UNIVERSITY COLLEGE LONDON

University of London

EXAMINATION FOR INTERNAL STUDENTS

For The Following Qualification:-

M.Sc.

M.Sc. Radiation Biology: Paper 2

COURSE CODE	:	**RDBL0002**
DATE	:	**02-MAY-03**
TIME	:	**10.00**
TIME ALLOWED	:	**3 Hours**

03-N0240-3-30

TURN OVER

Please use a SEPARATE ANSWER BOOK for EACH QUESTION

Standard electronic calculators may by used.

Answer FIVE questions

1. Explain why charged particles have a limit to their depth of penetration but a beam of X- or gamma-rays can never be stopped completely.

   What parameters are used to describe the penetration of charged particles in a material? Describe, with the aid of suitable diagrams, how you would measure any of these parameters and sketch the result that you would expect to obtain.

   What precautions would need to be taken in the experiment so that the depth of penetration could be accurately determined?

2. Describe the methods of biological dosimetry using peripheral blood lymphocytes within 1 year after suspected exposure and more than 5 years after exposure. How is the method calibrated? How can the homogeneity of dose distribution be estimated?

3. List the basic features of the three major groups of tandemly repetitive sequences in eukaryotic DNA. Outline the technique used to detect ESTR mutations in mouse cells. Describe the advantages and disadvantages of mutation analysis in repeat sequences as a marker for radiation exposure.

4. What does the molecule p53 do? Compare the response of a normal cell containing wild-type p53 and a tumour cell with mutated p53 when these are irradiated.

5. Describe the concept and problems of radiation – mediated gene therapy of cancer.

6. Describe the radiochemical mechanism of the oxygen effect in radiotherapy. Describe the physiological and anatomical mechanisms of acute and of chronic hypoxia in tumours. Reoxygenation is assumed to be an important factor facilitating the cure of tumours by radiotherapy. Explain possible mechanisms and experiments to study the kinetics of reoxygenation.

TURN OVER

7. The type of developmental damage and its risk depend on the stage of pregnancy. Describe the experimental evidence for this statement. Which types of developmental damage after irradiation in utero have been observed in human populations? What is known about the pathogenetic mechanism and about the dose dependence of this risk in various stages of the intrauterine development?

8. The estimation of genetic risk after radiation exposure to the gonads is based on the seven locus method. Describe the experimental system and the results of the experiments performed in mice. How are these data used to estimate genetic risk to human populations?

9. Calculate the dose rate to a 20 g thyroid from the beta-component of the radiation from 850 MBq of iodine-131 contained in it. Indicate how the dose rate from the gamma component can be determined.
Iodine-131: mean beta energy = 188 keV; gamma energy = 364 keV; 1 eV = 1.6 x 10^{-19} J.

10. During follow-up of patients cured by radiotherapy from cancer, new cancers are frequently diagnosed. Describe the possible causes of those cancers and indicate probability of causation for each potential cause. Describe the epidemiological evidence that curative radiotherapy may induce second cancers and leukaemias.

END OF PAPER