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Candidate surname					Other names				
Centre Number					Candidate Number				
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Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Time 1 hour 10 minutes **Paper reference** **1SC0/1CF**

Combined Science
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 60.
- 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/




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 a metal spoon and two test tubes being heated in a water bath.

One test tube contains a piece of chocolate, the other some liquid egg white.

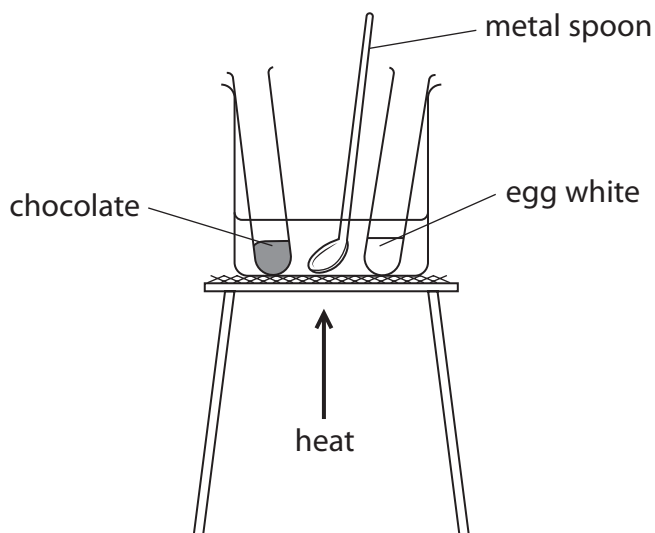


Figure 1

After heating, the spoon, the chocolate and the egg white are allowed to cool to room temperature.

Figure 2 shows the state of the three different substances before heating, when hot and after cooling.

substance	before heating	when hot	after cooling
metal spoon	solid	solid	solid
chocolate	solid	liquid	solid
egg white	liquid	solid	solid

Figure 2



- (a) Describe the differences in the arrangement and movement of the particles in a solid and in a liquid.

(2)

difference in arrangement of particles

difference in movement of particles

- (b) What name is given to the process when the chocolate changes from a solid to a liquid?

(1)

- ☐ **A** condensing
☐ **B** evaporating
☐ **C** freezing
☐ **D** melting

- (c) Give a reason why the metal spoon has not changed state during the experiment.

(1)

- (d) Explain how we know the change to the egg white is a chemical change rather than a physical change.

(2)

(Total for Question 1 = 6 marks)



2 Potable water is water that is suitable for drinking.

(a) River water can be treated to make it potable.

Chlorination, filtration and sedimentation are three of the processes involved in making the river water potable.

(i) Which row of the table shows these three processes in the order in which they are carried out?

(1)

	first	second	third
<input type="checkbox"/> A	chlorination	sedimentation	filtration
<input type="checkbox"/> B	chlorination	filtration	sedimentation
<input type="checkbox"/> C	sedimentation	filtration	chlorination
<input type="checkbox"/> D	sedimentation	chlorination	filtration

(ii) State the reason why chlorine is added during the water treatment.

(1)

(iii) Describe how sedimentation is carried out.

(2)

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(iv) Figure 3 shows the results of an analysis of a sample of potable water.

ion	concentration in mg dm^{-3}
chloride	60.70
fluoride	0.24
nitrate	24.90
sulfate	71.40
copper	0.05
magnesium	9.10

Figure 3

Using this information, explain why this sample of potable water is not the same as pure water.

(2)

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- (b) A student wanted to distil a sample of potable water.
Figure 4 shows apparatus the student used.

