

KATHMANDU UNIVERSITY  
End Semester Examination [C]  
December, 2024

Marks Scored:

Level : B.E.

Year : II

Exam Roll No. :

Time: 30 mins.

Course : CHEM 215

Semester : I

F. M. : 20

Registration No.:

Date :

3 DEC 2024

SECTION "A"

[20Q. × 1 = 20 marks]

Choose and encircle the most appropriate option from each set of choices.

- Which statement best describes the effect of conjugation on the absorption properties of a chromophore?  
 Increasing conjugation causes a hypsochromic shift, while decreasing conjugation causes a bathochromic shift.  
 Increasing conjugation causes a bathochromic shift, while decreasing conjugation causes a hypsochromic shift.  
 Conjugation has no effect on the absorption properties of a chromophore.  
 Both increasing and decreasing conjugation cause a hypsochromic shift.
- What is the principle behind potentiometric measurements?  
 Measuring the flow of current  
 Measuring the voltage across a resistor  
 Measuring the potential difference between two electrodes  
 Measuring the resistance of a solution
- Which mass spectrometry technique is best suited for determining the molecular mass of a large biomolecule such as a protein?  
 Electron Impact (EI) Mass Spectrometry  
 Matrix-Assisted Laser Desorption/Ionization (MALDI) Mass Spectrometry  
 Electrospray Ionization (ESI) Mass Spectrometry  
 Fast Atom Bombardment (FAB) Mass Spectrometry
- Which indicator is most appropriate for a titration of a weak acid with a strong base?  
 Methyl orange (pH range: 3.1-4.4)  
 Bromothymol blue (pH range: 6.0-7.6)  
 Phenolphthalein (pH range: 8.2-10.0)  
 Litmus (pH range: 4.5-8.3)
- The process of dispersing an insoluble material into a liquid as a colloid is called:  
 coagulation       peptization       nucleation       occlusion
- In affinity chromatography, the target molecule is typically eluted by:  
 Increasing the temperature       Changing the pH or ionic strength  
 Reducing the pressure       Adding surfactants



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Level : B.E.  
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Time : 2 hrs. 30mins.

13 DEC 2024

Course : CHEM 215  
Semester : I  
F. M. : 55

SECTION "B"

[5Q. × 5 = 25 marks]

Attempt ANY FIVE questions.

1.
  - a. What are the consequences of non-compliance with GLP regulations? [2]
  - b. Write at least three differences between Fluorescence and Phosphorescence. [3]
2.
  - a. State gravimetric factor. What size sample containing 14.4% chlorine (Cl) should be taken for analysis to obtain a precipitate of AgCl which weighs 0.440 g? [1+2]
  - b. State the desirable properties of primary standard substances. [2]
3.
  - a. Define spectral band pass or effective bandwidth. Why iodine is sometimes introduced into a tungsten lamp? [1+2]
  - b. Sketch different types of curve used to determine the end point in potentiometric titration. [2]
4.
  - a. Write general principles of titrimetric method of analysis. Calculate the pH of the solution made by mixing 100ml of 0.05 M NaOH and 100 ml of 0.05M CH<sub>3</sub>COOH. The K<sub>a</sub> of CH<sub>3</sub>COOH is 1.0 × 10<sup>-5</sup>. [3]
  - b. Show your familiarity with mass spectrometer. [2]
5.
  - a. What is the largest peak in a mass spectrum? How do you analyze mass spectrum? [1+2]
  - b. What is Doppler effect in AAS? How does it cause line broadening in AAS? [2]
6.
  - a. Explain briefly the concepts of bathochromic shift. A 0.00396 M solution of compound 'X' exhibited an absorbance of 0.624 at 238nm in a 1cm cuvette; a blank solution containing only solvent had an absorbance of 0.029 at the same wavelength. Find the molar absorptivity of compound 'X'. [1+1.5]
  - b. What are chromophores and auxochromes, explain clearly with examples? How would saturation of a double bond result in a hypsochromic shift in the UV spectrum? [1.5+1]

P.T.O.

SECTION "C"  
[5Q. × 6 = 30 marks]

Attempt ANY FIVE questions.

- 7.
- a. What are the key principles of GLP? How should laboratory equipment and instruments be maintained and calibrated to comply with GLP? [1+2]
  - b. Discuss on Von Weimarn's theory of relative supersaturation. How does the digestion improve the quality of the precipitates? [1.5+1.5]
- 8.
- a. Why is it necessary for the glass in the membrane of a pH sensitive electrode to be appreciably hygroscopic? What are the sources of the asymmetric potential in a glass membrane electrode? [1+2]
  - b. Define Molar conductance. The resistance of 0.1M solution of a salt occupying a volume between two platinum electrodes 1.8 cm apart and 5.4 cm<sup>2</sup> area was found to be 32 ohms. Calculate the molar conductance of the solution. [1+2]
- 9.
- a. State Beer's law. A typical simple infrared spectrophotometer covers a wavelength range from 3 to 15 μm. Express its range (a) in wavenumbers and (b) in hertz. [1+2]
  - b. Describe the alkaline error in the measurement of pH. Under what circumstances is this error appreciable? How is it different from acid error? [3]
- 10.
- a. Show your familiarity with hollow cathode Lamp used as radiation source in AAS.[3]
  - b. Write how partition chromatography differs from affinity chromatography on the basis of the principle of their separation. [3]
- 11.
- a. Justify why CO<sub>2</sub> does not appear in IR spectrum. Also find the total vibrational modes in CO<sub>2</sub>. [2+1]
  - b. Define continuum source. Why does a deuterium lamp produce a continuum rather than a line spectrum in the UV region? [1+2]
12. Write short notes on: (**ANY THREE**) [2×3=6]
- a. Fingerprint and functional region in IR
  - b. Retention time in chromatography
  - c. Infrared detector
  - d. photomultiplier tubes