PHYSICS

BOOKS - A2Z PHYSICS (HINGLISH)

NUCLEAR PHYSICS

Nucleus And Nuclear Reactions

1. The mass number of a nucleus is.

A. Always less then its atomic number

B. Always more than its atomic number

C. Always equal to its atomic number

D. Sometimes more than and sometimes equal to its atomic number

Answer: D

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

A. 138 protons and 88 neutrons

B. 138 neutrons and 88 protons

C. 226 protons and 88 electrons

D. 226 neutrons and 138 electrons

Answer: B

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3. Outside a nucleus.

A. Neutron is stable

B. Protons and neutron both are stable

C. Neutron is unstable

D. Neither neutron nor proton is stable

Answer: C

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4. The binding energy per nucleon of nucleus is a measure of its.

A. Charge

B. Mass

C. Momentum

D. Stability

Answer: D

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5. Mark the correct statement

A. Nuclei of different elements can have the same number of neutrons

B. Every element has only two stable isotopes

C. Only one isotope of each element is stable

D. All isotopes of every element are radioactive

Answer: A

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6. The curve of blinding energy per nucleon as a function of atomic mass number has a sharp peak for helium nucleus. This implies that helium.

A. Can easily be broken up

B. Is very stable

C. Can be used as fissionable material

D. Is radioactive

Answer: B

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7. Which of the following is most unstable ?

A. Electrons

B. Protons

C. Neutrons

D. $\propto$ $-$ particle

Answer: C

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8. Thermal neutrons are those which.

A. Are at very high temperature

B. Move with high velocities

C. Have kinetic energies similar to those of surrounding molecules

D. Are at rest

Answer: C

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9. Nuclear forces are.

A. Short ranged attractive and charge independent

B. Short ranged attractive and charge dependent

C. Long ranged repulsive and charge independent

D. Long ranged repulsive and charge dependent

Answer: A

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10. π mesons can be

A. π^{+} or π^{-}

B. π^{+} or π^{0}

C. π^{-} or π^{0}

D. π^{+}, π^{-} or π^{0}.

Answer: D

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11. In helium nucleus, there are.

A. 2 protons and 2 electrons

B. 2 nuetrons, 2 protons and 2 electrons

C. 2 protons and 2 neutrons

D. 2 positions and 2 protons

Answer: C

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12. Isotopes are atoms having.

A. Same number of protons but different number of neutrons

B. Same number of neutrons but different number of protons.

C. Same number of protons and neutrons

D. None of the above

Answer: A

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13. The mass of an $\alpha -$ particle is.

A. Less than the sum of masses of two protons and two neutrons

B. Equal to mass of four protons

C. Equal to mass of four neutrons.

D. Equal to sum of masses of two protons and two neutrons

Answer: A

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14. Atomic number of a nucleus is Z and atomic mass is M. The number of neutron is.

A. $M - Z$

B. M

C. Z

D. $M + Z$

Answer: A

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15. The force acting between proton and proton inside the nucleus is.

A. Coulombic

B. Nuclear

C. Both

D. None of these

Answer: C

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16. For a nucleus to be stable, the correct relation between neutron number N and proton number Z is.

A. $N > Z$

B. $N = Z$

C. $N < Z$

D. $N \geq Z$

Answer: D

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17. 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.

A. $F_2 > F_1 > F_3$

B. $F_1 = F_2 = F_1$

C. $F_1 = F_2 > F_3$

D. $F_1 = F_3 > F_2$

Answer: B

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

A. A^3

B. A

C. $A^{2/3}$

D. $A^{1/3}$

Answer: D

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

A. 11 electrons

B. 12 protons

C. 23 protons

D. 12 neutrons

Answer: D

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20. As compared to $\hat{}\ 12C$ atom, $\hat{}\ 14C$ atoms has

A. Two extra protons and two extra electrons

B. Two extra protons but no extra electrons

C. Two extra neutrons and no extra neutrons and no extra electrons and two extra electrons

D. Two extra neutrons and no extra electrons

Answer: C

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21. One requires energy E_n to remove a nucleon from a nucleus and an energy E_e to remove an electrons from the orbit of an atom. Then

A. $E_n = E_0$

B. $E_n < E_0$

C. $E_n > E_0$

D. $E_n \geq E_e$

Answer: C

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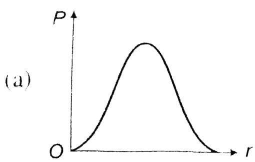
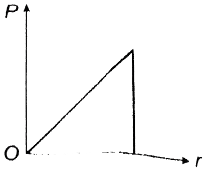
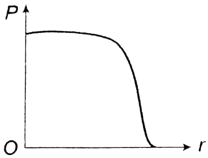
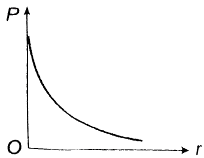
22. The charge density in a nucleus varies with distance from the centre of the nucleus according to the curve in Fig.

A. 