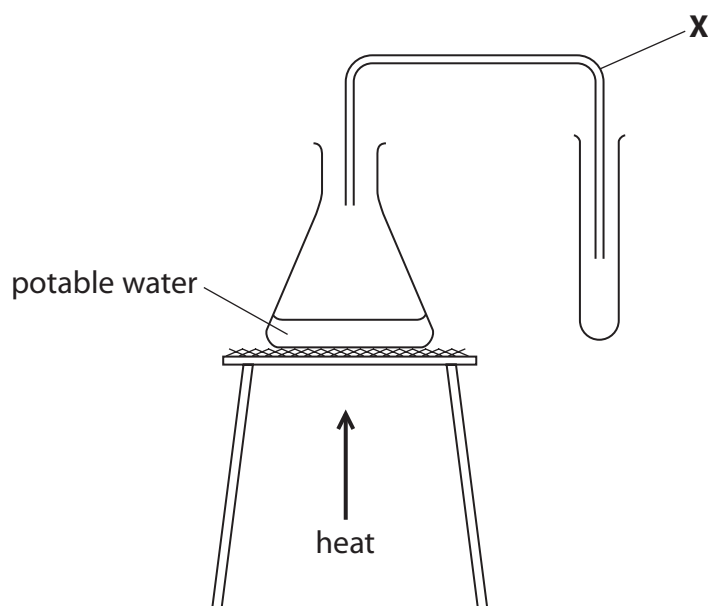


Figure 4

- (i) Name the piece of equipment labelled **X** in Figure 4.

(1)

- (ii) The student made an error when setting up the equipment in Figure 4.
This error meant no water could be collected in the test tube.

Explain what the student needs to do so water can be collected.

(2)

(Total for Question 2 = 9 marks)



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- 3 (a) An atom of aluminium has an atomic mass of 27.

Aluminium has an atomic number of 13.

State the number of electrons, neutrons and protons in this atom.

(3)

number of electrons =

number of neutrons =

number of protons =

- (b) Aluminium reacts with bromine to form aluminium bromide.

A sample of aluminium bromide contains 1.35 g of aluminium atoms and 12.00 g of bromine atoms.

Calculate the empirical formula of this sample of aluminium bromide.

(relative atomic masses: Al = 27.0, Br = 80.0)

(3)

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empirical formula =

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(c) Gallium is in the same group in the periodic table as aluminium and in the same period in the periodic table as bromine.

(i) State in which group and period of the periodic table gallium can be found.

You may want to refer to the periodic table.

(2)

group =

period =

(ii) Gallium had not been discovered when Mendeleev created his first periodic table.

Figure 5 shows some properties of gallium that Mendeleev predicted and some of the actual properties of gallium.

property	predicted property	actual property
relative atomic mass	about 68	70
density in g/cm ³	about 6.0	5.9
melting point	lower than 40°C	29.8°C
density of oxide in g/cm ³	about 5.5	5.9

Figure 5

Describe how Mendeleev predicted these properties of gallium.

(2)

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(Total for Question 3 = 10 marks)



- 4 (a) 3.14 g of solid copper sulfate was dissolved in water and made up to 250 cm³ of solution.

$$\text{concentration (g dm}^{-3}\text{)} = \frac{\text{mass of solid (g)}}{\text{volume of solution (dm}^3\text{)}}$$

Calculate the concentration of this copper sulfate solution in g dm⁻³.

(2)

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concentration = g dm⁻³

- (b) Sodium hydroxide solution was added to a solution of copper sulfate.
A precipitate of copper hydroxide and a solution of sodium sulfate were formed.

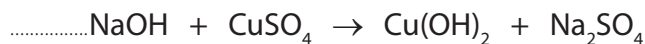
- (i) State what would be **seen** in the reaction.

(1)

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- (ii) Complete the balanced equation for the reaction by adding a number in front of NaOH.

(1)



- (iii) Describe how to obtain a pure, dry sample of the precipitate of copper hydroxide from the reaction mixture.

(3)

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- (c) Figure 6 shows the equipment used to electrolyse a sample of sodium sulfate solution.

