Seat No. _____

HP-003-2014022

B. Sc. (Biochemistry) (Sem. IV) (CBCS)
(W.E.F. 2019) Examination

April - 2023

Paper - BC - 401 : Biophysical & Biochemical Techniques

(New Course)

Faculty Code : 003

Subject Code : 2014022

Time : $2\frac{1}{2}$ / Total Marks : 70

1 (a) Answer the following questions briefly : **4**

(1) Arrange the following electromagnetic radiations in ascending order of their Energies : Gamma rays, UV-rays, X-rays, Microwaves and Visible light.

(2) Why glass cuvettes can't be used to record absorbance of a colorless solution in UV spectrophotometer ?

(3) Define photoelectric effect.

(4) Why do we use red coloured filter to record absorbance of a blue coloured solution (filter of complimentary color) in colorimeters ?

(b) Describe wavelength using a neat diagram of a electromagnetic wave. **2**

OR

(b) Write the Beer's and lambert's laws of light absorption. **2**

(c) Draw labelled diagram of double beam spectrophotometer showing different components. **3**

OR

(c) Briefly describe different types of light sources used in colorimeters and UV/Visible spectrophotometers. **3**

(d) Write a short note on Diffraction grating monochromators and explain why they are the best ? **5**

OR

(d) Discuss basic and advanced applications of spectrophotometers in biochemistry. **5**

2 (a) Answer the following questions briefly : **4**

(1) Write the formula showing relationship between Centrifugal force and Relative centrifugal force RCF.

(2) Why refrigeration system is important in high speed and ultra centrifuges ?

(3) List two applications of common laboratory centrifuge in biochemistry.

(4) Define differential centrifugation.

(b) Write the names of different types of rotors used in a centrifuge. **2**

OR

(b) In an angle head rotor, the top radius was 40 cms and bottom radius was 60 cms. What will be the average radius of the rotor? **2**

(c) Write a brief note on applications of density gradient centrifugation. **3**

OR

(c) Define density gradient centrifugation and list the materials used to prepare density gradients. **3**

(d) Write a short note on the process of isolation of cell organelles from liver homogenate by differential centrifugation. **5**

OR

(d) Discuss instrumentation and uses of analytical ultracentrifuges. **5**

3 (a) Answer the following questions briefly : **4**

(1) One Becquerel radioactivity means how many disintegrations per second (dps) from a radio isotope during the decay?

(2) Which device is used to check/detect spillage of radioactivity in the laboratory or a work place ?

(3) Write examples of different isotopes of Hydrogen.

(4) What would be the effect of atomic number (Z) and mass number (A) values of an radio isotope when it decays by emission of alpha particle ?

(b) Why gamma radiation has highest energy and highest penetration power compared to the other two i.e. alpha and beta particles emissions ? **2**

OR

(b) Define half-life of radioisotopes. **2**

(c) A sample containing radioisotope of phosphorous 32P having a mass of 100 grams. How many grams of the radioactivity of 32P would remain after 42 days ? Half life of Radioisotope of phosphorous 32P is 14 days. **3**

OR

(c) Briefly describe the technique of autoradiography and its applications in biochemistry. **3**

(d) Write a short note on liquid scintillation counter and its use. **5**

OR

(d) Write a detailed note on applications of radioisotopes in the fields of biological science and medicine. **5**

4 (a) Answer the following questions briefly : **4**

(1) Name the method used to detect spots of phospholipids on thin layer chromatography plate.

(2) Define Kd value in chromatography.

(3) What chromatographic technique would you use to separate substances from their mixture on the basis of their molecular size difference ?

(4) Write full form of HPLC.

(b) What factors governs the pore size of gel beads in polyacrylamide gels ? **2**

OR

(b) Write the examples of materials used in molecular sieve chromatography. **2**

(c) In thin layer chromatography of amino acids, the distance travelled by solvent front from the origin was 10 cm while the distance travelled by aspartic acid and histidine from the origin were 3 cm and 7 cm respectively. Calculate the Rf values of aspartic acid and histidine. **3**

OR

(c) Write the advantages of thin layer chromatography in comparison to paper chromatography. **3**

(d) Discuss the principle and applications of ion exchange chromatography. **5**

OR

(d) Describe the principle of Affinity chromatography and write the examples of various biomolecules that can be separated by using specific ligands using affinity chromatography. **5**

5 (a) Answer the following questions briefly : **4**

(1) Can we separate carbohydrates/sugars using electrophoresis ? Justify your answer.

(2) Which fluorescent dye is used to stain and detect DNA and RNA bands in gel electrophoresis ?

(3) Write example of trekking dye that we use in agarose gel electrophoresis of DNA.

(4) During electrophoresis, DNA molecules would migrate towards cathode or anode. Why ?

(b) How pH of the buffer could affect migration of protein in electrophoresis ? **2**

OR

(b) If you increase the potential difference across the two electrodes in an electrophoresis apparatus, what effect it would have on separation of nucleic acids ? **2**

(c) Briefly describe the principle of Isoelectric focusing. **3**

OR

(c) Name the two techniques that are used in 2D gel electrophoresis. **3**

(d) Write various applications of gel electrophoresis in biochemistry and molecular biology. **5**

OR

(d) Write principle and applications of SDS PAGE. **5**
