**ELECTROCHEMISTRY – ELECTROLYTIC CELL**

**A. Objective questions (5 marks)**

1. When an aqueous solution of AgNO3 is electrolyzed, a gas is observed to form at the

anode. The gas is

A. H2 B. O2

C. NO D. NO2

2. A current of 10 A is passed for 50 min through molten aluminium oxide using inert electrodes. What

is the volume of gas liberated at the anode, measured at S.T.P.?

A. 1.74 dm3 B. 3.48 dm3

C. 5.22 dm3 D. 10.44 dm3

3. When 5.10 mol of electrons was passed through an electrolyte containing manganese ions, 1.70 mol

of manganese was deposited on the cathode. Which of the following substances is the electrolyte?

A. Mn(NO2) B. MnSO4

C. KMnO4 D. MnCl3

4. In the commercial electrolysis of brine, the products are chlorine, hydrogen and sodium hydroxide.

What is the maximum yield of hydrogen and sodium hydroxide when y mol of chlorine gas is

obtained from the electrolysis.

|  |  |  |
| --- | --- | --- |
|  | **Hydrogen** | **NaOH** |
| A. | y | 2y |
| B. | 2y | y |
| C. | 2y | 2y |
| D. | y | y |

5. In the electrolysis of molten aluminium oxide form bauxite, how many faradays are required to produce

560 cm3 of gas at the anode, measured at S.T.P?

A. F/2 B. F/10

C. F/10 D. F/50

**B. Subjective Questions**

1. Draw and label the apparatus used to electrolyse molten (II) bromide in an evaporating basin using graphite electrodes and including an ammeter in the circuit. Give the equations for the half reactions occur at the anode and cathode. Determine the mass of lead obtained when a current of 3.0 A was passed through the circuit for 30 minutes,.

[10 marks]

2.In an electrolytic cell, a current of 0.250 ampere is passed through a solution of a chloride of Z, producing Z(s) and Cl2 (g).

(a) Write an equation for the reaction that occurs at the anode.

(b) When the cell operates for 2.00 hr, 0.521 g of Z is deposited at one electrode.

Determine the formula of the chloride of Z in the original solution.

[Faraday’s constant = 96500 C mol−1; Ar Z = 56 g mol-1] [10 marks]

**ANSWER :**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. | 2. | 3. | 4. | 5. |
| **B** | **A** | **D** | **A** | **B** |

|  |  |  |
| --- | --- | --- |
| **NO.** | **PART** | **SUGGESTED ANSWER** |
| **1.** |  | i.  **Anode (graphite electrode)**  **cathode (graphite electrode)**  **molten PbBr2**  **2 Electrode & electrolyte - 1**  **label - 1**  **power supply and ammeter -1**    A(s)    **1**  **ii. Anode : 2Br - (*l*) ⎯→ Br2(*l*) + 2e-**  **Cathode : Pb2+(*l*) + 2e- ⎯→Pb(*l*)**  **1** |
|  |  | **iii. Q = It**  **1**  **= 3 × 30 × 60**  **1**  **= 54000 C = 0.05596 F**  **1**  **2F** ≡ **1 mol Pb**  **1**  **0.05596 F** ≡ **0.02741 mol Pb**  **Mass of Pb obtained = 0.02741**× **207.2**  **1**  **= 5.679 g** |
|  |  | **TOTAL = 10** |
| **2.** | **(a)** | **Anode: 2Cl−(aq) → Cl2(g) + 2e−**  **1** |
|  | **(b)** | **Q = It**  **1**  = 0.250 × 2.00 × 60 × 60  **1**  = **1800 C**  96500 C ≡ 1F  1800 C ≡  = 0.0187 F  **1**  @ **0.0187 mol e-**  **mol**  **1**  **1**  **Cathode: Zn+(aq) + ne- →Z(s)**  **n F ≡ n mol e- ≡ 1 mol Z**  **1**  9.304 × 10−3 mol Z ≡ 0.0187 F @ 0.0187 mol e-  1 mol Z ≡  **1**  = **2F** @ **2 mol e-**  n = 2  Cathode: Z2+(aq) + 2e- **→**Z(s)  2 F ≡ 2 mol e- ≡ 1 mol Z  **1**  **Formula of Z ion = Z2+**  **1**  **Formula of chloride of Z = ZCl2** |
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|  |  | **TOTAL = 10** |