

Vidya Prasarak Mandal's
B. N. Bandodkar college of science, Thane-400 601.
Preliminary examination, Feb-2012.
T. Y. B. SC.
Chemistry-IV

Day:

TIME: 3 hrs

Date: 0 -02-2012

MARKS: 100

N.B.: 1) All questions are compulsory

2) Figures to the right indicate full marks.

3) Use of log tables/non-programmable calculator is allowed

- Q1.** Answer the following:
- a** Explain the use of sample thief in the sampling of homogenous liquid. **3**
- OR
- a** Define the terms i) increment ii) sampling unit iii) random sampling. **3**
- b** Name the light dispersing devices used in UV-Visible spectrophotometers. Describe any one. **3**
- OR
- b** Name the detectors used in IR spectroscopy explain any one in brief. **3**
- c** Describe the working of fluoride ion selective electrode. **3**
- d** What are the sources of noise in chemical analysis? **3**
- e** Discuss the use of diphenylamine indicator in redox titrations. **3**
- f** Give the classification of chromatographic techniques based on physical principles involved. **3**
- g** What are the advantages of amperometric titrations? **2**
- OR
- g** What are the different types of columns used in gas solid chromatography? **2**
- h** Explain variance ratio test. **2**
- OR
- h** What are the parameters considered for method validation. **2**

Q 2

5

- a** Distinguish between methodic and Operational Error.
Calculate the mean and the standard deviation for the following set of results;
10.28, 10.24, 10.25, 10.25, 10.30

OR

- a** What are determinate error? Can they be minimized with proper care?
Different aliquots of AgNO_3 solution were titrated with NaCl and the following result were obtained

Calculate the relative and absolute error

Sample no.	mgms of AgNO_3 found	mgms of AgNO_3 present
1	240	250
2	480	500
3	960	1000

Attempt any three of the following:.

- b** Describe sampling of gases with special reference to
i) pressure ii) temperature. **5**
- c** How is the pH at the equivalence point calculated for the titration of
i) strong acid and weak base ii) weak acid and weak base. **5**
- d** Describe the Volhard's method for the estimation of chloride ions by back titration method. **5**
- e** What are metal-ion indicators? Give the properties of a good metal-ion indicator with suitable examples. **5**

Q 3

- a** With reference to solvent extraction define:-
i) distribution ratio ii) separation factor **5**

The distribution ratio D for an organic solvent and water for a given solute is 20 in favour of organic solvent. Calculate the percentage extraction for a volume ratio V_0/V_{aq} of

- i) 1 for a single extraction ii) 10 for two successive extractions.

OR

- a** What is the principle of extraction of metals by chelation
 200cm^3 portion of an aqueous solution containing 0.05mole of a certain solute is extracted twice with 25cm^3 of ether. Calculate i) the amount of solute remaining unextracted ii) the percentage extraction
(Given : $D_0/W=12.0$) **5**

Attempt any three from the following:

- b** Explain the term retardation factor. Give its significance for the qualitative analysis carried out in TLC. **5**
- c** i) write a short note on slab gel electrophoresis. **3**
ii) Explain the principle of size exclusion chromatography **2**
- d** Name the different type of detectors used in UV-Visible spectrophotometry. **5**
Explain the working of any one of them
- e** Describe the kBr pellet method and the mull method for the handling of solid samples in IR analysis. **5**

Q 4

- a** Define Half wave potential. **5**

In the polarographic estimation of Cd(II) ions, the following results were obtained for a sample solution. $I_d = 8.76 \mu\text{A}$, $D = 6.9 \times 10^{-6} \text{ cm}^2 \text{ s}^{-1}$, $m = 2.34 \text{ mg s}^{-1}$ and $t = 4.35 \text{ s}$. Find the concentration of Cd(II) ions in the sample solution.

OR

- a** Define diffusion current. **5**

In a polarographic determination of lead, the wave heights determined for a series of solution were as follows.

Conc. Of pb(mM)	0.25	0.40	0.50	0.65
Height of wave(mM)	31.2	49.5	62.5	79.9

A sample solution containing unknown amount of lead gave a wave height of 46.3mm. Find the concentration of lead in sample solution.

Attempt any three of the following

- b** Draw a schematic diagram of HPLC unit and describe briefly the function of each part. **5**
- c** Explain the following terms:- **5**
1. Retention time 2. Peak resolution 3. Longitudinal diffusion
- d** What is meant by leveling effect of a solvent? Explain with a suitable example. **5**
- e** What is meant by ion exchange capacity? How is the capacity of cation exchanger determined? **5**

Q 5

- a** What is meant by standard deviation? **5**

The estimation of lead in a water sample for six replicate measurements gave the following results in ppm

ppm lead: 0.172, 0.151, .0170, 0.163, 0.173, 0.156.

calculate the 95% confidence interval for the mean. The value of t for n=6 and 95% confidence level is 2.57.

OR

Distinguish between uncertainty and error **5**

Two independent methods were applied to analyse the sample for its calcium content. The results were as follows:

Method I

Method II

% of Ca	% of Ca
7.84	7.55
8.01	7.59
7.88	7.32

The combined standard deviation is 0.031.

Determine whether the two methods differ statistically or only numerically.

Given : $t_{\text{table}} = 2.78$ at 95% probability level.

Attempt any three of the following

- b** What is Good laboratory practice? What is the need for the same? **5**
- c** Describe the principle and working of turbidimeter. **5**
- d** . (i) Discuss the applications of mass spectrometry. **5**
 ii) Explain the principle underlying neutron activation analysis.
- e** What is thermogravimetry? Explain the thermogravimetric curve obtained in the thermal decomposition of calcium oxalate monohydrate **5**