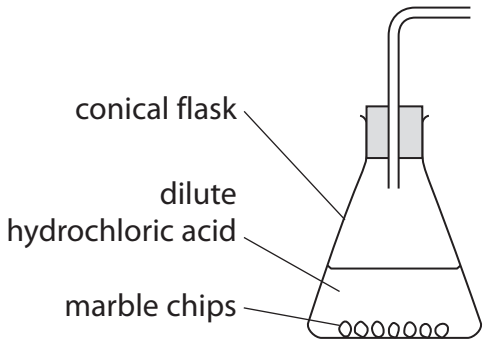

Figure 14

(b) Figure 15 shows a graph of the results of the experiment.

A tangent has been drawn on the curve at a time of 3.5 minutes.

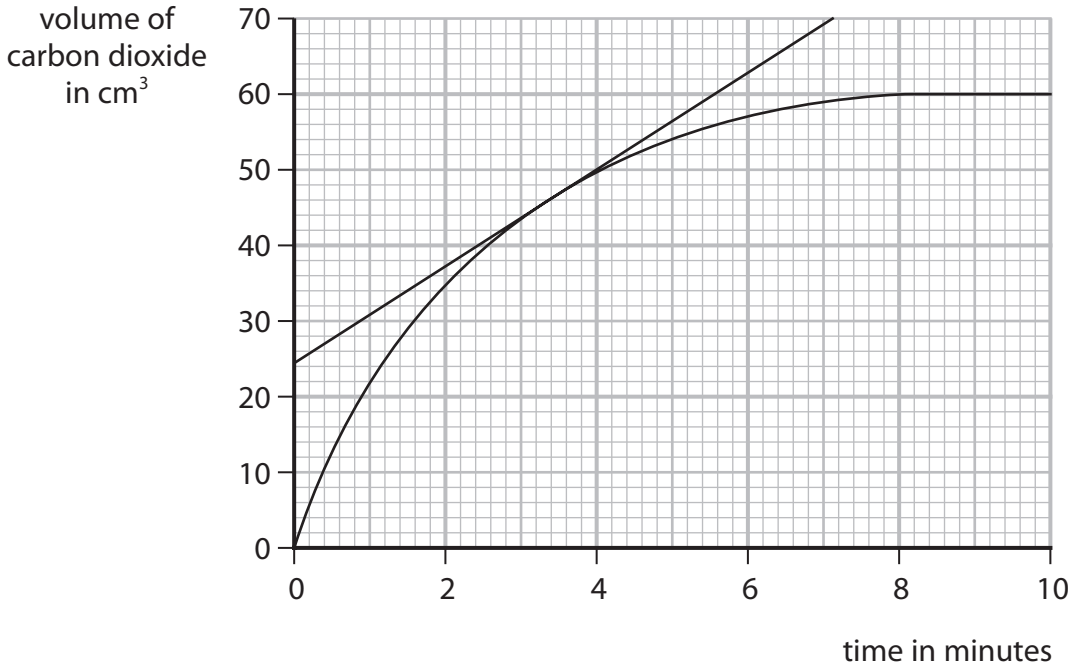

Figure 15

(i) State the total volume of carbon dioxide produced in the first 3.5 minutes.

(1)

volume = ... cm^3

(ii) Using the tangent, calculate the rate of reaction at 3.5 minutes in cm^3 per minute.

$$\text{rate of reaction} = \frac{\text{change in gas volume}}{\text{change in time}}$$

(3)

.....

.....

.....

.....

rate = ... cm^3 per minute

(c) The student repeats the experiment using the same mass of smaller marble chips.

All other conditions remain the same.

Explain the effect on the rate of reaction of using smaller marble chips.

(2)

(d) Which change would make the rate of reaction slower?

(1)

- ☒ **A** using the same acid at a higher temperature
- ☒ **B** using acid of a lower concentration
- ☒ **C** using a larger flask
- ☒ **D** adding a catalyst

(e) In this experiment the volume of carbon dioxide gas produced is measured.

Give a different way that the amount of carbon dioxide produced can be measured.

