



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2014/2015**

COURSE NAME : RADIATION BIOPHYSICS  
COURSE CODE : BWC 31703  
PROGRAMME : 3 BWC  
EXAMINATION DATE : JUNE 2015 / JULY 2015  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER ALL QUESTIONS

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

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- Q1**
- (a) Explain **Bohr postulates** on hydrogen atom. (4 marks)
- (b) Explain **Max Planck Theory** on atom. (4 marks)
- (c) Explain **de Broglie duality principle**. (6 marks)
- (d) Differentiate between **Bremsstrahlung X-ray** and **characteristic X-ray** (6 marks)
- Q2**
- (a) Two groups of element nuclide are as follows. Determine a specific name of this group and differentiate between these two groups.
- i)  $H_1^3$  and  $He_2^4$
- ii)  $H_1^2$  and  $He_2^3$  (4 marks)
- (b) Explain the Q-value concept (4 marks)
- (c) Estimate the mass defect and binding energy for uranium-235. One uranium-235 atom has a mass of 235.043924 amu. Assume that 1 amu is equivalent to 931.5 MeV of energy. (Given: the mass of Lithium-7 = 7.016003 amu, mass of a proton,  $m_p=1.007277$  amu, mass of a neutron,  $m_n=1.008665$  amu and mass of an electron,  $m_e=0.000548597$  amu) (6 marks)
- (d) Estimate the Q-value for the following nuclear reaction, and then, evaluate whether it is exothermic or endothermic reactor.
- $${}^7_3\text{Li} + {}^1_1\text{H} \rightarrow 2 {}^4_2\text{He}$$
- (Given: The exact mass of  ${}^7_3\text{Li}$  isotope = 7.01601 amu,  ${}^1_1\text{H} = 1.00738$  amu and  ${}^4_2\text{He} = 4.00260$  amu) (6 marks)

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- Q3**
- (a) Categorize natural background sources of radiation and explain in detail for each category. (4 marks)
- (b) Categorize man made background sources of radiation and explain in detail for each category. (4 marks)
- (c) Biological effect of radiation on living tissue may lead to **prompt effect** and **delayed effect**. Differentiate both effects. (4 marks)
- (d) **Compton scattering** and **photoelectric effects** are very important in biological imaging techniques.
- (i) Differentiate between these two effects?
- (ii) Point out on how both effects can improve the image quality? (8 marks)
- Q4**
- (a) Define the following terms:
- (i) Pair product process.
- (ii) Interaction probability (4 marks)
- (b) The interaction between photon and matter will lead to energy loss mechanism. List all the possible mechanisms in this interaction and explain in detail for each. (4 marks)
- (c) (i) Differentiate the term of Radiation Absorbed Dose (RAD) and Roentgen Equivalent Man (REM).
- (ii) Convert a radiation dose of 10 micro Sievert ( $\mu\text{Sv}$ ) to millirem (mrem). (4 marks)
- (d) A nuclear reactor operator has received the dose rate at 50 millirem per hour. The dose“limit” inside this reactor is 100 millirem. Estimate
- (i) the radiation dose he will receive after  $\frac{1}{2}$  hour.
- (ii) his stay time inside this reactor. (8 marks)

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- Q5**
- (a) Differentiate between elastic and inelastic neutron scattering (6 marks)
  - (b) Elaborate the term of “neutron capture”. (4 marks)
  - (c) Elaborate the term of “carcinogenesis” (4 marks)
  - (d) Differentiate between stochastic and no stochastic effects. (6 marks)

- END OF QUESTION -