Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE (9–1)

Monday 18 May 2026

Morning (Time: 2 hours)

Paper reference **4CH1/1C 4SD0/1C**

Chemistry

UNIT: 4CH1
Science (Double Award) 4SD0
PAPER: 1C

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **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.*
- Show all the steps in the calculations and state the units.

Information

- The total mark for this paper is 110.
- 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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P 7 9 4 0 1 A 0 1 2 8

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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
[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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GradeMax

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Answer ALL questions.

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 Ammonium carbonate is a compound used in baking powders.

(a) What is the formula of the ammonium ion?

(1)

☒ **A** NH^{4+}

☒ **B** NH_3^+

☒ **C** NH_4

☒ **D** NH_4^+

(b) What is the formula of the carbonate ion?

(1)

☒ **A** CO_2^{3-}

☒ **B** CO_3^{2-}

☒ **C** C^{4+}

☒ **D** C^{4-}

(c) Explain why ammonium carbonate is a compound.

(2)

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(d) When heated, ammonium carbonate decomposes into ammonia and carbon dioxide.

(i) Describe a test for carbon dioxide.

(2)

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(ii) Calculate the relative molecular mass (M_r) of ammonia.

(1)

M_r = ...

(iii) Using the relative molecular mass, determine the percentage by mass of nitrogen in ammonia.

(1)

percentage = ... %

(iv) Explain why aqueous ammonia is an alkali **and** a base.

(2)

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(Total for Question 1 = 10 marks)

2 This question is about some Group 1 elements and their compounds.

(a) A teacher adds a piece of sodium of mass 0.25 g to a trough of water.

(i) Give two observations made when sodium reacts with water.

(2)

1 .....

2 .....

(ii) Give the word equation for this reaction.

(2)

.....

(iii) Calculate the amount, in moles, of 0.25 g of sodium.

Give your answer to two significant figures.

(2)

amount = ... mol

(iv) The teacher adds a piece of potassium of mass 0.25 g to a different trough of water.

Explain whether the volume of hydrogen produced in the reaction with potassium would be more than, less than or the same as the volume of hydrogen produced in the reaction with sodium.

(2)

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(b) The teacher then reacts sodium with oxygen.

(i) Complete the equation for the reaction.

Include state symbols.

(2)

..... Na (.....) + ... O_2 (.....) → ..... Na_2O (.....)

(ii) This passage is about the reaction between sodium and oxygen.

Use words from the box to complete the passage.

acidic	basic	complete	covalent	endothermic
exothermic	ionic	maximum	minimum	molecular

(4)

Sodium reacts with oxygen to form sodium oxide. To start the reaction, the sodium needs to be heated to overcome the activation energy. Activation energy is the ..... energy needed to start the reaction. The enthalpy change for the reaction is negative, which means that the reaction is ..... .

Sodium oxide contains ..... bonding. It is a metal oxide that has ..... properties.

(Total for Question 2 = 14 marks)

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3 A student does an experiment to investigate the decomposition of hydrogen peroxide in the presence of a catalyst.

This is the equation for the decomposition.

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

The student collects the oxygen produced from the decomposition. They record the volume of oxygen every 20 seconds until 100 cm^3 of oxygen has been produced.

The student does the experiment twice, first with catalyst A and then with catalyst B.

(a) Name a suitable piece of apparatus to measure the volume of oxygen collected.

(1)

.....

(b) Give two variables that the student must control to obtain valid results.

(2)

1 .....

.....

2 .....

.....

(c) Give the test for oxygen gas.

(1)

.....

.....

(d) Explain what is meant by the term **catalyst**.

(2)

.....

.....

.....

.....

(e) The table shows the student's results for catalyst A.

