JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -3 EXAMINATION- 2023
PhD (BT)

Course Code (Credits): 21MS2MB312 (3) Max. Marks: 35
Course Name: Biosensor: Principles and Applications
Course Instructors: Dr. Abhishek Chaudhary Max. Time: 2 Hours

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. Glucose is one of the essential nutrients and has been widely used in the food and drug industry. It plays an important role in human life as a major energy source and metabolic intermediate. However, the abnormal level of glucose in blood is considered to be responsible for endocrine and metabolic disorders such as diabetes mellitus, which may cause serious diseases. To overcome the above problems, early detection of glucse is required. Proposed a mechanism for the development of electroanalytical biosensor based on GOx/FCA/PEG-modified SWCNT electrode for determination of glucose [6]

2. Living cell-based biosensors are analytical devices designed to detect and report on analytes or other nonchemical stimuli using genetically engineered cells. The major incentive for deploying living cells in sensors is that they are able to sense and respond to a wide variety of signals amid carrying out their biological functions through a complex network of signal transduction pathways. Proposed a mechanistic concept for the designing of living cell-based biosensors using microgels with a selectively permeable shell that can harbor bacterial species [6]

3. Outbreaks of pathogenic bacteria like *Listeria, Escherichia coli* and *Salmonella* in most part of the world, make clear the danger of microbial pathogens disseminated through contaminated food. Among these pathogens, *L. monocytogenes* is a Gram-positive non-spore forming rod bacterium that causes listeriosis in humans, and serious infections manifested by septicemia and meningitis can result in death. Proposed a mechanism of peptide-based Biosensor development utilizing fluorescent gold nanoclusters for detection of *Listeria monocytogenes* [6]

4. Milk adulteration is one of the major global concerns as milk is being consumed as a wholesome dairy product in every part of the world. The fraudulent practice of milk adulteration is on the rise, which is making people apprehensive about the purity and quality of milk. The adulterants such as water, vegetable and animal fat, extraneous proteins and chemical components viz. melamine, urea, formalin, detergents, ammonium sulphate, boric acid, caustic soda, benzoic acid, salicylic acid, hydrogen peroxide and sugars deliberately mixed in milk can be an be harmful to the health of consumers. Over the years, various methods have been developed for the detection of milk adulterants. Proposed the overview of various conventional and biosensor based approaches for the detection of milk adulterant. [6]

5. The rapid detection of specific bacterial species has many potential applications in medicine ,environmental and food safety. Conventional methods, including culturing, ELISA, and polymerase chain reaction (PCR) methods, have important drawbacks, such as long processing times and the need for specialized equipment. Gold nanoparticles (AuNPs) are an ideal candidate for rapid biosensing based on the sensitivity of the surface plasmon resonance to aggregation state, which produces a visible color change. Propose a strategy for rapid colorimetric detection of bacterial species through the capture of gold nanoparticles by Chimeric Phages to overcome the limitation associated with conventional methods. [6]

6. In agriculture, farmers use numerous pesticides to protect crops and seeds before and after harvesting. The pesticide residues may enter into the food chain through air, water and soil and affect ecosystems or cause several health problems to animals and humans. Pesticides can be carcinogenic and cytotoxic. They can produce bone marrow and nerve disorders, infertility, and immunological and respiratory diseases. Over the past decade various technique has been develop for the detection of pesticide residue but all have some limitation in term of time-consumption , laborious, and require expensive equipments and highly-trained technicians. To overcome the above limitations, biosensor development would be a suitable alternative. Give a strategy for the designing of enzyme based biosensors against organophosphate using enzyme inhibition concept. [5]