Chapter 21

NUCLEAR PHYSICS

Each question has four possible answers, tick (✓) the correct answer:

1. Atomic theory was announced in 1808 by:

(a) Einstein **(b)** Dalton

(c) Newton **(d)** J.J. Thomson

2. By passing an electric discharge through a gas at low pressure, the electron was discovered:

(a) Millikan **(b)** Chadwick

(c) Bohr **(d)** J.J. Thomson

3. Charge on an electron was determined by:

(a) Ampere **(b)** Millikan

(c) Maxwell **(d)** Bohr

4. The early Greeks believed that matter waves was:

(a) Discrete **(b)** Continuous

(c) Both continuous and discrete **(d)** All of above

5. The electron was discovered by J.J Thomson by passing an electric discharge through:

(a) A liquid **(b)** A solid

(c) A gas at low pressure **(d)** A gas at high pressure

6. The charge on electron was experimentally determined by Millikan in:

(a) 1895 **(b)** 1916

(c) 1905 **(d)** 1909

7. Structure of Nucleus successfully explained by:

(a) Bohr **(b)** Millikan

(c) J.J. Thomson **(d)** Rutherford

8. Rutherford determined the size of nucleus to be equal to:

(a) 10^{-10} m **(b)** 10^{-13} m

(c) 10^{-16} m **(d)** 10^{-14} m

9. Proton was discovered by Rutherford in:

(a) 1917 **(b)** 1920

(c) 1910 **(d)** 1915

10. Chadwick discovered neutron by the study of scattering of α-particles from:

(a) Nitrogen **(b)** Oxygen

(c) Gold foil **(d)** Beryllium

11. Neutrons and protons in the Nucleus are together called:

(a) Nucleons **(b)** Atomic particles

(c) Photons **(d)** Phenons

12. In the unit of unified mass scale, The mass of an electron is:

(a) 0.000554 u **(b)** 0.0000554 u

(c) 1,007276 u **(d)** 1.0086654 u

13. Unified mass scale means that atomic mass is expressed in:

(a) Kilogram **(b)** Gram

(c) U only **(d)** Atomic mass unit

14. The particle which is 7000 times heavier than the electron is called:

(a) β-particle **(b)** R.ray

(c) α-Particle **(d)** Proton

15. The Isotopes of hydrogen are:

(a) Protium **(b)** Deutrium

(c) Tritium **(d)** All

16. The ratio of the mass of nucleus and the total mass of all the constituents making the nucleus is always:

(a) Grater than one **(b)** Equal to one

(c) Less than one **(d)** None of these

17. The energy required to breaks up helium nuclear into two protons and two neutron is:

(a) 28.2 eV **(b)** 28.2 Kev

(c) 28.2 Mev **(d)** 28.2 μev

18. A large amount of energy can be obtained when:

(a) Fission takes palace **(b)** A heavy element breakup in to lighter element

(c) Both (a) and (b) **(d)** None of these

19. A particle having the mass of an electron and the charge of a proton is called a:

(a) Photon **(b)** Nucleons

(c) Positron **(d)** Antiproton

20. Charge on Neutron is:

(a) Zero **(b)** $+1.6 \times 10^{-19}$ c

(c) -1.6×10^{-19} c **(d)** None of above

21. Mass of proton is:

(a) 1.67×10^{-27} kg **(b)** 9.1×10^{-31} kg

(c) 1.67×10^{-17} kg **(d)** 2.1×10^{-27} kg

22. Mass of electron is:

(a) 1.67×10^{-27} kg **(b)** 9.1×10^{-31} kg

(c) 1.67×10^{-17} kg **(d)** 2.1×10^{-27} kg

23. Charge on an electron is:

(a) $+1.6 \times 10^{-19}$ c **(b)** -1.6×10^{-19} c

(c) 2.1×10^{-19} c **(d)** None of above

24. 1 amu is equal to:

