

Write your name here

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Pearson Edexcel Certificate

Centre Number

Candidate Number

**Pearson Edexcel
International GCSE**

Chemistry

Unit: KCH0/4CH0**Science (Double Award) KSC0/4SC0****Paper: 1C**

Tuesday 13 May 2014 – Morning

Time: 2 hours

Paper Reference

**KCH0/1C 4CH0/1C
KSC0/1C 4SC0/1C****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.*
- Show all the steps in any calculations and state the units.
- 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 120.
- 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.
- Keep an eye on the time.
- 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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2

Relative atomic mass	Symbol	Name	Atomic number
1	H	Hydrogen	1
12	C	Carbon	6
16	O	Oxygen	8
32	S	Sulfur	16
35.5	Cl	Chlorine	17
56	Fe	Iron	26
64	Cu	Copper	29
65	Zn	Zinc	30
79.9	Ag	Silver	47
108	Pb	Lead	82
137	Ba	Barium	56
162	Er	Erbium	68
175	Lu	Lutetium	71
181	Re	Rhenium	75
201	Tl	Thallium	81
209	Po	Polonium	84
210	Bi	Bismuth	83
223	Fr	Francium	87
226	Ra	Radium	88
238	U	Uranium	92
238	Th	Thorium	90
244	Am	Americium	95
244	Cm	Curium	96
254	Es	Einsteinium	99
261	Bh	Berkelium	97
262	Cf	Californium	98
267	Lr	Lanthanum	103
271	Db	Dubnium	105
272	Sg	Seaborgium	106
277	Bh	Berkelium	107
285	Uu	Ununpentium	115
286	Uu	Ununhexium	116
289	Uu	Ununseptium	117
293	Uu	Ununtrium	119
294	Uu	Ununquadium	120
297	Uu	Ununseptium	121
301	Uu	Ununtrium	123
304	Uu	Ununquadium	124
309	Uu	Ununseptium	125
311	Uu	Ununhennium	127
315	Uu	Ununpentium	129
318	Uu	Ununhexium	130
321	Uu	Ununseptium	131
324	Uu	Ununquadium	132
327	Uu	Ununseptium	133
330	Uu	Ununhennium	135
334	Uu	Ununpentium	137
336	Uu	Ununhexium	138
339	Uu	Ununseptium	139
343	Uu	Ununquadium	141
348	Uu	Ununseptium	143
351	Uu	Ununhennium	145
354	Uu	Ununpentium	147
357	Uu	Ununhexium	148
361	Uu	Ununseptium	149
364	Uu	Ununquadium	150
367	Uu	Ununseptium	151
370	Uu	Ununhennium	152
374	Uu	Ununpentium	153
376	Uu	Ununhexium	154
379	Uu	Ununseptium	155
383	Uu	Ununquadium	156
386	Uu	Ununseptium	157
389	Uu	Ununhennium	158
393	Uu	Ununpentium	159
396	Uu	Ununhexium	160
399	Uu	Ununseptium	161
402	Uu	Ununquadium	162
405	Uu	Ununseptium	163
408	Uu	Ununhennium	164
411	Uu	Ununpentium	165
414	Uu	Ununhexium	166
417	Uu	Ununseptium	167
420	Uu	Ununquadium	168
423	Uu	Ununseptium	169
426	Uu	Ununhennium	170
429	Uu	Ununpentium	171
432	Uu	Ununhexium	172
435	Uu	Ununseptium	173
438	Uu	Ununquadium	174
441	Uu	Ununseptium	175
444	Uu	Ununhennium	176
447	Uu	Ununpentium	177
450	Uu	Ununhexium	178
453	Uu	Ununseptium	179
456	Uu	Ununquadium	180
459	Uu	Ununseptium	181
462	Uu	Ununhennium	182
465	Uu	Ununpentium	183
468	Uu	Ununhexium	184
471	Uu	Ununseptium	185
474	Uu	Ununquadium	186
477	Uu	Ununseptium	187
480	Uu	Ununhennium	188
483	Uu	Ununpentium	189
486	Uu	Ununhexium	190
489	Uu	Ununseptium	

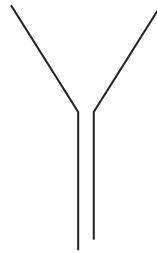
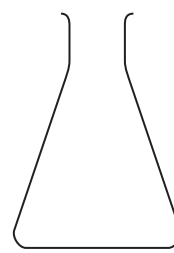
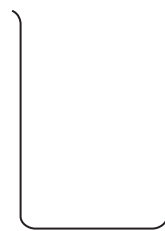
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P 4 2 8 6 5 A 0 3 3 2

Answer ALL questions.

- 1 The diagram shows some pieces of apparatus that you may find in a laboratory.

