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SECTION A

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

(a) Give the name or symbol of the least reactive element in Group 1.

.....
(1)

(b) Give the name or symbol of the least reactive element in Period 3.

.....
(1)

(c) Give the name or symbol of an element whose atoms have one electron in the outer shell.

.....
(1)

(d) Give the names or symbols of **two** elements that have similar chemical properties.

.....
(1)

(e) Give the name or symbol of a metal which reacts with cold water to form an alkaline solution.

.....
(1)

(Total 5 marks)

Q1



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2. Atoms contain electrons, neutrons and protons.

(a) Which of these particles

(i) has no electrical charge?

..... (1)

(ii) has the lowest mass?

..... (1)

(iii) orbits the nucleus?

..... (1)

(b) The table below gives some information on two different atoms of lithium.

	Mass number	Atomic number
first atom	6	3
second atom	7	3

(i) What is the name given to two atoms with the same atomic number but different mass numbers?

..... (1)

(ii) Complete the sentences by using numbers from the box. Each number may be used once, more than once or not at all.

3	4	6	7
9	10	12	13

All atoms of lithium contain protons and electrons.

Some atoms of lithium contain neutrons while

others contain neutrons.

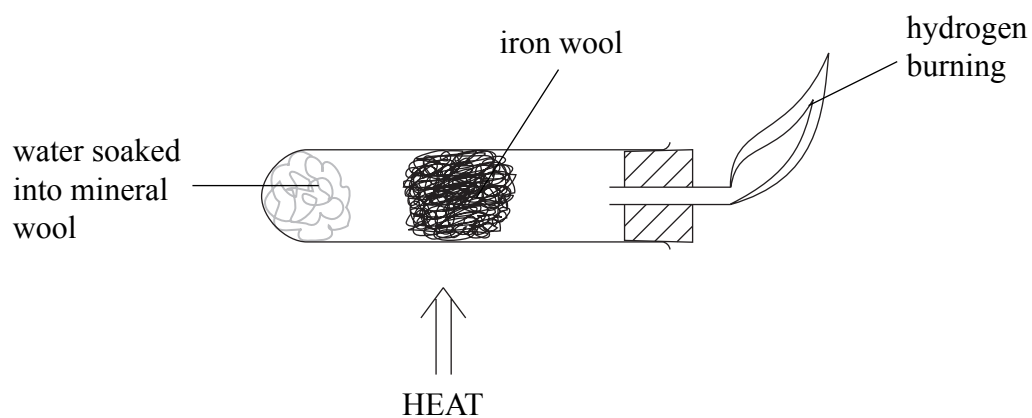
(4)

Q2

(Total 8 marks)



3. Steam reacts with hot iron. The products are a dark coloured solid and hydrogen gas. The hydrogen gas can be burned off.



(a) Write a word equation for the reaction of steam with iron.

..... (1)

(b) When hydrogen burns, steam forms.

(i) How can steam be turned into liquid water?

..... (1)

(ii) Describe and give the result of a **physical** test to show that a liquid is pure water.

Test

Result

..... (2)



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- (c) Anhydrous copper(II) sulphate can be used to show if a substance contains water. Describe the colour change seen when water is added to anhydrous copper(II) sulphate. Give the **name** of the product.

Colour change

.....

Name of product

(3)

- (d) The product in (c) is heated until another colour change occurs. Give the final colour of the solid and state the type of reaction that occurs.

.....

.....

.....

(2)

Q3

(Total 9 marks)



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4. (a) Aluminium, copper and iron are three important metals.
Complete the table by selecting from the boxes one use for each metal and the property on which this use depends.
Each use and property may be used once, more than once or not at all.

Uses			
aircraft bodies	railway tracks	solder	water pipes

Properties	
good conductor of electricity	low density
resists corrosion	strong

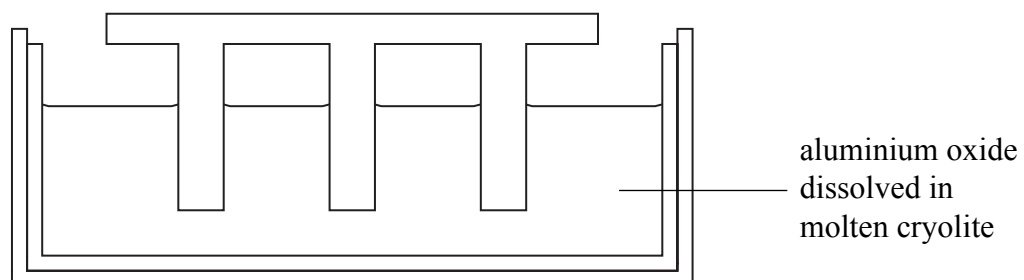
Name of metal	Use of metal	Property on which this use depends
aluminium		
copper		
iron		

(6)



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(b) Aluminium is extracted using electrolysis. The diagram shows part of an electrolysis cell.