(a) 1.0606×10^{-27} kg **(b)** 1.66×10^{-31} kg

(c) 1.66×10^{-34} kg **(d)** 1.66×10^{-19} kg

25. Atoms of an element whose atomic number are the same but have different mass numbers are called:

(a) Isomers **(b)** Isotones

(c) Isotopes **(d)** None of these

26. The mass number of a nucleus is the number of:

(a) Positive particle nucleus **(b)** Neutrons in the nucleus

(c) Nucleons in the nucleus **(d)** Protons in the nucleus

27. An apparatus used to determine the masses of protons, nuclei, ions and to detect the isotopes is:

(a) Mass spectrograph **(b)** Dosimeter

(c) Geiger counter **(d)** None of these

28. For an atom having atomic mass A and atomic number Z, the number of neutrons in the nucleus is:

(a) A + Z **(b)** A – Z

(c) Z **(d)** None of these

29. The chemical behaviour of an atom is determined by:

(a) Number of isotopes **(b)** Atomic number

(c) Mass number **(d)** None of these

30. The amount of energy required to break the nucleus is called its:

(a) Binding energy **(b)** Potential and kinetic energy

(c) Atomic energy **(d)** Nuclear energy

31. The average amount of energy to remove one nucleon from the nucleus is called:

(a) Nuclear energy **(b)** Binding energy

(c) Binding energy per nucleon **(d)** None of above

32. Mass defect per nucleon is called:

(a) Average energy of nucleon **(b)** Binding energy of nucleus

(c) Packing fraction **(d)** None of these

33. The binding energy of deutron is:

(a) 22.22 Mev **(b)** 2.224 Mev

(c) 0.224 Mev **(d)** 20.2 Mev

34. Radio activity was discovered by:

(a) Rutherford **(b)** Einstein

(c) H-Becqueral **(d)** Bohr

35. A naturally occurring disintegration involving the emission of high energy electron is called:

(a) α-decay **(b)** β-decay

(c) γ-decay **(d)** None of these

36. When a nucleus emits an α-particle, its mass number drops by:

(a) 1 **(b)** 3

(c) 2 **(d)** 4

37. The interaction of different radiation with matter depends upon:

(a) Mass of interacting particle **(b)** Charge

(c) Energy **(d)** All of above

38. Artificial radio activity is:

(a) Unstable to unstable element **(b)** Stable to stable element

(c) Unstable to stable element **(d)** Stable to unstable element

39. Radioactivity happen due to the disintegration of:

(a) Nucleus **(b)** Mass

(c) Electrons **(d)** Protons

40. Which of the following have similar nature as that of electrons:

(a) β-rays **(b)** γ-rays

(c) α-rays **(d)** X-rays

41. Artificial radioactivity was discovered by:

(a) Rutherford **(b)** Roentgen

(c) Marie curie and Pierre Currie **(d)** Henry Bacquerel

42. Marie curie and Pierre curie discovered two new radioactive elements which are:

(a) Polonium and radium **(b)** Radium and crypton

(c) Platinum and radium **(d)** Uranium and radium

43. When α-particle is emitted out of the nucleus then the mass number of the nucleus decreases by:

(a) 4 **(b)** 3

(c) 2 **(d)** 1

44. The mass and charge of an α-particle is:

(a) 2u and + 4e **(b)** 4u and + 2e

(c) 2u and + 2e **(d)** 4u and + 4e

45. The wavelength of γ-rays is:

(a) Greater than that of x-rays **(b)** Equal to that of x-ray

(c) Shorter than that of x-rays **(d)** None of these

46. γ-radiation:

(a) has no mass **(b)** has no energy

(c) is a proton **(d)** All of the above

47. When α-particle emitted out of the nucleus then charge number of the nucleus decreased by:

(a) 4 **(b)** 3

(c) 2 **(d)** 1

48. The distance at which the radioactive particle comes to rest after emitting from a source is called:

(a) Stopping distance **(b)** Range

(c) Distance **(d)** All of above

49. Which of the reaction shows the emission of β-particle:

(a) ${}_{Z}X^{A} \longrightarrow {}_{Z-1}X^{A-4}$ **(b)** ${}_{Z}X^{A} \longrightarrow {}_{Z+1}X^{A}$

