10. For effective nuclear forces, the distance should be

[Orissa PMT 2004]

(1) $10^{-10} m$ (2) $10^{-13} m$
(3) $10^{-15} m$ (4) $10^{-20} m$

11. The masses of neutron and proton are 1.0087 *a.m.u.* and 1.0073 *a.m.u.* respectively. If the neutrons and protons combine to form a helium nucleus (alpha particles) of mass 4.0015 *a.m.u.* The binding energy of the helium nucleus will be (1 *a.m.u.*= 931 *MeV*)

[CPMT 1986; MP PMT 1995; CBSE PMT 2003]

(1) 28.4 *MeV* (2) 20.8 *MeV*
(3) 27.3 *MeV* (4) 14.2 *MeV*

12. The mass defect for the nucleus of helium is 0.0303 *a.m.u.* What is the binding energy per nucleon for helium in *MeV*

[NCERT 1990]

(1) 28 (2) 7
(3) 4 (4) 1

13. Atomic power station at Tarapore has a generating capacity of 200 *MW*. The energy generated in a day by this station is

[NCERT 1975]

(1) 200 *MW* (2) 200 *J*
(3) $4800 \times 10^{6} J$ (4) $1728 \times 10^{10} J$

14. One microgram of matter converted into energy will give

[CPMT 1984; EAMCET (Engg.) 1995; SCRA 1994; BVP 2003]

(1) 90 *J* (2) $9 \times 10^{3} J$
(3) $9 \times 10^{10} J$ (4) $9 \times 10^{5} J$

15. The average binding energy per nucleon in the nucleus of an atom is approximately

[EAMCET 1988; CBSE PMT 1992; CPMT 1999; RPET 2002]

(1) 8 *eV* (2) 8 *KeV*
(3) 8 *MeV* (4) 8 *J*

16. The binding energy of deuteron ${}_1^2H$ is 1.112 *MeV* per nucleon and an $\alpha-$particle ${}_2^4He$ has a binding energy of 7.047 *MeV* per nucleon. Then in the fusion reaction ${}_1^2H + {}_1^2H \to {}_2^4He + Q$, the energy Q released is

[MP PMT 1992; Roorkee 1994; IIT 1996; AIIMS 1997]

(1) 1 *MeV* (2) 11.9 *MeV*
(3) 23.8 *MeV* (4) 931 *MeV*

17. Binding energy of a nucleus is

(1) Energy given to its nucleus during its formation

(2) Total mass of nucleus converted to energy units

(3) Loss of energy from the nucleus during its formation

(4) Total K.E. and P.E. of the nucleons in the nucleus

18. One requires energy E_n to remove a nucleon from a nucleus and an energy 'E_e' to remove an electron from the orbit of an atom. Then

[NCERT 1981]

(1) $E_n = E_e$ (2) $E_n < E_e$
(3) $E_n > E_e$ (4) $E_n \geq E_e$

19. Which of the following pairs is an isobar **[MP PET 1994]**

(1) $1H^{1}$and $1H^{2}$ (2) $1H^{2}$and $1H^{3}$
(3) $6C^{12}$and $6C^{13}$ (4) $15P^{30}$and $14Si^{30}$

20. Equivalent energy of mass equal to 1 *a.m.u.* is

[CBSE PMT 1992; MP PET 1988, 2002; MP PMT 1994, 98, 2004; RPET 1997; RPMT 2000]

(1) 931 *KeV* (2) 931 *eV*
(3) 931 *MeV* (4) 9.31 *MeV*

21. The binding energies per nucleon for a deuteron and an $\alpha-$particle are x_1 and x_2 respectively. What will be the energy Q released in the reaction $1H^{2} + {}_1H^{2} \to {}_2He^{4} + Q$

[CBSE PMT 1995]

(1) $4(x_1 + x_2)$ (2) $4(x_2 - x_1)$
(3) $2(x_1 + x_2)$ (4) $2(x_2 - x_1)$

22. The mass number of a nucleus is equal to the number of

[MP PET 1996]

(1) Electrons it contains (2)Protons it contains

(3) Neutrons it contains (4) Nucleons it contains

23. The rest energy of an electron is

[MP PMT 1996; BCECE 2003]

(1) 510 KeV (2) 931 KeV

(3) 510 MeV (4) 931 MeV

24. In $88Ra^{226}$ nucleus, there are

[MP PMT/PET 1998]

(1) 138 protons and 88 neutrons

(2) 138 neutrons and 88 protons

(3) 226 protons and 88 electrons

(4) 226 neutrons and 138 electrons

25. Outside a nucleus [MP PET 1999; CPMT 2000; BHU 2000]

(1) Neutron is stable

(2) Proton and neutron both are stable

(3) Neutron is unstable

(4) Neither neutron nor proton is stable

26. Order of magnitude of density of uranium nucleus is $(m_p = 1.67 \times 10^{-27} kg)$

[MP PET 1995; IIT-JEE 1999; MP PMT 2000; UPSEAT 2003]

(1) $10^{20} kg/m^3$ (2) $10^{17} kg/m^3$

(3) $10^{14} kg/m^3$ (4) $10^{11} kg/m^3$

27. Radius of ${}_2^4He$ nucleus is 3 *Fermi*. The radius of $3{\rightarrow}2$ nucleus will be [CPMT 1999]

(1) 5 *Fermi* (2) 6 *Fermi*

(3) 11.16 *Fermi* (4) 8 *Fermi*

28. Nucleus of an atom whose atomic mass is 24 consists of

[CPMT 1999]

(1) 11 electrons, 11 protons and 13 neutrons

(2) 11 electrons, 13 protons and 11 neutrons

(3) 11 protons and 13 neutrons

(4) 11 protons and 13 electrons

29. Atomic weight of boron is 10.81 and it has two isotopes $5B^{10}$ and $5B^{11}$. Then ratio of $5B^{10}$:${}_5B^{11}$ in nature would be

[CBSE PMT 1998; JIPMER 2001, 02]

(1) 19 : 81 (2) 10 : 11

(3) 15 : 16 (4) 81 : 19

30. The mass of a neutron is the same as that of

[KCET 1994]

