**August, 2015**

**STATE MEDICAL FACULTY OF WEST BENGAL**

**Preliminary Examinations**
**for Diploma in Radiotherapeutic Technology : DRT (Tech) Course**

## Paper – I
## Radiotherapy Physics – Part I

Time : 3 Hours | Full Marks : 80

*Question 1 & 6 are Compulsory.*
*Answer any Two from Question No. 2 to 5 and any Four from Question No. 6*

Q-1) Write down the correct answer: **10x1 = 10**

i) In Current electricity, Ohm's law is obeyed by all:
- a) Solids
- b) Metals
- c) Gasses

ii) Gauss is the unit of:
- a) Magnetic flux density in SI system
- b) Electric field intensity
- c) Magnetic flux density in CGS system

iii) An electric motor:
- a) Generates mechanical energy
- b) Converts mechanical energy into electrical energy
- c) Converts electrical energy into mechanical energy

iv) Point out the wrong statement: Electromagnetic waves:
- a) Are transverse wave
- b) Travel with speed of light in free space
- c) Travel with same speed in all medias

v) Cathod rays are:
- a) Electromagnetic waves
- b) Moving electrons
- c) Moving negative ions

vi) Highest energy photoelectrons will be produced by:
- a) Visible light
- b) Ultra-violet rays
- c) ɾ rays

vii) In an X-ray tube, the intensity of emitted X-ray beam increases by:
- a) Increasing filament current
- b) Increasing potential difference
- c) Decreasing potential difference

viii) Radioactive substance do not emit:
- a) Electrons
- b) Protons
- c) Electromagnetic radiation

ix) Which of the following particle do not exist in the $_{92}U^{238}$ nucleus?
- a) 92 protons
- b) 92 electrons
- c) 146 neutrons

x) An α –particle is emitted by the nucleus of radium $_{88}Ra^{226}$. The atomic number Z and the mass number A of the residual atom are:
- a) Z = 84, A = 224
- b) Z = 86, A = 224
- c) Z = 86, A = 222

**Contd.....P2/**

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## Paper – I
## Radiotherapy Physics – Part I

*Answer any Two from Question No. 2 to 5 and any Four from Question No. 6*

**2x20 = 40**

Q2. Define Electromagnetic waves. State four common properties of the Electromagnetic waves. What do you understand by quantum nature of light? Describe in brief Compton's scattering. Compare graphically importance of different interaction mechanisms of ionization radiation relevant to radiation therapy. Define absorbed dose and its unit. Distinguish between ionization and excitation. Define Roentgen.

2+2+2+3+4+3+3+1 = 20

Q3. State Bohr's postulates. Using them derive an expression for the stationary energy levels of electron in Hydrogen atom. What are Isotopes? Give an example of Isotopic nuclei. Define mass defect of a nucleus. How is it related to Binding Energy of the nucleus? State principle of production of X-ray. Define characteristic X-ray.

3+4+2+1+2+2+4+2 = 20

Q4. Define capacitance. Define also its SI unit. Name three dielectrics commonly used in capacitor. Describe any two uses of capacitor. State Joule's Law. Define Tesla and Gauss. What is alternating current? Show that $i_{rms}=i_O/\sqrt{2}$, where symbols have their usual meaning. What is Power Factor of A.C. Circuit? Explain the principle, construction and working of a Transformer? Why is its core laminated?

2+1+2+1+1+2+2+3+2+3+1 = 20

Q5. Define artificial radioactivity. Define decay constant of a radioactive material. Give its unit. Starting with the law of radioactive disintegration, show that: $N=N_0e^{-\lambda t}$ where terms have their usual meaning. Name two natural radioactive materials. Define specific activity. State the properties of Radium and its daughter products. State the principle of operation of gas filled detectors. Define Half Value Layer.

2+2+1+4+2+2+3+3+1 = 20

Q6. Write short notes on the following (**Any Four**):- **4 x 7½ = 30**

a) Mutual and Self Induction
b) Radioactive equilibrium
c) Principle of measurement of gamma rays
d) Basic principle of CT scan
e) Photoelectric effect.

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## Paper – II
**Anatomy, Physiology & Principles of Pathology in relation to Radiotherapy**

Time : 3 Hours | Full Marks : 80

*Question 1 & 6 are Compulsory.*
*Answer any Two from Question No. 2 to 5 and any Four from Question No. 6*

Q-1A) Write down the correct answer: **5x1 = 5**

i) Most radiosensitive phase of cell cycle:

a) G1 phase
b) S phase
c) G2 phase
d) M phase

ii) Which of the following is a Ball and Socket type joint?

a) Shoulder joint
b) Elbow joint
c) Knee joint
d) Ankle joint

iii) Sebaceous glands are found in:

a) Heart
b) Lungs
c) Central Nervous System
d) Skin

iv) Chymotripsin is secreted from:

a) Stomach
b) Small intestine
c) Pancreas
d) Large intestine

v) Tympanic membrane is found in:

a) Anterior $^{2}/_{3}$ of Tongue
b) Auditory canal
c) Fallopian tube
d) Floor of mouth

Q-1B) Match the following: **5x1 = 5**

| | | |
|---|---|---|
| i) | Scapula | a) Pituitary |
| ii) | Growth hormone | b) Neoplasia |
| iii) | Elbow | c) Cell cycle |
| iv) | Mitosis | d) Flat bone |
| v) | Papilloma | e) Hinged joint |

**Contd.....P2/**

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## Paper – II
**Anatomy, Physiology & Principles of Pathology in relation to Radiotherapy**

*Answer any Two from Question No. 2 to 5 and any Four from Question No. 6*

**2x20 = 40**

Q2. Describe the anatomy of right and left lung with labeled diagram. How many compartments are there in the Mediastinum? Enumerate the contents of each compartment of Mediastinum.

10+2+8 = 20

Q3. Classify joints. Describe with labeled diagram the characteristic features of a Ball and Socket Joint. State the functions of the Vertebral Column.

5+10+5 = 20

Q4. Define Neoplasia. Describe the characteristic features of benign and malignant neoplasms. What is Metastasis? What is the commonest male and female malignancy in India?

4+8+4+4 = 20

Q5. Draw a labeled diagram of a typical cell showing the internal organelles in the cytoplasm and in the nucleus. Describe briefly the functions of a cell? What is Cell cycle? Enumerate different phases of cell cycle.

8+8+2+2 = 20

Q6. Write short notes on the following (**Any Four**):- **4 x 7½ = 30**

a) LET
b) Reoxygenation
c) Therapeutic gain
d) Necrosis
e) Retromolar trigone
f) Apoptosis.

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