Q. P. Code: 19826

[Time: Three Hours] **[Marks:100]**

Please check whether you have got the right question paper.

N.B: 1. All questions are compulsory.
2. Figures to right indicate full marks.
3. Use of log table and non-programmable calculators is allowed.

Q.1 A Select the correct option & complete the following sentences (12 M)

1) In semi-micro analysis the sample size is ----------.
a) more than 100 mg b) between 10 mg to 100mg c) between 1mg to 10 mg

2) Analysis of impurities in the given sample is ---------- analysis.
a) proximate b) complete c) trace

3) Sample is miniature replica of ---------.
a) Universe b) Sub sample c) analysis sample

4) Physical limitations of the analyst and biased approach of the analyst introduce ----------.
a) methodic error b) personal error c) instrumental error

5) The concentration of 1 M H_2SO_4 solution is equal to the concentration of --------- H_2SO_4 solution.
a) 1N b) 2 N c) 3 N

6) Determinate errors are also known as ----- errors.
a) Random b) systematic c) instrumental

7) In the titration of weak acid against strong base , pH at equivalence point is ----------.
a) Greater than 7 b) less than 7 c) equal to 7

8) Sintered glass crucible is used in ---------- analysis.
a) titrimetric b) gravimetric c) titrimetric as well as gravimetric

9) For dilute solution of an absorbing species, the graph of absorbance of it's solution against concentration is a ---------- .
a) Straight line passing through origin
b) Straight line with positive slope making Y intercept
c) Straight line with negative slope making Y intercept

10) Absorbance of ---------- solution can be measured by using colorimeter..
a) Only colored b) Only colorless c) Colored as well as colorless

11) In ---------- titration, absorbance of titrated solution during titration is plotted against volume of titrant added.
a) Conductometric b) photometric c) redox

12) λ_{max} of an absorbing species is -----.
a) the maximum wavelength available
b) the wavelength at which absorbing species shows maximum absorbance
c) the wavelength at which absorbing species shows maximum transmittance

B. State whether the following statements are true or false: (3 marks)

i) Conductometry is non-classical method of analysis.

ii) A multistep washings with small volume of wash liquid are more efficient to remove the impurities than a single step washing with large volume of wash liquid.

iii) A violet beam of wavelength 395 nm is a polychromatic light.

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C) Match the following columns **(5 M)**

Sr. No.	Column A	Sr. No.	Column B
1	Calibration curve method	a	Thermogravimetry
2	Disodium salt of EDTA	b	Neutralization titration
3	Based on thermal interactions	c	Calibration of instruments
4	phenolphthalein indicator	d	Sampling of air
5	Ambient sampling	e	Complexometric titration
		f	Quantitative analysis

Q. 2 A i) How are determinate errors minimized? (5 M)

ii) Distinguish between accuracy and precision. (3 M)

OR

A i) Explain the terms random and systematic sampling. (5 M)

ii) Explain coning and quartering method used for reduction of sample size in solids. (3M)

B i) An acid buffer of pH 5.60 was prepared. Its pH was measured thrice. The readings obtained were 5.58, 5.61 and 5.59. Calculate absolute error and percentage relative error for these readings. (5 M)

ii) Distinguish between constant error and proportionate error? (3 M)

OR

B i) In gravimetric estimation of barium as $BaSO_4$, the following results were obtained (5M)

Sample No.	Weight of sample (g)	Weight of barium obtained (g)	Weight of barium actually present (g)
1	1	0.198	0.200
2	2	0.398	0.400
3	3	0.598	0.600

For this estimation, calculate the absolute error and the relative error in parts per thousand.

ii) Distinguish between determinate error and indeterminate error? (3 M)

C) i) Define a) Complete analysis b) Sampling (2 M)

ii) Define a) Analytical chemistry b) Increment (2 M)

OR

C) i) Define a) Proximate analysis b) Sampling techniques (2 M)

ii) Define a) Classical method of analysis b) Sampling unit (2 M)

Q. 3 A i) What are the requirements a reaction must fulfill to be studied by titrimetric analysis? (5 M)

ii) What is iodometry and iodimetry? (3 M)

OR

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A i) Explain the different steps involved in a precipitation gravimetry. (5 M)
ii) What are the applications of gravimetric analysis? (3 M)

B. i) Calculate the amount of solute required to prepare
I. 700 cm^3 of 0.05 N succinic acid ($C_4H_6O_4$) and
II. 500 cm^3 of 0.05 N Sodium hydroxide (NaOH)
[Atomic weight C=12, H= 1, O= 16, Na =23] (5 M)
ii) What are the conditions of precipitation? (3 M)

OR

B. i) Consider the titration of 10 cm^3 of 0.1 M ammonium hydroxide (K_b = 1.8 X 10^{-5}) with 0.1 M HCl. Calculate pH of the solution i) at the start of titration ii) when 5.0 cm^3 of 0.1 M HCl has been added. (5 M)
ii) What is volatilization gravimetry? (3M)

C) i) Define a) Titration curve b) Standard solution (2 M)
ii) Define a) Ignition of a precipitate b) Precipitation gravimetry (2 M)

OR

C) i) Define a) Neutralization reaction b) Titration error (2 M)
ii) Definea) Drying of precipitate b) Titrimetric analysis (2 M)

Q. 4 A i) What are the deviations from Beer-Lambert's law. (5 M)
ii) What is absorption and emission spectroscopy? (3 M)

OR

A i) Draw schematic diagram of single beam colorimeter. Describe the function of each component (5 M)
ii) What are the applications of UV- Visible spectroscopy? (3 M)

B. i) A solution of a substance with molar absorptivity 10500 dm^3 mol^{-1} cm^{-1} gives an absorbance 0.70 having a path length 1 cm. Calculate concentration and % transmittance of the solution. (5 M)
ii) What are the advantages of photometric titrations? (3 M)

OR

B. i) A 1x 10^{-5} M solution of a substance has 50% transmittance at λ_{max} = 280nm when a cell of path length 1 cm is used. Calculate the molar absorptivity of the substance. (5 M)
ii) Distinguish between colorimeter and spectrophotometer. (3 M)

C) i) Define a) Absorbance b) Radiant power (2 M)
ii) Define a) Transmittance b) Molar absorptivity (2 M)

OR

C) i) Define a) Detector b) Analyte (2 M)
ii) Define a) Chromophore b) Monochromatic light (2 M)

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Q. 5 Answer any four questions from following : (20 M)

A) Write a note on sampling of immiscible liquids.

B) Explain types of classical and non-classical methods of analysis.

C) Explain the methods used to determine end point of neutralization titrations?

D) Explain digestion of precipitate and its importance in gravimetric analysis.

E) The absorbance of a 1 x x 10^{-5} M solution placed in a cell with path length 1 cm, was found to be same as another solution of same substance placed in a cell with path length 3 cm using the same incident radiation. Calculate the concentration of second solution.

F) With the help of a neat labeled diagram explain the working of photomultiplier tube used as detector in colorimeter and spectrophotometer.

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