B. (b) 

C. (c) 

D. (d) 

Answer: C

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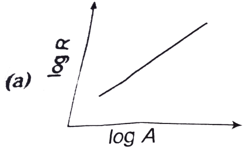
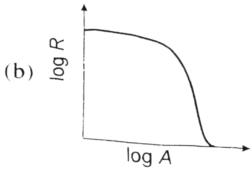
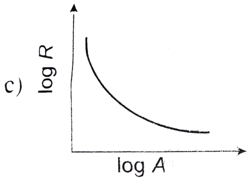
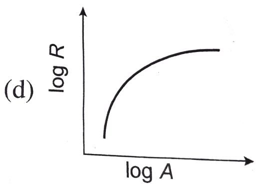
23. The graph between log R and log A wher R is the nuclear radius and A is the mass of is.

A. 

B. 

C. 

D. 

Answer: A

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24. Order of magnitude of density of uranium nucleus is

A. $10^{20} kg/m^3$

B. $10^{17} kg/m^3$

C. $10^{14} kg/m^3$

D. $10^{11} kg/m^3$

Answer: B

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25. Radius of $._{2}^{4}He$ nucleus is 3 Fermi. The radius of $._{82}^{206}Pb$ nucleus will be.

A. 5 Fermi

B. 6 Fermi

C. 11.16 Fermi

D. 8 Fermi

Answer: C

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26. How many electron potons and mass number in a nucleus of atomic number 11 and mass 24?

(i) number of electron = (ii)number of proton =

(iii)number of neutrons =

A. 11 electrons, 11 protons and 13 neutrons

B. 11 electrons, 13 protons and 11 neutrons

C. 11 protons and 14 neutrons

D. 11 protons and 13 electrons

Answer: C

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27. When a boron nucleus ($_5^{10}B$) is bombarded by a neutron, an α-particle is emitted. Which nucleus will be formed as a result?

A. $._6 C^{12}$

B. $._3 Li^6$

C. $._3 Li^7$

D. $._4 Be^9$

Answer: C

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28. In nuclear reaction $._2 He^4 ._z X^A \rightarrow ._{z+2} Y^{A+3} + A$, denotes.

A. Electron

B. Positron

C. Proton

D. Neutron

Answer: D

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29. 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.

A. $2/3$

B. $4/9$

C. $3/4$

D. $5/9$

Answer: B

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30. When a $._{4}Be^{9}$ atom is bombarded with $\propto$ $-$ particle, one of the product of nuclear transmutation is $._{6}C^{12}$. The other is.

A. $._{1}e^{0}$

B. $._{1}H^{1}$

C. $._{1}D^{2}$

D. $._{0}n^{1}$

Answer: D

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31. A reaction between a proton and $._8 O^{18}$ that produces $._9 f^{18}$ must also liberate

A. $._0 n^1$

B. $._1 e^0$

C. $._1 n^0$

D. $._0 e^1$

Answer: A

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32. In the nuclear reaction $._{92}U^{238} \rightarrow ._{z}Th^{A} + ._{2}He^{4}$, the values of A and Z are.

A. $A = 234, Z = 94$

B. $A = 234, Z = 90$

C. $A = 238, Z = 94$

D. $A = 238, Z = 90$

Answer: B

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33. If m, m_n and m_p are masses of $._Z X^A$ nucleus, neutron and proton respectively.

A. $m = (A - Z)m_n + Zm_p$

B. $m < (A - Z)m_n + Zm_p$

C. $m > (A - Z)m_n + Zm_p$

D. $m = (A - Z)m_p + Zm_p$

Answer: B

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34. $1g$ of hydrogen is converted into $0.993g$ of helium in a thermonuclear reaction. The energy released is.

A. $63 \times 10^{7} J$

B. $63 \times 10^{10} J$

C. $63 \times 10^{14} J$

D. $63 \times 10^{20} J$

Answer: B

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

A. $._{76}Y^{287}$

B. $._{77}Y^{285}$

C. $._{77}Y^{281}$

D. $._{77}Y^{289}$

Answer: C

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36. In the following reaction.

$\cdot_{12} Mg^{24} + \cdot_{2} He^{4} \rightarrow \cdot_{14} Si^{X} + \cdot_{0} n^{1}, X$ is.

A. 28

B. 27

C. 26

D. 22

Answer: B

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37. In the nuclear process , $C_6^{11} \rightarrow_2 B^{11} + \beta^+ + X$, X stands for.......

A. An elecron

B. A proton

C. A neutron

D. A neutrino

Answer: D

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38. $._1H^1 + ._1H^1 + ._1H^2 \rightarrow X + ._{+1}e^0 +$ energy. The emitted particle is.

A. Neutron

B. Proton

C. $\alpha -$ particle

D. Neutrino

Answer: C

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

A. A neutrino

B. An antineutrino

C. An alpha particle

D. A beta particle

Answer: B

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40. In the following reaction the value of 'X' is.

$$._7 N^{14} + ._2 He^4 \rightarrow X + ._1 H^1.$$

A. $._8 N^{17}$

B. $._8 O^{17}$

C. $._7 O^{16}$

D. $._7 N^{16}$

Answer: B

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41. A deutron is bombarded on $._8 O^{16}$ nucleus and $\alpha -$ particle is emitted. The product nucleus is.

A. $._7 N^{13}$

B. $._5 B^{10}$

C. $._4 Bc^9$

D. $._7 N^{14}$

Answer: D

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42. Atomic weight of boron is 10.81 and it has two isotopes $._5 B^{10}$ and $._5 B^{11}$. Then ratio of $._5 B^{10}$ in nature would be.

