

Detection and Measurement of Radiation

Chapter 4

1. Which of the following may cause a malfunction of a radiation monitoring device?
1. *Power failure* 2. *Damage to the probe* 3. *Meter failure*
A. 1 & 2 only C. 2 & 3 only
B. 1 & 3 only D. 1, 2, & 3
2. The principal active component of a thermoluminescent dosimeter is a special crystal called: 8:148
A. Silver Bromide C. Lithium fluoride
B. Sodium iodide D. Calcium tungstate
3. The location of a lost radioactive source is most easily accomplished by using a: 8:406
A. Survey Meter C. Densitometer
B. Pocket dosimeter D. Scintillation counter
4. When film badges are employed for radiation monitoring, which of the following factors may effect the reading of the badge? 17:89
1. *Exposure to excessive heat*
2. *Submersion of the badge in fluids*
3. *Damage to the film wrapper*
A. 1 & 2 only C. 2 & 3 only
B. 1 & 3 only D. 1, 2, & 3
5. The roentgen is a unit of measurement that specifies the _____ of air by x-rays or gamma rays. 8:88
A. Excitation C. Absorption
B. Ionization D. Attenuation
6. A Geiger-Muller Counter will often indicate inaccurate exposure rate when measuring for: 8:406
1. *Pulsed x-ray beams* 2. *Continuous x-ray sources* 3. *Contained gamma sources*
A. 1 only C. 3 only
B. 2 only D. 1, 2, & 3
7. The most sensitive device for the detection of gamma radiation is a special type of radiation device called a/an: 4:565
A. Scintillation counter C. Film badge
B. Ionization chamber D. Pocket dosimeter
8. The amount of x-ray or gamma exposure resulting in the production of 2.58×10^{-4} coulombs in 1 Kg of air defines the: 8:88
A. Rad C. Becquerel
B. Seivert D. Roentgen
9. If the absorbed dose of 1 cGy of fast neutrons has the same biological effect as 10 cGy of 2 MeV photons, the RBE of these neutrons is: 7:156
A. 1 C. 100
B. 10 D. Unable to determine

10. Which of the following is not a basic component of a film badge? 17:88
- A. Plastic holder
B. Various metal filters
C. Light-tight pocket
D. Self-reading meter
11. A patient is exposed to 70 rads of alpha having a quality factor (QF) of 20. This person's dose equivalency is: 17:50
- A. 14 rem
B. 70 rem
C. 1400 rem
D. 2800 rem
12. The ionization produced in a gas-filled cavity placed in a medium, is related to the energy absorbed in the surrounding medium by the: 8:128
- A. Chamber volume theory
B. Absorbed dose
C. Bragg-Gray theory
D. Conversion factor
13. Which type of radiation detection devices are most desirable for cumulative radiation monitoring? 8:410
1. GM counters 2. TLD's 3. Film badges
- A. 1 & 2 only
B. 1 & 3 only
C. 2 & 3 only
D. 1, 2, & 3 only
14. The primary difference between a Geiger-Muller detector and cutie pie detector is: 8:406
- A. Basic operating principle
B. Method of display
C. Method of detection
D. Operating potential
15. Because of environmental factors, the manufacturers recommend _____ as the maximum period of time that the film badge may be worn for personnel monitoring. 7:584
- A. Two weeks
B. One month
C. 3 months
D. 6 months
16. The principal difference between a free air ionization and a thimble chamber is the 8:91
- A. Design of the chamber
B. Range of energies detected
C. Number of channels for analysis
D. Number of penetrometer steps
17. The rate of decay of a radionuclide is effected by changes in 21:45
- A. Chemical bonding
B. Temperature
C. Barometric pressure
D. None of the above
18. During the calibration of x-ray machines with peak energies of 2.50 MeV the avoidance of electron contamination can be accomplished by placing the ionization chamber 15:73
- A. Above the surface of the water phantom
B. At the depth of absorbed dose maximum
C. Above the absorbed dose maximum
D. Below the absorbed dose maximum
19. A film badge can be used for the measurement of a/an _____ source(s) 4:583
1. X-ray 2. Beta 3. Gamma
- A. 1 & 2 only
B. 1 & 3 only
C. 2 & 3 only
D. 1, 2, & 3
20. The radiation unit best suited for measuring the output of an x ray tube below 3 MeV is the 4:12
- A. Roentgen
B. Rad
C. Rem
D. Gray