**A****B****C****D****E****F**

- (a) Complete the table by giving the name of each piece of apparatus.

(4)

Letter	Name
A	measuring cylinder
B	
C	conical flask
D	
E	
F	

- (b) Give the letters of the **two** pieces of apparatus that could each be used to measure an accurate volume of a liquid.

(2)

..... and

(Total for Question 1 = 6 marks)



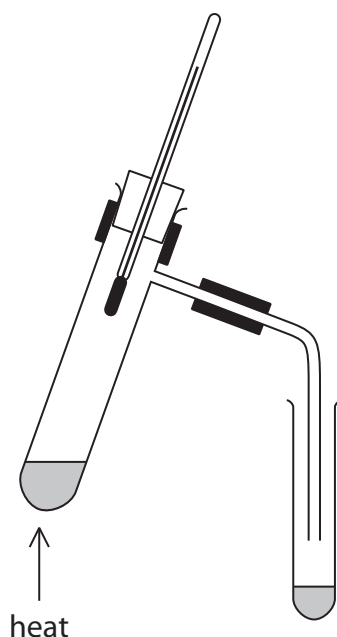
2 Crude oil is a mixture of substances.

(a) Which word best describes the main substances in crude oil?

(1)

- ☐ A bases
- ☐ B carbohydrates
- ☐ C elements
- ☐ D hydrocarbons

(b) This apparatus can be used to separate the substances present in a sample of crude oil into several fractions.



These sentences describe the steps in the method for separating the substances into fractions, but the steps are in the wrong order.

- R** Connect a delivery tube to the boiling tube.
- S** Pour crude oil into a boiling tube.
- T** Collect each fraction in a different test tube.
- U** Fit a thermometer into the boiling tube.
- V** Heat the crude oil gently at first, then more strongly.

Put a letter in each box to show the correct order. One has been done for you.

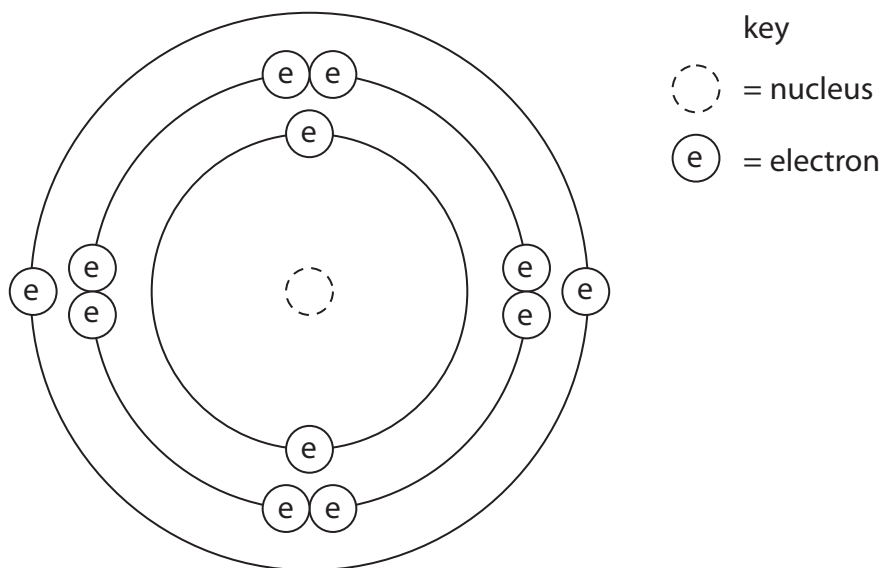
(2)

	U			
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(Total for Question 2 = 3 marks)



3 The diagram shows the electronic configuration of an atom of element X.



(a) (i) How many protons does the nucleus of the atom contain?

(1)

(ii) Which group of the Periodic Table contains element X?

Give a reason for your choice.

(2)

(iii) Give the formula of the ion formed by element X in its compounds.

(1)



(b) Element X has three isotopes.

The table gives the mass number of each isotope and its percentage abundance in a sample of element X.

Mass number	Percentage abundance (%)
24	79.0
25	10.0
26	11.0

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

Give your answer to one decimal place.