(1)

(f) In this experiment there is an excess of dilute hydrochloric acid.

State what you would **see** in the conical flask at the end of the experiment.

(1)

(Total for Question 8 = 11 marks)

9 This question is about the atmosphere.

(a) Describe the test to show that a gas is oxygen.

(2)

.....

.....

.....

(b) Copper reacts with oxygen to form copper oxide.

2.100 g of copper will react completely with 0.529 g of oxygen.

In an experiment, 4.200 g of copper is heated with 50.000 g of oxygen until the reaction is complete.

Calculate the mass of oxygen remaining at the end of the experiment.

(2)

.....

.....

mass of oxygen = ... g

(c) Helium, neon and argon are all inert.

(i) Explain, in terms of electrons, why these gases are inert.

(2)

.....

.....

.....

(ii) Two pieces of steel can be joined by heating the metal pieces with a very hot flame.

This process is often carried out in an argon atmosphere rather than in air.

Which property makes argon gas suitable for this use?

(1)

☒ **A** argon has a low density

☒ **B** argon has a low melting point

☒ **C** argon is colourless

☒ **D** argon is unreactive

*(d) Figure 16 shows how plant life and the atmosphere of Earth have changed over time.

period of time	plant life	amount of carbon dioxide in atmosphere	amount of oxygen in atmosphere
the earliest Earth	no plant life	very high	none
about 3,500 million years ago	plant life evolved	high	very low
about 10,000 years ago	about 60% of land covered by trees	0.03%	about 21%
today	less than 40% of land covered by trees	0.04%	about 21%

Figure 16

Explain the effect that plant life has had on the Earth's atmosphere and the temperature of the Earth.

You should refer to the information in Figure 16 including

- the plant life
- the amounts of carbon dioxide
- the amounts of oxygen

(6)

(Total for Question 9 = 13 marks)

10 (a) Figure 17 shows a poly(ethene) bottle containing substance **K** with one of its hazard symbols showing.

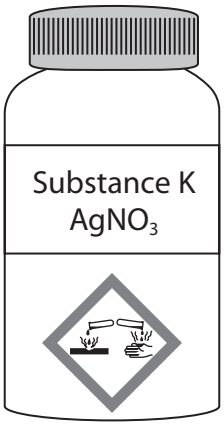

Figure 17

(i) Explain a safety precaution that should be taken when using a substance with the hazard symbol shown in Figure 17.

(2)

.....

.....

.....

.....

(ii) Substance **K** has the formula $AgNO_3$. Give the name of substance **K**.

(1)

.....

(iii) State **one** property of poly(ethene) that makes it a suitable material to make a container for storing substances.

(1)

.....

.....

(iv) A student tests a solid for chloride ions.

The student uses the following method.

step 1 dissolve a small amount of the solid in water

step 2 add some dilute hydrochloric acid

step 3 add a few drops of a solution of **K**

step 4 observe whether or not a white precipitate forms.

This method to show whether the solid contains chloride ions will not work.

Explain a change that needs to be made to **step 2** to allow this method to work.

(2)

.....

.....

.....

.....

(b) In the test for carbonate ions, the carbonate ions react with an acid.

Sodium carbonate, Na_2CO_3, is reacted with dilute hydrochloric acid.

Complete and balance the equation for this reaction.

(3)

$Na_2CO_3 + 2HCl \rightarrow$ ..... + ... + ...

(c) The carbonate of element X has the formula X_2CO_3.
The relative formula mass of this carbonate is 230.

Using this information, calculate the relative atomic mass of X.

(relative atomic masses: C = 12, O = 16)

(2)

.....

.....

.....

relative atomic mass of X = ...

(Total for Question 10 = 11 marks)

TOTAL FOR PAPER = 100 MARKS

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

Tuesday 11 June 2024

Paper reference **1CH0/2F**

Chemistry

PAPER 2

Foundation Tier

Periodic Table Insert

Do not return this Insert with the question paper.

Turn over ▶

P74425A

F:1/1/1/1/1/1/1/1/1/

P 7 4 4 2 5 A

Pearson

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.