21. The instrument used for absolute exposure dose measurements is the: 8:100
 A. Baldwin-Farmer ionization chamber C. Geiger-Muller counter
 B. Victoreen condenser chamber D. Direct reading dosimeter
22. Damage to the G-M counter will result from operation in the _____ region. 17:95
 A. Threshold C. Plateau
 B. Starting Potential D. Continuous discharge
23. The smallest detectable dose of a standard film badge is approximately: 2:583
 A. 1.0 mrem C. 50 mrem
 B. 10 mrem D. 100 mrem
24. The most sensitive type of personnel monitoring devices is the: 2:585
 A. Film badge C. Weekly blood test
 B. Pocket dosimeter D. Thermoluminescent dosimeter
25. The detection of neutrons is most easily accomplished using a _____ type survey monitor. 8:408
 A. G-M C. Scintillation
 B. Proportional D. Continuous discharge
26. In a thermoluminescent dosimeter, the amount of light obtained when the crystal is heated is proportional to the _____ by the crystal. 21:93
 A. Energy absorbed C. Both of the above
 B. Radiation emitted D. Neither of the above
27. The radiation unit derived when a rad is multiplied by the quality factor results in the unit of dose equivalency termed the: 4:14
 A. Roentgen (Cg) C. Rem (Sievert)
 B. Rad (Gray) D. Rep (Calorie)
28. Which type of radiation survey instrument is best suited for the detection of a high intensity radiation field?
 1. G-M counter 2. Scintillation counter 3. Cutie pie
 A. 1 only C. 3 only 17:70
 B. 2 only D. 1, 2, & 3
29. Which of the following is classified as a rate meter? 17:70
 A. Geiger-Muller counter C. Pocket dosimeter
 B. Thermoluminescent dosimeter D. Film badge
30. The sensitivity of a scintillation-type detector is greatly improved by an instrument called a/an: 2:43
 A. Photo-multiplier C. Thyatron
 B. Electroscopie D. Vidicon
31. When an unsealed ionization chamber is employed for a given measurement the exposure rate will increase if the _____ is above reference limits. 8:108
 A. Temperature C. Humidity
 B. Pressure D. Dew point
32. The amount of energy that is transferred to the absorbing material per unit length of travel is termed:
 A. RBE C. Rem 17:9
 B. LET D. Rad

