JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -2 EXAMINATION- 2023
M.Sc/-III Semester/PhD (BT)

Course Code (Credits): 21MS2MB312 (3) Max. Marks: 25
Course Name: Biosensor:Principles and Applications
Course Instructors: Dr. Abhishek 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

1. Electrochemical sensing usually requires a reference electrode, a counter or auxiliary electrode and a working electrode, for the same if you would like to use working electrode of Cu then how will you calculate the electrode potential at a copper electrode dipped in a 0.001M solution of copper sulphate at 25^0C. The standard potential of Cu^{2+}/Cu system is 0.34 volt at 298 K. also writes down the nerst equation and its significance in electrochemical biosensor designing. [5]

2. A student working on genetic disorder which is a disease caused in whole or in part by a change in the DNA sequence away from the normal sequence. Later on he will he identified the DNA sequence responsible for the disease and the sequence he identified is 5'-CGTTTTTTTAAAAAATTTTTTAAAAAGC-3". For the diagnosis of this disease using above sequence, student would like to develop a sensor. To support the student, proposed a mechanism for biosensor development using above information also describe that, how will he immobilize the receptor over the surface of the transducer? Also discuss the different components of biosensor used to identified the above analyte. [5]

3. Electrochemical sensing strategies are versatile and powerful tools in providing real-time and on-site measurement in a variety of areas, including clinical diagnostic, environmental, agricultural, and food monitoring. The electrochemical sensing provides advantages in offering high sensitivity, selectivity, accuracy, and cost effectiveness. Therefore, biosensors with electrochemical monitoring systems dominate the commercial glucometer market. Wrtite down the different generation of glucose biosensor and the important difference between first, second and third generation of glucose electrochemical biosensor [5]

4. Quantum yield is defined as the efficiency of converting absorbed light into emitted light, which can be in the form of fluorescence. In an experiment a student obtained the quantum yield 0.2 for the decomposition of a compound X. In the same experiment if 0.001 moles of the compound X are decomposed. Calculate the number of photons absorbed by the compound also calculate the number of emitted photon. Also write down the difference between static and dynamic quenching. [5]

5. Biosensors are nowadays ubiquitous in biomedical diagnosis as well as a wide range of other areas such as point-of-care monitoring of treatment and disease progression, environmental monitoring, food control, drug discovery, forensics and biomedical research. A wide range of techniques can be used for the development of biosensors. Enzyme-Based Electrochemical Biosensors for Measuring Relatively Small Biomolecules is one of them. Proposed a mechanism to design an electrochemical biosensor for sugar molecule detection using enzyme glucose oxidase and explain various components involved in sensor designing. [5]