

**Post M.Sc Diploma in Radiological Physics Examinations  
January 2018**

**Radiation Dosimetry and Standardisation**

**Time: 3 hours****Maximum Marks: 100**

- **Answer all questions**
- **Use of Calculators/physical and mathematical tables permitted.**

**Essays****(2x14 = 28)**

1. Describe the significance of dosimetry parameters used in IAEA TRS-398 protocol. Also explain that how this protocol differs from TG-51 AAPM protocol. The average electrometer reading obtained in the experiment to determine absorbed dose to water  $D_w$  in standard reference conditions according to TRS- 398 in  $^{60}\text{Co}$  beam was  $24\text{nC}$  for a set machine time of 3 minutes. Calculate dose rate in Gy/min for the parameters given below: "T1 = 220 C." "T2 = 22.40 P1 = 980 mbar, P2 = 982 mbar, machine timing error = 0.02 min, ND, W of the dosimeter =  $44.8 \times 10^7$  Gy/C at 200 C". and 1013.2 mbar.  
(9+5=14)
2. Describe about Bragg – Gravy cavity theory and derive an expression for the volume of the cavity chamber.  
An unsealed air equivalent ion chamber of volume 0.5cc at 00C", 760 mm of Hg is exposed to a continuous radiation at 50 R/min. Calculate the ionization current at 2270C".and 700 mm of Hg pressure.  
(9+5=14)

**Short Essays****(4x8 = 32)**

3. Derive the expression to relate exposure, Kerma and absorbed dose and the usefulness of these quantities in radiation dosimetry
4. Manganese sulphate bath method for primary standardization of neutrons
5. Explain the standardization methods used for brachytherapy sources.
6. Define calibration factors  $N_x$ ,  $N_k$ ,  $N_{D,\text{air}}$ ,  $N$  and quality factor. Explain about cross calibration method

**Short Notes****(10x4 = 40)**

7. Classification of neutron sources based on energy.
8. Calorimetry
9. Re-entrant ionization chamber
10. Classification of neutron sources based on energy
11. Fricke dosimeter
12. Beer-Lambert's law
13. Free radicals and Radiation chemical yield
14. Ambient and directional dose equivalents
15. Requirements for an ideal chemical dosimeter
16. Neutron survey meters and calibration

\*\*\*\*\*