Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER I
SESSION 2020/2021

COURSE NAME	:	PHYSICS OF DIAGNOSTIC RADIOLOGY
COURSE CODE	:	BWC 40803
PROGRAMME CODE	:	BWC
EXAMINATION DATE	:	JANUARY/FEBRUARY 2021
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS **OPEN BOOK EXAMINATION**

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) State the ratio of energy converted into heat and energy converted into photon in the X-ray production.

(4 marks)

(b) Distinguish the effect of increasing the X ray parameter between voltage and current on the continuum radiation.

(4 marks)

(c) The filament inside the X-ray tube is normally made from various type of elements such as tungsten, thenium and molybdenum. Explain why this particular element is used as cathode material

(6 marks)

(d) Two of X-ray tubes are made from tungsten (W=74) and molybdenum (Mo=42).

(i) Determine which X-ray tube will produce higher intensity as both are applied with 100 keV of voltage.

(3 marks)

(ii) Sketch the shape of a continuum X-ray spectrum for both X-ray tubes.

(3 marks)

Q2 (a) Distinguish between the function of the collimator and focusing cup in X-ray generator component.

(4 marks)

(b) Distinguish between stationary and rotating anode in X-ray tube.

(4 marks)

(c) Define the term of "anode heel effect" and explain in detail why this particular effect can reduce the X-ray intensity.

(6 marks)

(d) **Figure Q2(d)** shows a graph of transmitted intensity versus thickness absorber. Based on this graph, determine the;

(i) material absorption coefficient, μ.

(3 marks)

(ii) transmitted intensity at 16 cm

(3 marks)

Q3 (a) List **FIVE (5)** steps of quality control procedure in diagnostic radiology.

(5 marks)

(b) Define the term of X-ray tube rating charts and state the rule of using these charts.
(5 marks)

(c) (i) In a radiography process, 10 exposures have been done within 0.43 second at X ray setting of 80 kVp and 200 mA using high frequency X-ray unit. If the rectification constant, *Cr* is 1.43, calculate the heat unit (HU) produced by this X-ray tube.
(5 marks)

(iii) Anode cooling chart for **Q3(c)(i)** is shown in **Figure Q3(c)**. Determine how long does it take for this X ray tube to operate for another exposure.
(5 marks)

Q4 (a) Classify the basic components for projection radiography system.
(4 marks)

(b) Explain in detail the image formation mechanism for the projection radiography system.
(6 marks)

(c) Explain in detail how X-ray Computed Tomography (CT) works.
(4 marks)

(d) There are four types of CT scanner generation. Differentiate between the first and the fourth CT generation.
(6 marks)

Q5 (a) Latent image formation is different in conventional radiography (CR) and digital radiography (DR). Differentiate the mechanism of image formation between CR and DR.
(4 marks)

(b) In radiography imaging, there are two types of digital radiography (DR) imaging techniques. Differentiate between the mechanism of indirect and direct digital radiography.
(4 marks)

(c) Deduce the **FIVE (5)** factors that contribute to the image quality of the radiography.
(5 marks)

(d) (i) The image resolution for various kind of radiography imaging technique as shown in **Figure 5(d)**. Compare the value of resolution for each imaging technique and suggest the best technique that give sharp and higher resolution image.
(3 marks)

(ii) Geometric factor is one of the factor that affect the quality of radiography imaging. Predict the effect of the image formation as the source to image distance (SID) and object to image distance (OID) are varied from shorter to longer distance.

(4 marks)

END OF QUESTIONS

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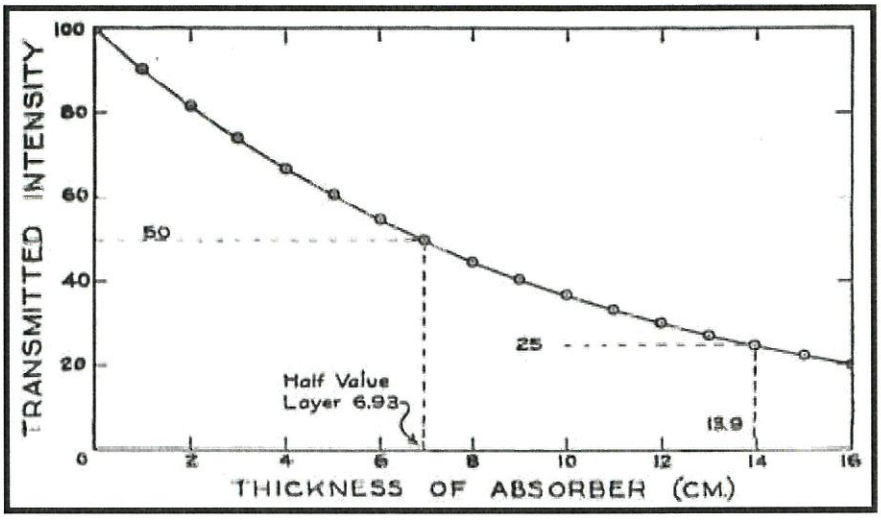

