

High Demand Questions

QUESTIONSHEET 1

Aluminium is manufactured by the electrolysis of molten aluminium oxide which is obtained from the ore bauxite.

- (i) Explain why the aluminium has to be in the **molten** form for the electrolysis to take place.

..... [1]

- (ii) Pure aluminium oxide melts at 2045°C. Name the **substance** to which the aluminium oxide is added in order that the melting point is reduced to below 1000°C.

..... [1]

- (iii) Explain the reason why aluminium is extracted from its oxide by means of electrolysis rather than a chemical reducing agent such as carbon.

.....

..... [1]

- (iv) Name the substance that the positive electrode is made of.

..... [1]

- (v) Name the **gas** given off at the positive electrode.

..... [1]

- (vi) Give a **balanced symbol** equation for the reactions taking place at the **positive** and **negative** electrode.

I. At the positive electrode.

.....

II. At the negative electrode.

.....

[4]

- (vii) Explain why the positive electrodes must be **replaced** on a regular basis.

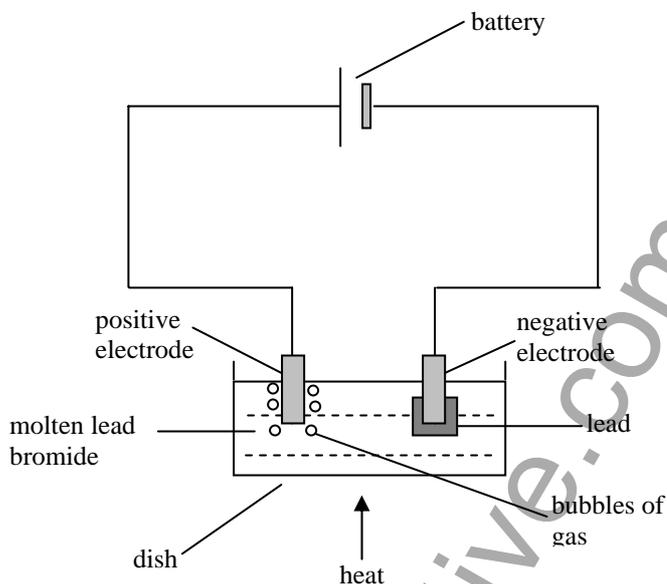
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QUESTIONSHEET 2

The following diagram shows the apparatus that could be used to investigate the electrolysis of molten lead(II) bromide. Molten lead(II) bromide is an **electrolyte**. Both **electrodes** are made from graphite.



(i) Give the meaning of the terms:

I. **electrode**

.....

II. **electrolyte**

..... [2]

(ii) State why the dish was **heated** during the experiment.

..... [1]

(iii) Give the **symbols** for the **two** ions present in the molten lead bromide.

..... and [2]

(iv) Give the colour of the vapour released around the positive electrode.

..... [1]

(Continued...)

QUESTIONSHEET 2 CONTINUED

(v) The word equation for the reaction that took place at the negative is:



Give the balanced **symbol** equation for this reaction.

..... [2]

(vi) This experiment can be repeated using different substances. Predict the products of electrolysis of the following **two** molten compounds by completing the table.

<i>Molten compound</i>	<i>Produced at the positive electrode</i>	<i>Produced at the negative electrode</i>
Sodium chloride		
Lithium sulphide		

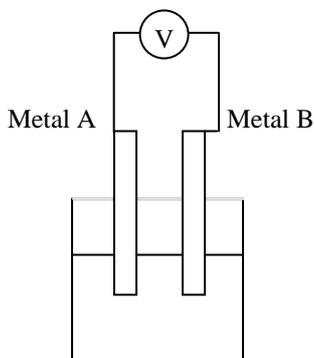
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QUESTIONSHEET 3

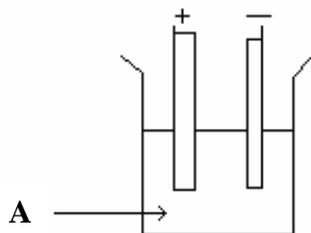
If two different metals are placed in salt solution, electricity can be made as shown.