A. $19:81$

B. $10:11$

C. $15:16$

D. $81:19$

Answer: A

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

A. $1.5 \times 10^{10} J$

B. $3 \times 10^{-10} J$

C. $4.5 \times 10^{-10} J$

D. None of these

Answer: B

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44. An antomic Power station has a generating capacity of $200MW$. The energy generated in a day by this station is.

A. 200 M J

B. 200 J

C. $4800 \times 10^6 J$

D. $1728 \times 10^{10} J$

Answer: D

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45. One microgram of matter converted into energy will give.

A. $90J$

B. $9 \times 10^3 J$

C. $9 \times 10^{10} J$

D. $9 \times 10^5 J$

Answer: C

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46. The rest energy of an electron is.

A. $510KeV$

B. $931KeV$

C. $510MeV$

D. $931MeV$

Answer: A

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

A. 1 MeV

B. 938 MeV

C. 9.38 MeV

D. 238 MeV

Answer: B

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48. The mass defect in a particular nuclear reaction is 0.3 grams. The amont of energy liberated in kilowatt hours is.

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

A. 1.5×10^6

B. 2.5×10^6

C. 3×10^6

D. 7.5×10^6

Answer: D

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49. A gamma ray photon creates an electron-positron pair. If the rest mass energy of an electron is $0.5MeV$ and the total $K.E.$ of the electron-position pair is $0.78MeV$, then the energy of the gamma ray photon must be.

A. 0.78 MeV

B. 1.78 MeV

C. 1.28 MeV

D. 0.28 MeV

Answer: B

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50. The mass equivalent of $931 MeV$ energy is.

A. $1.66 \times 10^{-27} kg$

B. $6.02 \times 10^{-24} kg$

C. $1.66 \times 10^{-20} kg$

D. $6.02 \times 10^{-27} kg$

Answer: A

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51. $\gamma - rays$ radiation can be used to create electron-positron pair. In this process of pair production. $\gamma - rays$ energy cannot be less than.

A. 5.0 MeV

B. 4.02 MeV

C. 15.0 MeV

D. 1.02 MeV

Answer: D

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52. If M is the atomic mass and A is the mass number, packing fraction is given by.

A. $\frac{A}{M-A}$

B. $\frac{A-M}{A}$

C. $\frac{M}{M-A}$

D. $\dfrac{M-A}{A}$

Answer: D

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53. 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 ?

A. 28

B. 7

C. 4

D. 1

Answer: B

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54. Binding energy of a nucleus is.

A. Energy given to its nucleus during its formation.

B. Total mass of nucleus converted to energy units

C. Loss of energy from the the nucleus during its formation

D. Total $K.E$ and $P.E$ of the nucleous in the nucleus.

Answer: C

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55. If the binding energy of the deuterium is $2.23MeV$. The mass defect given in a.m.u. is.

A. -0.0024

B. -0.0012

C. 0.0012

D. 0.0024

Answer: D

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56. 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 following reaction ?

$\cdot_1 H^2 + \cdot_1 H^2 \rightarrow \cdot_2 He^4 + Q.$

A. $4(x_1 + x_2)$

B. $4(x_2 - x_1)$

C. $2(x_1 + x_2)$

D. $2(x_2 - x_1)$

Answer: B

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

A. $._{2}^{4}He$

B. $._{26}^{56}Fe$

C. $._{56}^{141}Ba$

D. $._{92}^{235}U$

Answer: B

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58. 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.

A. 19.6 MeV

B. 2.4 MeV

C. 8.4 MeV

D. 17.3 MeV

Answer: D

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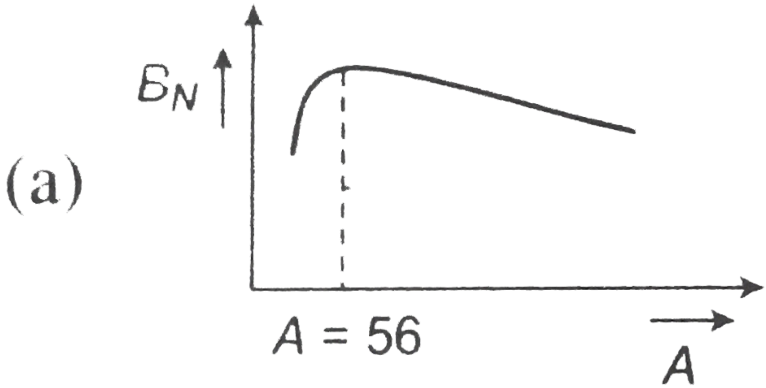
59. The dependence of binding energy per nucleon, B_N on the mass number, A is represented by.



