Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE (9–1)

Centre Number | Candidate Number

Time 1 hour 10 minutes

Paper reference **4SS0/1C**

Science (Single Award)

Chemistry
PAPER: 1C

You must have:
Calculator

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.
- 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 ☒.

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.
- Good luck with your examination.

Turn over ▶

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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
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112–116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
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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Answer ALL questions.

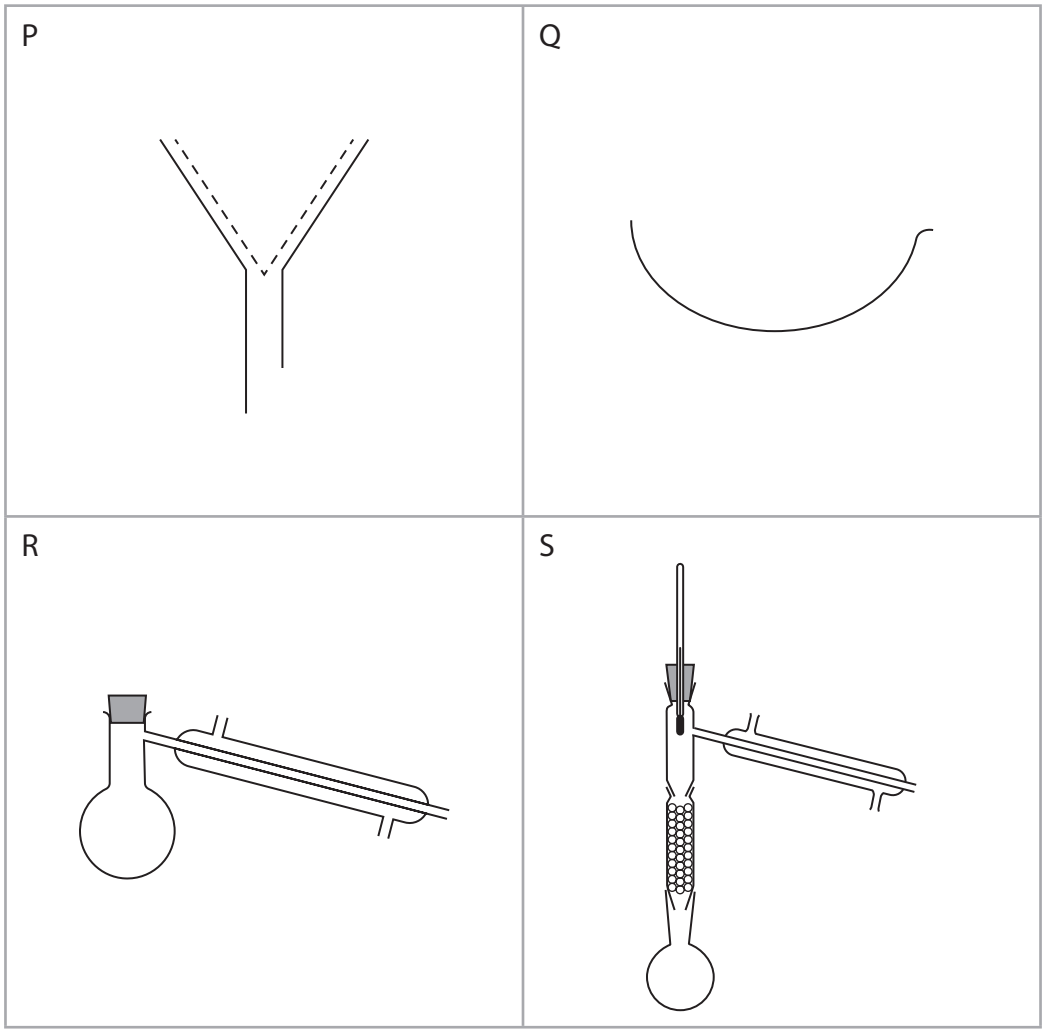
1 This question is about the separation of mixtures.

(a) Name the method used to separate the dyes in a sample of ink.

(1)

.....

(b) The diagram shows four pieces of apparatus, P, Q, R and S, used in the separation of mixtures.



(i) Which type of separation is apparatus P used for?

(1)

- ☒ **A** crystallisation
- ☒ **B** filtration
- ☒ **C** fractional distillation
- ☒ **D** simple distillation

(ii) Which type of separation is apparatus S used for?

(1)

- ☒ **A** crystallisation
- ☒ **B** filtration
- ☒ **C** fractional distillation
- ☒ **D** simple distillation

(iii) Give the name of apparatus Q.

(1)

.....