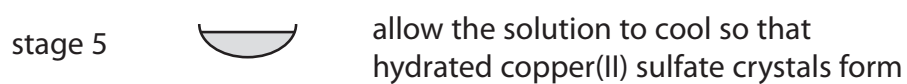
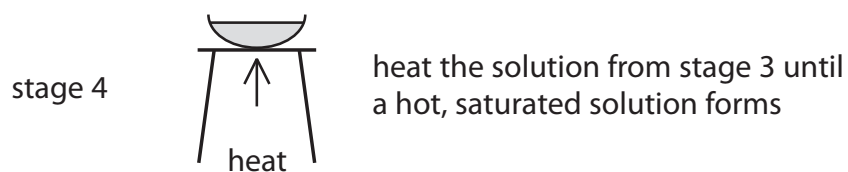
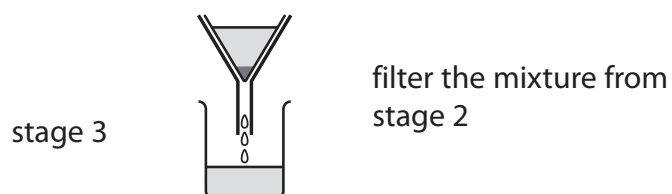
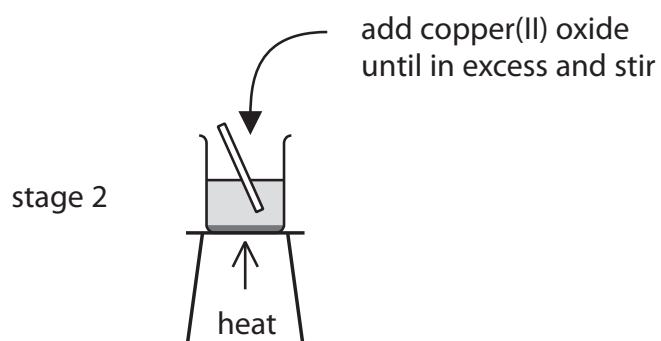
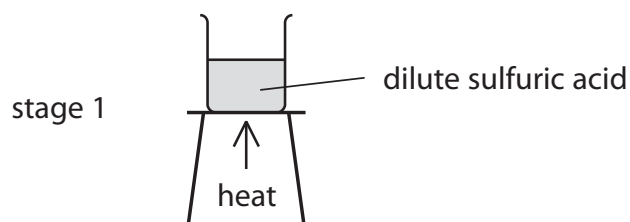
(3)

relative atomic mass of X =

(Total for Question 3 = 7 marks)



- 4 The diagram shows how hydrated copper(II) sulfate crystals can be made by reacting copper(II) oxide with dilute sulfuric acid.



(a) Why is the sulfuric acid heated in stage 1?

(1)

(b) How would you know when the copper(II) oxide is in excess in stage 2?

(1)

(c) Why is the mixture filtered in stage 3?

(1)

(d) Why do crystals form when the hot saturated solution is cooled in stage 5?

(1)

(e) State the colour of the crystals formed in stage 5.

(1)

(f) The crystals are removed by filtration and then dried.

Suggest a suitable method of drying the crystals.

(1)

(Total for Question 4 = 6 marks)



5 The table shows some properties of four substances A, B, C and D.

Substance	Melting point in °C	Boiling point in °C	Conducts electricity when solid?	Conducts electricity when molten?
A	-101	-35	no	no
B	1063	2970	yes	yes
C	801	1413	no	yes
D	3550	4830	no	no

(a) Use the information in the table to identify the substance that

(i) is a metal

(1)

☐ A ☐ B ☐ C ☐ D

(ii) could be diamond

(1)

☐ A ☐ B ☐ C ☐ D

(iii) is a gas at 20°C

(1)

☐ A ☐ B ☐ C ☐ D

(iv) contains oppositely charged ions

(1)

☐ A ☐ B ☐ C ☐ D

(b) Some of the substances in the table are compounds.

What is meant by the term **compound**?

(2)

.....

.....

.....

.....



(c) (i) The electronic configurations of atoms of sodium and chlorine are

Na 2.8.1

Cl 2.8.7

Describe the changes in the electronic configurations of sodium and chlorine when these atoms form sodium chloride.

(3)

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.....

(ii) Calculate the relative formula mass of sodium chloride (NaCl).

Use the Periodic Table on page 2 to help you.

(2)

