

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson Edexcel  
International GCSE (9–1)**

Centre Number

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Candidate Number

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**Wednesday 10 June 2020**

Afternoon (Time: 1 hour 10 minutes)

Paper Reference **4SS0/1C**

**Science (Single Award)**

**Chemistry**

**Paper: 1C**

**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.

## 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.*

## Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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# The Periodic Table of the Elements

1	2	3	4	5	6	7	0										
7 <b>Li</b> lithium 3	9 <b>Be</b> beryllium 4	11 <b>Na</b> sodium 11	12 <b>Mg</b> magnesium 12	13 <b>Al</b> aluminium 13	14 <b>N</b> nitrogen 7	15 <b>P</b> phosphorus 15	16 <b>O</b> oxygen 8	17 <b>F</b> fluorine 9	18 <b>Ne</b> neon 10								
19 <b>K</b> potassium 19	20 <b>Ca</b> calcium 20	21 <b>Sc</b> scandium	22 <b>Ti</b> titanium 22	23 <b>V</b> vanadium 23	24 <b>Cr</b> chromium 24	25 <b>Mn</b> manganese 25	26 <b>Fe</b> iron 26	27 <b>Co</b> cobalt 27	28 <b>Ni</b> nickel 28	29 <b>Cu</b> copper 29	30 <b>Zn</b> zinc 30	31 <b>Ga</b> gallium 31	32 <b>Ge</b> germanium 32	33 <b>As</b> arsenic 33	34 <b>Se</b> selenium 34	35 <b>Br</b> bromine 35	36 <b>Kr</b> krypton 36
37 <b>Rb</b> rubidium 37	38 <b>Sr</b> strontium 38	39 <b>Y</b> yttrium 39	40 <b>Zr</b> zirconium 40	41 <b>Nb</b> niobium 41	42 <b>Mo</b> molybdenum 42	43 <b>Tc</b> technetium [98]	44 <b>Ru</b> ruthenium 44	45 <b>Rh</b> rhodium 45	46 <b>Pd</b> palladium 46	47 <b>Ag</b> silver 47	48 <b>Cd</b> cadmium 48	49 <b>In</b> indium 49	50 <b>Sn</b> tin 50	51 <b>Sb</b> antimony 51	52 <b>Te</b> tellurium 52	53 <b>I</b> iodine 53	54 <b>Xe</b> xenon 54
55 <b>Cs</b> caesium 55	56 <b>Ba</b> barium 56	57 <b>La*</b> lanthanum	72 <b>Hf</b> hafnium 72	73 <b>Ta</b> tantalum 73	74 <b>W</b> tungsten 74	75 <b>Re</b> rhenium 75	76 <b>Os</b> osmium 76	77 <b>Ir</b> iridium 77	78 <b>Pt</b> platinum 78	79 <b>Au</b> gold 79	80 <b>Hg</b> mercury 80	81 <b>Tl</b> thallium 81	82 <b>Pb</b> lead 82	83 <b>Bi</b> bismuth 83	84 <b>Po</b> polonium 84	85 <b>At</b> astatine 85	86 <b>Rn</b> radon 86
[223] <b>Fr</b> francium 87	[226] <b>Ra</b> radium 88	[227] <b>Ac*</b> actinium 89	[261] <b>Rf</b> rutherfordium 104	[262] <b>Db</b> dubnium 105	[266] <b>Sg</b> seaborgium 106	[264] <b>Bh</b> bohrium 107	[277] <b>Hs</b> hassium 108	[268] <b>Mt</b> meitnerium 109	[271] <b>Ds</b> darmstadtium 110	[272] <b>Rg</b> roentgenium 111	Elements with atomic numbers 112–116 have been reported but not fully authenticated						

1	<b>H</b>
hydrogen	1

relative atomic mass
name
atomic symbol
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.



