

Post Graduate Teaching Department of Chemistry
Master of Science (M.Sc.) Semester-II (CBCS) (Chemistry)
Examination
Analytical Chemistry (CH-204)
Paper-VIII

Time: Three Hours]

[Max. Marks: 60

- N.B.: 1. All questions are compulsory and carry equal marks
 3. Use of Calculator is permitted
 4. Draw labelled diagrams wherever necessary

- 1 (a) Explain the method of sampling of soil with respect to sampling tools, 4
 procedure and precautions.
- (b) Titration of 50.0 mL of 0.047 M $\text{Na}_2\text{C}_2\text{O}_4$ required 39.25 mL of potassium 4
 permanganate solution according to reaction-
 $2\text{MnO}_4^- + 5\text{Na}_2\text{C}_2\text{O}_4 + 6\text{H}^+ \longrightarrow 2\text{Mn}^{2+} + 10\text{CO}_2 + 8\text{H}_2\text{O}$
 Calculate the molar concentration of KMnO_4 .
- (c) Explain sample wet digestion and dry ashing methods of sample 4
 preparation.

OR

- 1(d) What is meant by analytical noise? Explain its types. 4
- (e) In hardness experiment, 100 mL water samples were titrated with 4
 standard EDTA solution. It required 15.35 mL of 0.0125 M EDTA solution
 for total hardness and 9.15 mL of 0.0125 M EDTA solution for permanent
 hardness. Calculate the total, permanent and temporary hardness in
 terms of ppm of CaCO_3 .
- (f) Write short note on: (i) substoichiometric titration (ii) coning and 4
 quartering.
- 2(a) Describe principle, construction and working of electron capture 4
 detector.
- (b) Equal volumes of mono, di and tri-chlorobenzene were found to have 4
 areas of 6.36, 7.55 and 7.45 cm^2 on a chromatogram. Calculate the
 percentage composition of the system.
- (c) What is temperature programmed GC? Give its advantages. 4

OR

- 2(d) Give advantages of SFC over GC and HPLC. 4
- (e) Describe any two types of detectors used in HPLC. 4
- (f) Calculate the number of theoretical plates if retention time is 104 s and 4
 width of the peak base is 4 s.
- 3(a) Explain construction and working of premix burner in flame photometry. 4
- (b) A 0.5 g alloy sample was dissolved in acid and Mn was oxidized to 4
 permanganate. The solution was diluted to 100 mL. The absorbance in
 1.00 cm cell at 525 nm was found to be 0.350. If molar absorptivity of

permanganate is 2240 at 525 nm, calculate percentage of Mn in alloy.
 (Mn=54.98 g/mol)

- (c) How will you determine the two coloured components present in a 4
 solution which interfere with each other simultaneously?

OR

- 3(d) Define the terms and give their units: (i) Transmittance (ii) Absorbance 4
 (iii) Molar absorptivity (iv) Sandell's sensitivity
- (e) How do you determine pK of indicator by spectrophotometry? 4
- (f) Calculate the molar extinction coefficient of a compound (Mol. wt. 80) 4
 whose 0.001 M solution shows absorbance of 0.93 in a cell of pathlength
 1.0 cm.

- 4(a) Explain principle and instrumentation of amperometric titrations. 4
- (b) An unknown solution of organic compound (M.W.=120) yielded a 4
 diffusion current of 0.650 μA . To 10.0 mL of this solution, 0.1 mL of
 standard 25.0 mM solution was added when the diffusion current was
 found to be 0.730 μA . Calculate the concentration of organic compound
 in original solution.
- (c) Explain the principle of differential pulse polarography.

OR

- 4(d) Explain the role of (i) maxima suppressor (ii) nitrogen purging, in 4
 polarography.
- (e) Diffusion coefficient of O_2 in dilute aqueous solution is $2.61 \times 10^{-5} \text{ cm}^2/\text{s}$. 4
 A 1.0 mM solution of O_2 gives diffusion current of 23.2 μA . If $m=1.84$
 mg/s and $t=4.10 \text{ s}$, calculate the number of electrons involved (n) in
 reduction of oxygen molecule and also predict the product formed.
- (f) What is meant by charging current? How is it originated? How can you 4
 eliminate it?

- 5(a) How will you prepare 500 mL of approximately 0.1 N HCl solution starting 1½
 with concentrated HCl solution (11.3N)? ×8
- (b) Define 'sensitivity' and 'limit of detection'.
- (c) Give advantages of supercritical fluid chromatography.
- (d) What is meant by gradient elution in chromatography?
- (e) Explain principle of Jobs method of continuous variation.
- (f) Draw well labelled schematic diagram of double beam 4
 spectrophotometer.
- (g) Define 'half wave potential' and give its significance.
- (h) Write Ilkovic equation and explain terms involved.