(1) A proton (2) A meson

(3) An epsilon (4) An electron

31. The mass defect per nucleon is called

[EAMCET 1994; MP PMT 2002; MP PMT 2002]

(1) Binding energy (2) Packing fraction

(3) Ionisation energy (4) Excitation energy

32. Nuclear forces are

[EAMCET (Engg.) 1995; CPMT 1999; AMU 2001]

(1) Short ranged attractive and charge independent

(2) Short ranged attractive and charge dependent

(3) Long ranged repulsive and charge independent

(4) Long ranged repulsive and charge dependent

33. In helium nucleus, there are

[RPET 1997]

(1) 2 protons and 2 electrons

(2) 2 neutrons, 2 protons and 2 electrons

(3) 2 protons and 2 neutrons

(4) 2 positrons and 2 protons

34. Antiparticle of electron is

[RPMT 1997]

(1) $0n^1$ (2) $1{\rightleftarrows}H^1$

(3) Positron (4) Neutrino

35. The binding energy per nucleon is maximum in the case of

[CBSE PMT 1993; JIPMER 2001, 02]

(1) ${}_4^2He$ (2) ${}_{26}^{56}Fe$

(3) ${}_{56}^{141}Ba$ (4) ${}_{92}^{235}U$

36. Isotopes are atoms having **[KCET 1994; BHU 2001]**

(1) Same number of protons but different number of neutrons

(2) Same number of neutrons but different number of protons

(3) Same number of protons and neutrons

(4) None of the above

37. The mass of an α-particle is **[CBSE PMT 1992]**

(1) Less than the sum of masses of two protons and two neutrons

(2) Equal to mass of four protons

(3) Equal to mass of four neutrons .

(4) Equal to sum of masses of two protons and two neutrons

38. If the binding energy per nucleon in Li^7 and He^4 nuclei are respectively 5.60 MeV and 7.06 MeV, then energy of reaction $Li^7 + p \rightarrow 2\ _2He^4$ is **[CBSE PMT 1994; JIPMER 2000]**

(1) 19.6 MeV (2) 2.4 MeV

(3) 8.4 MeV (4) 17.3 MeV

39. The mass number of He is 4 and that for sulphur is 32. The radius of sulphur nucleus is larger than that of helium, by times **[CBSE PMT 1994]**

(1) $\sqrt{8}$ (2) 4

(3) 2 (4) 8

40. A nucleus ruptures into two nuclear parts which have their velocity ratio equal to 2 : 1. What will be the ratio of their nuclear size (nuclear radius) **[CBSE PMT 1996]**

(1) $2^{1/3}:1$ (2) $1:2^{1/3}$

(3) $3^{1/2}:1$ (4) $1:3^{1/2}$

41. Energy of 1g uranium is equal to **[CPMT 1996]**

(1) $9.0 \times 10^{13} J$ (2) $9.0 \times 10^{19} J$

(3) $3.0 \times 10^{16} J$ (4) $3.0 \times 10^{17} J$

42. In a fission reaction $^{236}_{92}U \rightarrow {}^{117}X + {}^{117}Y + n + n$, the binding energy per nucleon of X and Y is 8.5 MeV whereas of $236U$ is 7.6 MeV. The total energy liberated will be about **[CBSE PMT 1997]**

(1) 200 KeV (2) 2 MeV

(3) 200 MeV (4) 2000 MeV

43. Atomic number of a nucleus is Z and atomic mass is M. The number of neutron is **[CPMT 1997; RPMT 1999; BHU 1999]**

(1) $M - Z$ (2) M

(3) Z (4) $M + Z$

44. The α-particle is the nucleus of an atom of **[MP PET 2003]**

(1) Neon (2) Hydrogen

(3) Helium (4) Deuterium

45. The force acting between proton and proton inside the nucleus is **[RPET 1999]**

(1) Coulombic (2) Nuclear

(3) Both (4) None of these

46. For a nucleus to be stable, the correct relation between neutron number N and Proton number Z is **[RPET 1999]**

(1) $N > Z$ (2) $N = Z$

(3) $N < Z$ (4) $N \geq Z$

47. Two nucleons are at a separation of $1 \times 10^{-15} m$. The net force between them is F_1, if both are neutrons, F_2 if both are protons and F_3 if one is a proton and other is a neutron. In such a case **[KCET (Med.) 2000, 05; UPSEAT 2005]**

(1) $F_2 > F_1 > F_3$ (2) $F_1 = F_2 = F_3$

(3) $F_1 = F_2 > F_3$ (4) $F_1 = F_3 > F_2$

48. M_n and M_p represent mass of neutron and proton respectively. If an element having atomic mass M has N-neutron and Z-proton, then the correct relation will be

[CBSE PMT 2001]

(1) $M < [NM_n + ZM_P]$ (2) $M > [NM_n + ZM_P]$

(3) $M = [NM_n + ZM_P]$ (4) $M = N[M_n + M_P]$

49. If a H_2 nucleus is completely converted into energy, the energy produced will be around

[Kerala (Engg.) 2001]

(1) 1 MeV (2) 938 MeV

(3) 9.38 MeV (4) 238 MeV

50. The radius of a nucleus of a mass number A is directly proportional to

[MH CET 1999; AMU (Engg.) 2001; UPSEAT 2004]

(1) A^3 (2) A

(3) $A^{2/3}$ (4) $A^{1/3}$

51. The mass and energy equivalent to 1 *a.m.u.* respectively

(1) $1.67 \times 10^{-27} gm, 9.30 MeV$

(2) $1.67 \times 10^{-27} kg, 930 MeV$

(3) $1.67 \times 10^{-27} kg, 1 MeV$

(4) $1.67 \times 10^{-34} kg, 1 MeV$

52. The sodium nucleus $^{23}_{11}Na$ contains

[MP PET 2001]

(1) 11 electrons (2) 12 protons

(3) 23 protons (4) 12 neutrons

53. As compared ^{12}C atom, ^{14}C atom has

[MP PMT 2002]

