UNIVERSITI SAINS MALAYSIA

Peperiksaan Kursus Semasa Cuti Panjang
Sidang Akademik 2003/2004

April 2004

ZCE 538/2 - Radiobiology and Radiation Chemistry

[Radiobiologi dan Kimia Sinaran]

Masa : 2 jam

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

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

Instruction: Answer all **FOUR (4)** 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 survival curve for mouse skin cells is obtained experimentally.

[(a) Huraikan dengan teliti bagaimana lengkung kehidupan untuk sel kulit tikus didapati secara eksperimen.]

(40/100)

(b) The extrapolation number n cannot be extrapolated from the survival curve in (a). Why? Explain how it can be indirectly estimated.

[(b) Nombor ekstrapolasi n tidak boleh didapati dari lengkung kehidupan dalam (a). Mengapa? Terangkan bagaimana ia boleh didapati secara tak terus.]

(30/100)

(c) Explain what is meant by TCD_{50} and tumor growth delay.

[(c) Terangkan maksud TCD_{50} dan 'tumor growth delay'?]

(30/100)

2. (a) State the various evidence that indicate DNA is the radiation target which finally leads to cell death.

[(a) Nyatakan beberapa pembuktian yang menunjukkan DNA adalah sasaran sinaran yang akhirnya mengakibatkan maut sel.]

(35/100)

(b) Describe the importance of oxygen in fractionated radiotherapy treatment of tumor.

[(b) Terangkan kepentingan oksigen dalam rawatan 'fractimation' radioterapi bagi tumor.]

(35/100)

(c) Define oxygen enhancement ratio (OER). Ilustrate OER for a in vitro and in vivo survival data curve.

[(c) Takrifkan nisbah oksigen tambah (OER). Tunjukkan OER bagi 'in vitro' dan 'in vivo' dalam lengkungan data kehidupan.]

(30/100)

3. (a) The linear quadratic model rather than the NSD model has been used in calculating isoeffective radiotherapy schedules. Why?

[(a) Model linear kuadratik lebih digunakan daripada model NSD untuk menghitung rawatan radioterapi kesan sama. Mengapa?]

(30/100)

(b) For a rapidly proliferating tumor, would you choose either a hyperfraction radiotherapy or a accelerated radiotherapy. Explain.

[(b) Bagi tumor yang tumbuh dengan cepat, anda akan pilihkan radioterapi hiperfraction atau radioterapi accelerated. Terangkan.]

(30/100)

(c) In a radiotherapy treatment, the planned treatment was 60Gy in 30 fractions. After 6 fractions it was discovered a total dose of 18 Gy was given by mistake. It was decided to complete the treatment with the same total number of 30 fractions.

[(c) Dalam rawatan radioterapi, rawatan yang dicadangkan adalah 60Gy dalam 30 fractions. Selepas 6 fractions, didapati jumlah dos 18 Gy salah diberikan. Rawatan itu masih disambungkan dengan jumlah 30 fraction.]

(i) Calculate the fraction size used for the remaining fraction. Dose limiting tissue is late fibrosis where $\alpha/\beta = 3$.

[(i) Hitungkan saiz fraction yang digunakan dalam fraction yang tinggal. Tisue bagi dos terhad adalah late fibrosis $\alpha/\beta = 3$.]

(ii) Is there a risk of radiation damage in the spinal cord? Explain.

[(ii) Adakah ini memberi 'risk of radiation damage' pada spinal cord? Jelaskan.]

α/β for spinal damage = 2

(40/100)

4. (a) Explain the following terms:

[(a) Terangkan ungkapan-ungkapan berikut:]

(i) Relative biological efficiency (RBE)

[(i) Kecekapan biologi relatif (RBE)]

(ii) accelerated repopulation

[(ii) populasi 'accelerated']

(iii) linear energy transfer (LET)

[(iii) pemindahan tenaga linear (LET)]

(30/100)

(b) Explain the radio ratio biological basis for high LET radiotherapy.

[(b) Terangkan sebab-sebab radiobiologi untuk radioterapi LET tinggi.]

(35/100)

(c) State an alternative treatment in combination with radiation which can enhance tumor cell killing. Describe the factors influencing cell killing in these combined treatments.

[(c) Nyatakan rawatan alternatif yang bergabung dengan sinaran yang akan tambahkan sel tumor maut. Huraikan faktor-faktor yang mempengaruhi sel maut dalam gabungan rawatan ini.]

(35/100)

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