Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME	:	MATERIAL CHARACTERZATIONS
COURSE CODE	:	BEJ 43603
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	JULY / AUGUST 2023
DURATION	:	3 HOURS

INSTRUCTION

1. ANSWER ALL QUESTIONS
2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK.**
3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

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

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Q1 (a) Predict a technique that useful to characterize the chemical and structural information of a multilayer of thin-film sample using the vibrational energy level.

(2 marks)

(b) Based on your answer in **Q1(a)**, briefly explain the operation of the predicted technique.

(4 marks)

(c) Analyse the information obtained from the expected result of the multilayer thin-film sample measured using technique in part **Q1(a)**. Support your answer with aid of a diagram.

(14 marks)

(d) Propose **TWO (2)** conditions that can utilise this type of characterisation technique.

(5 marks)

Q2 (a) Recommend the chemical and physical technique that can use to investigate the internal structure of integrated circuit (IC) such as quality, shape, and quantum densities.

(2 marks)

(b) Determine and explain in detail **THREE (3)** common sequences of sample or specimen preparation prior to the characterisation technique that recommended in **Q2(a)** answer.

(11 marks)

(c) Compare **THREE (3)** major properties differences between Scanning Electron Microscopy (SEM) and Transmission Electron Microscope (TEM). Comparison properties must consist of the sample preparation, magnification, and current application. Write your answer in a table form.

(12 marks)

Q3 (a) List **ONE (1)** real application of characterisation technique that can measure the emitted radiation.

(2 marks)

(b) Determine and analyse the application of the characterisations technique from your answer in **Q3(a).**

(5 marks)

(c) Determine and explain the most efficient mechanism to estimate the life of product.

(6 marks)

(d) **Figure Q3(d)** shows a schematic of a polycrystalline line containing grain, grain boundary, and triple point. Based on **Figure Q3(d)**, determine **TWO (2)** factor that act along the line when potential is applied.

(4 marks)

(e) Based on your answer in **Q3(d),** analyse **FOUR (4)** conditions that can be occurred due to the potential.

(8 marks)

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Q4 (a) The most important of Metal Oxide Semiconductor (MOS) device is it gate oxide structure. Classify **THREE (3)** distinct region of oxide breakdown with the aid of a diagram oxide field versus number of failure.

(8 marks)

(b) Further failure analysis of a device was examine using Ga^+ ions with a final focus tip probe is less than 10 nm diameter as shown in **Figure 4(b).** Determine **THREE (3)** common procedures from the given image.

(6 marks)

(c) **Figure Q4(c)** shows the result of the thin-film obtained from the testing method. Analyse **THREE (3)** important point from the image given.

(6 marks)

(d) From your opinion, predict why test in **Figure Q4(c)** must be carried out.

(5 marks)

-END OF QUESTIONS-

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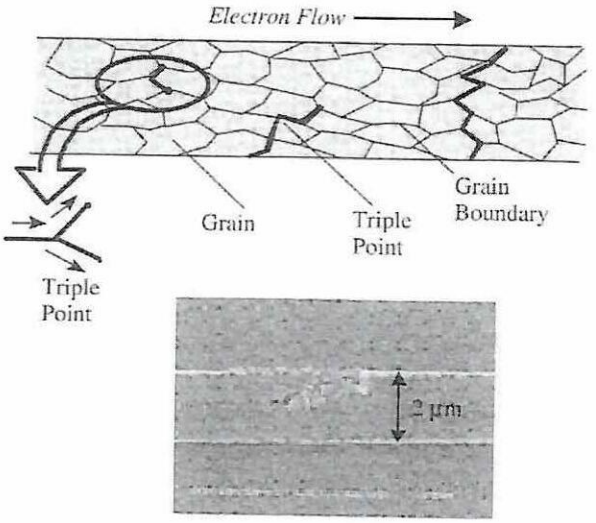

Figure Q3(d)

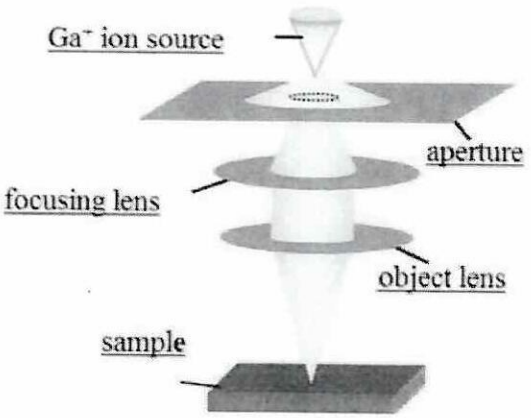

Figure Q4(b)

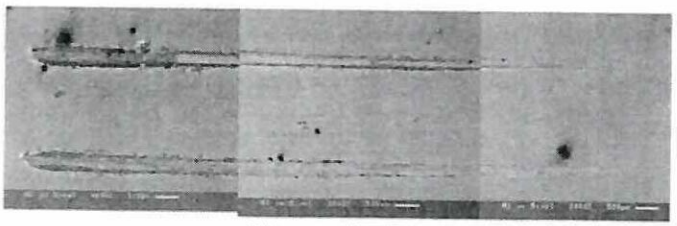

Figure Q4(c)

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