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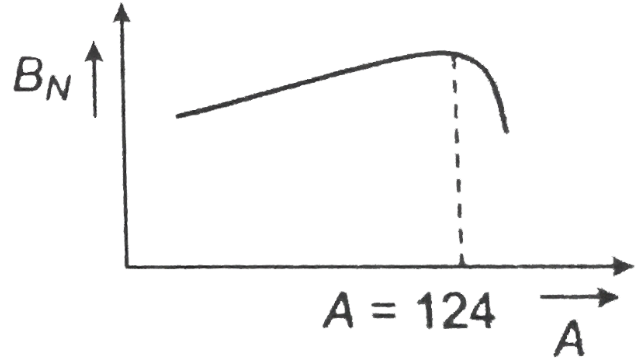
(b) 

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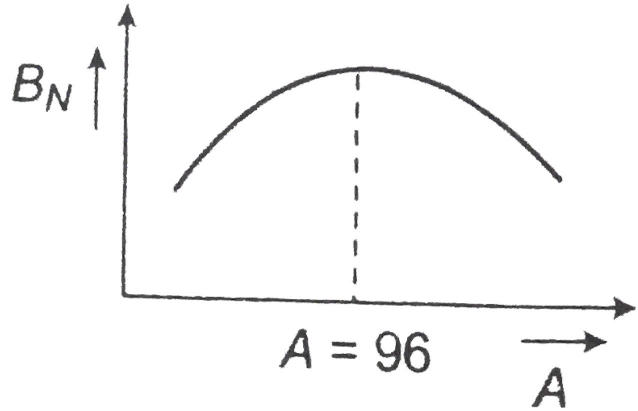
(c) 

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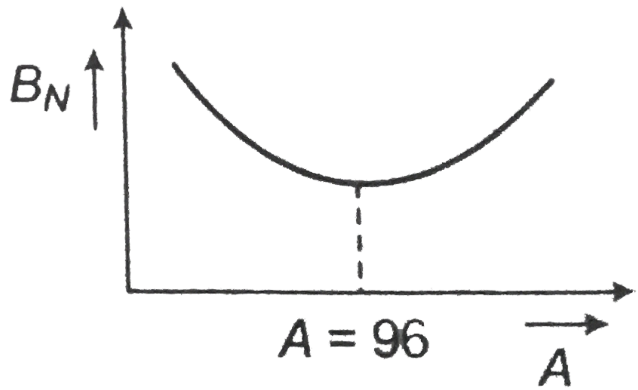
(d) 

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A. $Y \rightarrow 2Z$

B. $W \rightarrow X + Z$

C. $W \rightarrow 2Y$

D. $X \rightarrow Y + Z$

Answer: A

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60. 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 particle) of mass 4.0015 a.m.u. The binding energy of the helium nucleus will be $(1a.\ m.\ u.\ = 931MeV)$.

A. 28.4 MeV

B. 20.8 MeV

C. 27.3 MeV

D. 14.2 MeV

Answer: A

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61. The binding energy of deuteron $._{1}^{2}H$ is $1.112 MeV$ per nucleon and an $\alpha -$ particle $._{2}^{4}He$ has a binding energy of $7.047 MeV$ per nucleon. Then in the fusion reaction $._{1}^{2}H + ._{1}^{2}h \rightarrow ._{2}^{4}He + Q,$ the energy Q released is.

A. 1 MeV

B. 11.9 MeV

C. 23.8 MeV

D. 931 MeV

Answer: C

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

A. $._{7}^{14}N$

B. $._{7}^{13}N$

C. $._{5}^{13}B$

D. $._{6}^{13}C$

Answer: B

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63. Complete the reaction

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

A. ${}_{36}^{89}Kr$

B. ${}_{36}^{90}Kr$

C. ${}_{36}^{91}Kr$

D. ${}_{36}^{92}Kr$

Answer: A

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

A. $4v/206$

B. $4v/214$

C. $v/206$

D. $v/214$

Answer: A

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65. The energy in MeV is released due to transformation of $1kg$ mass completely into energy $\left(c = 3 \times 10^8 m / s\right)$.

A. $7.625 \times 10 Mev$

B. $10.5 \times 10^{29} MeV$

C. $2.8 \times 10^{-28} MeV$

D. $5.625 \times 10^{29} MeV$

Answer: D

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66. When U^{235} is bombarded with one neutron, the fission occurs and the products are three neutrons, $._{36}Kr^{94}$ and.

A. $._{52}I^{142}$

B. $._{56}Ba^{139}$

C. $._{58}Ce^{139}$

D. $._{54}Xe^{139}$

Answer: B

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67. 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.

A. 22,18

B. 18,22

C. 20,20

D. 18,18

Answer: A

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Fission And Fusion

1. The fission of a heavy nucleus gives, in general, two smaller nuclei, two or three neutrons, some $\beta-$ particles and some $\gamma-$ radiation. It is always true that the nuclei produced.

A. have a total rest-mass that is greater than that of the original nucleus.

B. have large kinetic energies that carry off the greater part of the energy released.

C. travel in exactly opposite directions.

D. have neutron-to-proton ratios that are too law for stability.

Answer: B

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2. The fission of $.^{235}U$ can be triggered by the absorption of a slow neutrons by a nucleus. Similarly a slow protons can also be used. This statement is.

A. Correct

B. Wrong

C. Information is insufficient

D. None of these

Answer: B

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3. Which of the following isotopes is normally fissionable ?

A. ${}^{238}_{92}U$

B. $._{93}\,Np^{239}$

C. $._{92}\,U^{235}$

D. $._{2}\,He^{4}$

Answer: C

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4. The explosion of the atomic bomb takes place due to

A. Nuclear fission

B. Nuclear fusion

C. Scattering

D. Thermionic emission

Answer: A

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5. Energy generation in starts is mainly due to

A. Chemical reactions

B. Fission of heavy nuclei

C. Fusion of light nuclei

D. Fusion of heavy nuclei

Answer: C

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6. Which of the following is the fusion reaction ?

