

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2025

B.Tech-VIII Semester (Open Elective)

COURSE CODE (CREDITS): 21B1WPH831 (03)

MAX. MARKS: 35

COURSE NAME: Biosensors

COURSE INSTRUCTORS: Ragini Raj Singh

MAX. TIME: 2 Hours

**Note:** (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Calculators are allowed.

Q.No	Question	CO	Marks
Q1	<p>(a) Explain the difference between systematic and random errors. Provide one example of each.</p> <p>(b) Why is it important to perform repeated measurements in experiments?</p> <p>(c) Describe what a histogram can reveal about a set of measurement data.</p>	2	2  1.5  1.5
Q2	<p>(a) A physical quantity was measured five times yielding the following values (in units): 10.1, 10.4, 10.2, 10.3, 10.0. Calculate the:</p> <ol style="list-style-type: none"> <li>Mean</li> <li>Standard deviation</li> <li>Variance</li> </ol> <p>(b) A voltmeter consistently reads 0.5 V higher than the actual value. Is this a systematic or random error? How would you account for this in your data analysis?</p> <p>(c) Given two sets of measurements of a physical quantity from two instruments:</p> <ul style="list-style-type: none"> <li>Instrument A: Mean = 49.8, Standard Deviation = 0.6</li> <li>Instrument B: Mean = 50.2, Standard Deviation = 0.9</li> </ul> <p>Which instrument is more precise? Which is more accurate if the true value is 50.0?</p>	3	2     2  2
Q3	<p>(a) Describe the working mechanism of an ISFET-based glucose biosensor. Include the role of glucose oxidase and how the ISFET detects glucose concentration.</p>	4	4



	<b>(b)</b> Explain the working principle of a potentiometric urea biosensor. Include the biochemical reactions and signal transduction mechanism.		4
Q4	<p><b>(a)</b> Compare optical fiber biosensors with electrochemical biosensors in terms of sensitivity, response time, and suitability for remote sensing. Discuss the applications of optical fiber based sensors in medical and environmental fields.</p> <p><b>(b)</b> Discuss in detail about biological sensors</p> <ol style="list-style-type: none"> <li>I. Pacinian corpuscle</li> <li>II. Chemoreceptors</li> <li>III. Sensors for smell</li> </ol>	5	4
Q5	<p><b>(a)</b> What are</p> <ol style="list-style-type: none"> <li>I. Micro electrodes</li> <li>II. Surface electrodes</li> <li>III. Chemical electrodes</li> </ol> <p><b>(b)</b> What are the various approaches can be taken to increase the selectivity of the detecting electrode in electrochemical biosensors? Discuss in detail.</p> <p><b>(c)</b> Discuss</p> <ol style="list-style-type: none"> <li>I. Surface plasma resonance based biosensors</li> <li>II. Calorimetric biosensors</li> <li>III. Semiconducting biosensors</li> </ol>	5	3