

## Multiple Choice Questionnaires

### Subject: Physics

1. An element with atomic mass number of 18 and atomic number 8 has how many neutrons?

- a. 6
- b. 8
- c. 10
- d. 20

Ans: c

2. If  $Z$  is the atomic number of an atom and its atomic mass by  $A$ , then its neutron number is given by

- a.  $N = A + Z$
- b.  $N = Z - A$
- c.  $N = A - Z$
- d. None of the above is correct.

Ans:c

3. The binding energy per nucleon

- a. increases steadily as we go to heavier elements.
- b. decreases steadily as we go to heavier elements.
- c. is approximately constant throughout the periodic table, except for very light nuclei.
- d. has a maximum near iron in the periodic table.

Ans: d

4. The amu unit is defined as

- a. the mass of a proton.
- b. the mass of an electron.
- c. the mass of a hydrogen-1 atom.
- d. one twelfth the mass of a carbon-12 atom.

Ans: d

5. An alpha particle is also known as

- a. an electron.
- b. a positron.
- c. a helium nucleus.
- d. a photon.

Ans: c

6. Isotopes of an element have nuclei with

- a. the same number of protons, but different numbers of neutrons.
- b. the same number of protons, and the same number of neutrons.
- c. a different number of protons, and a different number of neutrons.
- d. a different number of protons, and the same number of neutrons.

Ans: a

7. A beta- particle is also known as

- a. A photon.
- b. a positron.
- c. a helium nucleus.
- d. an electron.

Ans: d

8. The existence of the neutrino was postulated in order to explain

- a. gamma emission.
- b. alpha decay.
- c. beta decay.
- d. fission.

Ans: c.

9. The neutral atoms of all isotopes of the same element contain the same number of

- a. neutrons only.
- b. Electrons
- c. Mass numbers
- d. Masses

Ans: b

10. In which type of radioactive decay the atomic number is not changed

- a. Beta
- b. Gamma
- c. Alpha
- d. The atomic number is affected by all forms of radioactive decay

Ans: b

11. Isotopes of an element have a different number of

- a. Proton
- b. Neutron
- c. Electron
- d. Atom

Ans: b

12. When an alpha particle is emitted from an unstable nucleus, the atomic number of the nucleus

- a. increases by 2.
- b. decreases by 2.
- c. increases by 4.
- d. decreases by 4.
- e. none of the above.

Ans: b

13. Three types of rays are emitted when unstable nuclei undergo radioactive decay. Which of the following is not one of them

- a. Beta
- b. Gamma
- c. Alpha
- d. delta

Ans: d

14. A nuclear fission reaction becoming self-sustaining depends on

- a. electrons
- b. Neutrons
- c. Energy
- d. Protons

Ans: b

15. When two atomic nuclei combine it is called as

- a. Chain reaction
- b. Nuclear fusion
- c. Nuclear decay
- d. Nuclear fission

Ans: b

16. The number of protons or atomic number is reduced to 2 by which form of radioactive decay?

- a. Beta-decay
- b. Gamma decay
- c. Alpha decay
- d. None of the above

Ans: c

17. Which statement is true for all three types of radioactive emission?

- a. They are deflected by electric fields
- b. They ionize gases
- c. They are completely absorbed by a thin aluminum sheet
- d. They emit light

Ans: b

18. Helium nuclei particles are called

- a. Gamma particles
- b. Beta particles
- c. Alpha particles
- d. No particles that are helium nuclei

Ans: c

19. A nuclide of the element plutonium  ${}_{94}\text{Pu}^{242}$ . What is the number of neutrons in its nucleus?

- a. 242
- b. 336
- c. 188
- d. 148

Ans: d

20. In the Geiger-Nuttall law,  $\log R = A \log \lambda + B$ , which factor is constant for almost all the radioactive series,

- a. R
- b. B
- c. A
- d.  $\lambda$

Ans: c

21. Which statement is true

- a. Neutrino has zero charge
- b. Neutrino has almost zero mass
- c. Neutrino has spin  $\frac{1}{2}$
- d. All of the above

Ans: d

22. Which of the following are atomic models?

- i. Thomson's plum pudding model
  - ii. Rutherford's nuclear model
  - iii. Bohr's model
  - iv. Sommerfeld's model
- a. i & ii
  - b. i, ii & iii
  - c. ii, iii & iv
  - d. All the above

Ans:d

23. Nucleus is

- a. positively charged
- b. negatively charged
- c. neutral
- d. charge keeps on changing

Ans: a

24. Proton has the charge

- a. 1637 times of an electron
- b. 1737 times of an electron
- c. 1837 times of an electron
- d. 1937 times of an electron

Ans: c

25. In neutral atom, the electrons are bound to the nucleus by

- a. Magnetic force
- b. Electrostatic force
- c. Friction force
- d. Centripetal force

Ans: b

26. Electron-capture is associated with \_\_
- a. conversion of a neutron to a proton.
  - b. decrease in mass number by 4 and atomic number by 2.
  - c. conversion of a proton to a neutron.
  - d. emission of  $\gamma$  rays.

