M.SC DEGREE I SEMESTER EXAMINATION IN ENVIRONMENTAL TECHNOLOGY DECEMBER 2004

ENV 2108 CHEMOMETRICS AND GOOD LABORATORY PRACTICES

Time : 3 Hours   Maximum Marks: 50

PART - A
(Answer *ANY FIVE* questions)
(All questions carry *EQUAL* marks)

$(5 \times 2 = 10)$

I.   1.   Express to four significant figures in litres
          (i)   12.00 ml.   (ii)   9.12 ml.

      2.   Express to appropriate significant figures if the precision of
the measurement is $\pm\ 1.0 \times 10^{-7}$

          (i)   0.0326480   (ii)   0.1462810

      3.   Express to appropriate significant figures the following:-

          (i) $7.354 \times 10^{3} - (219.5 - 60.21)$ (ii) $24.8 \times 0.32 \times 2818$

      4.   Give the number of significant figures

          (i) 17.29×10^{5} (ii)   2839

      5.   What is meant by a weak acid? Illustrate with an example.

      6.   What is a buffering system?

PART - B
(Answer *ANY FIVE* questions)
(All questions carry *EQUAL* marks)

$(5 \times 3 = 15)$

II.   1.   A set of 6 results are obtained for Chromium in a steel sample 17.30%, 17.34%, 17.95%, 17.35%, 17.29%, 17.33%. Are there any outliers in the set of results? If so, justify the rejection of the outlier.

2. Two chemists A and B determined Magnesium in a sample and got the following sets of results. Assuming that the sample homogeneity is ensured, which of the chemist inspires greater confidence. Justify your answer.

Chemist A		Chemist B	
Sample wt. (g)	%Mg	Sample wt.(g)	%Mg
0.1735	17.52	0.2709	17.53
0.1639	17.50	0.2862	17.58
0.1877	17.54	0.2654	17.54
0.1750	17.53	0.2902	17.55
0.1605	17.49	0.2408	17.57

3. 17.5 g of $Na_2CO_3.10H_2O$ is dissolved in water and made up to 1 litre at 25°C. What is the molality and normality of the solution?

4. Calculate the buffer capacity of a solution containing 2.0×10^{-2} M CH_3COOH and 2.0×10^{-2} M CH_3COONa (K_a of acetic acid 1.75×10^{-5}).

5. Define activity coefficient. Give one method for measurement of the activity coefficient.

6. Calculate the ionic strength of a solution, which is 0.25 M KCl, 0.02M $MgCl_2$ and 0.10 M Na_2SO_4.

PART - C
(Answer *ANY FIVE* questions)
(All questions carry *EQUAL* marks)

$(5 \times 5 = 25)$

III. A 100 ml aliquot of acetic acid solution is titrated with 0.2 M NaOH.

Vol.(Ml)	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.5	18.0
pH	5.37	5.41	5.60	5.82	6.13	8.50	10.91	11.20	11.35	11.47

Plot the titration curve, the first derivative curve. Determine the end point and the concentration of acetic acid solution.

IV. Calculate the e.m.f. of a cell having a Platinum wire dipping in 100 ml of 0.01 M Fe (II) solution, on addition of 1.0 ml of 0.1 M Cerium (IV) sulfate.

$$Ce^{++++} + 1e \leftrightarrow Ce^{+++} \qquad E_0 = 1.61V$$
$$Fe^{+++} + e \leftrightarrow Fe^{++} \qquad E_0 = 0.77V$$
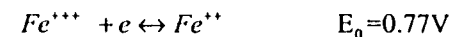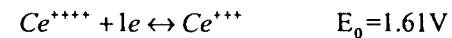
V. Barium sulphate has a solutility product of 1.1×10^{-10} at 25°C. Express the solubility in grams per litre.

VI. Give a method for the separation of the constituents of an alloy containing equivalent amounts of Ca, Cu, Fe and Si.

VII. Indicate why certain metallic species give flame tests, whereas others do not?

VIII. How does one dispose off organic solvents?

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