During electrolysis, oxygen gas forms at the positive electrode.

(i) Label the positive electrode on the diagram. (1)

(ii) Explain why this electrode must be replaced at regular intervals.
.....
..... (1)

(iii) The aluminium oxide is dissolved in molten cryolite.
Put a cross (☒) in **one** box to show the main reason for this.

Aluminium is extracted from cryolite.

Cryolite is a compound of sodium, aluminium and fluorine.

The solution has a lower melting point than pure aluminium oxide. (1)

(c) Iron is extracted from iron ore by reduction using carbon monoxide.

(i) Complete the word equation.
iron(III) oxide + carbon monoxide → + (1)

(ii) Explain why aluminium cannot be extracted from aluminium oxide using carbon monoxide.
..... (1)

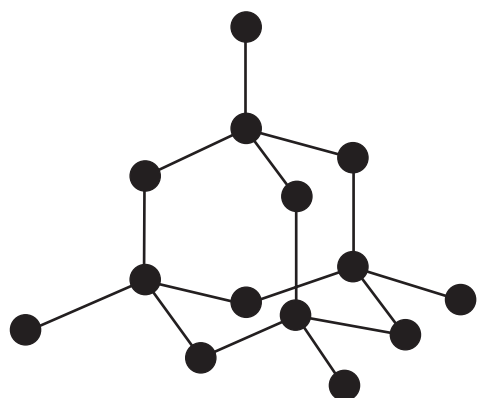
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Q4

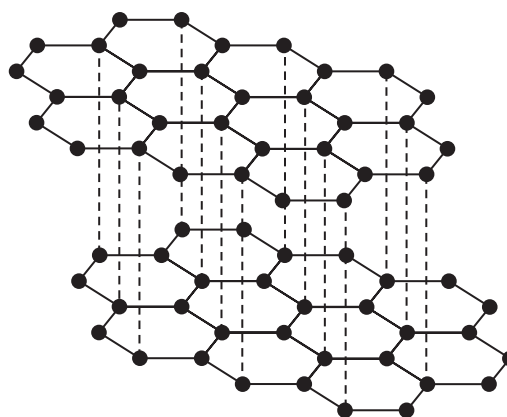
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5. The diagrams show the structures of diamond and graphite. They are different structural forms of the same element.



diamond



graphite

(a) Use words from the box to complete the sentences. Each word may be used once, more than once or not at all.

allotropes	carbon	isomers
isotopes	silicon	sulphur

Different structural forms of the same element are called

Diamond and graphite are both forms of the element

(2)

(b) When graphite burns it forms carbon dioxide.

(i) Identify the element with which graphite reacts to form carbon dioxide.

.....

(1)

(ii) Put a cross (☒) in **one** box to show the test for carbon dioxide and put a cross (☒) in **one** box to show the positive result.

Test		Positive result	
add carbonic acid	<input checked="" type="checkbox"/>	bubbles	<input checked="" type="checkbox"/>
add limewater	<input checked="" type="checkbox"/>	turns milky	<input checked="" type="checkbox"/>
add sodium hydroxide	<input checked="" type="checkbox"/>	turns orange	<input checked="" type="checkbox"/>

(2)



Leave blank

(iii) Carbon dioxide dissolves in water to form a very weakly acidic solution. Put a cross (X) next to the most likely pH of a solution of carbon dioxide.

- 1
- 3
- 5
- 7
- 9
- 11

(1)

(iv) Draw a diagram to show the shape of a molecule of carbon dioxide.

(1)

(v) Complete the passage using words from the box.
Each word may be used once, more than once or not at all.

atoms	high	large	low
molecules	small	strong	weak

Carbon dioxide has a boiling point. This is because there

are forces of attraction between its

These need a amount of energy to overcome.