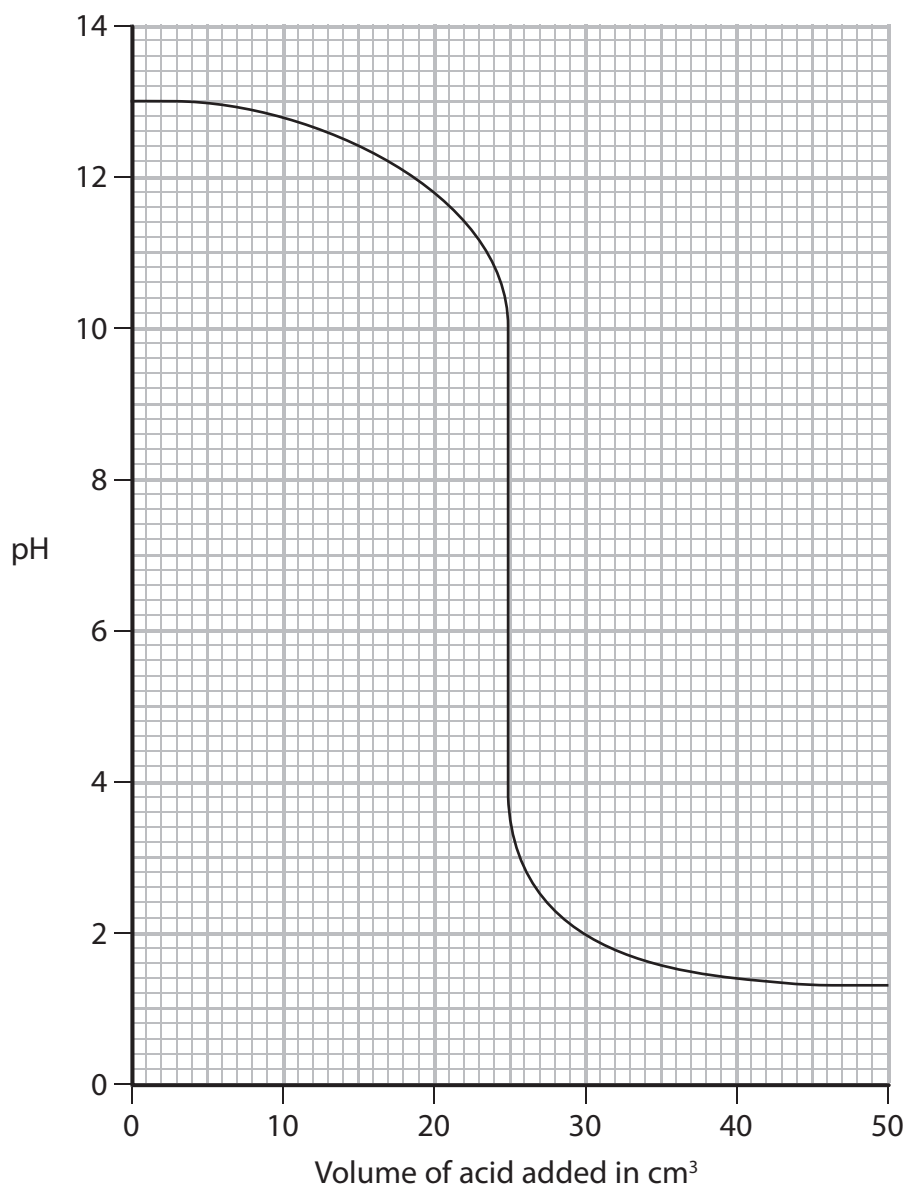
relative formula mass =

(Total for Question 5 = 11 marks)



- 6 A total volume of 50 cm^3 of hydrochloric acid is added gradually to 50 cm^3 of sodium hydroxide solution containing some universal indicator.

The graph shows how the pH of the solution changes as the acid is added.



(a) Use the graph to answer these questions.

- (i) What is the pH of the sodium hydroxide solution before any acid is added?

(1)

- (ii) What is the pH of the solution after 40 cm^3 of acid is added?

(1)

- (iii) What volume of acid is needed to completely neutralise the sodium hydroxide?

(1)



(b) The table shows the colour of universal indicator at different pH values.

pH	0–2	3–4	5–6	7	8–9	10–12	13–14
Colour	red	orange	yellow	green	blue	indigo	violet

Complete the table below to show the colour of the solution when the volume of hydrochloric acid added is 20 cm³ and when the volume added is 35 cm³.

(2)