(1) Two extra protons and two extra electrons

(2) Two extra protons but no extra electrons

(3) Two extra neutrons and no extra electrons

(4) Two extra neutrons and two extra electrons

54. Two protons exerts a nuclear force on each other, the distance between them is

(1) $10^{-14} m$ (2) $10^{-10} m$

(3) $10^{-12} m$ (4) $10^{-8} m$

55. If m, m_n and m_p are the masses of ZX^A nucleus, neutron and proton respectively

(1) $m < (A-Z)_{m_n} + Zm_p$ (2) $m = ($

(3) $m = (A-Z)m_p + Zm_n$ (4) $m > (A-Z)m_n + Zm_p$

56. The mass defect in a particular nuclear reaction is 0.3 *grams*. The amount of energy liberated in kilowatt hours is

(Velocity of light = $3 \times 10^8 m/s$)

(1) 1.5×10^6 (2) 2.5×10^6

(3) 3×10^6 (4) 7.5×10^6

57. Which of the following statement(s) is/(are) correct

[IIT 1994]

(1) The rest mass of a stable nucleus is less than the sum of the rest masses of its separated nucleons

(2) The rest mass of a stable nucleus is greater than the sum of the rest masses of its separated nucleons.

[CPMT 2000; MP PET/PMT 2001]

(3) In nuclear fusion, energy is released by fusing two nuclei of medium mass (approximately 100 *a.m.u.*)

(4) In nuclear fission, energy is released by fragmentation of a very heavy nucleus

58. On the bombardment of neutron with Boron. α-particle is emitted and product nuclei formed is

[RPMT 2000]

(1) $6C^{12}$ (2) $3Li^6$

(3) $3Li^7$ (4) $4Be^9$

59. The average kinetic energy of the thermal neutrons is of the order of **[MP PET 1993; AMU (Engg.) 1999]**

(1) $0.03\ eV$ (2) $3\ eV$

(3) $3\ KeV$ (4) $3\ MeV$

(Boltzmann's constant $K_B = 8 \times 10^{-5} eV/Kelvin$)

[CPMT 2002]

60. Which of the following isotopes is normally fissionable ?

[MP PET 1993]

(1) $92U^{238}$ (2) $93Np^{239}$

[KCET 2003; CPMT 2003]

(3) $\frac{9}{5}$ (4) $\frac{n^2}{Z}$

61. The control rod in a nuclear reactor is made of **[EAMCET (Med.) 1995]**

(1) Uranium (2) Cadmium
(3) Graphite (4) Plutonium

62. The process by which a heavy nucleus splits into light nuclei is known as **[MP PET 1996]**

(1) Fission (2) $\alpha-$ decay
(3) Fusion (4) Chain reaction

63. The explosion of the atomic bomb takes place due to **[CPMT 1984, 86; BHU 2001]**

(1) Nuclear fission (2) Nuclear fusion
(3) Scattering (4) Thermionic emission

64. In nuclear reaction $2He^4 + {}_zX^A \rightarrow {}_{z+2}Y^{A+3} + A$, A denotes **[CPMT 1997]**

(1) Electron (2) Positron
(3) Proton (4) Neutron

65. Energy generation in stars is mainly due to **[DCE 1999, 2000]**

(1) Chemical reactions (2) Fission of heavy nuclei
(3) Fusion of light nuclei (4)Fusion of heavy nuclei

66. Which of the following is the fusion reaction **[MP PET 1993]**

(1) $1H^2 + {}_1H^2 \rightarrow {}_2He^4$
(2) $0n^1 + {}_7N^{14} \rightarrow {}_6C^{14} + {}_1H^1$
(3) $0n^1 + {}_{92}U^{238} \rightarrow {}_{93}Np^{239} + \beta^{-1} + \gamma$
(4) $1H^3 \rightarrow {}_2He^3 + \beta^{-1} + \gamma$

67. If the speed of light were 2/3 of its present value, the energy released in a given atomic explosion will be decreased by a fraction **[Kerala PET 2002]**

(1) 2/3 (2) 4/9
(3) 3/4 (4) 5/9

68. Fusion reaction is initiated with the help of **[DPMT 2002]**

(1) Low temperature (2) High temperature
(3) Neutrons (4) Any particle

69. When a $4Be^9$ atom is bombarded with $\alpha-$ particles, one of the product of nuclear transmutation is $6C^{12}$. The other is **[CPMT 1982]**

(1) $-1e^0$ (2) $X-$
(3) $1D^2$ (4) $0n^1$

70. Atom bomb consists of two pieces of $92U^{235}$ and a source of **[MP PET/PMT 1988]**

(1) Proton (2) Neutron
(3) Meson (4) Electron

71. Most suitable element for nuclear fission is the element with atomic number near **[CPMT 1982]**

(1) 11 (2) 21
(3) 52 (4) 92

72. From the following equations, pick out the possible nuclear reactions **[IIT 1984]**

(1) $6C^{13} + {}_1H^1 \rightarrow {}_6C^{14} + 4.3\ MeV$
(2) $6C^{12} + {}_1H^1 \rightarrow {}_7N^{13} + 2\ MeV$
(3) $7N^{14} + {}_1H^1 \rightarrow {}_8O^{15} + 7.3\ MeV$
(4) $92U^{235} + {}_0n^1 \rightarrow {}_{54}X^{140} + {}_{38}Si^{94} + 2{}_0n^1 + \gamma + 200M$

73. During the nuclear fusion reaction **[IIT 1987]**

(1) A heavy nucleus breaks into two fragments by itself
(2) A light nucleus bombarded by thermal neutrons breaks up
(3) A heavy nucleus bombarded by thermal neutrons breaks up
(4) Two light nuclei combine to give a heavier nucleus and possibly other products

74. In a working nuclear reactor, Cadmium rods, (control rods) are used to **[CPMT 2003; MP PMT 2004]**

(1) Speed up neutrons (2) Slow down neutrons

(3) Absorb some neutrons (4)Absorb all neutrons

75. Fusion reaction takes place at high temperature because

[CPMT 1980; SCRA 1996; RPET 1999]

(1) Atoms are ionised at high temperature

(2) Molecules break-up at high temperature

(3) Nuclei break-up at high temperature

(4) Kinetic energy is high enough to overcome repulsion between nuclei

76. In nuclear reactions, we have the conservation of

[CPMT 1990; AIIMS 1997]