Ans: c

27. The limited number of electrons in 'L' shell is
- a. 2
  - b. 8
  - c. 18
  - d. 32

Ans: b

28. Which of the following rays are emitted during radioactivity?
- a. Alpha-rays
  - b. Beta-rays
  - c. Gamma-rays
  - d. All of the above

Ans: d

29. The difference in the mass of the nucleus and the sum of the masses of the constituent nucleons is known as
- a. mass defect
  - b. solid defect
  - c. weight defect
  - d. nucleus defect

Ans: a

30. When the nuclei of  $U^{235}$  is splitted into approximately two equal nuclei, the amount of energy released per nucleon is
- a. 0.45 MeV
  - b. 0.9 MeV
  - c. 1.35 MeV
  - d. 1.7 MeV

Ans: b

31. The half life of radioactive nuclei is
- a.  $0.693 / \lambda$
  - b.  $0.593 / \lambda$
  - c.  $0.603\lambda$
  - d.  $0.893\lambda$

Where  $\lambda$ =radioactive decay constant

Ans: a

32. The average (mean) life for particle decay is

- a. 1.045 times greater than half life
- b. 1.275 times greater than half life
- c. 1.945 times greater than half life
- d. 1.445 times greater than half life

Ans:d

33. An antiproton is an atomic particle that has

- a. the mass of a proton and the charge of an electron.
- b. the mass of an electron and the charge of a proton.
- c. the mass of a neutron and the charge of a proton.
- d. the mass of a electron and the charge of a neutron.

Ans: a

34. When lead-207 ( $Z = 82$ ) is bombarded with neutrons, it can change into

- a. lead-208
- b. lead-206
- c. tellurium-208 ( $Z = 81$ )
- d. bismuth-208 ( $Z = 83$ )

Ans:a

35. What is the mass of the products of a nuclear fission reaction compared to the mass of the original products?

- a. greater
- b. less
- c. the same
- d. varies according to the reaction

Ans: b

36. The fuel for nuclear fusion in the center of the Sun is

- a. He
- b. H
- c. U
- d. any radioactive material

Ans: b

37. In the fission reaction  $^{235}\text{U} + ^1_0\text{n} \rightarrow ^{141}\text{Ba} + ^{92}\text{Kr} + \text{neutrons}$ , the number of neutrons produced is

- a. zero.
- b. 1
- c. 2
- d. 3

Ans: d

38. All of the following are units used to describe radiation dosage in humans except

- a. curie.
- b. rad.
- c. rem.

- d. RBE.
- e. sievert.

Ans: a

39. The chief hazard of radiation is

- a. damage to living cells due to ionization.
- b. damage to cells due to heating.
- c. damage to living cells due to the creation of chemical impurities.
- d. the creation of new isotopes within the body.

Ans: a

40. A proton of energy 100 eV is moving perpendicular to a magnetic field  $10^{-4}$  T.  
The cyclotron frequency of the proton in radian/sec

- a.  $2.80 \times 10^6$
- b.  $9.6 \times 10^3$
- c.  $5.6 \times 10^6$
- d.  $1.76 \times 10^6$

Ans: b

41. The intrinsic spin of a photon is

- a. 1
- b. 0
- c.  $\frac{1}{2}$
- d.  $-\frac{1}{2}$

Ans: a

42. Which is not an energy term in Semi Empirical mass formula in Liquid drop model

- a. Volume Energy
- b. Surface Energy
- c. Coulombs Energy
- d. Nuclear Energy

Ans: (d)

43. Pairing Energy in Liquid drop model is zero for

- a. Even-Even Nuclei
- b. Odd-Odd Nuclei
- c. Even-Odd Nuclei
- d. All of the above

Ans: c

44. The angular frequency of a cyclotron is independent of

- a. Speed
- b. Mass
- c. Magnetic field
- d. Charge

Ans: a

45. The maximum kinetic energy of the positive ion in the cyclotron is

- a.  $qBR^2/2m$
- b.  $q^2B^2R$
- c.  $q^2B^2R^2/m$
- d.  $qBR/m$

Ans: b

46. Cyclotron cannot accelerate

- a. Electrons
- b. Neutrons
- c. Positive
- d. Both (1) and (2)

Ans: d

47. The cyclotron frequency of an electron grating in a magnetic field of 1 T is approximately

- a. 28 MHz
- b. 280 MHz
- c. 2.8 GHz
- d. 28 GHz

Ans: d

48. Suppose a cyclotron is operated at an oscillator frequency of 12 MHz and a dee radius of 53cm. What is the resulting kinetic energy of the deuterons?

- a. 16.6 MeV
- b. 12 MeV
- c. 15 MeV
- d. 14 MeV

Ans: a

49. An alternating electric field of frequency  $f$  is applied across the dees (radius =  $R$ ) of a cyclotron that is being used to accelerate protons (mass =  $m$ ). The operating magnetic field ( $B$ ) used in the cyclotron and the kinetic energy ( $K$ ) of the proton, produced by it, are given by

- a.  $B = mf/e$  and  $K = 2m\pi^2v^2R^2$
- b.  $B = 2\pi mf/e$  and  $K = m^2\pi vR^2$
- c.  $B = 2\pi mf/e$  and  $K = 2m\pi^2v^2R$
- d.  $B = mf/e$  and  $K = m^2\pi vR^2$

Ans: c



50. The energy of emergent protons in MeV from a cyclotron having a radius of its dees 2 m and applied magnetic field 0.8 T is (mass of proton =  $1.67 \times 10^{-27}$  kg).

- a.  $0.961 \times 10^{-11}$  J
- b.  $1.22 \times 10^{-11}$  J
- c.  $1.5 \times 10^{-12}$  J
- d.  $12 \times 10^{-11}$  J

Ans: a

**Prepared by**

Dr. Nandita Prodhani

Associate Professor,

Dept. of Physics