

**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) Which generation of a glucose biosensor needs oxygen for its operation?

(a) 1 st generation	(b) 2 nd generation
(c) 3 rd generation	(d) 4 th generation.
 - (ii) Which of the following biosensors use the movement of electrons produced during redox reactions?

(a) Amperometric biosensor	(b) Potentiometric biosensors
(c) Piezo-electric biosensors	(d) Optical biosensors.
 - (iii) Which among the following is a Piezo-electric crystal?

(a) Snowflakes	(b) Diamond
(c) Quartz	(d) Table salt.
 - (iv) To develop a biosensor, the biological component immobilised most effectively on the surface of a transducer by

(a) Adsorption	(b) Microencapsulation
(c) Physical entrapment	(d) Covalent bonding.
 - (v) Selectivity Coefficient for Ion Selective Electrodes more responsive to interfering ions as compared to the target ions is

(a) <1	(b) >1
(c) =1	(d) =0.
 - (vi) Response of an enzyme sensor depends on

(a) rate of enzymatic reaction	(b) diffusion through membrane
(c) membrane thickness	(d) both (b) and (c).
 - (vii) Which of the following is the physico-chemical component of biosensor?

(a) Enzymes	(b) Anti-bodies
(c) Transducer	(d) Cells or tissues.

- (viii) An example of biosensor, urea electrode makes use of which of the following electrodes?

(a) Carbon dioxide electrode	(b) Ammonia electrode
(c) Fluoride electrode	(d) Ammonium electrode.
- (ix) Which of these biosensors use the principle of heat released or absorbed by a reaction?

(a) Potentiometric biosensor	(b) Optical biosensors
(c) Piezo-electric biosensors	(d) Calorimetric biosensors.
- (x) Enzyme used in banana used in an enzyme electrode is suitable for detection of

(a) Alcohol	(b) Dopamine
(c) Phenol	(d) Benzene.

Group - B

2. (a) What is meant by activation of support matrix needed for enzyme immobilisation? Give two examples of this process.
(b) Define biosensor.
(c) What is inhibition based biosensor?
(2 + 6) + 1 + 3 = 12
3. (a) What is the response time of an enzyme biosensor? How is it related to the thickness of an enzyme layer?
(b) Explain the nature of profile of product concentration vs substrate concentration at different enzyme loading for an enzyme sensor.
(2 + 3) + 7 = 12

Group - C

4. (a) Write notes on salivary biosensor.
(b) Draw the schematic diagram of a typical biosensor and explain its different components.
6 + 6 = 12
5. (a) How can you detect Glucose with the help of an optical biosensor?
(b) Compare microbial biosensor with an enzyme biosensor.
6 + 6 = 12

Group - D

6. (a) Explain the working principle of EN-FET.
(b) Write down the advantages of nanotechnology based biosensors.
7 + 5 = 12
7. (a) Describe the working principle of an ion selective electrode.
(b) Describe the working principle of piezo-electric biosensor.
6 + 6 = 12

Group - E

8. (a) Explain two examples of heavy metal determination in soil by inhibition based enzymatic biosensor.
(b) How biosensor is used for BOD measurement of wastewater.
8 + 4 = 12
9. (a) Describe in detail, three examples of biosensor application in defence sector.
(b) Explain how organic acids can be detected in a food sample using a biosensor.
6 + 6 = 12