- (a) Name two metals which, when used in the apparatus, would give a reading on the voltmeter.
 [2]
- (b) What everyday use is made of this process?
 [1]
- (c) How can this experiment be used to work out a reactivity series of metals?

 [2]
- (d) Why does this process eventually stop working?
 [1]
- (e) List **three** ways in which the voltage of the cell could be increased.

 [3]



The chemical **A** is sodium chloride.

- (a) Write the formula for **A**.

..... [1]

- (b) When electricity is passed through **A**, what is produced at

(i) the anode?

..... [1]

(ii) the cathode?

..... [1]

- (c) Write a half equation showing the reaction at

(i) the anode.

..... [2]

(ii) the cathode.

..... [2]

- (d) (i) If **A** were molten, what mass of chlorine would be produced if 2.3 g of sodium were formed?

.....

.....

..... [3]

(ii) What volume will this gas occupy at room temperature?

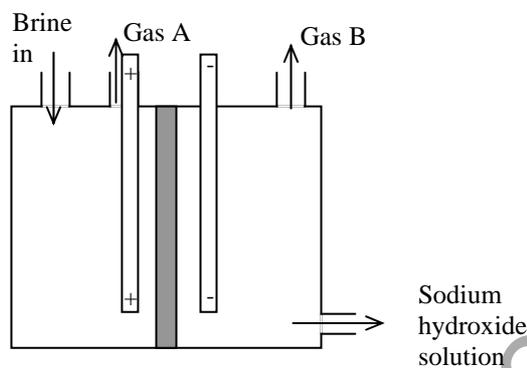
(The molar volume of a gas at room temperature is 24 dm^3)

.....

.....

..... [2]

The diagram shows electricity being passed into sodium chloride solution.



(a) Give the names of gas A and gas B.

Gas A.

Gas B.

[2]

(b) What four ions are present in sodium chloride solution?

.....

..... [2]

(c) Use equations to explain what happens

(i) at the anode

.....

..... [2]

(ii) at the cathode

.....

..... [2]

High Demand Questions

QUESTIONSHEET 6

Electricity is passed through molten sodium chloride.

- (a) What ions are present in molten sodium chloride?

.....
..... [2]

- (b) Use equations to explain what happens

- (i) at the anode

..... [2]

- (ii) at the cathode

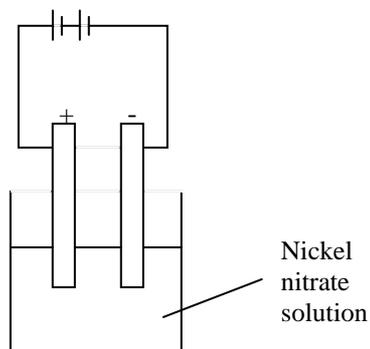
..... [2]

- (c) What is the safety problem with this experiment?

..... [1]

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Electricity is passed into nickel nitrate solution using nickel electrodes as shown in the diagram.



- (a) Give the formulae of all the ions that are in nickel nitrate solution.

.....
..... [2]

- (b) Write an equation for the deposition of nickel ions at the cathode.

..... [1]

- (c) 0.1 g of nickel was deposited in 60 minutes with a current of 0.1 A.

- (i) Calculate the quantity of electricity in coulombs.

.....
..... [1]

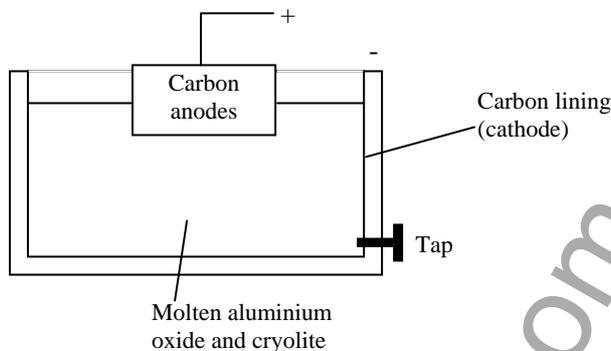
- (ii) How much electricity is needed to deposit 1 mole of nickel (59 g)?

.....
.....
..... [2]

High Demand Questions

QUESTIONSHEET 8

The diagram shows how aluminium can be manufactured by electricity.



- (a) What is the formula of aluminium oxide?