(4)

Q5

(Total 11 marks)

11

Turn over



6. (a) The table shows the displayed formulae of some organic compounds.

Compound	Displayed formula
A	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$
B	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$
C	$\begin{array}{c} \text{H} \quad \quad \text{H} \\ \diagdown \quad / \\ \text{C}=\text{C} \\ / \quad \diagdown \\ \text{H} \quad \quad \text{H} \end{array}$
D	$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$
E	$\begin{array}{c} \text{H} \quad \quad \text{H} \\ \diagdown \quad / \\ \text{C}=\text{C} \\ / \quad \diagdown \\ \text{H} \quad \quad \text{C} \\ \quad \quad / \quad \diagdown \\ \quad \quad \text{H} \quad \quad \text{H} \end{array}$

(i) Select one compound from the table which is an alkene.

..... (1)

(ii) Give the molecular formula of compound C.

..... (1)

(iii) Give the general formula for the homologous series of which compound D is a member.

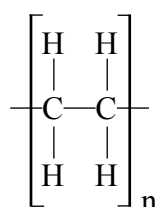
..... (1)

(iv) Select one compound from the table which is an unsaturated hydrocarbon.

..... (1)



- (v) Select one compound from the table which would form an addition polymer having the structure:



..... (1)

- (b) (i) Draw the displayed formula of butane.

(2)

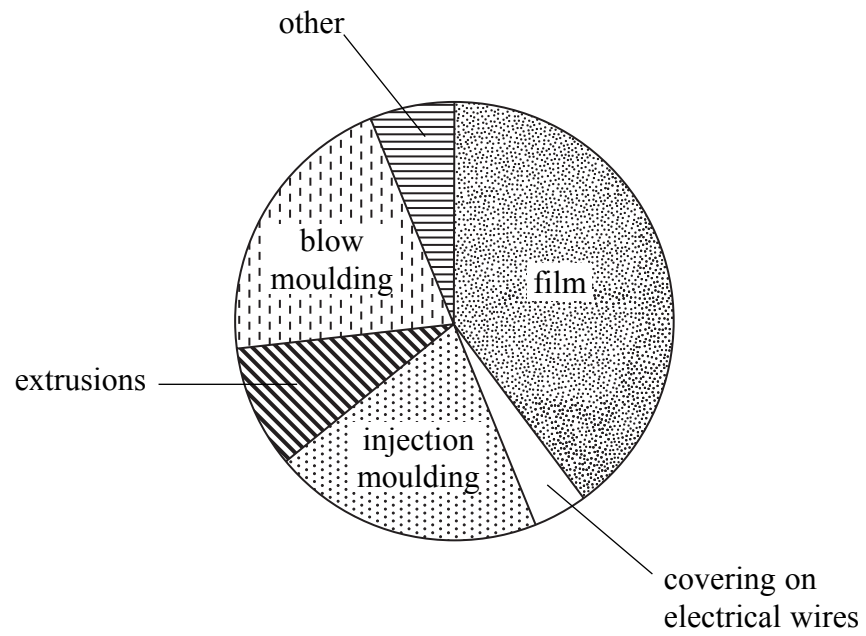
- (ii) What colour change, if any, is seen when butane is bubbled through bromine water? Explain your answer.

.....
..... (2)



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(c) The pie chart shows some uses of poly(ethene).



(i) What is the main use of poly(ethene)?

..... (1)

(ii) What property of poly(ethene) makes it suitable for use as a covering on electrical wires?

..... (1)

(Total 11 marks)