(c) ${}_{Z}X^{A} \longrightarrow {}_{Z-2}X^{A-4}$ **(d)** None of these

50. Which of the reaction shows the emission of α-particles:

(a) ${}_{Z}X^{A} \longrightarrow {}_{Z-1}X^{A-4}$ **(b)** ${}_{Z}X^{A} \longrightarrow {}_{Z+1}X^{A}$

(c) ${}_{Z}X^{A} \longrightarrow {}_{Z-2}X^{A-4}$ **(d)** None of these

51. Which one of the following is not affected by electric or magnetic field:

(a) Proton **(b)** Electrons

(c) γ-rays **(d)** x-rays

52. The half life of radioactive elements depends upon:

(a) Nature of element **(b)** Amount of radioactive substance

(c) Magnetic field **(d)** None of these

53. The radioactive decay obeys the law:

(a) $N = N_o e^{\lambda t}$ **(b)** $N = N_o e^{-\lambda t}$

(c) $N_o = N e^{-\lambda t}$ **(d)** $N_o = N (1 + e^{-\lambda t})$

54. The rate of decay of radioactive substance:

(a) Varies inversely with time **(b)** Decreases with time

(c) Constant **(d)** Decreases exponentially with time

55. The time taken for a radioactive element to decay to half of its original number of atoms is called:

(a) Half life of the material **(b)** Decay life of the material

(c) Average life of material **(d)** None of these

56. The half life of a radioactive element is given by:

(a) $T_{1/2} = 0.693/\lambda$ **(b)** $T_{1/2} = 0.603\lambda$

(c) $T_{1/2} = 0.693\lambda$ **(d)** $T_{1/2} = 0.603/\lambda$

57. The reciprocal of decay constant (λ) of a radioactive element is:

(a) Average life **(b)** Half life

(c) Mean life **(d)** None of these

58. The SI unit of decay constant is:

(a) m **(b)** m^{-1}

(c) S^{-1} **(d)** Nm^{-1}

59. If we have No number of atoms of any radioactive element, then after 4 half life's, the number of atoms left behind are:

(a) $\frac{1}{16}$ No **(b)** $\frac{1}{4}$ No

(c) $\frac{1}{8}$ No **(d)** None of these

60 The half life of uranium^{-238} is:

(a) 4.5×10^9 years **(b)** 3.8 days

(c) 1620 years **(d)** 23.5 minutes

61. The half life of radium –225 is:

(a) 4.5×10^9 years **(b)** 3.8 days

(c) 1620 years **(d)** 23.5 minutes

62. Rate of decay is actually described by:

(a) Half life **(b)** Decay constant

(c) Mean life **(d)** None of these

63. When a certain radiation passes through matters it lose energy due to:

(a) Ionization of material atoms sue to direct collision

(b) Ionization of material atoms due to electrostatic attraction

(c) Excitation of material atoms

(d) Any of these

64. The magnitude of range of radiation particle through matter depends upon:

(a) Its mass and charge **(b)** Its charge

(c) Its mass and charge **(d)** all of the above

65. The intensity I_o of a beam after passing through:

(a) $I = I_o e^{-\mu x}$ **(b)** $I = I_o x$

(c) $I = I_1 e^{\mu x}$ **(d)** $I = I_o x^2$

66. In equation $I = I_o e^{-\mu x}$, the symbol μ represents:

(a) Radiation coefficient **(b)** Absorption coefficient

(c) Emission coefficient **(d)** Material coefficient

67. The process in which a heavy nucleus is broken into two lighter nuclei with the release of energy in called:

(a) Nuclear fusion **(b)** Nuclear fission

(c) Chain reaction **(d)** None of these

68. Nuclear fission reaction can be produced in $_{92}U^{238}$ by:

(a) Slow neutrons **(b)** Fast neutrons

(c) Thermal neutrons **(d)** None of these

69. The product of the fission reaction of uranium named barium and krypton have a total mass equal to:

(a) 1.96 Mev **(b)** 0.67 Mev

(c) 0.9 Mev **(d)** 0.97 Mev

70. The chain reaction is controlled by a series of rods usually made of:

(a) Cadmium **(b)** Uranium

(c) Iron **(d)** Boron

71. The nuclear fission reaction is given by the following reaction:

(a) $_{92}U^{235} + {}_{0}n^{1} \longrightarrow {}_{56}B_{a}^{144} + {}_{36}kr^{92} + 3{}_{0}n^{1}$ **(b)** $_{1}H^{2} + {}_{1}H^{2} \longrightarrow {}_{2}He^{4} + Q$

(c) $_{7}N^{14} + {}_{0}n^{1} \longrightarrow {}_{6}C^{12} + {}_{1}H^{3}$ **(d)** None of these

72. Energy emitted when one atom of $_{92}U^{235}$ undergoes fission reaction is:

(a) 150 Mev **(b)** 70 Mev

(c) 200 Mev **(d)** 300 Mev

73. The process of nuclear fission was explained by:

(a) Lies Meitner **(b)** Stressman and Hann

(c) Bohr and Hahn **(d)** None of these

74. During fission process, a large amount of:

(a) Light energy is produced **(b)** Heat energy is released

(c) Nuclear energy is released **(d)** None of these

75. The energy released during fission process is controlled in:

(a) Nuclear reactor **(b)** Cyclotron

(c) Van de Graff generator **(d)** None of these

76. The moderator used in a nuclear reactor is:

(a) Uranium **(b)** Sodium

(c) Aluminum **(d)** Graphite

77. The first atomic reactor was introduced by:

(a) Currie **(b)** Enrico Fermi

(c) Newton **(d)** Bohr

78. The total energy transferred to a body by means of radiation is measured is units of:

(a) Rontgens **(b)** Rutherford's

(c) Curies **(d)** None of these

79. The mass of fissionable material needed for self sustaining chain reaction is called:

(a) Atomic mass **(b)** Critical mass

(c) Sub critical mass **(d)** None of these

80. Uranium bomb depends on the process of:

(a) Nuclear Fission **(b)** Nuclear Fusion

(c) Pair production **(d)** All of above

81. The first artificially produced nuclear transmutation was studied by:

(a) Chadwick **(b)** Rutherford

(c) Faraday **(d)** None of these

82. The process in which two or more lighter nuclei combine together to form heavier nuclei with release of energy is called:

(a) Nuclear fission **(b)** Nuclear fusion

(c) Chain reaction **(d)** None of these

83. The main source of energy in the stars and the sun is due to:

(a) Fission reaction **(b)** Fusion reaction

(c) Chemical reaction **(d)** None of above

84. The substances which slow down the speed of neutron produced during a fission reaction are called:

(a) Moderators **(b)** Retardants

(c) Both (a) and (b) **(d)** None of these

85. Examples of radiation detector case:

(a) Gorger counter **(b)** Wilson cloud chamber

(c) Solid state detector **(d)** All of the above

86. Certain radiation detector makes use of the fact that super saturated vapors condense preferentially on ions this type of detector is called:

