

UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2004/2005

February · March 2005

ZCE 538/2 - Radiobiology and Radiation Chemistry
[Radiobiologi dan Kimia Sinaran]

Duration 2 hours
[Masa 2 jam]

Please check that the examination paper consists of **THREE** pages of printed material before you begin the examination

*[Sila pastikan bahawa kertas peperiksaan ini mengandungi **TIGA** muka surat yang bercetak sebelum anda memulakan peperiksaan ini]*

Instruction Answer all **FOUR** questions Students are allowed to answer all questions in Bahasa Malaysia or in English

Arahan *Jawab kesemua **EMPAT** soalan Pelajar dibenarkan menjawab semua soalan sama ada dalam Bahasa Malaysia atau Bahasa Inggeris]*

- 1 (a) Describe in detail how a 'spleen colony assay' (colony forming bone marrow cells) is performed experimentally to obtain a dose response curve
[Huraikan dengan teliti bagaimana 'spleen colony assay' (colony forming bone marrow cells) dilakukan secara eksperimen untuk mendapati lengkung kehidupan dos]
 (30/100)
- (b) Draw this dose response curve on a linear-linear scale and on a logarithm-linear scale Explain the difference Label D_0 , D_q and n in the cell survival curve Explain D_0 and D_q
[Lakarkan lengkung kehidupan pada skala linear-linear dan pada skala logarithm-linear Terangkan perbezaannya Labelkan D_0 , D_q dan n dalam lengkung itu Terangkan D_0 dan D_q]
 (40/100)
- (c) Explain what is meant by TCD_{50} and tumor growth delay
[Terangkan maksud TCD_{50} dan 'tumor growth delay']
 (30/100)
- 2 (a) Compare and contrast a spheroid model with a human tumor according to Thomlinson & Gray
[Bandingkan model 'spheroid' dengan model tumor manusia oleh Thomlinson & Gray]
 (40/100)
- (b) Describe two methods to synchronise cell population
[Terangkan dua kaedah untuk 'synchronise' populasi sel]
 (30/100)
- (c) Describe the importance of oxygen in fractionated radiotherapy treatment of tumor
[Huraikan kepentingan oksigen dalam rawatan radioterapi 'fractionation' bagi suatu tumor]
 (30/100)
- 3 (a) Explain the linear quadratic model State its relevance to early responding and to late responding tissue in radiotherapy treatment
[Terangkan model linear-kuadratik Nyatakan relevansinya pada 'early responding' dan pada 'late responding' tisu dalam rawatan radioterapi]
 (30/100)

- (b) State the 4Rs in radiotherapy Explain how the 4Rs affect treatment planning for a rapidly proliferating tumor
[Nyatakan 4Rs dalam radioterapi Terangkan bagaimana 4Rs memberi kesan dalam rawatan pada tumor yang tumbuh dengan cepat]
 (30/100)

- (c) In a conventional treatment, 70 Gy in 35 fractions is given for 5 days per week A hyperfraction treatment is given twice daily 6 hours apart for 5 days per week The total treatment time is 7 weeks You have to choose to give hyperfraction of either 1.2 Gy/F or 1.4 Gy/F Which one would you choose Why?
[Dalam rawatan 'conventional' 70 Gy dalam 35 fraction diberi bagi 5 hari seminggu Dalam rawatan 'hyperfraction' sinaran diberi dua kali sehari dalam julat masa 6 jam untuk 5 hari seminggu Jumlah masa rawatannya 7 minggu Dalam hyperfraction, anda perlu pilih 1.2 Gy/F atau 1.4 Gy/F Manakah yang anda pilih? Mengapa?]

$\alpha/\beta = 10$ Early responding tissue

$\alpha/\beta = 3$ Late responding tissue

(40/100)

- 4 (a) How does low dose rate brachytherapy differ from high dose rate external therapy in terms of radiobiology
[Bagaimana kadar dos rendah dalam brachytherapy berbeza dari kadar dos tinggi dalam radioterapi luar dari segi radiobiologi]
 (40/100)

- (b) Explain the following terms
[Huraikan ungkapan berikut]

(i) oxygen enhancement ratio (OER)
[nisbah oksigen enhancement]

(ii) relative biological efficiency (RBE)
[kecekapan relatif biologi]

(iii) hyperfractionation and accelerated fractionation
[hyperfractionation dan accelerated fractionation]

(30/100)

- (c) Describe the factors influencing cell killing by hyperthermia
[Huraikan faktor-faktor yang mempengaruhi kematian sel oleh hipertermia]

(30/100)