T.Y. B.Sc. - chemistry - Paper IV
Sub- Analytical chemistry
Sem-V 2016-17

QP Code : 78951

(2½ Hours) [Total Marks : 75

N.B. : (1) **All** questions ae compulsory.
(2) **Figures** to the right indicate **full** marks.
(3) Use of log table / non-programmable calculator is allowed.

1. Answe any three of the following :- 15

A) Explain least square method for obtaining the slope of a plot passing through the origin.

B) A chemist obtained the following data for percentage of lindane, in triplicate analysis, of an insecticide preparation :

7.63, 7.48 and 7.53%

Calculate the 90% confidence interval for the mean of the data assuming that
i) no additional information about the precision of the method is known, and
ii) a large number of measurements gave $\sigma = 0.28\%$

[Given : t = 2.92, and z = 1.64 at 90% confidence level]

C) Name the different methods used for sampling of stack gases and describe any one of these in brief.

D) Define normal error curve with a neat diagram. A standard method for the determination of carbon monoxide level in gaseous mixtures is known to have standard deviation of 0.21 ppm. A modification of the method yields a value for standard deviation of 0.15ppm. Verify, using F test, whether the two standard deviations are same or different. [Given $F_{table} = 2.30$]

E) Write a note on preservation and dissolution of sample.

F) Name the different methods used for reduction of sample size in sampling of solid and discuss any one of these, in brief.

2. Answer any three of the following :- 15

A) Explain the following w.r.t.TLC.
i) Preparation of plate
ii) Ascending development.

B) Give any five applications of HPTLC.

C) Draw a neat labelled diagram of a typical HPLC unit and explain the following.
i) Isocratic and gradient elution
ii) Function of precolumn

[TURN OVER]

D) What are the various steps involved in the technique of paper chomatography. Give any four applications.

E) Explain the function of pump in HPLC. Name any two types of pumps used in HPLC giving one advantage and limitation of each type.

F) Define R_f value. Give the classification of chromatographic techniques based on phases involved, giving suitable examples. 15

3. Answer any three of the following :-

A) Draw a neat labelled diagram of a flame photometer and explain the function of each component.

B) Discuss : i) Determination of molecular weight of macromolecules by the turbidimetric method.
ii) Phase titration.

C) Explain the principle of AAS.

D) Draw a schematic diagram of single beam fluorimeter and explain its use in the determination of concentration of the sample solution.

E) Give any five applications of flame photometry.

F) Explain the factors affecting fluorescence. 15

4. Attempt any three of the following :-

A) 10.0cm^3 of 0.1M Fe (II) solution is titrated with 0.1M Ce (IV) in acidic medium. Calculate the potential i) at half the equivalence point, and ii) on addition of 11.1cm^3 of titrant. [$E^0_{Pt/Fe^{+3},Fe^{+2}} = 0.770V$ and $E^0_{Pt/Ce^{+4},Ce^{+3}} = 1.44V$]

B) What are redox titrations? How does diphenylamine behave as an indicator in redox titrations? What is the function of H_3PO_4 in such titrations?

C) What are the light dispersing devices used in UV-Visible spectrophotometers? Describe any one of these devices, in brief.

D) Write a note on synergistic solvent extraction.

E) Describe Craig's counter current extraction.

F) Explain the principle of solid phase extraction. Give any three advantages of solid phase extraction over solvent extraction methods.

5.A) Fill in the blanks :- 4

a) When all the observations recorded are with equal frequency without any prejudice, then the value of chi-square is .....

b) In Q-test, Q_{cal} is obtained by dividing the difference between the doubtful measurment and its neighbouring measurment by ..... of the set.

c) When the two variables x and y are not linearly related, the value of correlation coefficient is .....

d) A stated amount of material to be taken from sampling unit is called .....

OR

A) State true or false :- 4

p) Split-barrel sampler is used to collect samples of compact solids.

q) The peak of normal error curve indicates maximum error.

r) The test used by statisticians to determine relationship between dependent variables and independent variables is Null hypothesis.

s) Mixing of increments gives a sub-sample.

5.B) Fill in the blanks :- 4

a) In paper chromotography ..... value is used to identify separated components.

b) Densitometer is used as a ..... in HPTLC.

c) In HPLC, separation is caried out at ..... temperature.

d) Thickness of stationary phase in HPTLC is..... than that in TLC

OR

B) State true or false :- 4

p) TLC separation is based on adsorption.

q) Refractive index detectors are highly temperature sensitive.

r) In HPLC columns are reusable.

s) UV - visible detector in HPLC is based on absorption of UV or visible radiation.

5.C) Fill in the blanks :- 4

a) An expression of Boltzman distribution equation is $\frac{N^x}{No}$ = ...

b) In AAS, the steady light from hollow cathode lamp is converted into pulsating light by .....

c) Phosporimetric experiments are normally caried out at ..... tempareture.

d) In nephelometry, the detector is usually, but not necessarily, placed at ..... angle to the incident radiation.

OR

C) State true o false :- 4

p) Electrothermal atomiser is also called graphite fumace.

q) Flame serves as a radiation source for different elements in AAS.

r) Fluorescence is a delayed phosphorescence.

s) In nephelometry, highly monochromatic radiation is not necessary.

[TURN OVER]

D) **Fill in the blanks :-** 3

a) An ideal redox indicator should exhibit a detectable colour change when the titrant causes a shift of potential of about ..... V.

b) In spectrophotometry, ... lamp is used as a source of radiation for obtaining UV light.

c) In 12- crown-4, the number 4 indicates the number of ..... atoms.

OR

D) **State 'True' or 'False' :-** 3

p) For solvents with high dietectric constant, ion pair formation decreases with temperature.

q) UV - Visible spectroscopy is used for the detection of functional groups.

r) Chromophores are unsaturated groups which are responsible for the absorption of visible light.