Figure Q2(d)

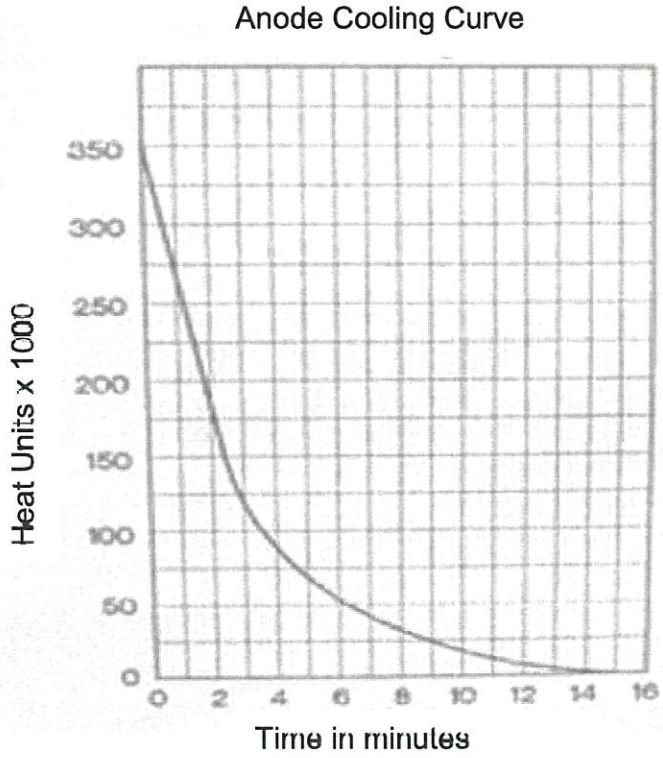

Figure Q3(c)

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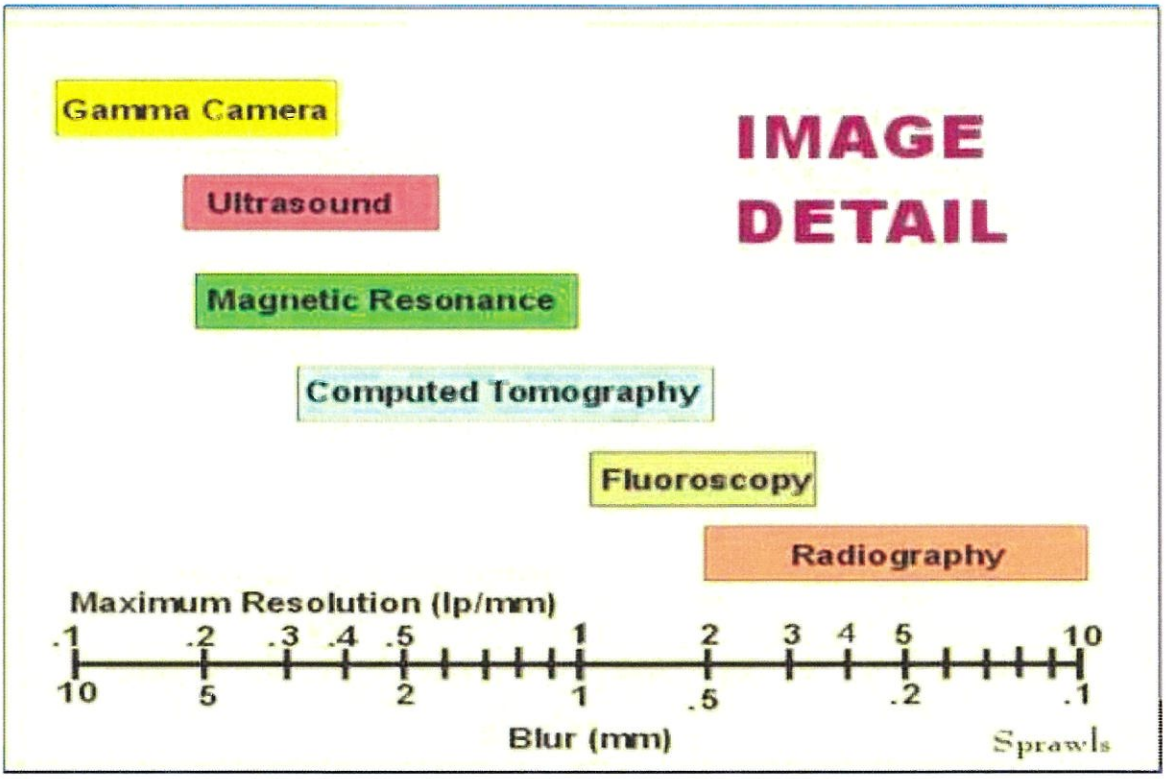

Figure Q5(d)