Volume of hydrochloric acid added in cm ³	Colour of solution
20	
35	

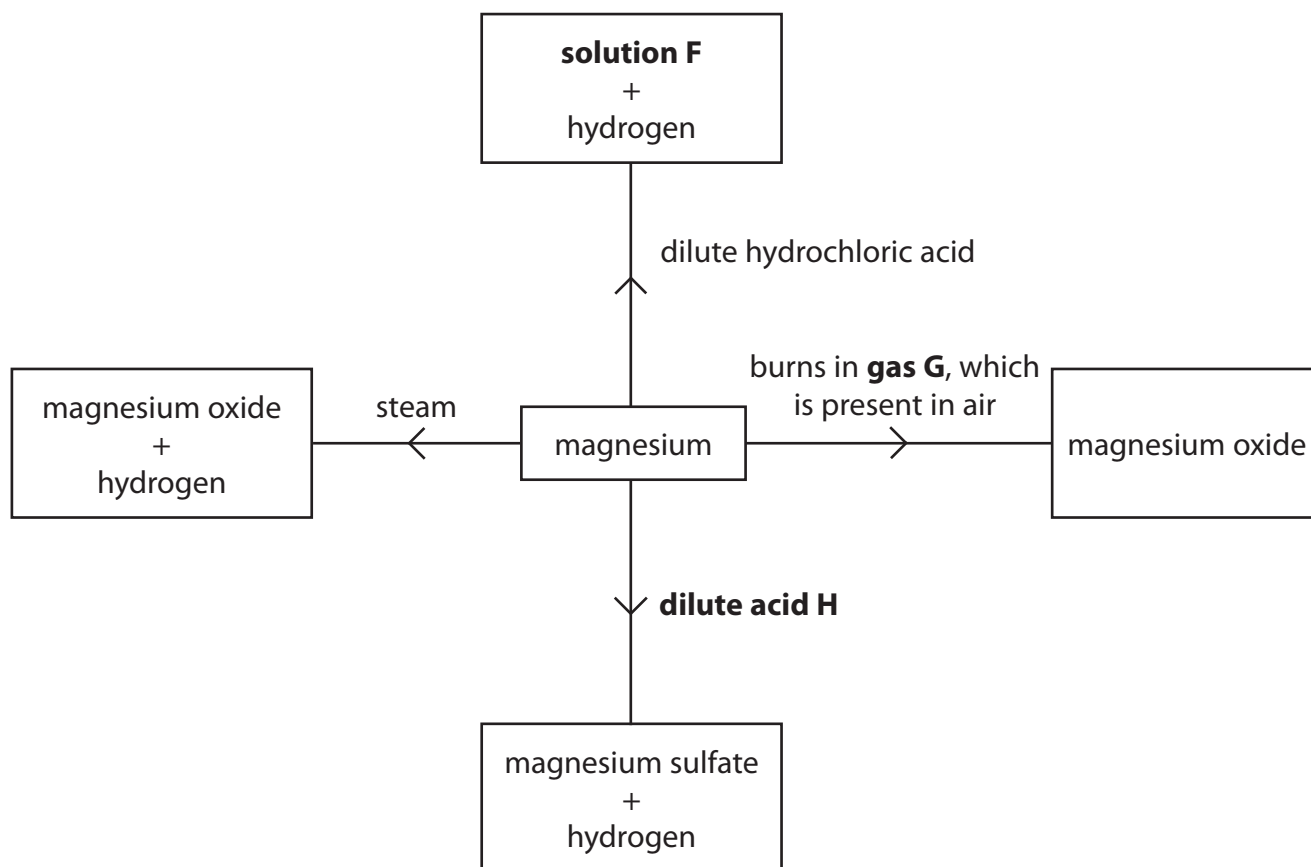
(c) Write a chemical equation for the reaction between sodium hydroxide and hydrochloric acid.

(1)

(Total for Question 6 = 6 marks)



7 The diagram shows some of the reactions of magnesium.



(a) Complete the table to give the identity of substances F, G and H.

(3)

Substance	Identity
solution F	
gas G	
dilute acid H	

(b) Write a chemical equation for the reaction between magnesium and steam.

(1)

(Total for Question 7 = 4 marks)



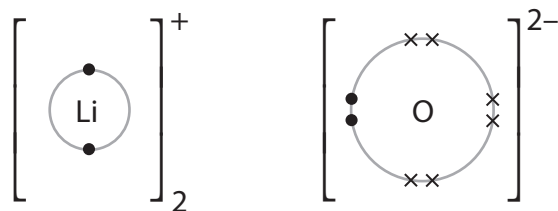
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- 8 When lithium is burned in air, the two compounds lithium oxide (Li_2O) and lithium nitride (Li_3N) are formed.

Both compounds are ionic and their ions can be represented by dot and cross diagrams.

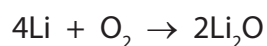
The dot and cross diagram for the ions in lithium oxide is



- (a) Draw a dot and cross diagram for the ions in lithium nitride.

(3)

- (b) The chemical equation for the reaction between lithium and oxygen is



Write a chemical equation for the reaction between lithium and nitrogen.

(2)



- (c) (i) Lithium nitride reacts violently with water to form a solution of lithium hydroxide and ammonia gas.

Complete the following equation by inserting the appropriate state symbols.

(1)



- (ii) Suggest a value for the pH of the solution formed.

Give a reason for your answer.

(2)

pH.....

reason.....

- (d) Solid lithium nitride conducts electricity and is used in batteries.

