UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2020/2021

COURSE NAME	:	BIOSENSOR: PRINCIPLE AND APPLICATION
COURSE CODE	:	MEU 10403
PROGRAMME CODE	:	MEE
EXAMINATION DATE	:	JULY 2021
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS **OPEN BOOK EXAMINATION**

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 (a) Analytical devices are comprised of a biological sensing element which converts the recognition phenomenon into a measurable signal. By using a suitable diagram, explain the basic operation of a biosensor.

(6 marks)

(b) Categorization is the human ability and activity of recognizing shared features or similarities between the elements of the experience of the world. Classify various bio-element and sensor elements for a biosensor.

(4 marks)

Q2 X-ray crystallography is a technique used for structure determination. Summarize the strategy for data collection and sufficient data required to perform the experiment.

(10 marks)

Q3 Modification of graphite rod based electrode with a bio-selective layer requires tedious preparation. Elaborate on the experimental steps involve.

(10 marks)

Q4 (a) Distinguish between a sensor and a biosensor.

(4 marks)

(b) Screen-printed electrodes (SPEs) are well-known suitable platforms for biosensors development. Evaluate the advantages of this technology in biosensor engineering by considering the design flexibility, process automation, reproducibility rate, and materials.

(6 marks)

(c) **Figure Q4(c)** shows an illustration of a typical lithography process to fabricate a biosensor from layer grown on substrate (wafer). Analyze the **THREE (3)** crucial steps used in photolithography based on the illustration given.

(10 marks)

Q5 (a) Evaluate the importance of bioreceptor in biosensor by giving **TWO (2)** examples of bioreceptors and the reaction between the bioreceptors with their variable of interests.

(10 marks)

(b) Demonstrate **THREE (3)** types of electrochemical biosensors by giving **ONE (1)** example of application for each of them.

(6 marks)

(c) Analyse the operation of pH sensor in order to measure the concentration of Hydrogen ions (H^+)

(4 marks)

Q6 (a) Glucose plays an important role in metabolic processes of a human body. A glucose sensor is a device that monitors the level of blood glucose to control and manage the disease such as diabetes mellitus.

(i) Suggest **TWO (2)** types of the biosensor used for glucose monitoring.
(2 marks)

(ii) Point out the principle of the optical-type glucose sensor.
(8 marks)

(iii) Produce the chemical reaction to describe the mechanism of the glucose sensor in **Q6(a)(ii)**.
(2 marks)

(iv) Analyse the detection of glucose by using the glucose test strips by giving the related chemical reaction.
(6 marks)

(b) Suggest and describe **TWO (2)** other applications of biosensors besides its application in the medical field.
(12 marks)

-END OF QUESTIONS –

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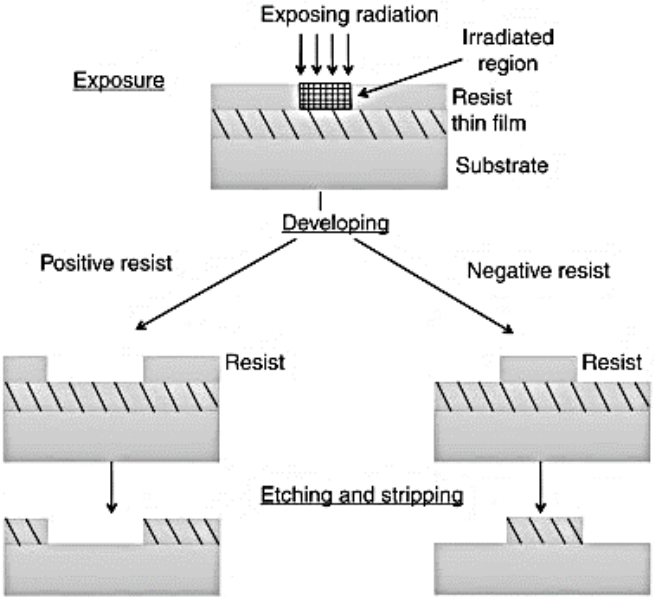

Figure Q4(c): A typical lithography process