A. $._1 H^2 + ._1 H^2 \rightarrow ._2 He^4$

B. $._0 n^1 + ._7 H^{14} \rightarrow ._6 C^{14} + ._1 H^1$

C. $._0 n^1 + ._{92} U^{238} \rightarrow ._{93} Np^{239} + \beta^{-1} + \gamma$

D. $._1 H^3 \rightarrow ._2 He^3 + \beta^{-1} + \gamma$

Answer: A

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7. Fusion reaction is initiated with the help of

A. Low temperature

B. High temperature

C. Neutrons

D. Any particle

Answer: B

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8. In nuclear reactions, we have the conservation of

A. Mass only

B. Energy only

C. Momentum only

D. Mass, energy and momentum

Answer: D

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9. A chain reaction is continuous due to

A. Large mass defect

B. Large energy

C. Production of more neutrons in fission

D. None of these

Answer: C

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10. 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.

A. $E_b + E_c = E_a$

B. $E_b + E_c > E_a$

C. $E_b + E_c < E_a$

D. $E_b . E_c = E_a$

Answer: B

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11. A nuclear bomb exploded $200km$ above the surface of moon. The sound of explosion on the moon.

A. Will heard before the axplosion on the moon

B. Will be heard at the same time

C. Will be heard after explosion

D. Will not heard at all

Answer: D

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12. Fast neutrons can easily be slowed down by

A. The use of lead shielding

B. Passing them through water

C. Elastic collisions with heavy nuclei

D. Applying a strong electric field.

Answer: B

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13. When $._{92}U^{235}$ undergoes fission, 0.1% of its original mass is changed into energy. How much energy is released if $1kg$ of $._{92}U^{235}$ undergoes fission ?

A. $9 \times 10^{10} J$

B. 9×10^{11}

C. $9 \times 10^{12} J$

D. $9 \times 10^{13} J$

Answer: D

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

A. 200 KeV

B. 2 MeV

C. 200 MeV

D. 2000 MeV

Answer: C

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15. $200MeV$ of energy may be obtained per fission of U^{235}. A reactor is generating $1000kW$ of power. The rate of nuclear fission in the reactor is.

A. 1000

B. 2 MeV

C. 3.125×10^{16}

D. 931

Answer: C

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16. If $200MeV$ 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 $1eV = 1.6 \times 10^{-19} J$).

A. 3.125×10^{13}

B. 3.125×10^{14}

C. 3.125×10^{15}

D. 3.125×10^{16}

Answer: A

Watch Video Solution

17. Complete the equation for the following fission process $._{92}U^{235}._{0}n^{1} \rightarrow ._{38}Sr^{90} + \dots.$

A. $._{54}Xe^{143} + 3._{0}n^{1}$

B. $._{54}Xe^{145}$

C. $._{57}Xe^{142}$

D. $._{54}Xe^{142}._0n^1$

Answer: A

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18. The example of nuclear fusion is.

A. For of barium and krypton from unranium

B. Formation of helium from hydrogen

C. Formation of plutonium 235 from uranium 235

D. Formation of water from hydrogen and oxygen.

Answer: B

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19. In nuclear fission, the fission reactions proceeds with a projectile. Which of the following suits it the best ?

A. Slow proton

B. Fast neutron

C. Slow neutron

D. None of these

Answer: C

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20. When two deuterium nuclei fuse together to form a tritium nuclei, we get a

A. Neutron

B. Deuteron

C. $\alpha-$ particle

D. Proton

Answer: D

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21. Energy released in the fission of a single $._{92}U^{235}$ nucleus is $200MeV$. The fission rate of a ${}_{92}U^{235}$ fuelled reactor operating at a power level of $5W$ is.

A. $1.56 \times 10^{+10} s^{-1}$

B. $1.56 \times 10^{+11} s^{-1}$

C. $1.56 \times 10^{+16} s^{-1}$

D. $1.56 \times 10^{+17} s^{-1}$

Answer: B

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22. Which one of the following unclear reactions is a source of energy in the sun ?

A. $._{4}^{9}Be + ._{2}^{4}He \rightarrow ._{6}^{12}C + ._{0}^{-1}n$

B. $._{2}^{3}He + ._{2}^{3}He \rightarrow ._{2}^{4}He._{+}1^{1}H + ._{1}^{1}H$

C. $._{56}^{144}Ba + ._{56}^{92}Kr \rightarrow ._{92}^{235}U + ._{0}^{-1}n$

D. $._{26}^{56}Fe + ._{48}^{112}Ca \rightarrow ._{74}^{167}W + ._{0}^{-1}n$

Answer: B

Watch Video Solution

23. 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 serveral.

A. Protons and positrons

B. $\alpha -$ particle

C. Neutrons

D. Protons and $\alpha -$ particles

Answer: C

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24. Energy is the sun is generated mainly by

A. Fusion of radioactive material

B. Fission of helium atoms

C. Chemical reaction

D. Fustion of hydrogen atoms

Answer: D

Watch Video Solution

25. Which of these is a fusion reaction ?

A. $._{3}^{1}H + ._{2}^{1}H = ._{4}^{2}He + ._{1}^{0}n$

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

C. $._{7}^{12}C \rightarrow ._{6}^{12}C + \beta^{+} + \gamma$

D. None of these

Answer: A

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26. Hydrogen bomb is based on which of the following phenomena ?

