

Exercise 8.73 – Electroplating (participating electrodes)

Q873-01 Electroplating processes usually involve depositing a metal from a solution of some salt, or ion of the metal. This deposition occurs:

- A. at the cathode of the cell.
- B. at the anode of the cell.
- C. when the metal is oxidized.
- D. when electrons are lost by the metal.

Q873-02 In the electrolytic refining of copper, an electric current is passed through a cell containing a pure copper electrode, an electrode of impure copper, and an aqueous solution containing copper cations. As metallic copper is removed from the impure electrode and redeposited on the pure copper electrode other metallic impurities are left behind, if the potential of the cell is adjusted properly. In this process, the impure copper electrode is called the..?

- A. anode.
- B. cathode.
- C. reference electrode.
- D. indicating electrode.

Q873-03 A metallic object is electroplated with copper using a solution of copper (II) sulphate. Which statement is correct?

- A. The positive electrode increases in mass
- B. The concentration of Cu^{2+} ions in the solution decreases
- C. Reduction occurs at the positive electrode
- D. The reaction occurring at the negative electrode is $\text{Cu}^{2+} + 2\text{e} \longrightarrow \text{Cu}$

Q873-04 Calculate the mass of pure copper deposited at the cathode during the purification of an impure copper anode if 10A are passed through a solution of copper (II) sulphate(aq) for 1 hour. [Cu = 63.5]

Q873-05 Two copper strips X and Y are placed in a solution of copper (II) sulphate and electrolysed for a certain time. X is attached to the negative terminal of the battery and Y to the positive terminal. X is then removed, dried and weighed.

- a) State and explain what would happen to the mass of X. [3]
- b) Give two ways in which the change in mass of X could be increased. [2]

Q873-06 Electroplating may be used to coat one metal with another metal.

- a) Identify the three factors affecting the amount of metal discharged during electroplating [3]
 - b) Explain why electrolysis of zinc sulphate solution is not used for coating with zinc metal. [2]
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Q873-07 Electrolysis of an aqueous solution of copper (II) sulphate can be carried out using copper electrodes instead of inert electrodes.

Describe the difference in the observations at each electrode and the electrolyte in the two cases.

Q873-08 A current of 0.2 amperes passing for 5 hours through a solution of gold ions deposits a mass of 2.45g of gold at the cathode.

Calculate the charge on the gold ions. [A^r of gold = 197]

Q873-09 Calculate the mass of copper deposited on a copper cathode by electrolysis of copper (II) sulphate solution, if the same current deposited 0.9g of silver from silver nitrate solution in the same period of time. [$A_g = 108$ $Cu = 63.5$]

Q873-10 A current of 0.75 amperes passes through 250cm³ of 0.25 mol dm⁻³ copper (II) sulphate solution.

Calculate how long it will take for all of the copper to be deposited at the cathode.