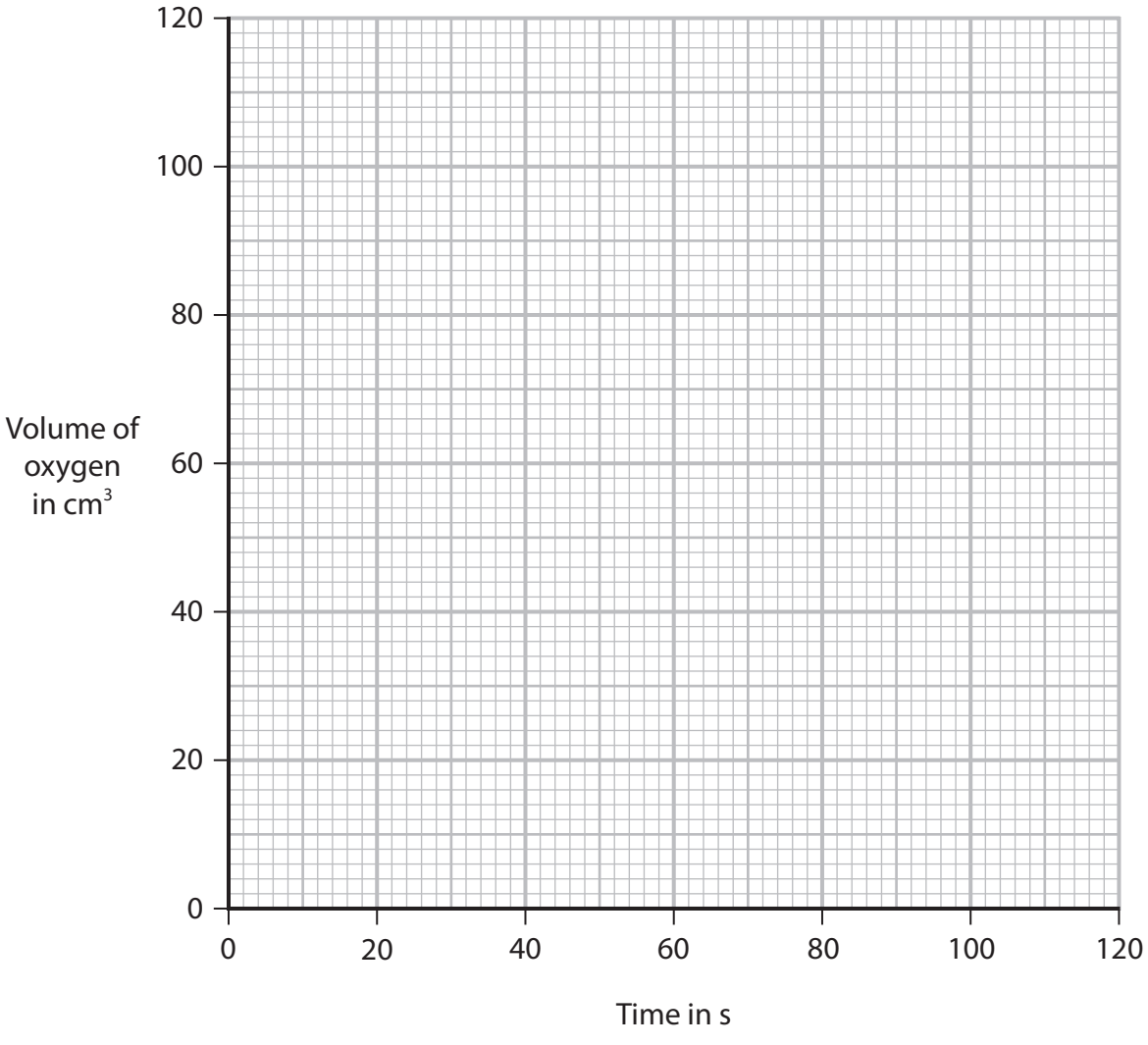
Time in s	0	20	40	60	80	100
Volume of oxygen collected in cm^3	0	54	79	91	96	100

(i) Plot the student's results on grid 1.

(1)

(ii) Draw a curve of best fit.