Q6

TOTAL FOR SECTION A: 55 MARKS

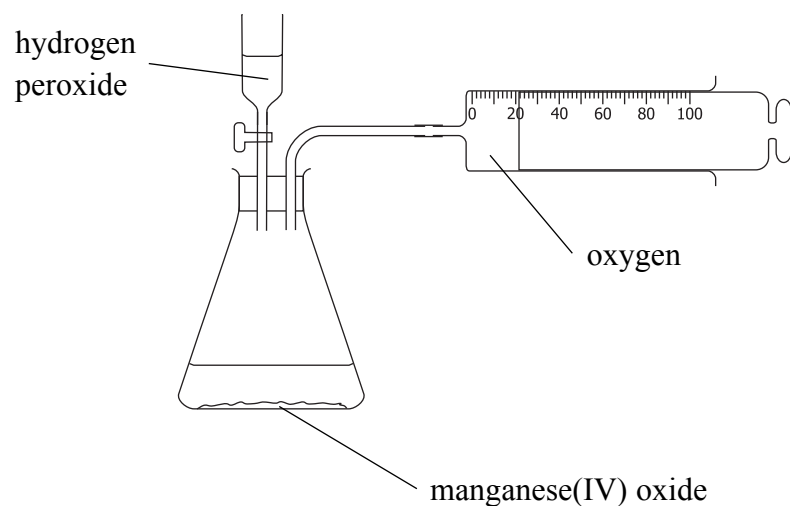


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SECTION B

7. Oxygen gas can be prepared and collected in the laboratory using the apparatus shown in the diagram.



(a) Hydrogen peroxide decomposes very slowly to form water and oxygen.

(i) Write a word equation for this reaction.

.....

 (1)

(ii) The reaction is much faster if a small amount of manganese(IV) oxide is added. What type of substance is manganese(IV) oxide in this reaction?

.....
 (1)

(b) The diagram shows oxygen gas being collected in a syringe. Suggest one other way to collect the gas.

.....

 (1)

(c) Describe the test for oxygen.

.....

 (1)

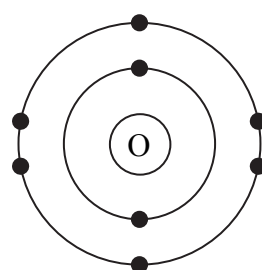
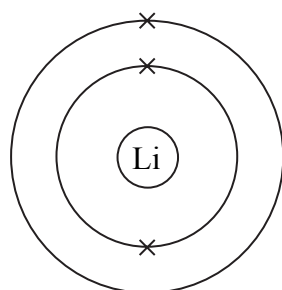


(d) Lithium burns in oxygen to form the ionic compound lithium oxide.

(i) State the colour of the flame when lithium burns.

..... (1)

(ii) The diagrams show the electronic configurations of an atom of lithium and an atom of oxygen.



Describe what happens, in terms of electrons, when lithium reacts with oxygen.

.....
.....
.....
..... (3)

(iii) Write the formula of each of the ions in lithium oxide.

Lithium ion

Oxide ion

(2)

Q7

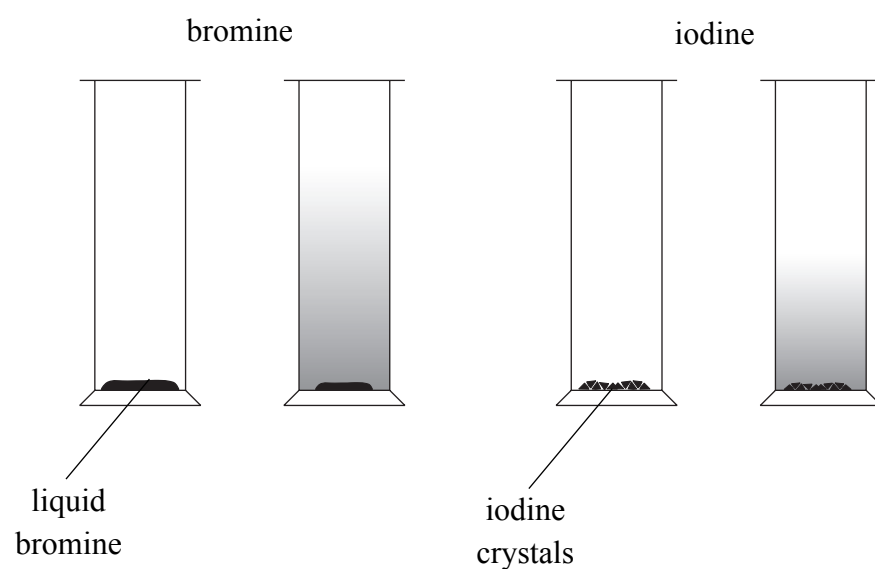
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8. A few drops of liquid bromine and a few crystals of solid iodine are placed in the bottom of separate gas jars and the open ends covered with lids. The jars are left for some time under the same conditions.

