

द्वितीय पत्र - सेवा सम्बन्धी
Section A- 30 Marks

1. CLINICAL ONCOLOGY

1.1 TUMORS

- 1.1.1 Tumor definition
- 1.1.2 Benign tumors and malignant tumors
- 1.1.3 Spread of tumors

1.2 CLINICAL PRESENTATION

- 1.2.1 Symptoms & signs
- 1.2.2 Diagnostic procedure
 - 1.2.2.1 Hemogram
 - 1.2.2.2 Biochemical
 - 1.2.2.3 Tumor marker
 - 1.2.2.4 Radiological- X-ray, U.S.G., C.T, M.R.I
 - 1.2.2.5 Pathological – FNAC, FNAB, Incision biopsy, excision biopsy
 - 1.2.2.6 Surgery

1.3 STAGING

- 1.3.1 TNM Classification

1.4 MALIGNANCIES & TREATMENT

- 1.4.1 Ca- Brain
- 1.4.2 Ca-Larynx
- 1.4.3 Ca-Tongue
- 1.4.4 Ca-Breast
- 1.4.5 Ca-Lung
- 1.4.6 Ca-Cervix
- 1.4.7 Ca-Oesophagus

Section B- 20 Marks

2. RADIOTHERAPY TECHNIQUE

2.1 PRINCIPALS OF RADOTHERAPY

- 2.1.1 Tumor histology
- 2.1.2 Grade, sensitivity,
- 2.1.3 Anatomical site, critical organs
- 2.1.4 General condition of the patient, extent of tumor, previous treatments
- 2.1.5 Radical/Palliative and prophylaxis.

2.2 TYPES AND METHODS OF RADIOTHERAPY

- 2.2.1 Tele-therapy Technique
- 2.2.2 Brachytherapy Technique

2.3 RADIOTHERAPY RESOURCES

- 2.3.1 Low energy beams
- 2.3.2 High energy beams
- 2.3.3 Electron beams

2.4 TREATMENT PLANNING

- 2.4.1 Tumor localization and verification
- 2.4.2 Isodose Curves

- 2.4.3 Single field, parallel opposed field, multiple field.
- 2.4.4 Rotation therapy
- 2.4.5 Beam Modification

Section C- 20 Marks

3. RADIOTHERAPY PHYSICS

3.1 ATOMIC STRUCTURE

- 3.1.1 General introduction
- 3.1.2 Electron shells & energy levels
- 3.1.3 Excitation and ionization.
- 3.1.4 Mass number, atomic number, atomic mass unit, binding energy
- 3.1.5 Emission of electromagnetic waves, spectra.
- 3.1.6 Properties of electromagnetic waves.
- 3.1.7 Properties of electromagnetic waves.
- 3.1.8 Concept of photon and quanta.
- 3.1.9 Nuclear fission and fusion.

3.2 RADIOACTIVITY

- 3.2.1 Radioactive elements.
- 3.2.2 Radioactive series, different types of radioactive disintegration.
- 3.2.3 Properties of radioactive particles.
- 3.2.4 Radioactive decay law.
- 3.2.5 Half-life, mean life.
- 3.2.6 Nuclear stability.
- 3.2.7 Alpha, beta and gamma disintegration

3.3 X-RAYS & GAMMA RAYS

- 3.3.1 Historical background of x-rays.
- 3.3.2 Mechanism & production of x-rays.
- 3.3.3 Properties of x-rays.
- 3.3.4 Continuous and characteristic spectra.
- 3.3.5 Gamma rays
- 3.3.6 Properties of gamma rays.

3.4 INTERACTION OF RADIATION WITH MATTER

- 3.4.1 Classical scattering.
- 3.4.2 Photoelectric interaction.
- 3.4.3 Compton scattering.
- 3.4.4 Pair production.
- 3.4.5 Transmission of a homogenous and heterogeneous beam through matter.

3.5 CLINICAL DOSIMETRY

- 3.5.1 Radiation absorbed dose.
- 3.5.2 Relationship between Kerma, Exposure and absorbed dose.
- 3.5.3 Cavity theory.
- 3.5.4 Measurement of absorbed dose.
- 3.5.5 Phantom.
- 3.5.6 Dose calibration parameters.
- 3.5.7 Depth dose distribution.
 - 3.5.7.1 Percentage depth dose.