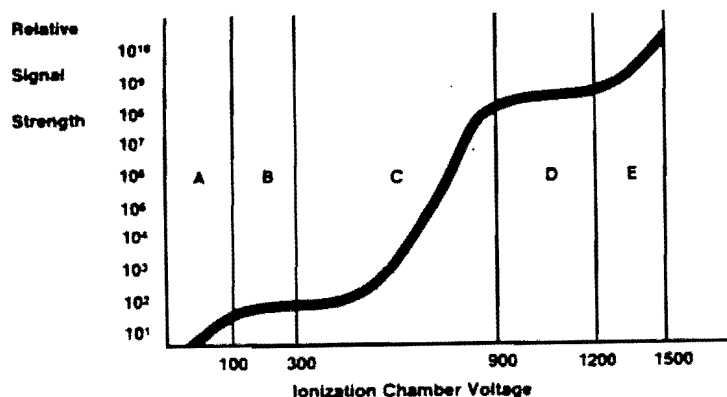
33. The short interval of time during which a radiation counter is unable to respond to radiation is called: 2:559
- A. Interval time C. Dead time
B. Spot time D. Recycle time
34. A patient receives a dose of 3 gray of fast moving neutrons with a quality factor (QF) of 10. The total dose equivalency of this patient is: 2:40
- A. 3.3 rem C. 30 rem
B. 3.3 Seivert D. 30 Seivert
35. Pocket ionization chambers are not normally employed in a radiology personnel monitoring program because: 17:96
- A. They require daily attention and recording C. They are difficult to read
B. They are not sufficiently accurate D. They have a long reading delay time
36. Monitoring of dose rate, making integrated dose measurements and surveys of field symmetry, are best accomplished using a/an: 8:56
- A. Ion chamber detector C. TLD
B. Pocket dosimeter D. G-M counter
37. The sensitivity of G-M counter is directly related to its: 8:406
- A. Starting potential C. Hydrogen
B. Operating potential D. Discharge potential
38. Quenching by a pressured gas such as argon in an G-M chamber will tend to: 2:560
- A. Increase the dead time C. Improve the resolving time
B. Limit the continuous discharge D. Maintain the hydroscopicity
39. A 300 rad absorbed dose is equivalent to a: 2:13
- A. 0.3 gray C. 30 gray
B. 3 gray D. 300 gray
40. The linear energy transfer of an x-ray or gamma photon is low because of its: 17:9
- A. Low energy C. Negative charge
B. High penetration D. Positive charge
41. A person receives an exposure to the following radiations. Which will result in the highest dose equivalency? 8:392
- A. 4 gray of x-ray C. 4 gray of gamma
B. 4 gray of beta D. 4 gray of alpha
42. The basic method of determining the absorbed dose in a medium due to its production of heat is termed: 8:144
- A. Chemical dosimetry C. Calorimetry
B. Fricke dosimetry D. Thermometry
43. The principal recording medium for a cutie pie detector is a/an: 8:405
- A. Light activated crystal C. Electrometer
B. Ionization chamber D. Radiation activated chemical reaction
44. In region E, the voltage is sufficient to cause spontaneous ionization of the chamber gases and is known as the region of: 17:26
- A. Partial recombination C. Minimum sensitivity
B. Maximum sensitivity D. Continuous discharge

45. The curie is the unit used in the measurement of the quantity of:

2:14

- A. Radioactivity
 B. Ionization
 C. Absorbed dose
 D. Exposure dose

Pertaining to the diagram answer questions 46 to 49.



46. The area of the chamber voltage curve, letter D, represents the primary operating region for the: 17:26

- A. Proportional counter
 B. Geiger-Muller counter
 C. Ionization chamber
 D. None of the above

47. Ionization chambers require a voltage in which no recombination of ion pairs takes place. This region is identified by: 17:26

- A. Letter A
 B. Letter B
 C. Letter D
 D. Letter E

48. In region C of the chamber voltage curve, the number of secondary ion pairs is proportional to the primary number of ion pairs produced and is termed the: 17:26

- A. Threshold region
 B. Recombination region
 C. Proportional region
 D. Glow region

49. An unsealed ionization chamber is being used to form a reading in which factors must be standardized or corrected for: 8:108

1. Room temperature 2. Barometric pressure 3. Relative humidity

- A. 1 & 2 only
 B. 1 & 3 only
 C. 2 & 3 only
 D. 1, 2, & 3

50. The calibration of an ionization type meter can be made by a comparison with a/an _____ radiation source.

- A. High intensity
 B. Short-lived
 C. Long-lived
 D. Alpha emitting
 17:83

51. The primary reference medium for the measurement and calculation of absorbed dose is: 8:141

- A. Air
 B. Water
 C. Lucite
 D. Polystyrene

52. The degree to which radiation can cause a chemical change can be used as a measure of absorbed dose. An example of this type of dosimeter is a: 8:146

- A. Friche dosimeter
 B. Thermoluminescent dosimeter
 C. Pocket dosimeter
 D. Film dosimeter

53. The kinetic energy of charged ionizing particles liberated per unit mass in a specific material by uncharged particles is known as the: 21:48
- A. KE factor
B. KP factor
C. Kerma
D. Gray
54. In order to properly calibrate ionization chambers, temperature and pressure are standardized to levels of: 8:96
- A. 0° C - 760 mmHg
B. 37°C - 670 mmHg
C. 68°C - 76 mmHg
D. 68°C - 760 mmHg
55. The principal advantage of scintillation-type detectors compared to an ionization-type chamber is: 8:120
1. Higher counting rate
 2. A shorter resolving time
 3. The recording of a broad energy spectrum
- A. 1 only
B. 2 only
C. 3 only
D. 1, 2, & 3