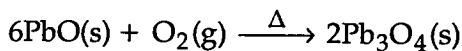


**P.G. DIPLOMA IN ANALYTICAL CHEMISTRY  
(PGDAC)****Term-End Examination****December, 2010****MCH-004 : ELECTROANALYTICAL AND OTHER  
METHODS***Time : 3 hours**Maximum Marks : 75*

*Note : Answer any five questions. All questions carry equal marks.*

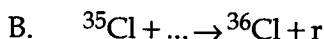
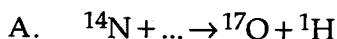
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1. (a) (i) Depict the cell notation for the following cell reaction : 1  
$$\text{Mg(s)} + 2\text{Ag}^+(\text{aq}) \rightleftharpoons \text{Mg}^{2+}(\text{aq}) + 2\text{Ag(s)}$$
- (ii) Write two practical problems in using hydrogen electrode. 1
- (iii) What is saturated calomel electrode ? 1
- (iv) Write the formula of cell constant. 1
- (v) Define over voltage. 1
- (b) (i) Write two main differences between DTA and DSC techniques. 2
- (ii) Give two advantages of amperometry. 2
- (iii) Why are the mobilities of  $\text{H}^+$  and  $\text{OH}^-$  exceptionally high ? Explain. 2

- (iv) Calculate the percentage mass change (m%) for the following reaction : 2

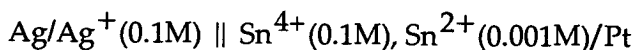


$$[A_r(\text{Pb}) = 207.00, A_r(\text{O}) = 16.00]$$

- (v) Complete the following nuclear reactions : 2



2. (a) Write the reaction, calculate the cell potential and predict whether the reaction is spontaneous or not for the following cell : 7



$$\left[ E^\circ_{\text{Ag}^+/\text{Ag}} = +0.799\text{V}; E^\circ_{\text{Sn}^{4+}/\text{Sn}^{2+}} = +0.154\text{V} \right]$$

- (b) Derive an expression which relates equilibrium constant and cell potential. 8

3. (a) Taking a suitable example, discuss the principle and working of a solid state membrane electrode. 7

- (b) Write five main features of Coulometric methods. 8

4. (a) Calculate the dissociation constant of 0.02 mol dm<sup>-3</sup> ethanoic acid, if its molar conductivity is  $11.57 \times 10^{-4} \text{ Sm}^2 \text{ mol}^{-1}$  and limited molar conductivity is  $3.90 \times 10^{-2} \text{ Sm}^2 \text{ mol}^{-1}$ . 7
- (b) What are the factors affecting the diffusion current? Discuss any one of the factor in detail. 8
5. (a) What is stripping voltammetry? Taking a suitable example discuss the anodic stripping voltammetry. 7
- (b) A solution of KCl (0.02 mol dm<sup>-3</sup>) has conductivity of  $0.00227 \text{ S cm}^{-1}$ . It is found to have a resistance of  $83 \Omega$ . When potassium sulphate (0.005 mol dm<sup>-3</sup>) solution was substituted, the resistance was  $326 \Omega$ . What is the cell constant and what is the conductivity and molar conductivity of the potassium sulphate solution. 8
6. (a) What are background radiations? Discuss their principal sources. 7
- (b) A mixture of CaCO<sub>3</sub> and CaO is analysed using TGA method. TG curve of the sample indicates that there is a mass change from 290.6 mg to 230.8 mg between 500 - 900°C. Calculate the percentage of CaCO<sub>3</sub> in the sample. 8

$$[A_r(\text{Ca}) = 40.1, A_r(\text{O}) = 16.00, A_r(\text{C}) = 12.00]$$

7. (a) Write down any five applications of DSC technique. 7
- (b) A  $0.6 \text{ cm}^3$  solution containing  $7.5 \mu\text{Ci}/\text{cm}^3$  of  $^{59}\text{Fe}$  was injected into the blood stream of a horse. After equilibrium,  $1.0 \text{ cm}^3$  of blood was taken out and it gave 13239 counts in 3 minutes. Calculate the blood volume in the body of horse. 8
8. Write short notes on *any three* of the following :  $5 \times 3 = 15$
- (a) Neutron Activation Analysis (NAA)
- (b) Square wave polarography
- (c) Constant potential electrolysis
- (d) Applications of Thermometric Titrations
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