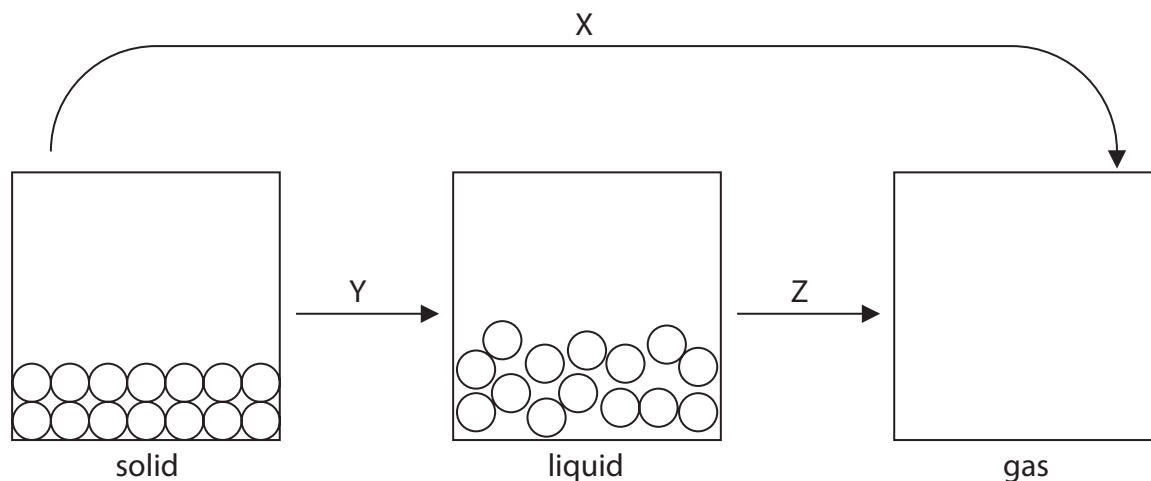
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1 This question is about states of matter.

The diagram shows the arrangement of particles in a solid and in a liquid.



- (a) Complete the diagram by drawing six circles to represent the particles in a gas. (1)
- (b) Three changes of state, X, Y and Z, are labelled on the diagram.

Use words from the box to name these changes of state.

boiling	condensation	crystallisation	melting	sublimation
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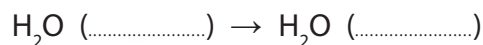
(3)

X .....

Y .....

Z .....

- (c) (i) Use state symbols to complete the equation for the freezing of water. (1)



- (ii) Suggest how a soluble impurity could affect the melting point of ice. (1)

.....

.....

.....

**(Total for Question 1 = 6 marks)**



- 2 (a) The diagram shows part of the Periodic Table, with elements represented by the letters L, M, Q, R and T.

The letters in the diagram represent elements but are **not** their chemical symbols.

Use the Periodic Table on page 2 to help you answer this question.

	L																M
	Q										R						
T																	

- (i) Give the letter that represents the element that is a non-metal. (1)

- (ii) Give the letter that represents the element with the greatest number of protons. (1)

- (iii) Give the formula of the compound that forms when element L reacts with element M. (1)

- (iv) Give a reason why elements L and Q react in a similar way. (1)



(b) A sample of element Q contains three different types of atom.

The table gives the mass number of each atom, and the percentage of each type of atom in the sample.

Mass number	Percentage of atom in the sample
24	79.0
25	10.0
26	11.0

(i) State the name given to atoms of the same element that have different mass numbers. (1)

(ii) Calculate the relative atomic mass ( $A_r$ ) of element Q.

Give your answer to one decimal place.

(2)

