

**BIOSENSOR
(BIOT 4124)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

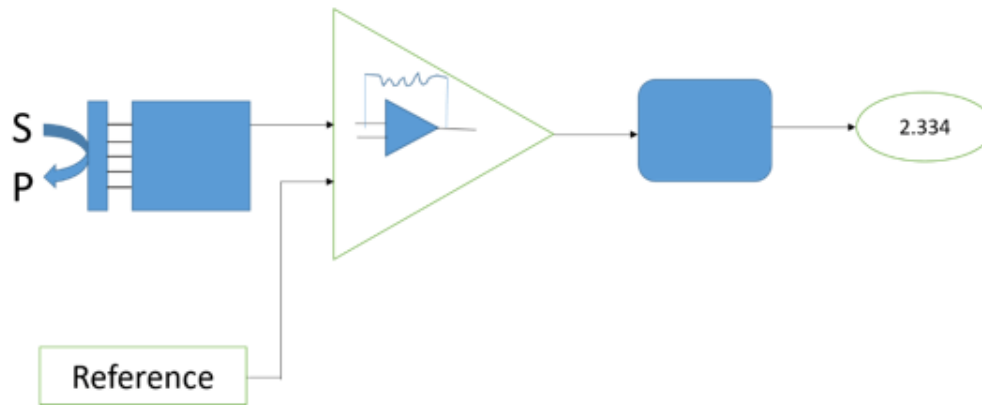
*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

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 of the following is not a Bio-recognition element?
(a) Enzymes (b) Antibody
(c) Nucleic acid (d) Mercury
- (ii) Which region of antibody binds with antigen?
(a) Fab (b) Fc
(c) Both of them (d) None of the above
- (iii) Which generation of a biosensor needs oxygen for its operation
(a) 1st Generation (b) 2nd Generation
(c) 3rd Generation (d) 4th Generation
- (iv) Biosensors which measures the change in current is known as
(a) Amperometric biosensor (b) Electrochemical biosensor
(c) Calorimetric biosensor (d) Piezoelectric biosensor
- (v) Evanescent waves are formed in
(a) Calorimetric Biosensor (b) Optical Biosensor
(c) Amperometric Biosensor (d) Potentiometric Biosensor
- (vi) Biosensors are used in
(a) Medical field (b) Agricultural field
(c) Pollution monitoring (d) All of the above
- (vii) _____ is measured by a biosensor consisting of silicon wafer pH sensitive layer on which penicillinase enzyme is immobilised
(a) Penicillin (b) Glucose
(c) Hormones (d) Sucrose

(viii) What does the following diagram represent?



- (a) Packed bed reactor
 (b) Schematic diagram showing the main components of a biosensor
 (c) Chromatography
 (d) Lock and key model

(ix) 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

(x) Substances which reduce the rate of enzyme catalyzed reactions are known as

- (a) Substrates
 (b) Enzymes
 (c) Products
 (d) Inhibitors.

Group- B

2. (a) Illustrate the variations on the biological / biochemical component of a biosensor. [(CO1, CO3)(Remember/LOCQ)]

(b) State the properties of an ideal biosensor. [(CO1) (Remember/LOCQ)]

(c) State few disadvantages of biosensor. [(CO1) (Analyse/IOCQ)]

4 + 6 + 2 = 12

3. (a) Discuss the method of immobilization of enzymes by entrapment method.

[(CO2) (Remember/LOCQ)]

(b) Draw and explain the plot of reaction velocity vs substrate concentration at different enzyme loading for an enzyme biosensor. [(CO2) (Critique/HOCQ)]

6 + 6 = 12

Group - C

4. (a) Discuss on the Wearable biosensors. [(CO5) (Analysis/IOCQ)]

(b) Describe the characteristics of Non-invasive biosensor. [(CO3) (Analysis/IOCQ)]

6 + 6 = 12

5. (a) Explain the working principle of Bananatrode. [(CO3) (Analyze/IOCQ)]
(b) Illustrate with an example the use of microbes in a biosensor.
[(CO3) (Illustrate/HOCQ)]
6 + 6 = 12

Group - D

6. (a) What do you mean by BIO-FET? [(CO4) (Remember/LOCQ)]
(b) Explain the working principle of ENFET. [(CO4) (Explain/IOCQ)]
(c) Design the process of detecting DNA hybridization with the help of Potentiometric biosensor. [(CO4) (Design/HOCQ)]
2 + 5 + 5 = 12
7. (a) A 10 KΩ NTC thermistors has a B value of 3455 between the temperature range of 25°C to 100°C. Calculate its resistive value at 100°C. Data Given: B=3455, R1=10 KΩ at 25°C. [(CO4) (Evaluate/HOCQ)]
(b) Discuss the principle of Ion selective electrode. [(CO4) (Analyze/IOCQ)]
5 + 7 = 12

Group - E

8. (a) Define inhibition based biosensor. State an application of this type of biosensor in environmental pollution monitoring. [(CO6, CO5)(Analyse/IOCQ)]
(b) Discuss on the application of biosensor in food packaging.
[(CO5) (critique/HOCQ)]
(2 + 5) + 5 = 12
9. (a) Explain the method of determination of BOD concentration in wastewater.
[(CO5) (Analyse/IOCQ)]
(b) What is bio-weapon? How is it detected by a biosensor?
[(CO5) (Understand/LOCQ)]
6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	25%	46.88%	28.12%

Course Outcome (CO):

At the end of this course students will be able to:

1. State types of bio-recognition elements and describe the fundamental components required to make a viable biosensor.
2. Illustrate types of enzyme immobilization methods used to make a biosensor and immobilize it to a transducer for the construction of biosensor.

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3. Describe each types of biosensing element in relation to their uses in biosensors.
4. Understand the classification, construction and working principle of various transducers.
5. Understand the concepts, types, working principles and practical applications of important biosensors.
6. Explain the working principle of different types of inhibition based biosensors.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

Department & Section	Submission Link
AEIE/CHE/ CSE	https://classroom.google.com/c/NDU00TAyODgyNzA2/a/NDU00TA3NDIwMDUy/details