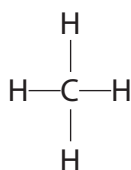
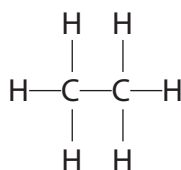
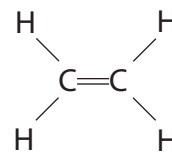
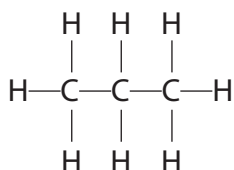
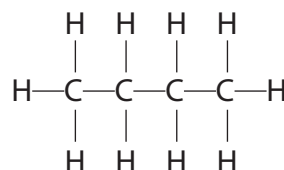
Why would you expect solid lithium nitride **not** to conduct electricity?

(1)

(Total for Question 8 = 9 marks)



9 The diagram shows the displayed formulae of five hydrocarbons A, B, C, D and E.

**A****B****C****D****E**

(a) Give the letter of a hydrocarbon to answer these questions.

You may use each letter once, more than once or not at all.

(i) Which hydrocarbon is the main component of natural gas?

(1)

(ii) Which other hydrocarbon is produced, together with D, when pentane (C_5H_{12}) is cracked?

(1)

(iii) Which hydrocarbon can undergo an addition reaction with hydrogen to form B?

(1)

(b) Give the molecular formula and the empirical formula of E.

(2)

molecular formula.....

empirical formula.....



(c) Hydrocarbons A, B, D and E all belong to the same homologous series.

(i) Give the name and the general formula of this homologous series.

(2)

name.....

general formula.....

(ii) Draw the displayed formula of an isomer of E.

(1)

(d) Two reactions that can occur when hydrocarbon A is burned in air are represented by these equations.



Explain why a different product is formed in reaction 2 and why this product is dangerous.

(3)

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(Total for Question 9 = 11 marks)



10 Aluminium and iron have some similar properties.

Both metals

- are malleable
- are ductile (can be drawn into a wire)
- are good conductors of electricity
- are good conductors of heat
- have a high melting point

(a) (i) Choose two properties from the list that make iron a suitable metal for saucepans. (2)

1

2

(ii) Choose two properties from the list that make aluminium a suitable metal for power cables.

(2)

1

2



(b) Steel is an alloy containing iron.

These are three differences between steel and aluminium.

- steel can rust but aluminium resists corrosion
- steel has a higher density than aluminium
- steel is much stronger than aluminium

(i) Use information from the list to suggest why steel is the better metal for making bridges.

(1)

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.....

(ii) Use information from the list to suggest why aluminium is the better metal for making aircraft bodies.

(1)

.....

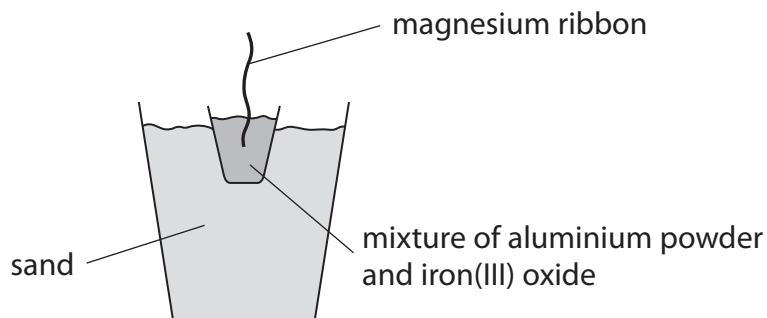
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(c) The reaction between aluminium and iron(III) oxide is known as a thermite reaction.

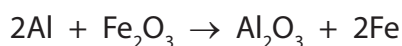
The diagram shows how this thermite reaction can be carried out.



The magnesium ribbon is lit to ignite the reaction mixture.

The reaction is highly exothermic.

The equation for the reaction is



(i) What is meant by the term **exothermic**?

(1)

.....

.....

.....

(ii) What does the reaction suggest about the reactivity of aluminium compared to the reactivity of iron?

Explain your answer.

(2)

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(iii) Which element is oxidised in this thermite reaction?

Give a reason for your answer.

(2)

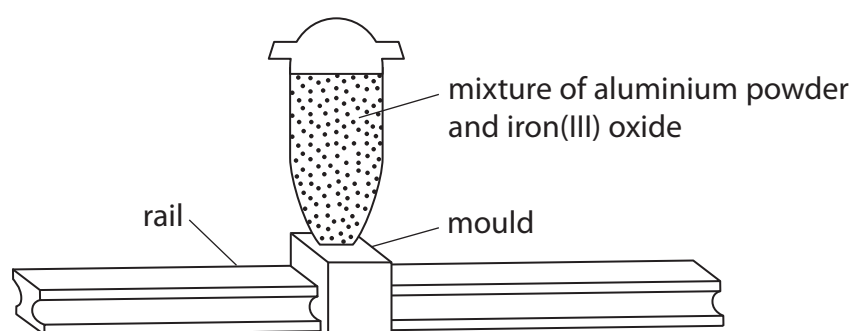
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(d) This thermite reaction can be used to join together two rails on a railway line.