A. Nuclear fission

B. Nuclear fusion

C. Radioactive decay

D. None of these

Answer: B

Watch Video Solution

27. The principle of controlled chain reaction is used in.

A. Atomic energy reactor

B. Atom bomb

C. The core of sun

D. Artifical radioactivity

Answer: A

Watch Video Solution

28. Nuclear fusion is common to the pair

A. Thermonuclear reactor, uranium based nuclear reactor

B. Energy production in sun, uranium based nuclear reactor

C. Energy productor in sun, hydrogen bomb

D. Disintegration of heavy nuclei, hydrogen bomb.

Answer: C

Watch Video Solution

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

A. 0

B. 1

C. 2

D. 3

Answer: D

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30. Energy released in fusion of $1kg$ of deuterium nuclei.

A. $8 \times 10^{13} J$

B. $6 \times 10^{27} J$

C. $2 \times 10^{7} KwH$

D. $8 \times 10^{23} MeV$

Answer: D

Watch Video Solution

31. If the energy released in the fission of the nucleus is $200 MeV$. Then the number of nuclei required per second in a power plant of $6 kW$ will be.

A. 0.5×10^{14}

B. 0.5×10^{12}

C. 5×10^{12}

D. 5×10^{14}

Answer: D

Watch Video Solution

32. To generate a power of 3.2 mega watt, the number of fissions of U^{235} per minute is.

(Energy released per fission $= 200 MeV, 1 eV = 1.6 \times 10^{-19} J$).

A. 6×10^{18}

B. 6×10^{17}

C. 10^{17}

D. 6×10^{16}

Answer: A

Watch Video Solution

33. The energy liberated on complete fission of $1kg$ of $._{92}U^{235}$ is (Assume $200MeV$ energy is liberated on fission of 1 nucleus).

A. $8.2 \times 10^{10}J$

B. $8.2 \times 10^{9}J$

C. $8.2 \times 10^{13}J$

D. $8.2 \times 10^{16}J$

Answer: C

Watch Video Solution

34. The nuclear reaction $.^{2}H + .^{2}H \rightarrow .^{4}He$ (mass of deuteron $= 2.0141 a.m.u$ and mass of $He = 4.0024 a.m.u$) is

A. Fusion reaction releasing $24 MeV$ energy

B. Fusion reaction absorbing $24 MeV$ energy

C. Fission reaction releasing $0.0258 MeV$ energy

D. Fission reaction absoring $0.0258 MeV$ energy

Answer: A

Watch Video Solution

35. In a nuclear reactor, the fuel is consumed at the rate of $1mg/s$. The power generated in kilowatt is

A. 9×10^{4}

B. 9×10^{7}

C. 9×10^{8}

D. 9×10^{12}

Answer: B

Watch Video Solution

36. If in a nuclear fission, piece of uranium of mass $0.5g$ is lost, the energy obtained in kWh is.

A. 1.25×10^7

B. 2.25×10^7

C. 3.25×10^7

D. 0.25×10^7

Answer: A

Watch Video Solution

37. The sun radiates energy in all directions. The average radiations received on the earth surface from the sun is $1.4 \text{kilowatt} / m^2$. The average earth-sun distance is 1.5×10^{11} meters. The mass lost by the sun per day is.

A. $4.4 \times 10^{9} kg$

B. $7.6 \times 10^{14} kg$

C. $3.8 \times 10^{12} kg$

D. $3.8 \times 10^{14} kg$

Answer: D

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38. An atomic power nuclear reactor can deliver $300 MW$. The energy released due to fission of each nucleus of uranium atom U^{238} is $170 MeV$. The number of uranium atoms fissioned per hour will be.

A. 30×10^{25}

B. 4×10^{22}

C. 10×10^{20}

D. 5×10^{15}

Answer: B

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39. Assuming that about $20MeV$ of energy is released per fusion reaction $._1 H^2 + ._1 H^2 \rightarrow ._2 He^3 + E +$ other particles then the mass of $._1 H^2$ consumed per day in a fusion reactor of power 1 megawatt wil approximately be.

A. $0.001g$

B. $0.1g$

C. $10.0g$

D. $1000g$

Answer: B

Watch Video Solution

40. Assuming that about $200MeV$ of energy is released per fission of $._{92}U^{235}$ nuceli, the mass of U^{235} consumed per day in a fission ractor of power 1 megawatt will be approximately .

A. $10^{-2}g$

B. 1 g

C. 100 g

D. 10,000 g

Answer: B

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Radioactivity

1. In the case of thorium $(A = 232 \text{ and } Z = 90)$, we obtain an isotope of lead $(A = 208 \text{ and } Z = 82)$ after some radiactive disintegrations. The number of α and β particle emitted are respectively.

A. 6, 3

B. 6, 4

C. 5, 5

D. 4, 6

Answer: B

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2. Atomic mass number of an element is 232 and its atomic number is 90. The end product of this radiaoctive element is an isotope of lead (atomic mass 208 and atomic number 82.) The number of α-and β -particles emitted are.