$A_r = \dots\dots\dots$

**(Total for Question 2 = 7 marks)**



**3** Food colourings contain one or more food dyes.

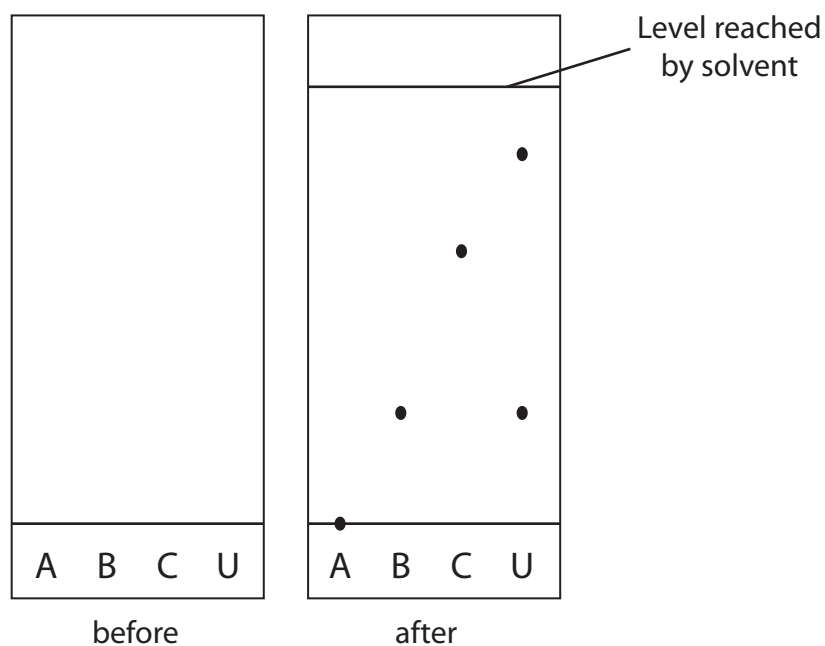
A student has samples of three pure food dyes, A, B and C.

She uses chromatography to investigate the composition of a food colouring, U.

She uses a pencil to draw a line and label A, B, C and U on chromatography paper.

She uses water as the solvent.

The diagram shows the appearance of the paper before and after the experiment.



(a) (i) Describe the method that the student could have used to obtain her results.

(3)

.....

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.....

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(ii) Describe the composition of food colouring U.

(2)

.....

.....

.....

.....

(iii) Suggest why food dye A does not move in the experiment.

(1)

.....

.....

.....

(b) Dyes can be identified by their  $R_f$  values.

$$R_f = \frac{\text{distance moved by dye}}{\text{distance moved by solvent}}$$

Calculate the  $R_f$  value of food dye B.

(2)

$R_f$  value = .....

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(c) The student repeats the experiment using solvent X instead of water.

(i) Solvent X produces a flammable vapour.

Give a safety precaution that the student should take when using solvent X.

(1)

(ii) Suggest why the  $R_f$  value of food dye C might be greater when solvent X is used instead of water.

(1)

**(Total for Question 3 = 10 marks)**





4 This question is about lithium carbonate.

(a) The formula of lithium carbonate is  $\text{Li}_2\text{CO}_3$

Calculate the relative formula mass ( $M_r$ ) of lithium carbonate.

(1)

$M_r =$  .....

(b) (i) Give a test to show that lithium carbonate contains **lithium** ions.

(2)

test .....

.....

result .....

.....

(ii) Describe a test to show that lithium carbonate contains **carbonate** ions.

(3)

test .....

.....

.....

.....

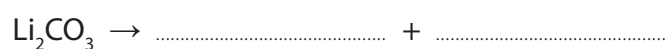
result .....

.....

(c) Lithium carbonate decomposes when heated to produce lithium oxide and carbon dioxide.

Complete the chemical equation for this reaction.

(1)

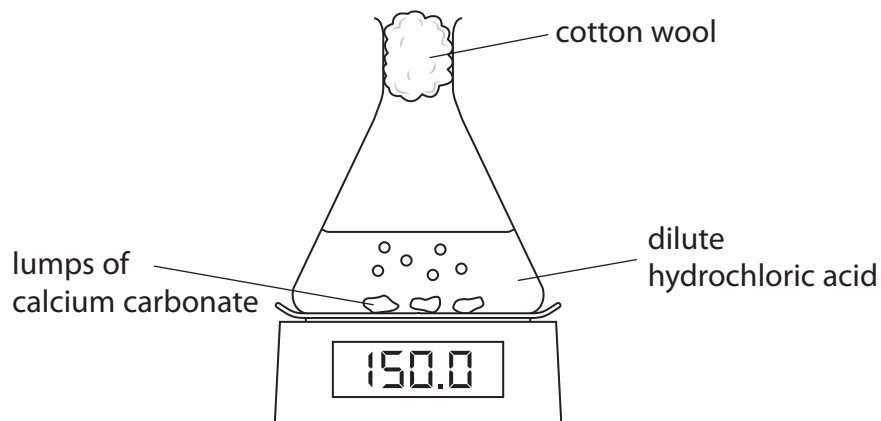


(Total for Question 4 = 7 marks)



- 5 A student uses this apparatus to investigate the rate of reaction between lumps of calcium carbonate and an excess of dilute hydrochloric acid.