3.5.7.2 Tissue-air ratio.

3.5.7.3 Tissue maximum ratio.

3.5.8 Principle of ionization chamber & electrometer.

3.6 RADIATION BIOLOGY

3.6.1 Cell cycle,

3.6.2 Effect of radiation on the normal cell, tissue and organs.

3.6.3 Radiation sensitivity.

3.6.4 Physical and biological factors affecting radiation sensitivity

3.6.4.1 LET

3.6.4.2 RBE

3.6.4.3 OER

3.6.5 Cell survival curves

3.6.6 $4R^s$ of radiobiology.

Section D- 30 Marks

4. RADIOTHERAPY EQUIPMENT & QUALITY ASSURANCE

4.1 TELETHERAPY EQUIPMENTS

4.1.1 Superficial and orthovoltage equipment.

4.1.2 Cobalt-60 tele therapy equipment.

4.1.3 Linear accelerator.

4.1.4 Simulator.

4.1.5 Brachytherapy equipment

4.1.5.1 Low dose rate (LDR)

4.1.5.2 Medium dose rate (MDR)

4.1.5.3 High dose rate (HDR)

4.2 QUALITY CONTROL

4.2.1 Cobalt-60.

4.2.2 Linear Accelerator.

4.2.3 Brachytherapy.

4.2.4 Simulator.

4.3 RADIATION PROTECTION

4.3.1 Concept of radiation protection.

4.3.2 Justification, Optimization and Limitation.

4.3.3 Units.

4.3.4 Maximum Permissible dose.

4.3.5 Personnel monitoring.

4.3.6 Protective materials.

-----the End-----

द्वितीय पत्रको एकाई, अङ्कभार र प्रश्नसंख्या निम्न बमोजिम हुनेछ ।

द्वितीय पत्रका एकाई	A	B	C	D
द्वितीय पत्रका एकाई	1	2	3	4
प्रश्न संख्या	3	2	2	3

Model Questions

1. Describe the parameters taken during the treatment planning of the patient in radiotherapy.
2. What is brachytherapy? Describe high dose rate after loading system and its advantages over manual and low dose rate after loading system.
3. What is cell cycle? Define cell cervical curves and its model.
4. What is simulator? Why it is necessary in radiotherapy planning?
5. Write short notes on
 - a. Biological effect of radiation
 - b. SSD/SAD Technique
 - c. Radiation protection on radiotherapy

लोक सेवा आयोग
नेपाल स्वास्थ्य सेवा, रेडियोग्राफी समूह, रेडियोथेरापी उपसमूहको सातौँ तहको खुला र आन्तरिक प्रतियोगितात्मक
परीक्षाको पाठ्यक्रम
नेपाल आर्थिक योजना तथा तथ्याङ्क, इन्जिनियरिङ्ग, कृषि, वन, विविध र शिक्षा सेवाका सबै समूह/उपसमूह,
राजपत्रांकित तृतीय श्रेणी र एवं स्वास्थ्य सेवाको सातौँ र आठौँ तहका पदहरूमा
प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र
लिइने **सामूहिक परीक्षण (Group Test)** को लागि

सामूहिक छलफल (Group Discussion)

यस प्रयोजनको लागि गरिने परीक्षण १० पूर्णाङ्क र ३० मिनेट अवधिको हुनेछ जुन नेताविहिन सामूहिक
छलफल (Leaderless Group Discussion) को रूपमा अवलम्बन गरिने छ। दिइएको प्रश्न वा Topic का
विषयमा पालैपालोसँग निर्दिष्ट समयभित्र समूहबीच छलफल गर्दै प्रत्येक उम्मेदवारले व्यक्तिगत प्रस्तुति
(Individual Presentation) गर्नु पर्नेछ। यस परीक्षणमा मूल्याङ्कनको लागि देहाय अनुसारको ३ जना भन्दा
बढीको समिति रहनेछ।

आयोगका सदस्य	-	अध्यक्ष
आयोगका सदस्य	-	सदस्य
मनोविज्ञ	-	सदस्य
दक्ष/विज्ञ (१ जना)	-	सदस्य

सामूहिक छलफलमा दिइने नमुना प्रश्न वा Topic

उदाहरणको लागि - उर्जा संकट, गरीबी निवारण, स्वास्थ्य बीमा, खाद्य सुरक्षा, प्रतिभा पलायन जस्ता Topics
मध्ये कुनै एक Topic मात्र दिइनेछ।