Dr Rajni

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST 3 EXAMINATIONS – MAY 2018

B.Tech (BT) IVth Semester

COURSE CODE:10B11PH212 MAX. MARKS: 35

COURSE NAME: Biophysical Techniques

COURSE CREDITS: 04 MAX. TIME: 2 HRS

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

Q.1. (a) [2.5] How many types of signals are there in SEM and from where the signals come from explain with the help of diagram?

(b) [3] Draw the Jablonski diagram and explain the each process in detail?

(c) [5] What is the basic physical principle of surface plasmon resonance spectroscopy? How to differentiate the SPR signals of analyte from the blank scan? Which important signals can be collected in the technique?

Q.2. (a) [3] What are the notable advantages and disadvantages of FTIR spectroscopy specifically in investigation of microorganisms?

(b) [2.5] What is Raman spectroscopy? Derive the equation which gives important features in Raman spectroscopy.

Q.3. (a) [4] A diatomic molecule HX has a harmonic vibrational force constant k= 9.6800 x 10^5 g/s^2. The harmonic vibrational frequency in wavenumbers is 4143.3 cm^{-1}. Find

(i) What is the reduced mass of the molecule?

(ii) Which atom corresponds to X among, F=18.99 amu or O=15.999 amu or Na= 22.990 amu

(b)[3] Determine for NaF the ground state (v=1) energy and higher state (v=6) energy in cm^{-1} assuming a harmonic oscillator and an anharmonic oscillator. Discuss the results. (Given ω_e= 536.1cm^{-1} and x_e= 0.007144)

Q.4. (a)[5] What are the main components of mass spectrometer. Discuss each one by considering the biomolecule analysis corresponding to each device section.

(b) [4] Discuss two specific applications of mass spectrometer for biomolecules (i) Protein sequencing and (ii) Peptide fragmentation

Q.5. [3] On which physical concept does NMR spectroscopy works and for what it is used. How many types of NMR spectroscopies are there and what we exactly measures in this technique.