BIOSENSORS
(BIOT 4124)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) The restriction of enzyme mobility in a fixed space is known as _____
(a) enzyme immobilization (b) enzyme inhibition
(c) enzyme kinetics (d) enzyme deactivation

(ii) Which of the following is the physico-chemical component of biosensor?
(a) Enzymes (b) Anti-bodies
(c) Transducer (d) Cells or tissues

(iii) Which among the following body fluid cannot be used in a non-invasive biosensor
(a) Tear (b) Sweat (c) Blood (d) Saliva

(iv) The component of a biosensor which binds with the analyte is known as
(a) Bio-recognition element (b) Transducer
(c) Signal processor (d) Reading device

(v) Biosensor which measures the mass change is known as
(a) Amperometric biosensor (b) Potentiometric biosensor
(c) Calorimetric biosensor (d) Piezoelectric biosensor

(vi) Which of the following is a chemiluminescent agent
(a) D- luciferin (b) Streptavidin
(c) Biotin (d) ATP

(vii) Which of the following is a bi-functional linker
(a) ATP (b) Avidin
(c) Glutaraldehyde (d) D-luciferin

(viii) _____ is measured by a biosensor consisting of a silicon wafer pH sensitive layer on which penicillinase enzyme is immobilized.
(a) Penicillin (b) Glucose
(c) Hormones (d) Sucrose

(ix) Biosensors are used in food industry to _____
(a) sense taste (b) detect mustard gas
(c) detect acid alcohols (d) determine fatigue

(x) The genetic monitoring and disease diagnosis are examples for _____ sensor?
(a) DNA sensors (b) Cell-based sensors
(c) Point of care sensors (d) All of the above

Fill in the blanks with the correct word

(xi) Fluorophore used in an optical biosensor is _____.

(xii) _____ is an example of a non-invasive fluid.

(xiii) For competitive enzyme immobilization, Km value _____ (increases / decreases / remains constant).

(xiv) Biosensor where microbe is used as bio-recognition element is called as _____.

(xv) Strptavidin is highly specific to _____.

Group - B

2. (a) What do you mean by activation of support material for enzyme immobilization. *[(CO2)(Analyse/IOCQ)]*

(b) Explain how the support material for immobilization of enzyme for enzyme biosensor can be activated using the following.
(i) Ethyl chloroformate.
(ii) Cyanogen Bromide. *[(CO2)(Remember/LOCQ)]*

2 + (5 + 5) = 12

3. (a) Explain the profile between reaction velocity vs substrate concentration as double reciprocal plot. Derive the liberalised form of Michaelis –Menten equation. *[(CO2)(Analyse/HOCQ)]*

(b) What is Michaelis-Menten constant? How the value of this parameter is changed for competitive and non competitive inhibition? *[(CO2)(Remember/IOCQ)]*

(3 + 4) + (1 + 4) = 12

Group - C

4. (a) What is a Biosensor? Give some examples of common analytes of a Biosensor. *[(CO1)(Remember/LOCQ)]*

(b) Illustrate the process of glucose estimation with the help of Calorimetric biosensor. *[(CO3)(Illustrate/IOCQ)]*

(c) Write notes on Ionophore. *[(CO1)(Apply/LOCQ)]*

(2 + 2) + 5 + 3 = 12

5. (a) Explain with an example the use of microbes as a Biosensor. *[(CO1)(Analyse/HOCQ)]*

(b) How can you detect alcohol with the help of Non-invasive biosensor? *[(CO5)(Describe/IOCQ)]*

6 + 6 = 12

Group - D

6. (a) Explain how can you detect DNA hybridization with the help of Potentiometric biosensor. *[(CO5)(Explain/HOCQ)]*

   (b) Explain with an example the working principle of Amperometric biosensor. *[(CO4)(Explain/IOCQ)]*

6 + 6 = 12

7. (a) Describe the working principle of Immuno Optical Biosensor by Fluorescent Evanescent Wave Sensors? *[(CO4)(Describe/HOCQ)]*

   (b) Describe the working principle of Piezo-electric Biosensor. *[(CO4)(Explain/IOCQ)]*

6 + 6 = 12

Group - E

8. Write down the application of biosensor for the following cases of environmental pollution control with the principle of determination:

   (i) Pesticide determination

   (ii) BOD in wastewater. *[(CO6)(Apply/IOCQ)]*

(6 + 6) = 12

9. (a) Describe two examples of nutrient quality determination by biosensor in food industry. *[(CO6)(Analyse/HOCQ)]*

   (b) How is blood glucose monitored by biosensor, describe with an example. *[(CO6)(Understand/IOCQ)]*

6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	17.7	50	32.3