(1)



Grid 1

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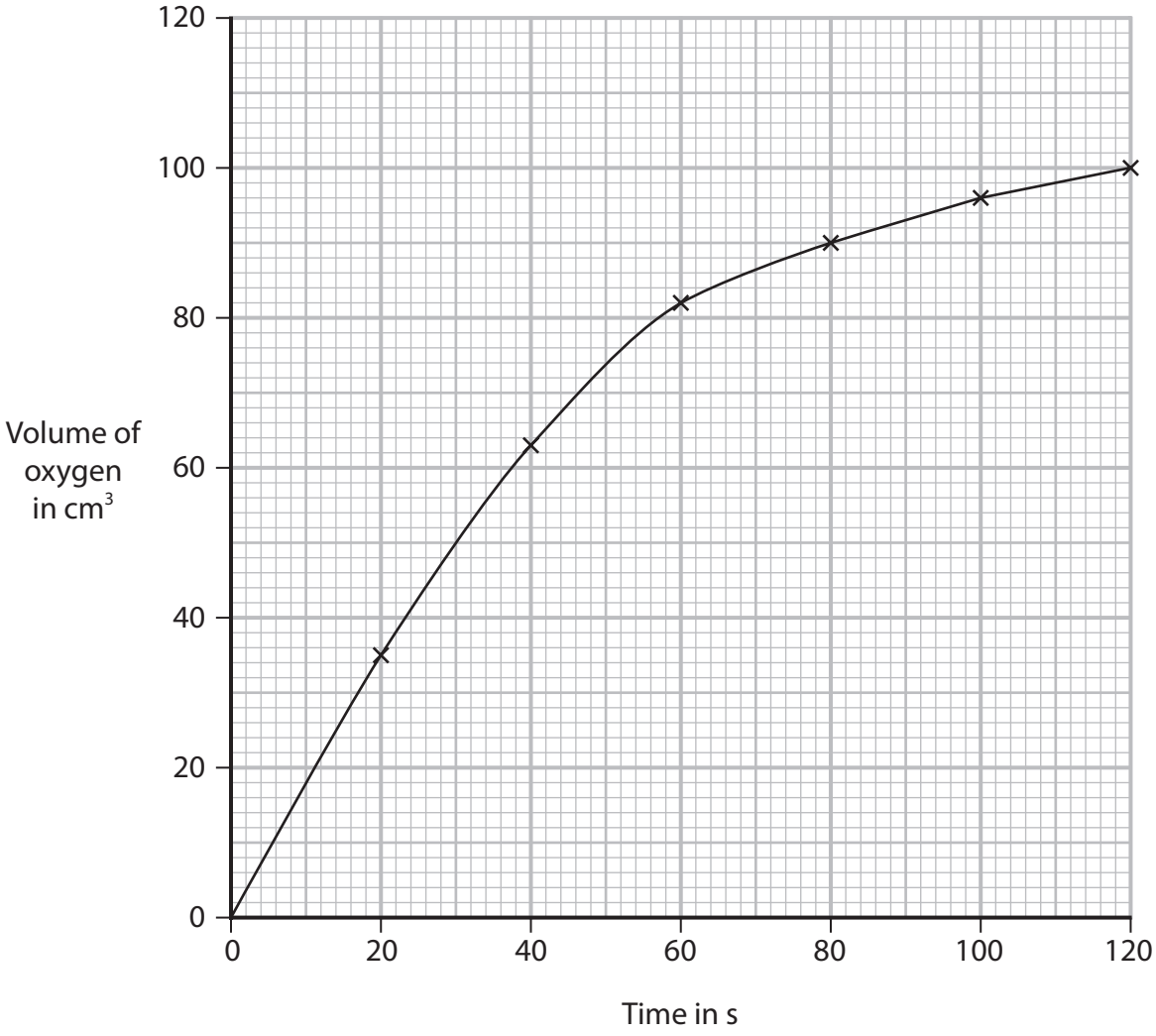
(f) The student repeats the experiment using catalyst B.

Grid 2 shows the results for catalyst B.



Grid 2

(i) On grid 2, draw a tangent to the curve for catalyst B at 60 s.

(1)

(ii) Use the tangent to determine the rate of reaction at 60 s.

Include the units for the rate of reaction.

