

Radiation Biology, Protection and Applications
(PHYS-450)

Quizzz

Week 12

1. Which of the following fact about radiation/ irradiation is true?

- a) All food items consumed by man are radioactive
- b) (Alpha) and beta particles and gamma photons are the radiations available for food preservation applications
- c) Energy lost per ion pair formed is greater than the ionization energy
- d) All of the mentioned

Answer: d

Explanation: All of the mentioned is true about radiation/ irradiation.

2. Which of the following is correct about alpha particles?

- a) High ionization due to relative size and carrying of double positive charge
- b) Low penetration power
- c) In air, they have a range of few centimeters
- d) All of the mentioned

Answer: d

Explanation: All of the mentioned is correct about alpha particles.

3. Which of the following is correct about beta particles?

- a) High specific ionization ability
- b) Low penetrating power
- c) Higher ionization ability than gamma radiation
- d) All of the mentioned

Answer: c

Explanation: Beta particles have low specific ionization ability and relatively high penetrating power. They have higher ionization ability than gamma radiation though.

Please recall:

Alpha particles (or heavy charged nuclei) are the least penetrating, as they are the most densely ionizing. Alpha particles can be absorbed by a 10 cm layer of air, 0.01 mm of lead or by a sheet of paper. This means that if a given number of alphas are fired at a target they will all cause ionization near the surface of the material, resulting in the effects of the radiation being concentrated in a small volume. The double charge and considerable mass of the alpha in comparison with the other nuclear radiation forms explains why the impact on matter is so great.

Beta particles can penetrate quite deeply into matter before its energy has been used up. Their penetrating power is therefore moderate (absorbed by 1m air, 0.1 mm lead or 3mm aluminum sheet). Betas have only about 1/8000 of the mass of an alpha particle and only half of the charge. Therefore its interaction with matter as it passes through is far less severe. Therefore, the effects of its interaction (ionization) are much more spread out.

Gamma Rays have an ionizing power so low that they penetrate very deeply into matter before most of the energy has been used up. Their penetrating power is therefore very high (about 99.9% is absorbed by 1 km of air or 10 cm lead). Gamma rays are pure energy - no charge and no mass - therefore their interaction with matter is much less than in the case of beta particles or alpha particles other two.

4. In which of the following ways does absorption/attenuation of gamma radiation take place?

- a) Photoelectric effect
- b) Compton effect
- c) Pair production
- d) All of the mentioned

Answer: d

Explanation: The absorption/attenuation of gamma radiation takes place in all of the mentioned ways.

5. Statement 1: _____ radiation is also called cathode radiation.

Statement 2: In _____ radiation, spent fuel elements can be used.

- a) Alpha, beta
- b) Gamma, alpha
- c) Beta, gamma
- d) All of the mentioned, all of the mentioned

Answer: c

Explanation: Beta radiation is also called cathode radiation. In gamma radiation, spent fuel elements can be used.

6. Which of the following reasons is why machine produced ionizing radiations are preferred over fission products?

- a) Fission products require extensive shielding and dose supplied may be so low that prolonged exposure times are required
- b) Machine produced radiations are unidirectional and can be turned off
- c) Both of the mentioned
- d) Neither of the mentioned

Answer: c

Explanation: Both of the mentioned are reasons why machine produced ionizing radiations are preferred over fission products.

7. Statement 1: _____ induce radioactivity in food items.

Statement 2: Variations in dose distributions in many types of containers and with all types of sources range between 100-125%.

- a) Protons, False
- b) Electrons, False
- c) Neutrons, True
- d) Any of the mentioned, True

Answer: c

Explanation: Neutrons induce radioactivity in food items. Variations in dose distributions in many types of containers and with all types of sources range between 100-125%.

8. Statement 1: It is safe to consume radiation-stabilized food processed with gamma photons of less than 2.3 MeV.

Statement 2: Provisions must be made to limit neutron fluxes in all radiation sources.

- a) True, False
- b) True, True
- c) False, False
- d) False, True

Answer: b

Explanation: It is safe to consume radiation-stabilized food processed with gamma photons of less than 2.3 MeV. Provisions must be made to limit neutron fluxes in all radiation sources.

9. Statement 1: When matter is traversed by any of the forms of ionizing radiations,

Statement 2: Ionization radiations produce _____

- a) Energy is absorbed, negligible temperature rise
- b) Ion pairs are produced, chemical changes in irradiated materials
- c) Both of the mentioned, both of the mentioned
- d) Neither of the mentioned, neither of the mentioned

Answer: c

Explanation: When matter is traversed by any of the forms of ionizing radiations, energy is absorbed and ion pairs are produced. Ionization radiations produce negligible temperature rise and chemical changes in irradiated materials.

10. Ion pair production by ionizing radiations is more efficient than the thermal process.

- a) True
- b) False

Answer: a

Explanation: Ion pair production by ionizing radiations is more efficient than the thermal process.