(a) Gorger counter **(b)** Wilson cloud chamber

(c) Solid state detector **(d)** None of these

87. In Wilson cloud chamber x-particle leave:

(a) Thick and continuous **(b)** Thin and discontinuous

(c) Thick and discontinuous **(d)** Thin and continuous

88. In Wilson cloud chamber, β-particles leave:

(a) Thin and continuous tracks **(b)** Thick and continuous tracks

(c) No tracks **(d)** Thin and discontinuous tracks

89. In G.M, counter, the cylinder is dilled with mixture of gases:

(a) Containing Ne and Br **(b)** Containing organ and alcohol

(c) Both (a) and (b) **(d)** None of these

90. To allow the entry of α or β-particles, one end of the Geiger counter tube vas a:

(a) Thin glass window **(b)** Thin mica window

(c) Wooden window **(d)** None of these

91. The counter which also provide the power to the G.M tube is called:

(a) Chamber **(b)** Amplifier

(c) Scalar **(d)** Vector

92. The term "dead time" in G.M counter means the time or the order of:

(a) More than 1 millisec **(b)** Less than 1 millisec

(c) More than 1 millisec **(d)** None of these

93. In solid-state detector, the reverse bias is applied through the two:

(a) Conducting layers of silver **(b)** Conducting layers of gold

(c) Conducting layers of aluminum **(d)** Conducting layers of plastic

94. In sold state detector, the energy needed to produce an electron hole pair is about:

(a) 3Mev to 4Mev **(b)** 3ev to 4Mev

(c) Both (a) and (b) **(d)** None of these

95. The phenomenon of nuclear fission is used in the construction of:

(a) Atomic bombs **(b)** Hydrogen bomb

(c) Both (a) and (b) **(d)** None of these

96. In fission reaction, heavy water is used as:

(a) Heat exchanger **(b)** Coolant

(c) Moderator **(d)** None of above

97. The Wilson cloud chamber is based on the principle that supper saturated vapors condense more readily on:

(a) Ions and dust particles **(b)** Dust particles

(c) Ions **(d)** None of these

98. Wilson cloud chamber is a device used as:

(a) Path of ionizing particle **(b)** Accelerating +vely charged particle

(c) Accelerating –vely charged particle **(d)** None of these

99. In Wilson Cloud chamber, the β-particle leave:

(a) Thin and discontinous tracks **(b)** No tracks

(c) Thick and continuous tracks **(d)** None of these

100. In Wilson Cloud chamber, the α-particle leave:

(a) Thin and discontinuous tracks **(b)** No tracks

(c) Thick, straight and continuous tracks **(d)** None of these

101. Geiger counter was designed by:

(a) Mosely **(b)** Michelson

(c) Geiger and Muller **(d)** Faraday

102. Geiger Muller counter is suitable for:

(a) Slow counting **(b)** Fast counting

(c) Both (a) and (b) **(d)** None of these

103. Geiger Muller counter is widely used:

(a) Radioactivity experiments **(b)** Electrical experiments

(c) Both (a) and (b) **(d)** None of these

104. Specially designed solid state detector can be used to detect:

(a) γ-rays **(b)** X-rays

(c) α-particles **(d)** β-particles

105. A solid state detector is basically:

(a) A p-n-p transistor **(b)** A n-p-n transistor

(c) A reverse p-n junction **(d)** A forward p-n-junction

106. The potential difference between the top and bottom of a cloud chamber is of the order of:

(a) 290 v **(b)** 400 v

(c) 1 kv **(d)** None of above

107. The potential difference between anode and cathode in a neon-bromine filled G.M counter is:

