

**BIOSENSORS
(BIOT 4181)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

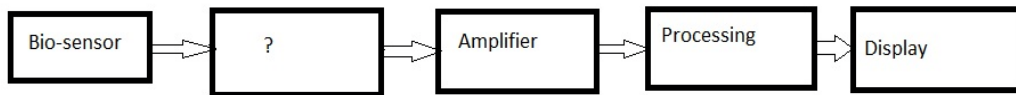
Candidates are required to give answer in their own words as far as practicable.

**Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**

- (i) Antibodies are large Y shaped
(a) Protein (b) Carbohydrate
(c) Lipid (d) Nucleic acid.
- (ii) Time required to return the sensor to working state after interaction with the sample is known as
(a) Response time (b) Regeneration time
(c) Specificity (d) None of the above.
- (iii) The response of an ion-selective electrode is given by
(a) $E = E_0 + (RT/zF)\ln[i]$ (b) $E = E_0 + (zF/RT)\ln[i]$
(c) $E_0 = E + (RT/zF)\ln[i]$ (d) $E_0 = E + (zF/RT)\ln[i]$.
- (iv) Biosensors which measures the light output is known as
(a) Optical biosensor (b) Electrochemical biosensor
(c) Calorimetric biosensor (d) Piezoelectric biosensor.
- (v) Biotin binds with
(a) Avidin (b) Streptavidin
(c) Both (a) and (b) (d) None of these.
- (vi) Which of the following is false for a biosensor?
(a) Self-contained integrated device
(b) Capable of providing specific information
(c) Uses a biological recognition
(d) Don't connect to a transduction element.

(vii) Given below is the diagram of biosensor. Identify the unmarked component



- (a) Microprocessor (b) Filter
(c) Transducer (d) A/D converter

(viii) Which of the following defines an analyte?

- (a) Any molecule may be protein, toxin, antigen, etc
(b) The concentration of the molecule
(c) The component which should not be detected
(d) The component which gives background noise

(ix) The biological response of the biosensor is determined by _____ .

- (a) Biocatalytic membrane (b) Physio-chemical membrane
(c) Chemical membrane (d) Artificial membrane

(x) Covalent and cross linking method of immobilization is

- (a) Never used in practice (b) Highly unstable
(c) Lightly stable (d) None of these.

Group – B

2. (a) Explain how the support material for immobilization of enzyme in a biosensor can be activated using ethyl chloroformate. Write the reaction scheme.

(b) State the properties of an ideal biosensor.

6 + 6 = 12

3. (a) Prepare a chart on types of biosensor based on biochemical component and transducer.

(b) Write down the Michaelis-Menten equation related to enzymatic reaction in a biosensor. Mention the significance of K_m and V_{max} parameters of the equation.

6 + (3 + 3) = 12

Group – C

4. (a) What are the different types of bio-recognition element found in a biosensor?

(b) Give some examples of common analytes of a biosensor.

(c) How can you detect alcohol with the help of Non-invasive biosensor?

3 + 2 + 7 = 12

5. (a) What are the advantages and limitations of a biosensor?

(b) Explain how DNA can be used as a bio-recognition element in an Optical biosensor.

(3 + 3) + 6 = 12

Group – D

6. (a) Explain the working principle of DNA-FET.
(b) Explain how you can detect bacteria in clinical or food samples with the help of an Optical biosensor.

6 + 6 = 12

7. (a) Discuss the working principle of Immuno-optical biosensor by Fluorescent Evanescent Wave Sensors.
(b) How can you measure Glucose with the help of Amperometric biosensor?

6 + 6 = 12

Group – E

8. (a) Is it possible to determine the pesticide in a sample using butyrylcholinesterase? If yes, then write down the sequence of chemical reactions to detect pesticide by this enzyme in the biosensor.
(b) How is biosensor used for food packaging?

8 + 4 = 12

9. Describe the application of biosensor with principle of operation in food industry for the following:
(i) Determination of microorganism
(ii) Determination of Lactose concentration in milk

6 + 6 = 12

Department & Section	Submission Link
CSE	https://classroom.google.com/c/MjQyMDU0ODE4NDE5/a/Mjc1NTE3MDQ5Nzc5/details
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