JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2024

B.Tech-I Semester (CSE/IT/ECE/CE)

COURSE CODE(CREDITS):04

COURSE NAME: Bioinstrumentation Techniques (18B11PH212)

COURSE INSTRUCTORS: Dr. Ragini Raj Singh

MAX. MARKS: 25

MAX. TIME: 1 Hour 30 Minutes

Note: (a) All questions are compulsory.

(b) Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

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Q. 1. Convert the following transmittance data to absorbance:

a 0.255;   b 0.567;   c 0.328;   d 0.036;   [CO:1, 1]

Q.2. A solution containing 3.75 mg/100 mL of X (335 g/mol) has a transmittance of 39.6% in a 1.50-cm cell at 425 nm. Calculate the molar absorptivity of X at this wavelength.   [CO:1, 2]

Q.3. A molecule phosphoresces with a single peak wavelength of 700 nm. The single fluorescence peak is at 590 nm. The absorption peak is at 490 nm. Based on this information, roughly sketch the Jablonski diagram, labeling transitions and calculating differences in each energy state in nm and cm-1.   [CO:2, 2]

Q.4. The fundamental vibrational transition (v = 0--→ v = 1) for CO is 2170.2 cm^{-1}. Treat CO as a harmonic oscillator, and determine the harmonic force constant k in g/s^2.   [CO:2, 3]

Q.5. Discuss the selection rules for UV-Vis Spectroscopy with explanation of spin and symmetry forbidden transitions.   [CO:3, 3]

(b) Explain the substituent effects in UV-Vis spectroscopy.   [CO:3, 2]

Q.6. What is circular dichroism spectroscopy? What kind of molecules can be analyzed using CD? What is the difference between UV-Vis spectroscopy and CD spectroscopy, explain with graphs.   [CO:3, 3]

Q.7. In photoluminescence spectroscopy how can you explain stokes shift, law of invariance, mirror image rule and quantum yield of fluorescence?   [CO:4, 4]

Q.8. What are different vibrational modes in FTIR spectroscopy? Explain the mechanical and mathematical operation of FTIR to obtain the FTIR spectra?   [CO:4, 3]

Q.9. What is Raman Spectroscopy and its mechanisms explain with the help of diagrams?   [CO:4, 2]