The reaction mixture is ignited and molten iron pours into the mould. The mould is removed and the molten iron solidifies to create a join between the two rails.

Explain why the iron produced in the reaction is molten.

(1)

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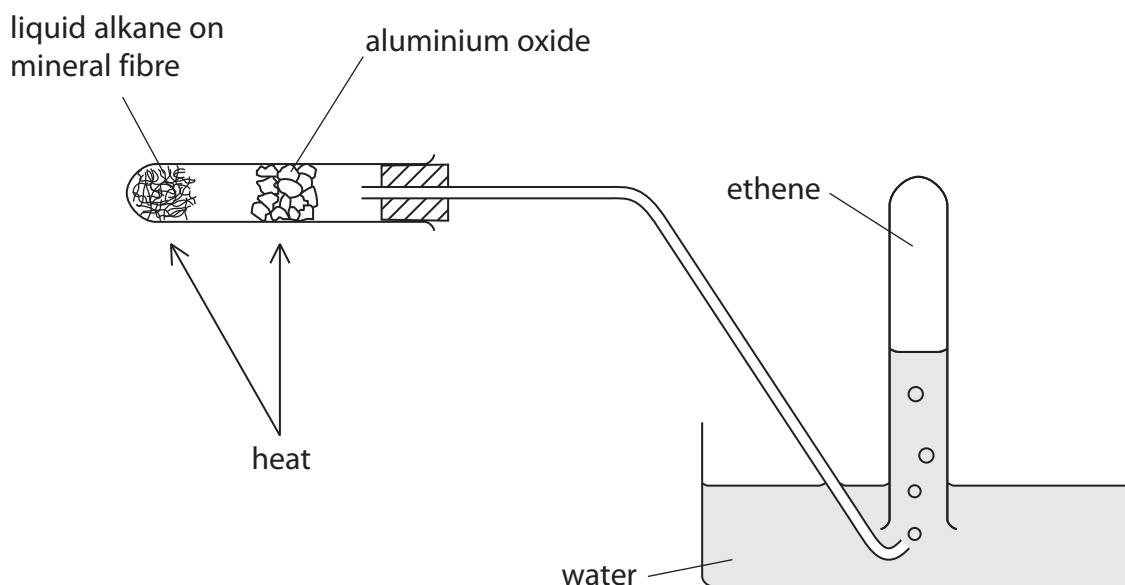
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(Total for Question 10 = 12 marks)



11 This apparatus can be used to obtain ethene by cracking a liquid alkane.



(a) What is meant by the term **cracking**?

(1)

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(b) Give a chemical test to show that the gas collected is unsaturated.

(2)

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.....

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(c) Cracking is also carried out in industry.

Give the name of the catalyst and the temperature used in the catalytic cracking of hydrocarbons.

(2)

catalyst.....

temperature.....

(Total for Question 11 = 5 marks)



12 A sample of a chlorofluorocarbon (CFC) contains 0.24 g of carbon, 0.38 g of fluorine and 1.42 g of chlorine.

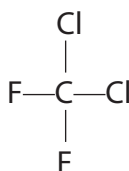
(a) (i) Show, by calculation, that the empirical formula of the CFC is CFCl_2 (3)

(ii) The relative formula mass of the CFC is 204.

Deduce the molecular formula of the CFC. (2)

molecular formula

(b) The displayed formula of another CFC is



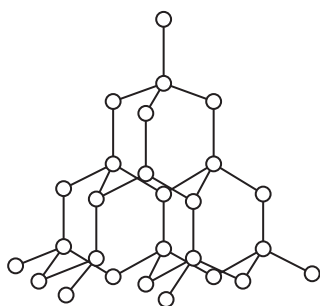
Draw a dot and cross diagram of this CFC.

Show only the outer electrons. (2)

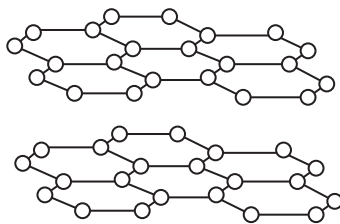
(Total for Question 12 = 7 marks)



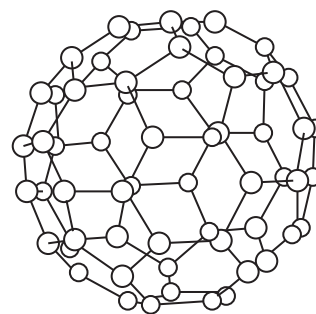
13 The diagram shows three different forms of carbon.



diamond structure



graphite structure



fullerene molecule

(a) Name the type of bond that exists between the carbon atoms in all three structures.

