

28/5/24



DOON UNIVERSITY, DEHRADUN

End Semester Examination, May, 2024

School of Physical Sciences, Department of Chemistry

NEP Chemistry, IInd Semester

Course: CYC-151: Instrumentation of Basic Spectroscopic Techniques (712111)

Time Allowed: 2 Hours.

Maximum Marks: 50

Note: Attempt All Questions

SECTION: A

Attempt All Questions.

(Marks: 6Q × 2 = 12)

1. What types of molecular vibration are associated with infrared absorption?
2. A sample in a 1.0-cm cell transmits 80% light at a certain wavelength. If the absorptivity of this substance at this wavelength is 2.0, what is its concentration?
3. What is a calibration curve and how it is plotted for an analysis in spectrophotometry?
4. Write a note on sample preparation in UV-Vis spectrometer and the precautions to be followed.
5. Write a note on environmental applications of AAS and AES.
6. How does temperature programming in GC improve separations?

SECTION: B

Attempt All Questions.

(Marks: 6Q × 3 = 18)

7. Define absorption, absorbance, percent transmittance and transmittance, absorptivity and molar absorptivity.

8. What should be the essential characteristics of the column material in GC technique.
9. A calibration curve for zinc was prepared using standard solutions, and the following linear equation was obtained:
$$A=0.2\times C+0.01$$
where A is the absorbance and C is the concentration of zinc in mg/L. If a sample has an absorbance of 0.45, what is the concentration of zinc in the sample?
10. A solution containing 1.00 mg iron (as the thiocyanate complex) in 100mL was observed to transmit 70.0% of the incident light compared to an appropriate blank. (a) What is the absorbance of the solution at this wavelength? (b) What fraction of light would be transmitted by a solution of iron four times as concentrated?
11. Describe the fundamental principles of IR spectroscopy and how it is used to identify molecular structures.
12. Why is a calibration curve likely to be linear over a wider range of concentrations at the wavelength of maximum absorption compared to a wavelength on a shoulder of the absorption curve?

SECTION: C

Attempt All Questions.

(Marks: 4Q × 5= 20)

13. Describe the operation of a photodiode array spectrophotometer and compare its efficiency with PMT based spectrometer.
14. Describe the principle and working of main components of mass spectrometer equipped with TOF mass analyzer.
15. What is the difference between FTIR and IR spectrometer in terms of their instrumentation as well as in working?
16. Write a note on (a) EIS (b) EI and (c) CI in mass spectrometry.