..... [1]

- (b) Why is the aluminium oxide dissolved in cryolite?

..... [1]

- (c) Write the equation for what happens at the cathode.

..... [1]

- (d) Why is it possible to tap off the aluminium at the bottom?

..... [1]

- (e) (i) What is the other product of the process?

..... [1]

- (ii) Explain why it is not possible to collect this product at the anode.

.....
 [2]

- (f) Give **two** major uses for the aluminium extracted by this process.

.....
 [2]

Medium Demand Questions

QUESTIONSHEET 9

- (a) (i) Describe an experiment that could be carried out to investigate whether aluminium conducts electricity or not. You may do this by means of a diagram if you wish.

.....

.....

.....

..... [2]

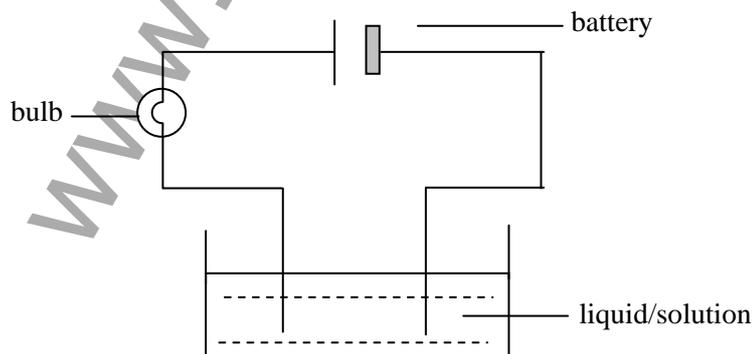
- (ii) Complete the following table of **conductors** and **non-conductors** by placing each substance from the box below into the correct column. One example has been done for you.

aluminium	copper	graphite
polythene	sulphur	

<i>Conductor</i>	<i>Non-conductor</i>
aluminium	

[2]

- (b) The apparatus shown in the diagram below may be used to distinguish between an **electrolyte** and a **non-electrolyte**.



Describe how the same equipment could be used to distinguish between **strong** and **weak electrolytes**.

.....

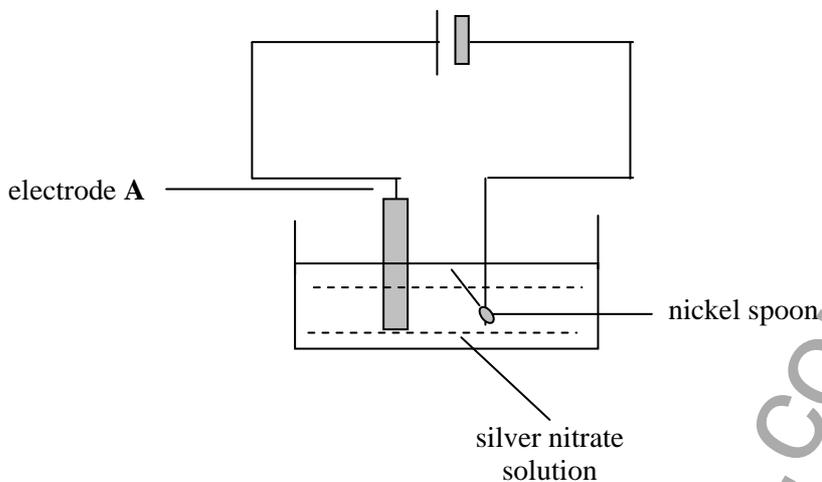
.....

..... [2]

(Continued...)

QUESTIONSHEET 9 CONTINUED

- (c) One important use of electrolysis is seen in **electroplating**. A nickel spoon can be silver plated by using the equipment shown below.



- (i) Give the name of the **metal** from which electrode A is made.

..... [1]

- (ii) Silver ions, Ag^+ , are deposited on the nickel spoon.

Place a tick (✓) in the box next to the correct answer.

The spoon is the:

positive electrode

negative electrode

[1]

- (iii) Give the symbol equation for the change that takes place at the surface of the nickel spoon.