(3)

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

(Total for Question 3 = 12 marks)

4 Diagram 1 shows the displayed formula of isoprene.

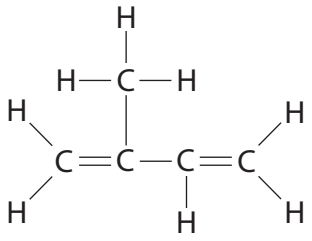


Diagram 1

(a) Explain why isoprene is a hydrocarbon.

(2)

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(b) Isoprene has this percentage composition by mass.

C = 88.2 % H = 11.8 %

Show by calculation that the empirical formula of isoprene is C_5H_8

(3)

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(c) Explain why isoprene does not have the same general formula as propene.

(2)

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(d) This is the equation for the complete combustion of isoprene.

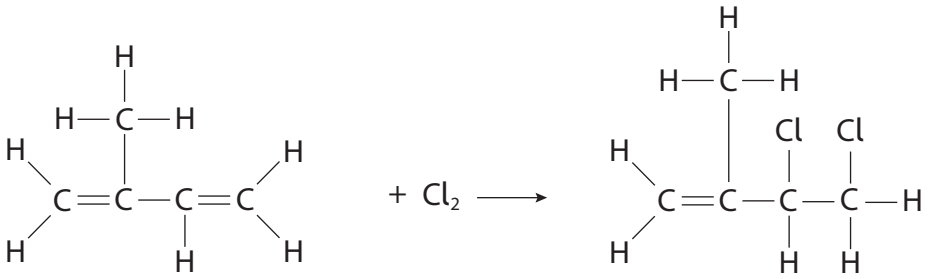
$$C_5H_8 + 7O_2 \rightarrow 5CO_2 + 4H_2O$$

Calculate the amount, in moles, of carbon dioxide produced when 50 g of isoprene undergoes complete combustion.

(3)

amount = ... mol

(e) Diagram 2 shows one of the reactions of isoprene with chlorine to give product X.



Product X

Diagram 2

(i) Name the type of reaction that occurs between isoprene and chlorine.

(1)

.....

(ii) 0.0500 mol of isoprene reacts with chlorine.

0.212 g of product X is produced.

Calculate the percentage yield of product X.

Give your answer to two decimal places.

[for Product X $M_r = 139$]

(3)

percentage yield = ...

(Total for Question 4 = 14 marks)

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5 Crude oil is a mixture of hydrocarbons.

(a) Describe how useful hydrocarbons can be obtained from crude oil.

Refer to fractional distillation and cracking in your answer.

(6)

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(b) (i) State what is meant by the term **fuel**.

(1)

(ii) Explain how the combustion of an impurity in some hydrocarbon fuels causes an environmental problem.

(4)

(Total for Question 5 = 11 marks)

6 This question is about ethane, C_2H_6

(a) Explain a problem caused by a product of the incomplete combustion of ethane.

(2)

(b) Draw a dot-and-cross diagram to show the outer shell electrons in a molecule of ethane.

(2)

(c) Ethane has a boiling point of –89°C.

Describe the arrangement and movement of particles of ethane at 25°C.

(2)

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(d) Explain why ethane has a lower boiling point than octane.

(2)

(e) Ethane can react with bromine.

(i) State the condition needed for ethane to react with bromine.

(1)

(ii) Give the displayed formula of each product.

(2)

product 1	product 2

(f) Explain why ethane does not have any isomers.

(2)

(Total for Question 6 = 13 marks)

7 (a) Anhydrous copper(II) sulfate reacts with water to produce hydrated copper(II) sulfate.

This is the equation for the reaction.

$$CuSO_4 + xH_2O \rightleftharpoons CuSO_4.xH_2O$$

(i) A student does an experiment and determines that 1.75 mol of $CuSO_4$ reacts with 5.25 mol of H_2O

Calculate the student's value of x in the formula of hydrated copper(II) sulfate.

(1)

x = ...

(ii) State what the $\rightleftharpoons$ symbol shows about this reaction.