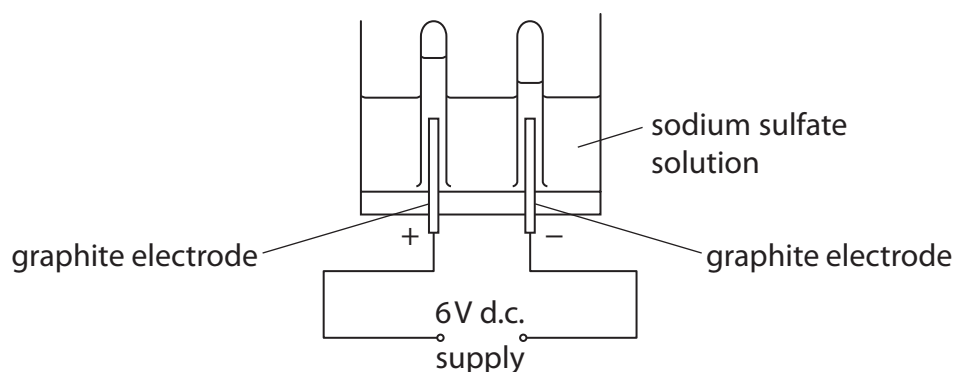


Figure 6

Graphite electrodes are used in the electrolysis of sodium sulfate solution. Graphite is used because it is inert and conducts electricity.

- (i) Figure 7 shows the ions in the sodium sulfate solution.

Draw a circle around each of the ions in Figure 7 that are attracted to the negative graphite electrode during the electrolysis.

(1)



Figure 7

- (ii) State why it is important that the electrodes are inert.

(1)

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- (iii) Explain, in terms of its structure, how graphite conducts electricity.

(2)

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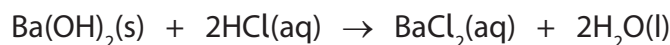
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(Total for Question 4 = 11 marks)

- 5 Barium hydroxide reacts with dilute hydrochloric acid to form barium chloride and water.

(a) The equation for the reaction is



Which row of the table shows the correct state of each of the substances in the equation for the reaction?

(1)

	barium hydroxide	hydrochloric acid	barium chloride	water
<input type="checkbox"/> A	solid	aqueous	aqueous	liquid
<input type="checkbox"/> B	solid	liquid	solid	aqueous
<input type="checkbox"/> C	aqueous	aqueous	solid	liquid
<input type="checkbox"/> D	aqueous	liquid	aqueous	aqueous

- (b) A student wanted to investigate how the pH of the mixture changes as barium hydroxide is added to dilute hydrochloric acid.

They followed this method.

step 1 measure out 50.0 cm³ of dilute hydrochloric acid into a beaker using a measuring cylinder

step 2 use a glass rod to place a drop of the acid onto a piece of universal indicator paper and record the pH

step 3 add 0.2 g of barium hydroxide to the acid in the beaker and stir

step 4 use the glass rod to place a drop of the mixture onto a new piece of universal indicator paper and record the pH again

step 5 repeat steps 3–4 until there is no further change in the pH.

- (i) Name a piece of equipment which could be used to measure out 50.0 cm³ of dilute hydrochloric acid more accurately than the measuring cylinder.

(1)

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- (ii) Describe how the pH of the mixture is determined when a drop of it is placed on the universal indicator paper.

(2)

- (iii) In the method, universal indicator paper is used to determine the pH.

Explain why litmus paper would not be a suitable indicator to use in this experiment.

(2)

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(iv) Figure 8 shows the student's results.

mass of barium hydroxide in g	pH of mixture
0.0	1
0.2	1
0.4	1
0.6	1
0.8	2
1.0	7
1.2	12
1.4	13
1.6	13

Figure 8

On the grid opposite:

- Add suitable scales to the vertical and horizontal axes.
- Plot a graph of the pH of the mixture against the mass of barium hydroxide.