..... [1]

High Demand Questions

QUESTIONSHEET 10

(a) The following box contains six substances.

carbon	copper	molten aluminium oxide
molten wax	silver	sulphur

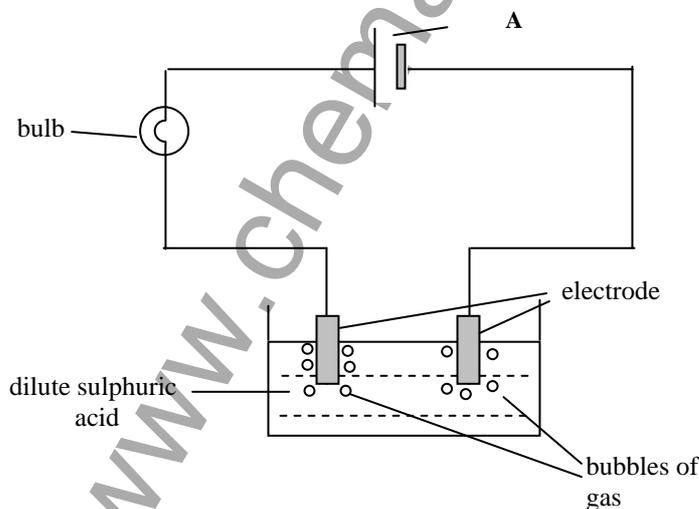
Choose **only** substances from the box to answer the following questions

Each substance can be used once, more than once or not at all.

Name the substance which is a:

- (i) metal that allows electricity to pass [1]
- (ii) non metal that does not conduct electricity [1]
- (iii) compound that conducts electricity [1]
- (iv) metal used in electrical cables [1]
- (v) non metal found in a dry cell (torch battery) [1]

(b) The apparatus drawn below can be used to investigate the electrolysis of dilute sulphuric acid.



(i) Name the apparatus labelled **A**. [1]

(ii) How would you know that electricity is flowing through the apparatus?

..... [1]

(iii) How would you know that electrolysis is taking place?

.....

..... [1]

TOTAL / 8

Medium Demand Questions

QUESTIONSHEET 11

A solid chemical X is burned in a green gas Y to form a white solid P. The solid P does not conduct electricity in the solid state. P dissolves in water and when the solution is crystallised cubic crystals are formed.

(a) Suggest names for: -

(i) Solid X

..... [1]

(ii) Gas Y

..... [1]

(iii) Chemical P

..... [1]

(b) How would melting P affect its ability to conduct electricity?

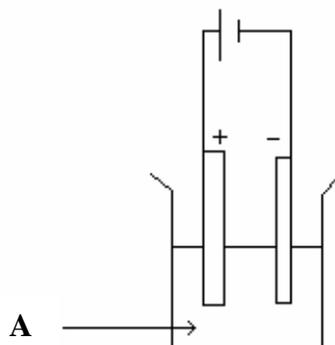
.....
..... [2]

(c) Write a balanced equation for the reaction of X and Y.

.....
..... [2]

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The diagram shows the process of electrolysis.



(a)(i) On the diagram, label the cathode and anode. [2]

(ii) At which electrode will metals always be discharged?

..... [1]

(iii) Why are non-metallic ions known as 'anions'?

..... [1]

(b)(i) What is the general name given to liquids such as A?

..... [1]

(ii) What is the essential property of liquid A?

..... [1]

(c) If liquid A is molten potassium bromide, name the products at the two electrodes.

(i) anode

..... [1]

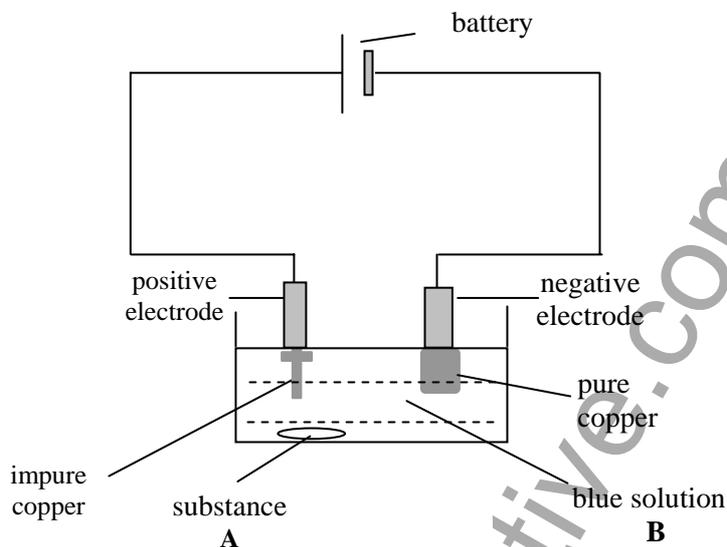
(ii) cathode

..... [1]