(Total for Question 1 = 4 marks)

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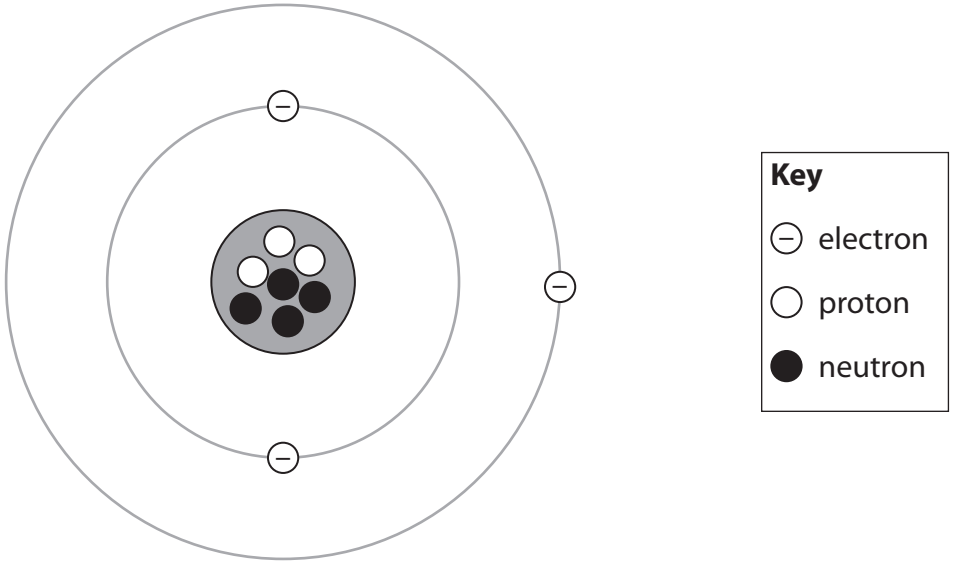
2 The diagram represents an atom of an element.



(a) Use information from the diagram and the Periodic Table to answer these questions.

(i) Give the atomic number of the atom.

(1)

.....

(ii) Name the part of the atom that contains protons and neutrons.

(1)

.....

(iii) Give the group in the Periodic Table that contains this element.

(1)

.....

(iv) Give the period in the Periodic Table that contains this element.

(1)

.....

(v) Give the name of this element.

(1)

.....

(vi) Give the charge on the ion formed from this element.

(1)

.....

(b) A sample of the element contains two isotopes, X and Y.

(i) Explain what is meant by the term **isotopes**.

(2)

.....

.....

.....

.....

(ii) The table shows the mass number and percentage abundance of each isotope in this sample of the element.

Isotope	Mass number	Percentage abundance (%)
X	6	7.8
Y	7	92.2

Calculate the relative atomic mass (A_r) of the element.

(2)

A_r = ...

(Total for Question 2 = 10 marks)

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3 This question is about the elements in Group 7 of the Periodic Table.

(a) (i) State the name given to Group 7.

(1)

.....

(ii) Which element is a liquid at room temperature?

(1)

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

(iii) What is the colour of chlorine gas?

(1)

- ☒ **A** brown
- ☒ **B** colourless
- ☒ **C** green
- ☒ **D** red

(iv) Describe a test for chlorine gas.

(2)

.....

.....

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(b) Iron reacts with chlorine to form iron(III) chloride, $FeCl_3$

(i) Use information from the Periodic Table to calculate the relative formula mass (M_r) of iron(III) chloride.

(2)

M_r = ...

(ii) Complete the chemical equation for the reaction of iron with chlorine.

(1)

..... Fe + ... Cl_2 → ..... $FeCl_3$

(Total for Question 3 = 8 marks)

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4 (a) Propene is an alkene with the molecular formula C_3H_6

(i) Give the general formula for the alkenes.

(1)

.....

(ii) Explain why propene is described as an unsaturated hydrocarbon.

(3)

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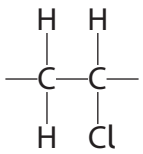
(b) The polymer poly(chloroethene) has the repeat unit



(i) Draw the displayed formula of the monomer that forms this polymer.

(1)

(ii) Explain why there is a problem in the disposal of polymers such as poly(chloroethene).

(2)

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(Total for Question 4 = 7 marks)

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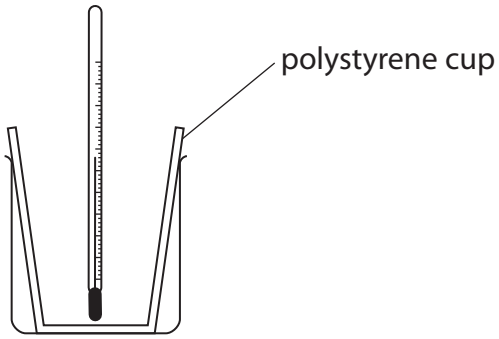
5 A student uses this apparatus to find the temperature change when sodium hydroxide solution reacts with dilute hydrochloric acid.



This is the student's method.

- pour 20 cm^3 of sodium hydroxide solution into a polystyrene cup
- record the temperature of the sodium hydroxide solution
- add 20 cm^3 of dilute hydrochloric acid and stir the mixture
- record the highest temperature of the mixture

(a) (i) Give the formula of the ion that causes sodium hydroxide solution to be alkaline.

(1)

.....