(3)

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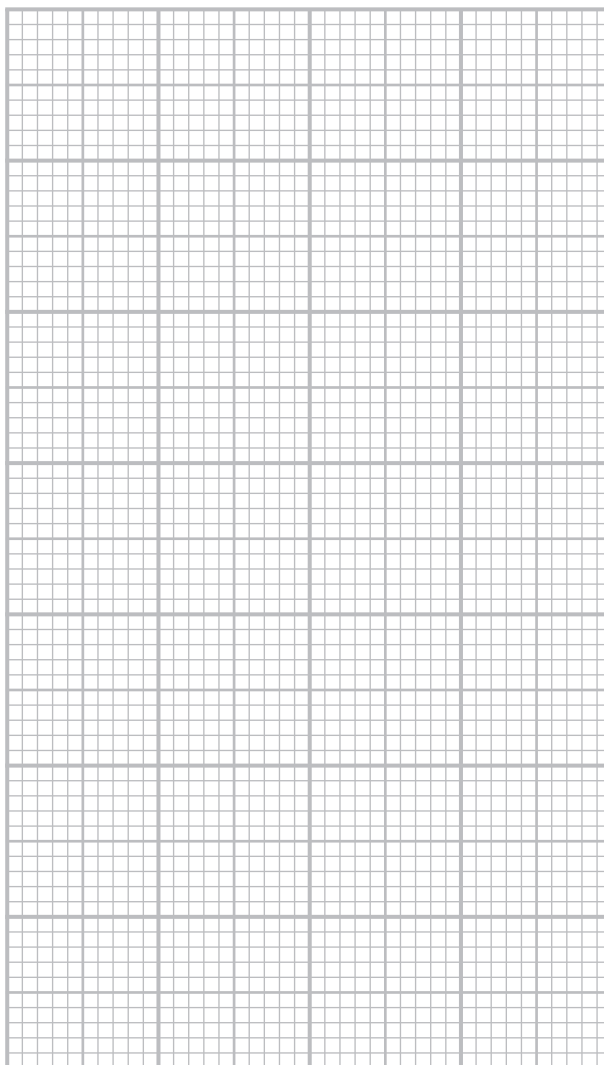
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pH of
the mixture

mass of barium hydroxide in g



P 6 9 4 8 1 A 0 1 5 2 0

(c) Figure 9 shows a hazard symbol placed on a container of barium hydroxide.



Figure 9

(i) What is the meaning of the hazard symbol in Figure 9?

(1)

- ☐ A flammable
- ☐ B health hazard
- ☐ C oxidising
- ☐ D toxic

(ii) Barium hydroxide is also corrosive.

Give **one** precaution that the student should take when using barium hydroxide.

(1)

(Total for Question 5 = 11 marks)



6 Magnesium carbonate has the formula MgCO_3 .

(a) Magnesium carbonate contains Mg^{2+} and CO_3^{2-} ions.

(i) The atomic number of magnesium is 12.

What is the electronic configuration of the Mg^{2+} ion?

(1)

- ☐ A 2
- ☐ B 2.8
- ☐ C 2.8.2
- ☐ D 2.8.4

(ii) Explain why solid magnesium carbonate cannot conduct electricity but solid magnesium can.

(3)

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(b) Calculate the percentage by mass of magnesium in magnesium carbonate, MgCO_3 .

(relative atomic masses: C = 12.0, O = 16.0, Mg = 24.0)

(3)

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percentage by mass of magnesium =



*(c) A student has two separate test tubes containing sulfuric acid.

The student adds a spatula measure of magnesium carbonate, MgCO_3 , to the first test tube and a piece of magnesium to the second test tube.

Explain what the student would see in each test tube and the tests that they should carry out to identify the gases produced.

Your answer should include word equations for the reactions that would take place.

(6)

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(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS



1	2	Key										3	4	5	6	7	0
1 H hydrogen 1		relative atomic mass atomic symbol name atomic (proton) number															
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 Ni nickel 28	59 Co cobalt 27	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	106 Pd palladium 46	103 Rh rhodium 45	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	195 Pt platinum 78	192 Ir iridium 77	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

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