A. $\alpha = 3, \beta = 3$

B. $\alpha = 3, \beta = 4$

C. $\alpha = 6, \beta = 0$

D. $\alpha = 4, \beta = 6.$

Answer: B

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3. A radioactive atom X emits a $\beta -$ particle to produce an atom Y which then emits an Particle to give an atom Z

(1) the atomic number of X is less than that of Z.

(2) the atomic number of Y is less than that of Z.

(3) the mass number of X is the same as that of Y.

A. $1, 2, 3$ correct

B. 1.2 correct

C. $2, 3$ correct

D. 3 correct

Answer: D

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4. Which of the following is in the increasing order for penetrating power ?

A. α, β, γ

B. β, α, γ

C. γ, α, β

D. γ, β, α

Answer: A

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5. During a beta decay

A. An atomic electron is ejected

B. An electron which is already present within the nucleus is ejected.

C. A neutron in the nucleus decays emitting an electron

D. A part of the binding energy is converted into electron.

Answer: C

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6. A radioactive nucleus undergoes a series of decay according to the scheme

$$A \xrightarrow{\alpha} A_1 \xrightarrow{\beta^-} A_2 \xrightarrow{\alpha} A_3^{172} \xrightarrow{\gamma} A_4.$$

A. 172 and 60

B. 174 and 70

C. 172 and 69

D. 176 and 70

Answer: C

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7. In the given reaction

$$\cdot_{z} X^{A} \rightarrow \cdot_{z+1} Y^{A} \rightarrow \cdot_{z-1} K^{A-4} \rightarrow \cdot_{z-1} K^{A-4}$$

Radioactive radiations are emitted in the sequence.

A. α, β, γ

B. β, α, γ

C. γ, α, β

D. β, γ, α

Answer: B

Watch Video Solution

8. A nucleus of atomic mass A and atomic number Z emits $\beta -$ particle. The atomic mass and atomic number of the resulting nucleus are

A. A, Z

B. $A+1, Z$

C. $A, Z+1$

D. $A-4, Z-2$

Answer: C

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9. If $._{92}U^{238}$ undergoes successively $8\alpha -$ decays and $6\beta -$ decays, then resulting nucleus is.

A. $._{82}U^{206}$

B. $._{82}Pb^{206}$

C. $._{82}U^{210}$

D. $._{82}U^{214}$

Answer: B

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10. The activity of a sample of radioactive material is A_1 at time t_1 and A_2 at time $t_2 (t_2 \leq t_1)$. Obtain an expression for its mean life.

A. $A_1 t_1 = A_2 t_2$

B. $A_1 - A_2 = t_2 - t_1$

C. $A_2 = A_1 e^{(t_1 - t_2) / T}$

D. $A_2 - A_1 e^{(t_1 / t_2) T}$

Answer: C

Watch Video Solution

11. When $._{90}Th^{228}$ transforms to $._{83}Bi^{212}$, then the number of the emitted $\alpha -$ and $\beta -$ particle is, respectively.

A. $8\alpha, 7\beta$

B. $4\alpha, 7\beta$

C. $4\alpha, 4\beta$

D. $4\alpha, 1\beta$

Answer: D

Watch Video Solution

12. Which of the following process represents a $\gamma - decay$?

A. $.^{A} X_{Z} + \gamma \rightarrow .^{A} X_{Z-1} + a + b$

B. $.^{A} X_{Z} + .^{1} n_{0} \rightarrow .^{A-3} X_{Z-2} + c$

C. $.^{A} X_{Z} \rightarrow .^{A} X_{Z} + f$

D. $.^{A} X_{Z} + e._{-1} \rightarrow .^{A} X_{Z-1} + g$

Answer: C

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13. A nucleus decays by β^{+} emission followed by a gamma emission. If the atomic and mass numbers of the parent nucleus are Z and A respectively, the corresponding numbers for the daughter nucleus are respectively.

A. $Z-1 \text{ and } A-1$

B. $Z+1 \text{ and } A$

C. $Z-1$ and A

D. $Z+1$ and $A-1$

Answer: C

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14. $\_86A^{222} \rightarrow_{84} B^{210}$. In this reaction, how many α and β particles are emitted?

A. $6\alpha, 3\beta$

B. $3\alpha, 4\beta$

C. $\alpha, 3\beta$

D. $3\alpha, 6\beta$

Answer: B

Watch Video Solution

15. In a radioactive reaction $\cdot_{92}X^{232} \rightarrow \cdot_{82}Y^{204}$, the number of $\alpha -$ particle emitted is.

A. 7

B. 6

C. 5

D. 4

Answer: A

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16. $._{90}^{232}Th$ an isotope of thorium decays in ten stages emitting six $\alpha -$ particle and four $\beta -$ particle in all. The end product of the decay is.

A. $._{90}^{232} Th$

B. $._{82}^{206} Pb$

C. $._{82}^{209} Pb$

D. $._{82}^{208} Pb$

Answer: C

Watch Video Solution

17. A nucleus with $Z = 92$ emits the following in a sequence

$a, \beta^{-}, \beta^{-} a, a, a, a, a, \beta^{-}, \beta^{-}, a, \beta^{+}, \beta^{+}, a$

Then Z of the resulting nucleus is

A. 74

B. 76

C. 78

D. 82

Answer: C

Watch Video Solution

18. A radioactive decay chain starts from $\cdot_{93} Np^{237}$ and produces $\cdot_{90} Th^{229}$ by successive emissions. The emitted particles can be

A. Two $\alpha -$ particle and one $\beta -$ particle

B. Three β^+ particle

C. One α particle and two β^+ particles

D. One α particle and two β^- particles

Answer: A

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19. Three $\alpha -$ particle and one $\beta -$ particle decaying takes place in series from an isotope $._{88} Ra^{238}$. Finally the isotope obtained will be.