(1) Mass only

(2) Energy only

(3) Momentum only

(4) Mass, energy and momentum

77. The mechanism of the hydrogen bomb is based on

(1) Fission of isotopes of hydrogen

(2) Fusion of protons

(3) Fusion of deutrium and tritium

(4) Fusion of neutrons

78. The main source of solar energy is

[CPMT 1990; MP PET 1985, 86; CBSE PMT 1992; EAMCET (Engg.) 1995; RPET 1996; AFMC 1998]

(1) Fission reactions (2) Fusion reactions

(3) Chemical reactions (4) Combustion reactions

79. A gamma ray photon creates an electron-positron pair. If the rest mass energy of an electron is 0.5 *MeV* and the total K.E. of the electron- positron pair is 0.78 *MeV*, then the energy of the gamma ray photon must be**[MP PMT 1991]**

(1) 0.78 *MeV* (2) 1.78 *MeV*

(3) 1.28 *MeV* (4) 0.28 *MeV*

80. Which of the following statement is true**[MP PET 1993]**

(1) $78Pt^{192}$ has 78 neutrons

(2) $84Po^{214} \rightarrow {}_{82}Pb^{210} + \beta^-$

(3) $92U^{238} \rightarrow {}_{90}Th^{234} + {}_2He^4$

(4) $90Th^{234} \rightarrow {}_{91}Pa^{234} + {}_2He^4$

81. What was the fissionable material used in bomb dropped at Nagasaki (Japan) in the year 1945 ?

[MNR 1985; UPSEAT 2003]

(1) Uranium (2) Nepturium

(3) Berkalium (4) Plutonium

82. Thermal neutrons are those which

[NCERT 1983]

(1) Are at very high temperature

(2) Move with high velocities

(3) Have kinetic energies similar to those of surrounding molecules

(4) Are at rest

83. In a fission process, nucleus *A* divides into two nuclei *B* and *C*, their binding energies being E_a, $E_b$and E_c respectively. Then

(1) $E_b = E_c = Ea$ (2) $E_b + E_c > E_a$

(3) $E_b + E_c < E_a$ (4) $E_b, E_c = E_a$

84. A nuclear bomb exploded 200 *km* above the surface of moon. The sound of explosion on the moon **[CPMT 1989]**

(1) Will heard before the explosion is seen

(2) Will be heard at the same time

(3) Will be heard after explosion

(4) Will not heard at all

85. Fast neutrons can easily be slowed down by **[IIT 1994]**

(1) The use of lead shielding

(2) Passing them through water

(3) Elastic collisions with heavy nuclei

(4) Applying a strong electric field

86. The mass equivalent of 931 *MeV* energy is **[MP PET 1994; MH CET 2003]**

(1) $1.66 \times 10^{-27} kg$ (2) $6.02 \times 10^{-24} kg$

(3) $1.66 \times 10^{-20} kg$ (4) $6.02 \times 10^{-27} kg$

87. When $92U^{235}$ undergoes fission, 0.1% of its original mass is changed into energy. How much energy is released if 1*kg* of $92U^{235}$ undergoes fission **[MP PET 1994; MP PMT/PET 1998; BHU 2001; BVP 2003]**

(1) $9 \times 10^{10} J$ (2) $9 \times 10^{11} J$

(3) $9 \times 10^{12} J$ (4) $9 \times 10^{13} J$

88. γ-rays radiation can be used to create electron-positron pair. In this process of pair production, γ-rays energy cannot be less than **[MP PMT 1994]**

(1) 5.0 *MeV* (2) 4.02 *MeV*

(3) 15.0 *MeV* (4) 1.02 *MeV*

89. A reaction between a proton and $8O^{18}$ that produces $9F^{18}$ must also liberate **[Roorkee 1995]**

(1) $0n^1$ (2) $1e^0$

(3) $1n^0$ (4) $0e^1$

90. 200 *MeV* of energy may be obtained per fission of U^{235}. A reactor is generating 1000 *kW* of power. The rate of nuclear fission in the reactor is **[MP PET 1995]**

(1) 1000 (2) 2×10^8

(3) 3.125×10^{16} (4) 931

91. In the nuclear reaction $92U^{238} \rightarrow {}_zTh^A + {}_2He^4$, the values of *A* and *Z* are **[MP PMT 1996]**

(1) *A* = 234, *Z* = 94 (2) *A* = 234, *Z* = 90

(3) *A* = 238, Z = 94 (4) *A* = 238, *Z* = 90

92. If 200 *MeV* energy is released in the fission of a single U^{235} nucleus, the number of fissions required per second to produce 1 *kilowatt* power shall be (Given $1\ eV = 1.6 \times 10^{-19} J$) **[AMU 1995; MP PMT 1999]**

(1) 3.125×10^{13} (2) 3.125×10^{14}

(3) 3.125×10^{15} (4) 3.125×10^{16}

93. A chain reaction is continuous due to **[CPMT 1999]**

(a) Large mass defect

(2) Large energy

(3) Production of more neutrons in fission

(4) None of these

94. Complete the equation for the following fission process $92U^{235} + {}_0n^1 \rightarrow {}_{38}Sr^{90} +$ .... **[CBSE PMT 1998]**

(1) $54Xe^{143} + 3\ {}_0n^1$ (2) $54Xe^{145}$

(3) $57Xe^{142}$ (4) $54Xe^{142} + {}_0n$

95. The example of nuclear fusion is **[KCET 1994]**

(1) Formation of barium and krypton from uranium

(2) Formation of helium from hydrogen

(3) Formation of plutonium 235 from uranium 235

(4) Formation of water from hydrogen and oxygen

96. In nuclear fission, the fission reactions proceeds with a projectile. Which of the following suits the best **[EAMCET 1994]**

(1) Slow proton (2) Fast neutron

(3) Slow neutron (4) None of these

97. When two deuterium nuclei fuse together to form a tritium nuclei, we get a **[EAMCET 1994; CPMT 2000]**

(1) Neutron (2) Deutron

(3) $\alpha -$ particle (4) Proton

98. Name of the India's first nuclear reactor is

[EAMCET (Med.) 1995]

