M.Sc. DEGREE I SEMESTER EXAMIANTION IN ENVIRONMENTAL TECHNOLOGY
December 2003

CHEMOMETRICS AND GOOD LABORATORY PRACTICES

Time : 3 Hours Maximum Marks: 50

SECTION- A

(Answer ANY FIVE questions)
(All questions carry EQUAL marks)

(5x2 =10)

I 1. Express to four significant figures in liters
(i) 13.64ml (ii) 43.02ml

2. Express to appropriate significant figures if the precision of the measurement is ± $1.0x10^{-7}$
(i) 0.000135100 (ii) 0.1234020

3. Express to appropriate significant figures the following
(i) 263 x 28.4 x 0.1063 (ii) 2.3142 + 12.643 + 0.1234

4. Give the number of significant figures
(i) 0.0083420 (ii) 0.82

5. Give the method for the calibration of pipettes.

6. Which are the chemicals, not to be used in a platinum crucible?

SECTION B

(Answer ANY FIVE questions)
(All questions carry EQUAL marks)

(5 x 3 =15)

II 1. Comment on the precision and accuracy of the following set of results obtained by three chemists on Nickel in a steel sample, the true value being 6.25%

Chemist A – 6.57%, 6.32%, 6.05%
Chemist B – 6.72%, 6.71%, 6.73%
Chemist C – 6.24%, 6.25%, 6.27%

2. For the determination of 1% of a constituent A in a 1g sample of an alloy one can either use gravimetry, weighing finally as oxide or use colorimetry in the range of

(Turn over)

0.1-5mg with an accuracy of ± 1%. Which of the two methods will give better accuracy? Balance has an accuracy of ± 1%.

3. An aqueous solution containing 219.6g HCl per litre has a specific gravity of 1.0980. Calculate a) Molarity, b) Molality and c) % of HCl by weight in solution?

4. Calculate the pH of a 2×10^{-8}M HCl?

5. State Arhenius theory of electrolytic dissociation? What is the modification of the theory developed by Debye - Huckel?

6. Calculate the ionic strength of a solution, which is 0.01M in KCl, 0.005M in $CaCl_2$and 0.02M in K_2SO_4.

SECTION – C

(Answer ANY FIVE questions)
(All questions carry EQUAL marks)

(5 x 5 =25)

III 1. A 50ml sample of 0.1M HCl is titrated with 0.1M NaOH. Calculate the pH of solution after addition of 1) 10ml 2) 50ml and 3) 90ml of base.

2. Calculate the e.m.f of the cell Sn / Sn^{2+} (a = 0.1) / Pb^{2+} (a = 10^{-5}) / Pb

$Sn^{++} + 2e \leftrightarrow Sn$ $\quad E_0 = - 0.136$ V

$Pb^{++} + 2e \leftrightarrow Pb$ $\quad E_0 = - 0.126$ V

3. Calculate the solubility of silver bromide in ammonia, when the concentration of free ammonia is 1.0M (Solubility product of AgBr 4×10^{-13}, Stability constant of $Ag(NH_3)_2^+$ - 1.4×10^8).

4. Select a precipitating agent and the conditions for the quantitative precipitation of the following.

Co^{2+} and Ni^{2+} in solution

5. Outline a procedure for the preparation of iron free hydrochloric acid using ion exchange.

6. What are the precautions to be followed while handling H_2SO_4?

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