(1)

.....

.....

(iii) Describe two experiments to show that the $\rightleftharpoons$ symbol is correct for this reaction.

Include any relevant observations.

(5)

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(b) Hydrated copper(II) sulfate crystals can also be made by reacting copper(II) oxide with dilute sulfuric acid.

(i) What is the colour of copper(II) oxide?

(1)

☒ **A** black

☒ **B** blue

☒ **C** green

☒ **D** white

(ii) Give the chemical equation for the reaction between copper(II) oxide and sulfuric acid.

(2)

.....

(iii) When making copper(II) sulfate using this method, excess copper(II) oxide is used.

Explain why the copper(II) oxide is chosen as the reagent in excess.

(2)

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(iv) Give a reason why copper metal cannot be used in this reaction.

(1)

.....

.....

(Total for Question 7 = 13 marks)

8 Fluorine is an element found in Group 7 of the Periodic Table.

(a) (i) Give the electronic configuration of an atom of fluorine.

(1)

.....

(ii) Which period does fluorine belong to?

(1)

☒ **A** Period 1

☒ **B** Period 2

☒ **C** Period 3

☒ **D** Period 7

(b) Fluorine gas exists as the molecule F_2

(i) Describe how two fluorine atoms combine to form a fluorine molecule.

(2)

.....

.....

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.....

(ii) One mole of fluorine gas contains 6.0×10^{23} molecules.

Calculate the number of molecules in 100 g of fluorine.

Give your answer in standard form.

(3)

number of molecules = ...

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(c) Fluorine forms fluoride ions when reacted with a metal.

(i) Describe the changes in the electronic configurations of a lithium atom and a fluorine atom when they form lithium fluoride.

(2)

fluorine

lithium

(ii) Lithium fluoride has a giant ionic structure.

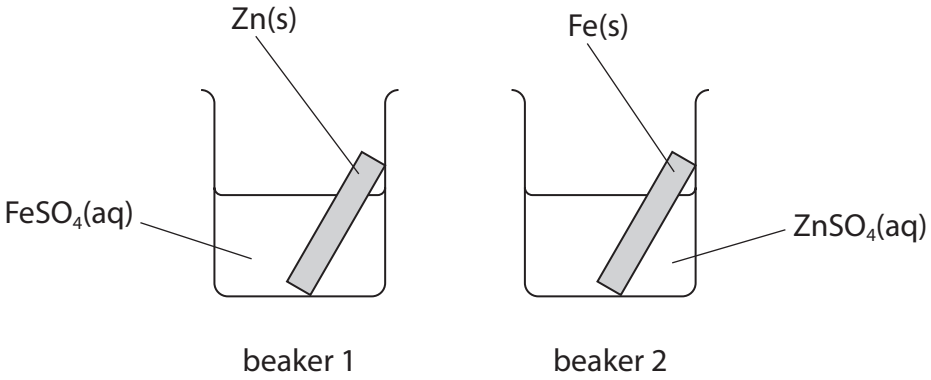
Explain why lithium fluoride has a high melting point.

(3)

(Total for Question 8 = 12 marks)

9 A student does an experiment to investigate the reactivity of metals.

The diagram shows the set-up for the experiment.



(a) (i) What type of reaction occurs in beaker 1?

(1)

- ☒ **A** addition
- ☒ **B** combustion
- ☒ **C** displacement
- ☒ **D** neutralisation

(ii) Give the chemical equation for the reaction that occurs in beaker 1.

(2)

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(iii) Explain which species is the oxidising agent in beaker 1.

(2)

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(b) Explain why no changes are observed in beaker 2.

(2)

(c) The student wants to confirm that both beakers contain sulfate ions.

Before testing for sulfate ions, the student acidifies the solutions in the beakers.

(i) Describe a test to show that the solutions in the beakers contain sulfate ions.

(2)

(ii) Explain why the student acidifies the solutions in the beakers before testing for sulfate ions.

(2)

(Total for Question 9 = 11 marks)

TOTAL FOR PAPER = 110 MARKS

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