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Question Paper Code:R2P06

B.E./B.Tech. DEGREE EXAMINATION, APRIL / MAY 2025

Second Semester

BioMedical Engineering

R21UPH206 – MEDICAL PHYSICS

(Regulations R2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. All of them use non-ionizing radiation except CO1- U
(a) MRI (b) Radiography (c) Ultrasonography (d) Thermography
2. What is the frequency range of Ultrasound? CO1- U
(a) >20 kHz (b) 20-20000 Hz (c) < 20 kHz (d) none of these
3. Which material cannot be used as moderator in nuclear reactor. CO1- U
(a) D₂O (b) Graphite (c) Beryllium (d) Uranium
4. Technetium generator is a device used to extract the metastable CO1- U
isotope of technetium from a decaying sample of -----.
(a) Technetium (b) Uranium (c) Thorium (d) Molybdenum
5. In the case of annihilation radiation, the β particle collides with orbital electron CO2- U
and produce _____ energy.
(a) 511 keV (b) two 511keV (c) three 511keV (d) four 511keV
6. Which of the following radiation types has the least penetrating CO2- U
ability in matter?
(a) Alpha particles (b) Beta particles (c) Gamma rays (d) X-rays
7. Which of the following is the most suitable radiation detection method for CO1- U
detecting high-energy gamma rays?
(a) Geiger-Müller counter (b) Scintillation counter
(c) Pocket dosimeter (d) Thermo luminescent dosimeter (TLD)

8. The monitoring and measuring a person's exposure to radiation is called CO1- U
 (a) Densitometry (b) Dosimetry (c) Senitometry (d) ALARA
9. The SI unit of equivalent dose is ----- CO1- U
 (a) Sievert (b) Roentgen (c) Becquerel (d) Gray
10. _____ converts the amount of exposure in roentgen to the amount of CO1- U
 absorbed dose in radian.
 (a) Q factor (b) F factor (c) R factor (d) H factor

PART – B (5 x 2= 10 Marks)

11. What is Doppler Effect? Mention few clinical applications. CO1 U
12. Define Isomeric transition. CO2 U
13. If two radionuclide decay occurs at a rate of 50%/hr and 40%/hr, compare its CO3- App
 half-life?
14. Compare TLD and OSLD. CO1 U
15. Calculate the radiation exposure at 10 cm from a vial containing 30 mCi CO4- App
 (1.11 GBq) of ^{201}Tl .

PART – C (5 x 16= 80Marks)

16. (a) Explain the dielectric properties of tissue depend upon the CO1 U (16)
 frequency of electromagnetic radiation?
 Or
 (b) Differentiate A-scan, B-scan and C-scan techniques in CO1- U (16)
 ultrasound?
17. (a) (i) Explain in detail about the spontaneous emission, isometric CO1- U (12)
 transition, and electron capture.
 (ii) Differentiate natural and artificial radioactivity. (4)
 Or
 (b) Describe the theory, construction and working of cyclotron. Also CO1- U (16)
 explain the production of radionuclides in cyclotron.
18. (a) Illustrate briefly about the interaction of gamma radiation with CO3- App (16)
 matter in human body?
 Or
 (b) (i) Justify how the neutron can react with matter? CO3- App (8)
 (ii) Differentiate mass and linear attenuation coefficients. (8)

19. (a) Describe the principle, construction and working of gas filled detectors? CO1- U (16)
- Or
- (b) Explain in detail about the film dosimetry and TLD dosimetry. CO1- U (16)
20. (a) Discuss briefly about the relationship between the various dosimetric quantities? CO1- U (16)
- Or
- (b) Explain in detail about Roentgen, Gray and Sievert. CO1- U (16)