The diagrams show the jars just after the bromine and iodine are added, and after some time.



- (a) State the colour of
 liquid bromine.....
 solid iodine

(2)

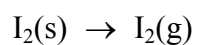
- (b) The diagrams show that the particles of bromine and iodine spread out in the jars.

- (i) What is the name of this process?

.....

(1)

- (ii) The iodine changes into a gas before this process occurs.
 The chemical equation for this change is



The change involving bromine is called evaporation.
 Write a chemical equation, including state symbols, for this change.

.....

(2)



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(iii) Describe how the movement and spacing of the particles in $I_2(g)$ is different from that in $I_2(s)$.

Movement.....

Spacing

(2)

(c) The gases chlorine and hydrogen react together to form hydrogen chloride gas. Hydrogen chloride gas dissolves in water to form hydrochloric acid.

Bromine reacts in a similar way to chlorine.

(i) Write a word equation for the reaction between bromine and hydrogen.

.....

.....

(1)

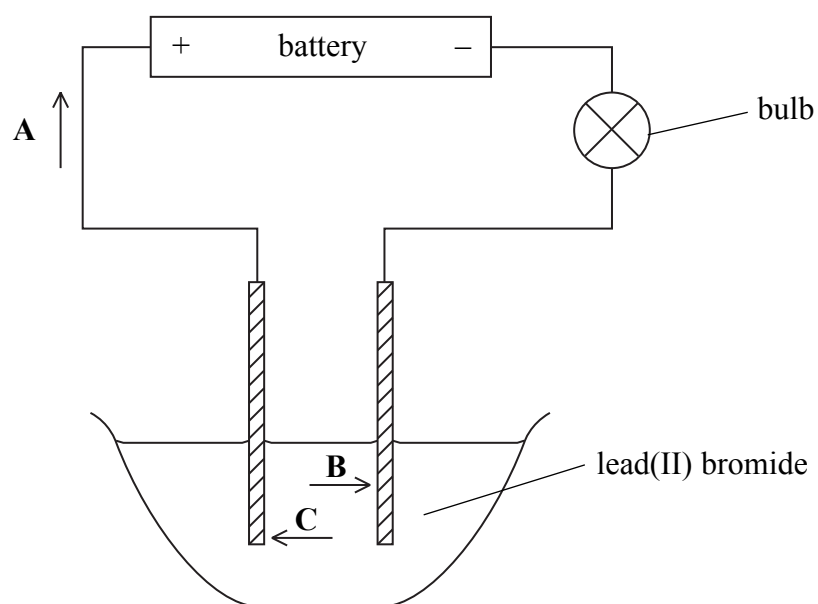
(ii) Suggest the name of the acid formed when the product in (c)(i) dissolves in water.

.....

(1)



(d) The diagram shows apparatus for electrolysis of lead(II) bromide.



(i) When the apparatus is set up as shown, electrolysis does not occur. State what must be done before electrolysis can occur.

.....

 (1)

(ii) When electrolysis occurs, particles **A**, **B** and **C** move in the directions shown by the arrows in the diagram. Identify each of these particles.

A

B

C

(3)

(e) Explain why the reaction at the negative electrode is described as reduction.

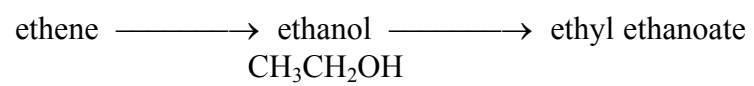
.....
 (1)

Q8

(Total 14 marks)



10. Ethene can be converted to ethyl ethanoate as follows:



(a) In industry, ethene is converted to ethanol by reacting it with steam in the presence of a catalyst.

(i) Write the chemical equation for this reaction.

.....
 (1)

(ii) Name the catalyst used.

..... (1)

(b) Ethanol can also be made by fermentation. Describe how this is done.

.....

 (4)



(c) Ethanol is converted to ethyl ethanoate by warming it with ethanoic acid in the presence of a catalyst.

(i) Write the chemical equation, including state symbols, for this reaction.

.....
.....

(3)

(ii) How can a student detect the formation of ethyl ethanoate in this reaction?

.....
.....

(1)

Q10

(Total 10 marks)

TOTAL FOR SECTION B: 45 MARKS

TOTAL FOR PAPER: 100 MARKS

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