Medium Demand Questions

QUESTIONSHEET 13

Copper has many important uses, including electrical wires, since it is a very good conductor of electricity. For copper to be used in this way it needs to be very pure. Copper is purified by using electrolysis. The diagram below shows how the metal is purified.



(i) What is substance **A**?

..... [1]

(ii) Name the blue solution **B**.

..... [1]

(iii) State and explain **two** changes you would **see** during this electrolysis.

..... [2]

(iv) State what would happen to the **blue** colour of the solution **B** during electrolysis.

..... [1]

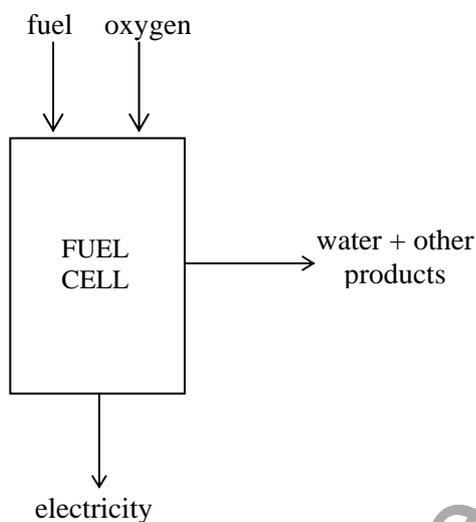
(v) Copper is a **shiny**, **colourful** and **malleable** metal. Give **one** use of copper that relies on all three properties of the metal.

..... [1]

Medium Demand Questions

QUESTIONSHEET 14

The diagram shows a fuel cell of the type taken into space by astronauts.



In the Apollo spacecraft, the fuel was hydrogen and the electrolyte was potassium hydroxide.

(a) (i) Why is a fuel cell particularly suitable for supplying power in space?

.....
..... [2]

(ii) What does the cell also produce which is of use to the astronauts?

..... [1]

(b) Suggest one other source of power that could have been taken into space.

..... [1]

(c) Give a reason in each case to explain why each of the following power cells was rejected for use in space.

(i) a dry cell

..... [1]

(ii) a car battery

..... [1]

(iii) a hearing aid type of cell

..... [1]

Medium Demand Questions

QUESTIONSHEET 15

- (a) Complete the table below to show the electrolyte and the anode and cathode products in the cells.

cell	electrolyte	anode product	cathode product
A	sodium chloride solution	chlorine	hydrogen
B	dilute sulphuric acid		
C		chlorine	copper
D	molten lead(II) bromide		
E	magnesium sulphate solution	oxygen	

[6]

- (b) Explain why hydrogen is collected at the cathode in cell A instead of sodium.

.....
.....
..... [2]

- (c)(i) What is the name of the process occurring in each cell?

..... [1]

- (ii) What does this name mean?

..... [1]

Medium Demand Questions

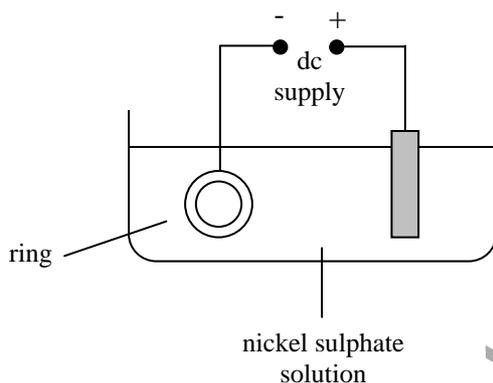
QUESTIONSHEET 16

Many metal objects that we use are electroplated with another metal.

- (a) Give **two** reasons for electroplating metals.

.....
..... [2]

- (b) The diagram below shows a ring being plated with nickel.



- (i) From what material would the anode be made? Give a reason for your answer.