The equation for the reaction is



- (a) Give a reason why the student puts cotton wool in the top of the flask.

(1)

- (b) The student records the mass of the flask and its contents every 20 seconds for two minutes.

The table shows her results.

Time in s	Mass in g
0	150.0
20	148.2
40	147.2
60	146.6
80	146.2
100	146.0
120	146.0



(i) The mean (average) rate of reaction can be calculated using the expression

$$\text{mean rate of reaction} = \frac{\text{mass lost}}{\text{time taken to lose this mass}}$$

Calculate the mean rate of reaction during the first 20 seconds.

Give a unit.

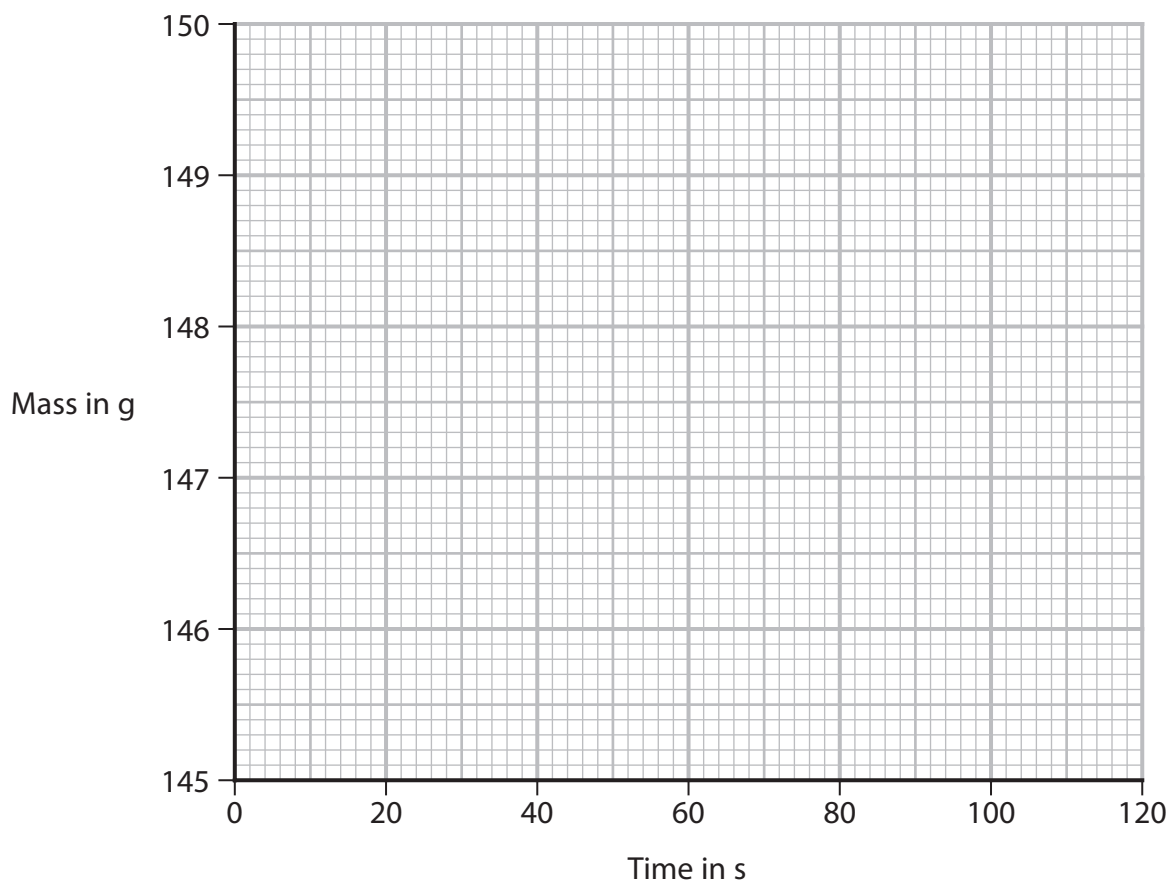
(2)

mean rate of reaction = ..... unit .....

(ii) Plot the student's results.

Draw a curve of best fit.

(2)



(iii) Explain why the rate of reaction decreases during the experiment.