(a) 290 v **(b)** 400 v

(c) 1 kv **(d)** 1 MV

108. Which one of the following detectors can count fast and operate at low voltage:

(a) Solid state detector **(b)** G.M counter

(c) Wilson cloud chamber **(d)** None of these

109. In G.M counter, the electrons take time to reach the anode is:

(a) 1 μs **(b)** 10^{-6} μs

(c) 2 μc **(d)** None of these

110. In G.M counter, the positive ions take time to reach the cathode is:

(a) 10^{-2} s **(b)** 10^{-3} μs

(c) 10^{-4}s **(d)** 10^{-6} s

111. The capture of a neutron by a nucleus results in the formation of:

(a) Deutron **(b)** Proton

(c) Helium **(d)** Radio Isotope

112. One mass scale 1u is equal to:

(a) 1.66×10^{18} kg **(b)** 1.66×10^{-19} kg

(c) 1.66×10^{-27} kg **(d)** 1.66×10^{27} kg

113. One joule of energy absorbed per kilogram of a body is:

(a) Roentgen **(b)** Grey

(c) Rem **(d)** Curie

114. The total energy transferred to a body by means of radiation is measured in units of:

(a) Becquerels **(b)** Grey

(c) Rem **(d)** Roentgen

115. The SI unit of radiation dose is:

(a) Roentgen **(b)** Curie

(c) Grey **(d)** Rem

116. The number of fundamental forces present in nature are:

(a) 3 **(b)** 2

(c) 5 **(d)** 4

117. During fusion of hydrogen into helium:

(a) Energy is released

(b) Energy is absorbed

(c) Mass is increased due to energy absorption

(d) Mass is reduced due to energy released

118. A pair of quark and anti quark makes a:

(a) Meson **(b)** Bargon

(c) Photon **(d)** Proton

119. The mass spectrum of naturally occurring neon, showing:

(a) 1 isotope **(b)** 2 isotope

(c) 3 isotope **(d)** 4 isotope

120. The energy of photon for photoelectric effect is less than:

(a) 1 MeV **(b)** 2 MeV

(c) 5 MeV **(d)** 8 MeV

121. In Wilson cloud chamber, if tracks are thick, straight and continuous, then particle is:

(a) α-particles **(b)** β-particles

(c) γ-rays **(d)** All

122. Low level radiations effects:

(a) Less of hair **(b)** Ulceration

(c) Drop of white blood cells **(d)** All

ANSWERS

1.	(b)	**2.**	(d)	**3.**	(b)	**4.**	(a)	**5.**	(c)
6.	(d)	**7.**	(d)	**8.**	(d)	**9.**	(a)	**10.**	(d)
11.	(a)	**12.**	(a)	**13.**	(d)	**14.**	(c)	**15.**	(d)
16.	(b)	**17.**	(c)	**18.**	(c)	**19.**	(c)	**20.**	(a)
21.	(a)	**22.**	(b)	**23.**	(b)	**24.**	(a)	**25.**	(c)
26.	(c)	**27.**	(a)	**28.**	(b)	**29.**	(a)	**30.**	(a)
31.	(c)	**32.**	(b)	**33.**	(b)	**34.**	(c)	**35.**	(b)
36.	(c)	**37.**	(d)	**38.**	(d)	**39.**	(a)	**40.**	(a)
41.	(d)	**42.**	(a)	**43.**	(c)	**44.**	(b)	**45.**	(c)
46.	(d)	**47.**	(c)	**48.**	(b)	**49.**	(b)	**50.**	(c)
51.	(c)	**52.**	(b)	**53.**	(b)	**54.**	(d)	**55.**	(a)
56.	(a)	**57.**	(c)	**58.**	(b)	**59.**	(a)	**60.**	(a)
61.	(c)	**62.**	(b)	**63.**	(d)	**64.**	(d)	**65.**	(a)
66.	(b)	**67.**	(b)	**68.**	(b)	**69.**	(c)	**70.**	(a)
71.	(a)	**72.**	(c)	**73.**	(b)	**74.**	(c)	**75.**	(a)
76.	(d)	**77.**	(b)	**78.**	(a)	**79.**	(b)	**80.**	(a)
81.	(b)	**82.**	(b)	**83.**	(b)	**84.**	(a)	**85.**	(d)
86.	(b)	**87.**	(a)	**88.**	(d)	**89.**	(c)	**90.**	(b)
91.	(c)	**92.**	(a)	**93.**	(b)	**94.**	(b)	**95.**	(b)
96.	(c)	**97.**	(a)	**98.**	(a)	**99.**	(a)	**100.**	(c)
101.	(c)	**102.**	(a)	**103.**	(a)	**104.**	(a)	**105.**	(c)
106.	(c)	**107.**	(b)	**108.**	(c)	**109.**	(a)	**110.**	(b)
111.	(d)	**112.**	(c)	**113.**	(b)	**114.**	(d)	**115.**	(c)
116.	(d)	**117.**	(a)	**118.**	(a)	**119.**	(c)	**120.**	(c)
121.	(a)	**122.**	(d)						