(1) RAMBHA (2) MENAKA

(3) URVASI (4) APSARA

99. 1 g of hydrogen is converted into 0.993 g of helium in a thermonuclear reaction. The energy released is

[EAMCET (Med.) 1995; CPMT 1999]

(1) $63 \times 10^{7} J$ (2) $63 \times 10^{10} J$

(3) $63 \times 10^{14} J$ (4) $63 \times 10^{20} J$

100. In the nuclear reaction $85X^{297} \rightarrow Y + 4\alpha$, Y is

[Bihar MEE 1995]

(1) $76Y^{287}$ (2) $77Y^{285}$

(3) $77Y^{281}$ (4) $77Y^{289}$

101. In the following reaction

$12Mg^{24} + {}_2He^4 \rightarrow {}_{14}Si^X + {}_0n^1$, X is **[SCRA 1994]**

(1) 28 (2) 27

(3) 26 (4) 22

102. Thermal neutrons can cause fission in **[SCRA 1994]**

(1) U^{235} (2) U^{238}

(3) Pu^{238} (4) Th^{232}

103. In the nuclear reaction $6C^{11} \rightarrow {}_5B^{11} + \beta^+ + X$, what does X stand for **[MNR 1998]**

(1) An electron (2) A proton

(3) A neutron (4) A neutrino

104. When neutrons are bombarded on nucleus of $92U^{235}$, the number of emitted neutrons will be

[RPMT 1997]

(1) 1 (2) 2

(3) 3 (4) 4

105. Energy released in the fission of a single $92U^{235}$ nucleus is 200 MeV. The fission rate of a $92U^{235}$ fuelled reactor operating at a power level of 5W is **[CBSE PMT 1993]**

(1) $1.56 \times 10^{+10} s^{-1}$ (2) $1.56 \times 10^{+11} s^{-1}$

(3) $1.56 \times 10^{+16} s^{-1}$ (4) $1.56 \times 10^{+17} s^{-1}$

106. The energy released in a typical nuclear fusion reaction is approximately

[IIT 1992]

(1) 25 MeV (2) 200 MeV

(3) 800 MeV (4) 1050 MeV

107. Which one of the following nuclear reactions is a source of energy in the sun

[BHU 1994]

(1) ${}^9_4Be + {}^4_2He \rightarrow {}^{12}_6C + {}^{-1}_0n$

(2) ${}^3_2He + {}^3_2He \rightarrow {}^4_2He + {}^1_1H + {}^1_1H$

(3) ${}^{144}_{56}Ba + {}^{92}_{56}Kr \rightarrow {}^{235}_{92}U + {}^{-1}_0n$

(4) ${}^{56}_{26}Fe + {}^{112}_{48}Ca \rightarrow {}^{167}_{74}W + {}^{-1}_0n$

108. Heavy water is used as moderator in a nuclear reactor. The function of the moderator is

[CBSE PMT 1994; EAMCET (Engg.) 1995; AFMC 2002; DPMT 2003; DCE 2004]

(1) To control the energy released in the reactor

(2) To absorb neutrons and stop chain reaction

(3) To cool the reactor faster

(4) To slow down the neutrons to thermal energies

109. Nuclear fission experiments show that the neutrons split the uranium nuclei into two fragments of about same size. This process is accompanied by the emission of several

[CBSE PMT 1994; SCRA 1994; DPMT 2000]

(1) Protons and positrons (2) α-particles

(3) Neutrons (4) Protons and α-particles

110. $1H^1 + {}_1H^1 + {}_1H^2 \rightarrow X + {}_{+1}e^0 +$ energy. The emitted particle is **[CPMT 1996]**

(1) Neutron (2) Proton

(3) $\alpha-$ particle (4) Neutrino

111. In a nuclear reaction, which of the following is conserved

[BHU 1997]

(1) Atomic number

(2) Mass number

(3) Atomic number, mass number and energy

(4) None of these

112. A free neutron decays into a proton, an electron and

[CBSE PMT 1997; DPMT 2001]

(1) A neutrino (2) An antineutrino

(3) An alpha particle (4) A beta particle

113. Which of the following is used as a moderator in nuclear reactors **[CBSE PMT 1997; AIIMS 1999; AFMC 2001]**

(1) Uranium (2) Heavy water

(3) Cadmium (4) Plutonium

114. Energy in the sun is generated mainly by

[JIPMER 1997; AIIMS 1999; BHU 2000]

(1) Fusion of radioactive material

(2) Fission of helium atoms

(3) Chemical reaction

(4) Fusion of hydrogen atoms

115. When a slow neutron goes sufficiently close to a U^{235} nucleus, then the process that takes place is

[AFMC 1998]

(1) Fission of U^{235} (2) Fusion of neutron

(3) Fusion of U^{235} (4) First (1) then(2)

116. If a proton and anti-proton come close to each other and annihilate, how much energy will be released

[DCE 1999; 2003]

(1) $1.5 \times 10^{-10} J$ (2) $3 \times 10^{-10} J$

(3) $4.5 \times 10^{-10} J$ (4) None of these

117. Which of these is a fusion reaction **[DCE 1999]**

(1) ${}_{3}^{1}H + {}_{2}^{1}H = {}_{4}^{2}He + {}_{1}^{0}n$

(2) ${}_{92}^{238}U \rightarrow {}_{82}^{206}Pb + 8({}_{2}^{4}He) + 6({}_{-1}^{0}\beta)$

(3) ${}_{7}^{12}C \rightarrow {}_{6}^{12}C + \beta^{+} + \gamma$

(4) None of these

118. In a nuclear fission reaction

(1) Two light nuclei combine to produce a heavier nucleus

(2) A light nucleus bombarded by thermal neutrons breaks up

(3) A heavy nucleus bombarded by thermal neutrons breaks up

(4) A heavy nucleus breaks up by itself

119. Hydrogen bomb is based on which of the following phenomenon **[CPMT 2000]**

(1) Nuclear fission (2) Nuclear fusion

(3) Radioactive decay (4) None of these

120. The number of neutrons released when $92U^{235}$ undergoes fission by absorbing $0n^{1}$ and $({}_{56}Ba^{144} + {}_{36}Kr^{89})$ are formed, is