(2)

(iv) Give a reason why the last two mass readings are the same.

(1)

(c) The student repeats the experiment using the same mass of calcium carbonate, but in powdered form instead of lumps.

(i) Give two other variables that she should control.

(2)

1

2

(ii) Explain why the rate of reaction is greater when using powder instead of lumps of calcium carbonate.

(2)

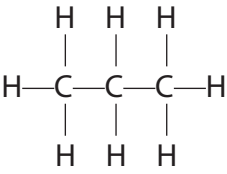
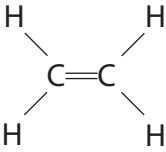
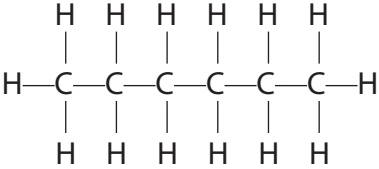
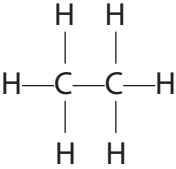
(iii) Suggest how the graph would be different when the reaction is repeated using the same mass of calcium carbonate, but in powdered form instead of lumps.

(1)

**(Total for Question 5 = 13 marks)**



6 The table gives the displayed formulae of four hydrocarbons, P, Q, R and S.

P 	Q 
R 	S 

(a) (i) Explain why P, Q, R and S are all hydrocarbons.

(2)

(ii) Give the name of hydrocarbon P.

(1)

(iii) Give the molecular formula of hydrocarbon S.

(1)

(iv) Describe a test to show that hydrocarbon Q is unsaturated.

(2)



(b) Hydrocarbons P, Q, R and S have the same type of structure.

(i) Explain why P, Q, R and S all have low boiling points.

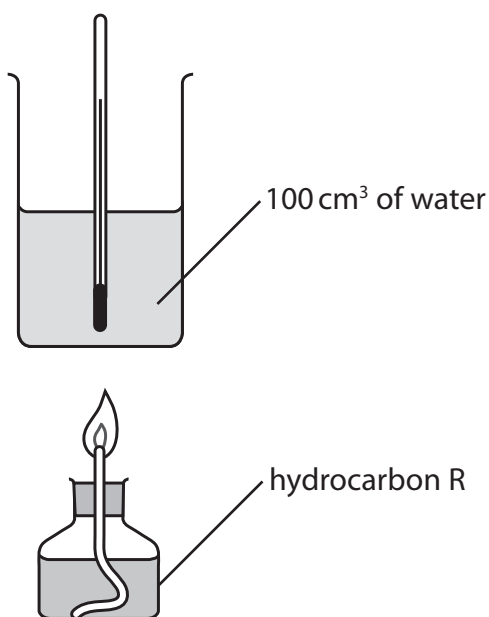
Refer to the type of structure in your answer.

(3)

(ii) Suggest why the boiling point of hydrocarbon R is higher than the boiling point of hydrocarbon S.

(1)

(c) A teacher uses this apparatus to investigate the increase in temperature of  $100\text{ cm}^3$  of water when hydrocarbon R is burned.



The temperature of the water before heating is  $19.7^\circ\text{C}$ .

The temperature of the water after heating is  $57.2^\circ\text{C}$ .

The temperature rise is less than the teacher expected.



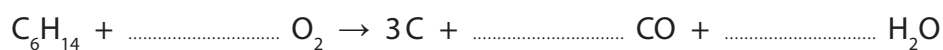
- (i) One reason why the temperature rise is less than expected is that some of hydrocarbon R undergoes incomplete combustion.

Give another reason why the temperature rise is less than expected.

(1)

- (ii) Complete the equation for the incomplete combustion of hydrocarbon R.

(1)



- (iii) Explain why carbon monoxide (CO) should not be released into the laboratory.

(2)

- (iv) Calculate the heat energy change ( $Q$ ), in joules, in this experiment.

[mass of  $1.0 \text{ cm}^3$  of water =  $1.0 \text{ g}$ ]

[for water,  $c = 4.2 \text{ J/g/}^\circ\text{C}$ ]

(3)

$Q = \dots\dots\dots \text{ J}$

**(Total for Question 6 = 17 marks)**

**TOTAL FOR PAPER = 60 MARKS**

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