(1)

.....

(b) (i) Explain why diamond has a very high melting point.

(4)

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(ii) Fullerene has a simple molecular structure.

Explain why it has a low melting point.

(2)

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(c) There are two theories used to explain why graphite can act as a solid lubricant.

Theory A The forces of attraction between the layers are weak, allowing the layers to slide over one another.

Theory B Gas molecules are trapped between the layers allowing the layers to slide over one another.

The table shows the ability of graphite to act as a lubricant in different locations.

Location	Ability to act as a lubricant
Earth's surface	good
high altitude	average
outer space	very poor

Suggest which theory is supported by the evidence in the table.

Give a reason for your choice.

(1)

.....

.....

.....

(d) Graphite and diamond can be changed from one form to the other according to the equation



Would a low or a high temperature favour the conversion of graphite into diamond?

Give a reason for your choice.

(1)

.....

.....

.....

.....

(Total for Question 13 = 9 marks)



14 (a) The table shows information about two common addition polymers.

Complete the table for these two polymers.

(4)

Name of polymer	Structure of monomer	Structure of polymer	One use for the polymer
poly(ethene)	$ \begin{array}{c} \text{H} \quad \text{H} \\ \diagdown \quad \diagup \\ \text{C} = \text{C} \\ \diagup \quad \diagdown \\ \text{H} \quad \text{H} \end{array} $		
		$ \left[\begin{array}{cc} \text{CH}_3 & \text{H} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right]_n $	water pipes

(b) State two changes that occur in the formation of an addition polymer from its monomer.

(2)

1

.....

2

.....



(c) Addition polymers such as poly(ethene) are very difficult to dispose of because they do not biodegrade easily.

(i) State a reason why addition polymers do not biodegrade easily.

(1)

(ii) Burning and landfill (burying in the ground) are two methods used to dispose of addition polymers.

Suggest a problem with each method of disposal.

(2)

burning.....

.....

landfill.....

.....

(Total for Question 14 = 9 marks)



15 (a) A student made a solution of sodium hydroxide by dissolving 10.0 g of solid sodium hydroxide in distilled water to make 250 cm³ of solution.

(i) Calculate the amount, in moles, of NaOH in 10.0 g of sodium hydroxide.

(3)

amount = mol

(ii) Calculate the concentration, in mol/dm³, of this solution of sodium hydroxide.

(2)

concentration = mol/dm³

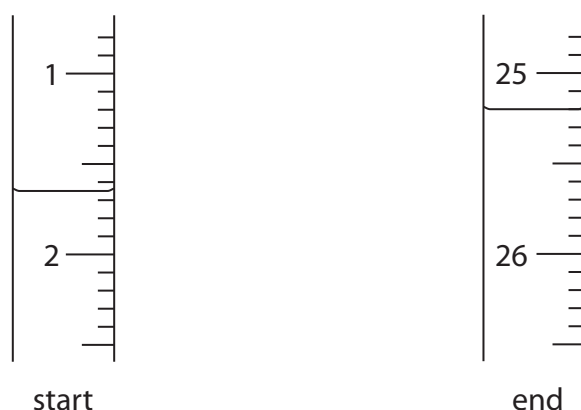


- (b) (i) The student uses the sodium hydroxide solution to find the concentration of a solution of hydrochloric acid.

He uses this method

- use a pipette to put 25.0 cm^3 of the sodium hydroxide solution into a conical flask
- add a few drops of methyl orange indicator to the solution
- gradually add the hydrochloric acid from a burette until the solution in the flask just changes colour

The diagram shows his burette readings.



Complete the table, giving all values to the nearest 0.05 cm^3 .

(3)

burette reading at end in cm^3	
burette reading at start in cm^3	
volume of acid added in cm^3	

- (ii) State the colour of the methyl orange at the start and at the end of the experiment.

(2)

colour at start

colour at end

- (iii) Why is a burette used instead of a pipette for adding the acid?

(1)

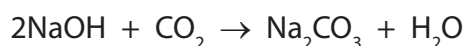
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QUESTION 15 CONTINUES ON NEXT PAGE



(c) Sodium hydroxide reacts with carbon dioxide.

The equation for this reaction is



A solution of sodium hydroxide of concentration 2.00 mol/dm^3 is used.

- (i) Calculate the amount, in moles, of sodium hydroxide in 200 cm^3 of this solution. (2)

amount of sodium hydroxide = mol

- (ii) Deduce the maximum mass, in grams, of carbon dioxide that can react with this solution of sodium hydroxide. (2)

mass of carbon dioxide = g

(Total for Question 15 = 15 marks)

TOTAL FOR PAPER = 120 MARKS