(1) 0 (2) 1

(3) 2 (4) 3

121. Energy released in fusion of 1 *kg* of deuterium nuclei

[RPET 2000]

(1) $8 \times 10^{13} J$ (2) $6 \times 10^{27} J$

(3) $2 \times 10^{7} KwH$ (4) $8 \times 10^{23} MeV$

122. Best neutron moderator is

(1) Berillium oxide (2) Pure water

(3) Heavy water (4) Graphite

123. Nuclear fission was discovered by

(1) Auto Hahn and F. strassmann

(2) Fermi

(3) Bethe

(4) Rutherford

124. Which of the following is true for a sample of isotope containing U^{235} and U^{238}

(1) Number of neutron are same in both

(2) Number of proton, electron and neutron are same in both

(3) Contain same number of protons and electrons but U^{238} contains 3 more neutrons than U^{235}

(4) U^{238} contains 3 less neutron then U^{235}

125. Which of the following particle has similar mass to electron **[RPMT 2000]**

(1) Proton (2) Neutron
(3) Positron (4) Neutrino

126. Boron rods in nuclear reactor are used as a **[RPMT 2000]**

(1) Moderator (2) Control rods
(3) Coolants (4) Protective shield

127. If the energy released in the fission of one nucleus is 200 *MeV*. Then the number of nuclei required per second in a power plant of 16 *kW* will be **[KCET (Engg.) 2000; CPMT 2001; Pb. PET 2002]**

(1) 0.5×10^{14} (2) 0.5×10^{12}
(3) 5×10^{12} (4) 5×10^{14}

128. Neutrino is a particle, which is

(1) Charged and has spin
(2) Charged and has no spin
(3) Charge less and has spin
(4) Charge less and has no spin

129. To generate a power of 3.2 *mega watt*, the number of fissions of U^{235} per minute is (Energy released per fission = 200*MeV*, $1eV = 1.6 \times 10^{-19} J$) **[EAMCET (Engg.) 2000]**

(1) 6×10^{18} (2) 6×10^{17}
(3) 10^{17} (4) 6×10^{16}

130. The average number of prompt neutrons produced per fission of U^{235} is

(1) More than 5 (2) 3 to 5
(3) 2 to 3 (4) 1 to 2

131. In the nuclear reaction: $X(n,\alpha)_3Li^7$ the term X will be 3 **[CBSE PMT 2001; AIEEE 2005]**

(1) $5B^{10}$ (2) $5B^9$
(3) $5B^{11}$ (4) $2He^4$

132. In an atomic bomb, the energy is released due to **[AIIMS 2001]**

(1) Chain reaction of neutrons and $92U^{235}$
(2) Chain reaction of neutrons and $92U^{238}$
(3) Chain reaction of neutrons and $92P^{240}$
(4) Chain reaction of neutrons and $92U^{236}$

133. If an electron and a positron annihiliate, then the energy released is **[DCE 2001; AIIMS 2004]**

(1) $3.2 \times 10^{-13} J$ (2) $1.6 \times 10^{-13} J$
(3) $4.8 \times 10^{-13} J$ (4) $6.4 \times 10^{-13} J$

134. The binding energy per nucleon of deuterium and helium atom is 1.1 *MeV* and 7.0 *MeV*. If two deuterium nuclei fuse to form helium atom, the energy released is **[Pb. PMT 2001; CPMT 2001; AIEEE 2004]**

(1) 19.2 *MeV* (2) 23.6 *MeV*
(3) 26.9 *MeV* (4) 13.9 *MeV*

135. The energy liberated on complete fission of 1 *kg* of $92U^{235}$ is (Assume 200 *MeV* energy is liberated on fission of 1 nucleus) **[AIIMS 2000]**

(1) $8.2 \times 10^{10} J$ (2) $8.2 \times 10^{9} J$
(3) $8.2 \times 10^{13} J$ (4) $8.2 \times 10^{16} J$

136. Which one of the following statements about uranium is correct **[UPSEAT 2002]**

(1) $235U$ is fissionable by thermal neutrons
(2) Fast neutrons trigger the fission process in $n = 1 \; to \; n = 2$
(3) $238U$ breaks up into fragments when bombarded by slow neutrons
(4) $n = 2 \; to \; n = 1$ is an unstable isotope and undergoes spontaneous fission

137. In nuclear fission the percentage of mass converted into energy is about **[MP PMT 2000]** **[KCET 2002]**

(1) 10% (2) 0.01%
(3) 0.1% (4) 1%

138. In a material medium, when a positron meets an electron both the particles annihilate leading to the emission of two gamma ray photons. This process forms the basis of an important diagnostic procedure called **[AIIMS 2003]**

(1) MRI (2) PET
(3) CAT (4) SPECT

139. The nuclear reaction $2 \rightleftarrows H + {}^2\rightleftarrows H \rightarrow {}^4\rightleftarrows He$ (mass of deuteron = 2.0141 *a.m.u.* and mass of *He* = 4.0024 *a.m.u.*) is **[Orissa JEE 2002]**

(1) Fusion reaction releasing 24 *MeV* energy
(2) Fusion reaction absorbing 24 *MeV* energy
(3) Fission reaction releasing 0.0258 *MeV* energy
(4) Fission reaction absorbing 0.0258 *MeV* energy

140. In the following reaction the value of '*X*' is
$7N^{14} + {}_2\rightleftarrows He^4 \rightarrow X + {}_1\rightleftarrows H^1$ **[DPMT 1999; CPMT 2003]**

(1) $8N^{17}$ (2) $8O^{17}$
(3) $7O^{16}$ (4) $7N^{16}$

141. A π^0 at rest decays into 2γ rays $\pi^0 \rightarrow \gamma + \gamma$. Then which of the following can happen

(1) The two $\gamma' \rightleftarrows s$ move in same direction
(2) The two $\gamma' \rightleftarrows s$ move in opposite direction
(3) Both repel each other
(4) Both attract each other

