

1. Describe the difference between a galvanic cell and an electrolytic cell. /2
 2. Consider a galvanic cell which uses solutions of iodide and acidified permanganate as the reagents. The product for iodide ions is iodine (I_2). The product for acidified permanganate is manganese ions (Mn^{2+})
 - (a) Write balanced half-equations and hence explain which electrode is the anode. /3
 - (b) Draw a labeled diagram of the cell. Clearly show charge on the electrodes, direction of electron flow, and movement of ions in the salt bridge on the diagram. /3
 3. Electroplating uses electrolysis to deposit (plate) a metal onto the surface of an object. The object to be plated is one electrode, and the electrolyte contains ions of the plating metal. The ions get reduced by electrolysis to the metal which deposits on the object. The other electrode usually consists of the plating metal. The metal gets oxidised to its ions and goes into solution to replace the ions that get reduced at the electrode where the plating process takes place.
 - (a) Sketch a diagram to represent nickel plating, which includes a spoon to be electroplated, a nickel electrode, and an electrolyte of aqueous nickel sulfate. /4
 - (b) State and explain which electrode contained the spoon to be nickel plated. /2
 - (c) Write half-equations for the reactions that occur at (i) the anode and (ii) the cathode. /2
 4.
 - (a) Draw a galvanic cell which incorporates zinc as the reductant and an acidified potassium permanganate solution as the oxidant. /3
 - (b) Explain the role of the salt bridge. /2
 - (c) State the difference between an inert and an active electrode in a voltaic (galvanic) cell. /1
 5. Explain what a fuel cell is and state the advantages and disadvantages compared with other galvanic cells. /3
 6. Explain what a rechargeable galvanic cell is and compare recharging with discharging. /3
 7. Describe, with an example diagram and example equations, how an electrolytic cell can be used to produce highly reactive metals such as lithium, sodium, magnesium and calcium. /4
- TOTAL /32