

1. Define electrolysis

- The breakdown of an ionic compound in molten state or in aqueous solution
- By the passage of electricity/ electric current

2. Suggest how magnesium can be produced from magnesium chloride by electrolysis.

Heat magnesium chloride until it is molten, and then electrolyse.

Melting of magnesium chloride (given in newer MS)

NOTE: ionic compounds can conduct electricity in molten state / aqueous solution due to presence of free/mobile ions that can carry charge

3. Why NaCl cannot conduct electricity when solid, but can conduct in molten state.

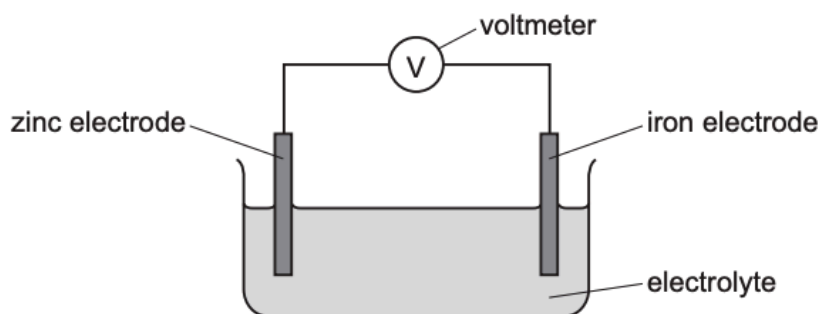
Explain in terms of bonding.

- Ions
- In solid, ions are held in a fixed lattice
- In molten, ions are mobile and can carry charge

NOTE: Reaction in a hydrogen-fuel cell is exothermic

4.

The diagram shows the apparatus used in the production of electrical energy in a simple cell.



Draw an arrow to show direction of electron flow

Arrow from zinc to iron

Metal that can replace zinc to increase reading on voltmeter

Any metal more reactive than zinc

Metal that can replace iron to increase reading on voltmeter

Any metal less reactive than iron

5. A metal spoon is electroplated with copper. State what is used as:

- The positive electrode (anode): copper

- The negative electrode (cathode): spoon
- The electrolyte: aqueous solution of (named) copper salt

6. Why graphite is suitable for use as an electrode

Inert AND conducts electricity

7. Advantage of using hydrogen-oxygen fuel cells instead of petrol in vehicle engines

Less carbon dioxide evolved // more efficient

8. Disadvantage of using hydrogen-oxygen fuel cells instead

Higher cost // high pressure required to store hydrogen

9. State what is meant by the term electrolyte

- Ionic compound
- In aqueous or molten state
- That conducts electricity/ undergoes electrolysis

10. The electrolysis of aqueous copper (II) sulphate is repeated using copper electrodes.

State what happens to the anode

Anode dissolves

NOTE: whenever hydrogen is formed, the observation will be effervescence. Do not state bubbling/ fizzing!

11. Concentrated hydrochloric acid is electrolysed. The pH of the electrolyte is measured throughout the experiment. Suggest the pH of the electrolyte at the beginning of the experiment.

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State how the pH changes, if at all, during the experiment. Explain your answer.

- Increases
- H⁺ ions are being removed

12. Electrolysis of molten lead(II) bromide. Describe what is seen at the:

- Cathode: silver / grey solid
- Anode: bubbles of orange / brown gas

13.

(b) The table gives information about the electrolysis of two electrolytes. Carbon (graphite) electrodes are used in each experiment.

(i) Complete the table to show the observations and products of electrolysis.

| electrolyte | positive electrode (anode) | | negative electrode (cathode) | |
|-------------------------------------|----------------------------|-----------------|------------------------------|-----------------|
| | observations | name of product | observations | name of product |
| aqueous copper(II) sulfate | colourless bubbles | | | |
| concentrated aqueous sodium bromide | | | colourless bubbles | hydrogen |

- M1 oxygen (1)
- M2 pink / brown solid (1)
- M3 copper (1)
- M4 orange / brown / yellow liquid (1)
- M5 bromine (1)