.....
..... [2]

- (ii) Why is the ring attached to the negative terminal of the dc supply?

.....
..... [2]

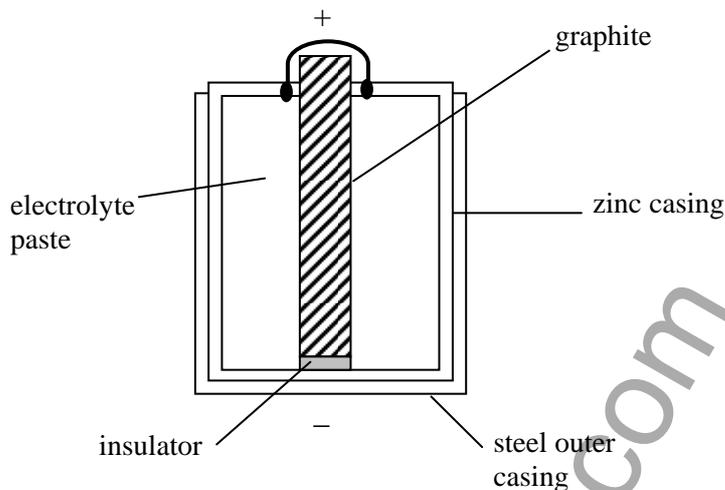
- (c) List three objects that are often electroplated, and name the plating metal in each case.

1.
2.
3. [3]

Low Demand Questions

QUESTIONSHEET 17

The diagram below shows a dry cell.



A Dry Cell

- (a) Explain why the cell cannot be totally dry, despite its name.

.....
 [2]

- (b) Name the materials of

(i) the anode

..... [1]

(ii) the cathode

..... [1]

- (c) On the diagram, draw an arrow to show the direction of flow of the electrons. [1]

- (d) Why does the dry cell eventually stop working?

..... [1]

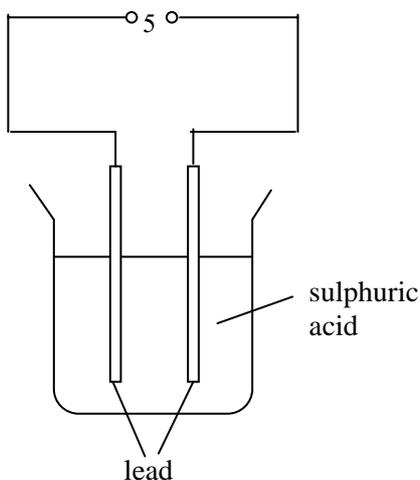
- (e) State **two** everyday uses of dry cells.

.....
 [2]

Low Demand Questions

QUESTIONSHEET 18

A lead-acid cell consists of two pieces of lead dipping into a solution of sulphuric acid.



(a) Why would this cell not produce any electricity?

.....
 [1]

(b) When a dc power supply is connected at X, the piece of lead attached to the positive terminal turns brown.

This is called charging the cell.

What is the piece of lead which turns brown known as?

..... [1]

(c) (i) A single lead-acid cell produces 2 volts.

A car battery consists of six of these cells linked together.

What is the voltage of a car battery?

..... [1]

(ii) Name **two** things that need power from the battery in a car.

.....
 [2]

(iii) Why does a car battery lose its charge more quickly in winter?

.....
 [2]

(d) What is the main danger from car batteries?

..... [1]

Low Demand Questions

QUESTIONSHEET 19

(a) Match the list of power cells in the list on the left with the uses in the right hand list.

dry cell

hearing aid

mercury cell (or button cell)

personal stereo

lead-acid cell

heart pacemaker

rechargeable cell

invalid car

lithium cell (reliable, long-lasting, expensive)

space station

solar cell

mobile phone

[6]

(b) Give reasons for your choices of cell for

(i) heart pacemakers

..... [1]

(ii) space stations

..... [1]

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Fill in the missing words in the following sentences.

The electrodes in cells are made from _____ or from _____.

The negative electrode is called the _____ and the positive one is the _____.

_____ and _____ form at the cathode, whilst _____ form at the anode.

The liquid which conducts the electricity is called the _____. It must contain _____.

Two ways to make solid salt conduct electricity are to _____ it in _____ or to _____ it.

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