(ii) Suggest a pH value for the dilute hydrochloric acid.

(1)

.....

(b) Explain why a polystyrene cup is used in this experiment.

(2)

.....

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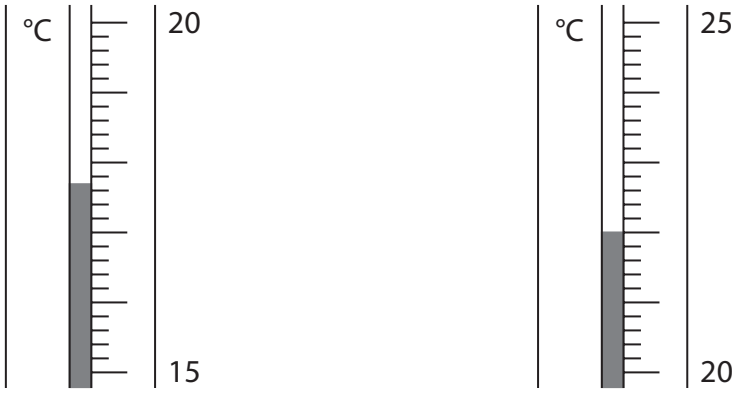
.....

(c) The diagram shows the thermometer readings at the start and at the end of the experiment.



start end

Use the readings to complete the table, giving all values to the nearest 0.1 °C.

(3)

temperature in °C at end	
temperature in °C at start	
temperature change in °C	

(d) Another student does the experiment, but uses 25 cm^3 of sodium hydroxide solution and 25 cm^3 of dilute hydrochloric acid.

She records a temperature change of 5.2 °C.

Calculate the heat energy (*Q*) in kilojoules (kJ) released in this reaction.

[mass of 1.0 cm^3 of solution = 1.0 g]

[for the solution, c = 4.2 J / g / °C]

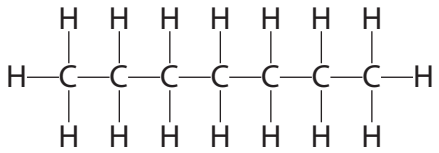
(4)

Q = ... kJ

(Total for Question 5 = 11 marks)

6 (a) Two of the fractions obtained from crude oil are gasoline and bitumen.

(i) This is the displayed formula for one of the alkanes in the gasoline fraction.



Determine the molecular formula of this alkane.

(1)

.....

(ii) Give a use of bitumen.

(1)

.....

(iii) Describe the differences between the gasoline and bitumen fractions, in terms of colour, boiling point and viscosity.

(3)

colour .....

.....

boiling point .....

.....

viscosity .....

.....

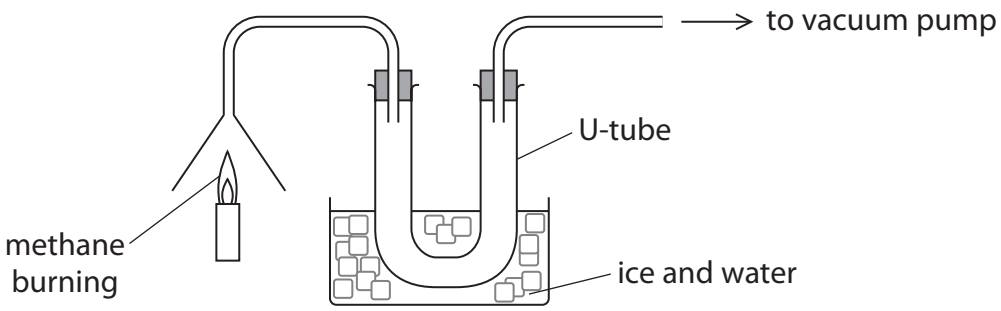
(b) Methane is an alkane used as a fuel.

When methane burns in a plentiful supply of air, carbon dioxide and water vapour form.

The equation for the reaction is

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

The diagram shows how water can be collected when methane burns in the air.



(i) Water freezes at 0 °C and boils at 100 °C.

Carbon dioxide sublimes at −78 °C.

Explain why water collects in the U-tube, but carbon dioxide does not.

(4)

(ii) Describe how anhydrous copper(II) sulfate can be used to show that the U-tube contains water.

(2)

(Total for Question 6 = 11 marks)

7 Nitrogen dioxide and silicon dioxide are compounds containing covalent bonds.

(a) State what is meant by the term **covalent bond**.

(1)

.....

.....

(b) In a car engine, nitrogen and oxygen from the air react to form nitrogen dioxide, NO_2

(i) Give a chemical equation for this reaction.

(1)

.....

(ii) State an environmental problem that occurs when nitrogen dioxide is released into the atmosphere.

(1)

.....

.....

(c) Nitrogen dioxide and silicon dioxide both contain covalent bonds.

Explain why nitrogen dioxide has a much lower melting point than silicon dioxide.

Refer to structure and bonding in your answer.

(6)

(Total for Question 7 = 9 marks)

TOTAL FOR PAPER = 60 MARKS

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