UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2004/2005

February - March 2005

ZCE 538/2 - Radiobiology and Radiation Chemistry
[Radiobiologi dan Kintia 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 EMPATsoalan. Pelajar dibenarkan menjawab semua soalan sama ada dalam Bahasa Malaysia atau Bahasa Inggeris.]*

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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_o, Dq and n in the cell survival curve. Explain D_o and Dq.
[Lakarkan lengkung kehidupan pada skala linear-linear dan pada skala logarithm-linear. Terangkan perbezaannya. Labelkan D_o, Dq *dan* n *dalam lengkung itu. Terangkan* D_o *dan* Dq.7

(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.
[Bandingan model 'spheroid' dengan model tumor manusia oleh Thomlinson & Gray.]

(40/100)

(b) Describe two methods to synchronise cell population. (30/100)
[Terangkan dua kaedah untuk 'synchronise' populasi self

(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-kuadratic. Nyatakan relevansnya pada 'early responding' dan pada 'late responding' tisu dalam rawatan radioterapi.]

(30/100)

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(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 brachytherapi berbeza dari kadar dos tinggi dalam radioterapi luar dari segi radiobiologi.f

(40/100)

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

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

(ii) relative biological efficiency (RBE)
[kecekapan relatifbiologi]

(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)

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