142. Which of the following are suitable for the fusion process **[CBSE PMT 2002]**

(1) Heavy nuclei (2) Light nuclei
(3) Atom bomb (4) Radioactive decay

143. A deutron is bombarded on $8O^{16}$ nucleus and α-particle is emitted. The product nucleus is

(1) $7N^{13}$ (2) $5B^{10}$
(3) $4Bc^9$ (4) $7N^{14}$

144. A nuclear reaction given by
$ZX^A \rightarrow {}_{Z+1}Y^A + {}_{-1}e^0 + \bar{p}$ represents **[CBSE PMT 2003]**

(1) γ-decay (2) Fusion
(3) Fission (4) β-decay

145. Work of moderator is **[AFMC 2003]**

(1) To control the velocity of neutrons
(2) Cooling
(3) As fuel
(4) It is used for safety

146. Light energy emitted by stars is due to **[Orissa JEE 2003]**

(1) Breaking of nuclei (2) Joining of nuclei
(3) Burning of nuclei (4) Reflection of solar light

147. Solar energy is mainly caused due to **[CBSE PMT 2003]**

(1) Fission of uranium present in the sun
(2) Fusion of protons during synthesis of heavier elements
(3) Gravitational contraction
(4) Burning of hydrogen in the oxygen

148. The binding energy of nucleus is a measure of its **[MP PMT 2004**

(1) Charge (2) Mass
(3) Momentum (4) Stability

149. Mark the correct statement **[MP PMT 2004]**

(1) Nuclei of different elements can have the same number of neutrons **[CPMT 2002]**
(2) Every element has only two stable isotopes
(3) Only one isotope of each element is stable
(4) All isotopes of every element are radioactive

150. The nuclear reactor at Kaiga is a **[KCET 2004]**

(1) Fusion reactor (2) Research reactor
(3) Power reactor (4) Breeder reactor

151. Heavy water is **[KCET 2004]**

[CBSE PMT 2002]
(1) Water at 4^oC
(2) Compound of deuterium and oxygen
(3) Compound of heavy oxygen and heavy hydrogen
(4) Water, in which soap does not lather

152. If *M* is the atomic mass and *A* is the mass number, packing fraction is given by **[KCET 2004]**

(1) $\frac{A}{M-A}$ (2) $\frac{A-M}{A}$
(3) $\frac{M}{M-A}$ (4) $\frac{M-A}{A}$

153. M_p denotes the mass of a proton and M_n that of a neutron. A given nucleus, of binding energy *B*, contains *Z* protons and *N* neutrons. The mass *M*(*N*, *Z*) of the nucleus is given by (*c* is the velocity of light) **[CBSE PMT 2004]**

(1) $M(N,Z) = NM_n + ZM_p - Bc^2$

(2) $M(N,Z) = NM_n + ZM_p + Bc^2$

(3) $M(N,Z) = NM_n + ZM_p - B/c^2$

(4) $M(N,Z) = NM_n + ZM_p + B/c^2$

154. If in a nuclear fusion process the masses of the fusing nuclei be m_1 and m_2 and the mass of the resultant nucleus be m_3, then **[CPMT 1982; CBSE PMT 2004]**

(1) $m_3 = m_1 + m_2$ (2) $m_3 = |m_1 + m_2|$

(3) $m_3 < (m_1 + m_2)$ (4) $m_3 > (m_1 + m_2)$

155. The principle of controlled chain reaction is used in

[Orissa PMT 2004]

(1) Atomic energy reactor (2) Atom bomb

(3) The core of sun (4) Artificial radioactivity

156. ${}^{12}_{6}C$ absorbs an energetic neutron and emits beta particles. The resulting nucleus is

[Kerala PMT 2004]

(1) ${}^{14}_{7}N$ (2) ${}^{13}_{7}N$

(3) ${}^{13}_{5}B$ (4) ${}^{13}_{6}C$

157. Complete the reaction

$n + {}^{235}_{92}U \rightarrow {}^{144}_{56}Ba + ... + 3n$

[Kerala PMT 2004]

(1) ${}^{89}_{36}Kr$ (2) ${}^{90}_{36}Kr$

(3) ${}^{91}_{36}Kr$ (4) ${}^{92}_{36}Kr$

158. Nuclear fusion is common to the pair **[CPMT 2004]**

(1) Thermonuclear reactor, uranium based nuclear reactor

(2) Energy production in sun, uranium based nuclear reactor

(3) Energy production in sun, hydrogen bomb

(4) Disintegration of heavy nuclei, hydrogen bomb

159. 1 atomic mass unit is equal to

[Pb. PET 2001]

(1) $\frac{1}{25}$ (mass of F_2 molecules)

(2) $\frac{1}{14}$ (mass of N_2 molecules)

(3) $\frac{1}{12}$ (mass of one *C*-atom)

(4) $\frac{1}{16}$ (mass of O_2 molecules)

160. The nucleus $92U^{234}$ splits exactly in half in a fission reaction in which two neutrons are released. The resultant nuclei are

[UPSEAT 2004]

(1) $46Pd^{116}$ (2) $45Rh^{117}$

(3) $45Rh^{116}$ (4) $46Pd^{117}$

161. A nucleus of ${}^{210}_{84}Po$ originally at rest emits α particle with speed *v*. What will be the recoil speed of the daughter nucleus

[DCE 2002]

(1) $4v/206$ (2) $4v/214$

(3) $v/206$ (4) $v/214$

162. In a nuclear reactor, the fuel is consumed at the rate of 1 *mg*/*s*. The power generated in kilowatt is **[DCE 2003]**

(1) 9×10^4 (2) 9×10^7

(3) 9×10^8 (4) 9×10^{12}

163. What is used as a moderator in a nuclear reactor

[DCE 2004]

(1) Water (2) Graphite

(3) Cadmium (4) Steel

164. A nucleus is bombarded with a high speed neutron so that resulting nucleus is a radioactive one. This phenomenon is called

[DCE 2004]

(1) Artificial radioactivity (2) Fusion

(3) Fission (4) Radioactivity

165. The curve of binding energy per nucleon as a function of atomic mass number has a sharp peak for helium nucleus. This implies that helium **[DCE 2004]**

(1) Can easily be broken up

(2) Is very stable

(3) Can be used as fissionable material

(4) Is radioactive

166. Which of the following cannot cause fission in a heavy nucleus **[RPET 2002]**

(1) α-particle (2) Proton

(3) Deutron (4) Laser rays

167. The energy in *MeV* is released due to transformation of 1 *kg* mass completely into energy $(c = 3 \times 10^8 m/s)$ **[Pb. PMT 2003]**

(1) $7.625 \times 10 MeV$ (2) $10.5 \times 10^{29} MeV$

(3) $2.8 \times 10^{-28} MeV$ (4) $5.625 \times 10^{29} MeV$

168. If in a nuclear fission, piece of uranium of mass 0.5 *g* is lost, the energy obtained in *kWh* is **[Pb. PET 2003]**

(1) 1.25×10^7 (2) 2.25×10^7

(3) 3.25×10^7 (4) 0.25×10^7

169. When U^{235} is bombarded with one neutron, the fission occurs and the products are three neutrons, $36Kr^{94}$ and **[Pb. PET 2004; UPSEAT 2004]**

(1) $53I^{142}$ (2) $56Ba^{139}$

(3) $58Ce^{139}$ (4) $54Xe^{139}$

170. The atoms of same element having different masses but same chemical properties, are called **[RPMT 2002]**

(1) Isotones (2) Isotopes

(3) Isobars (4) Isomers

171. If the mass number of an atom is $A = 40$ and its electron configuration is $1s^2, 2s^2, 2p^6, 3s^2, 3p^6$, the number of neutrons and protons in its nucleus will be **[RPMT 2002]**

(1) 22, 18 (2) 18, 22

(3) 20, 20 (4) 18, 18

172. Which of the following is most unstable **[AFMC 2005]**

(1) Electrons (2) Protons

(3) Neutrons (4) α -particle

173. In the reaction ${}_1^2H + {}_1^3H \rightarrow {}_2^4He + {}_0^1n$. If the tending energies of ${}_1^2H, {}_1^3H$ and ${}_2^4He$ are respectively a, b and c (in *MeV*), then the energy (in *MeV*) released in this reaction is **[CBSE PMT 2005]**

(1) $c + a - b$ (2) $c - a - b$

(3) $a + b + c$ (4) $a + b - c$

174. The nuclei of which one of the following pairs of nuclei are isotones **[CBSE PMT 2005]**

(1) $34Se^{74}, {}_{31}Ca^{71}$ (2) $42Mo^{92}, {}_{40}Zr^{92}$

(3) $38Sr^{81}, {}_{38}Sr^{86}$ (4) $20Ca^{40}, {}_{16}S^{32}$

175. Fission of nuclei is possible because the binding energy per nucleon in them **[CBSE PMT 2005]**

(1) Increases with mass number at high mass numbers

(2) Decreases with mass number at high mass numbers

(3) Increases with mass number at low mass numbers

(4) Decreases with mass number at low mass numbers

176. In any fission process the ratio $\frac{mass\ of\ fission\ products}{mass\ of\ parent\ nucleus}$ is **[CBSE PMT 2005]**

(1) Less than 1

(2) Greater than 1

(3) Equal to 1

(4) Depends on the mass of the parent nucleus

177. If radius of the ${}_{13}^{27}Al$ nucleus is estimated to be 3.6 *Fermi* then the radius of ${}_{52}^{125}Te$ nucleus be nearly **[AIEEE 2005]**

(1) 4 *Fermi* (2) 5 *Fermi*

(3) 6 *Fermi* (4) 8 *Fermi*

179. The example of nuclear fusion is **[BCECE 2005]**

(1) Formation of *Ba* and *Kr* from U^{235}

(2) Formation of *He* from *H*

(3) Formation of *Pu* – 235 from *U* - 235

(4) Formation of water from hydrogen and oxygen

Radioactivity

1. Radioactive substance do not emit **[CPMT 1997; AIEEE 2003]**

(1) Electron (2) Helium nucleus

(3) Positron (4) Proton

2. In a radioactive substance at $t = 0$, the number of atoms is 8×10^4. Its half life period is 3 *years*. The number of atoms 1×10^4 will remain after interval **[MP PMT/PET 1988]**

(1) 9 *yearss* (2) 8 *years*

(3) 6 *years* (4) 24 *years*

3. The half life period of radium is 1600 *years*. The fraction of a sample of radium that would remain after 6400 *years* is **[NCERT 1980; SCRA 1994; JIPMER 1997 CBSE PMT 1994; MNR 1998; MP PMT 2004; DPMT 2004]**

(1) $\frac{1}{4}$ (2) $\frac{1}{2}$

(3) $\frac{1}{8}$ (4) $\frac{1}{16}$

4. During a negative beta decay **[IIT 1987; MNR 1990]**

(1) An atomic electron is ejected

(2) An electron which is already present within the nucleus is ejected

(3) A neutron in the nucleus decays emitting an electron

(4) A part of the binding energy is converted into electron

5. Some radioactive nucleus may emit **[IIT 1986]**

(1) Only one $-13.6\ eV$ or γat a time

(2) All the three $92U^{238}$ and γ one after another

(3) All the three α, β and γ simultaneously

(4) Onlyα and β simultaneously

6. Which can pass through 20 *cm* thickness of the steel **[MNR 1985; CPMT 1990; RPET 2000]**

(1) $\alpha -$ particles (2) $\beta -$ particles

(3) $\gamma -$ rays (4) Ultraviolet rays

7. The half-life period of radium is 1600 *years*. Its average life time will be **[MP PET/PMT 1988]**

(1) 3200 *years* (2) 4800 *years*

(3) 2319 *years* (4) 4217 *years*

8. What percentage of original radioactive atoms is left after five half lives **[AFMC 1996; RPMT 1996]**

(1) 0.3% (2) 1%

(3) 31% (4) 3.125%

9. Beta rays emitted by a radioactive material are **[IIT 1983; ISM Dhanbad 1994; AFMC 1997; BHU 2000; AIEEE 2002]**

(1) Electromagnetic radiation

(2) The electrons orbiting around the nucleus

(3) Charged particles emitted by nucleus

(4) Neutral particles