A. $._{84} X^{220}$

B. $._{86} X^{222}$

C. $._{83} X^{224}$

D. $._{83} X^{215}$

Answer: C

Watch Video Solution

20. Atomic mass number of an element is 232 and its atomic number is 90. The end product of this radiaoctive element is an isotope of lead (atomic mass 208 and atomic number 82.) The number of α-and β -particles emitted are.

A. $\alpha = 3, \beta = 3$

B. $\alpha = 6, \beta = 4$

C. $\alpha = 6, \beta = 0$

D. $\alpha = 4, \beta = 6.$

Answer: B

Watch Video Solution

21. What is the respective number of α and β particles emitted in the following radioactive decay

$\cdot_{90} X^{200} \rightarrow \cdot_{80} Y^{168}$.

A. 6 and 8

B. 8 and 8

C. 6 and 6

D. 8 and 6

Answer: D

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22. A radioactive nucleus $\cdot_{92} X^{235}$ decays to $\cdot_{91} Y^{231}$. Which of following particles are emitted ?

A. One alpha and one electron

B. Two deutrons and one position

C. One alpha and one proton

D. One proton and four neutrons

Answer: A

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23. In the final Uranium radioactive series the initial nucleus is U_{92}^{238} and the final nucleus is Pb_{82}^{206} . When Uranium neucleus decays to lead , the number of a - particle is .... And the number of β - particles emited is ......

A. 1

B. 2

C. 4

D. 8

Answer: D

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24. After 1α and 2β emissions.

A. Mass number reduces by 3

B. Mass number reduces by 4

C. Mass number reduces by 6

D. Atomic number remains unchanged.

Answer: B

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25. Which of the following is a correct statement ?

A. Beta rays are same as cathode rays

B. Gamma rays are high energy neutrons

C. Alpha particle are singly ionized helium atoms

D. Protons and neutrons have exactly the same mass.

Answer: A

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26. $.^{22} Ne$ nucleus after absorbing energy decays into two $\alpha -$ particles and an unknown nucleus. The unknown nucleus is.

A. Nitrogen

B. Carbon

C. Boron

D. Oxygen

Answer: B

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27. A nucleus $._{n}X^{m}$ emits one α and one β particles. The resulting nucleus is.

A. $._{n} X^{m-4}$

B. $._{n-2} Y^{m-4}$

C. $._{n-4} Z^{m-4}$

D. $._{n-1} Z^{m-4}$

Answer: D

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28. The nucleus $._{48}^{115} Cd$ after two successive β^{-} decays will give.

A. $._{46}^{115} Pa$

B. $._{49}^{114} In$

C. $._{50}^{113} Sn$

D. $._{50}^{115} Sn$

Answer: D

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29. An atom of mass number 15 and atomic number 7 captures an $\alpha-$ particle and then emits a proton. The mass number and atomic number of the resulting product will respectively be.

A. 14 and 2

B. 15 and 3

C. 16 and 4

D. 18 and 8

Answer: D

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30. In the disintegration series

$\cdot_{92}^{238} U \overrightarrow{\alpha} X \overrightarrow{\beta^-} \cdot_Z^A Y$ the values of Z and A, respectively, will be

A. 92236

B. 88230

C. 90234

D. 91234

Answer: D

Watch Video Solution

31. In the given nuclear reaction A, B, C, D, E represents

$\cdot_{92} U^{238} \rightarrow^{\alpha} \cdot_{B} Th^{A} \rightarrow^{\beta} \cdot_{D} Pa^{C} \rightarrow^{E} \cdot_{92} U^{234}.$

A.

$$A = 234, B = 90, C = 234, D = 91, E = \beta$$

B.

$$A = 234, B = 90, C = 238, D = 94, E = \alpha$$

C.

$$A = 238, B = 93, C = 234, D = 91, E = \beta$$

D.

$$A = 234, B = 90, C = 234, D = 93, E = \alpha$$

Answer: A

Watch Video Solution

32. A radioactive element $._{90}X^{238}$ decay into $._{83}Y^{222}$. The number of $\beta -$ particles emitted are.

A. 4

B. 6

C. 2

D. 1

Answer: D

Watch Video Solution

33. An element A decays into element C by a two-step process :

$A \rightarrow B + ._2 He^4$

$B \rightarrow C + 2e^{-}$

Then.

A. A and C are isotopes

B. A and C are isobars

C. A and B isotopes

D. A and B are isobars

Answer: A

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34. An artifical radioactive decay series begins with unstable $._{94}^{241} Pu$. The stable nuclide obtained after eight $\alpha -$ decays and five $\beta^{+} -$ decays is.

A. $._{83}^{209} Bi$

B. $._{82}^{209} Pb$

C. $._{82}^{205} Ti$

D. $._{82}^{201} Hg$

Answer: A

Watch Video Solution

35. A nucleus of an element $._{84}X^{202}$ emits an $\alpha-$ particle first a $\beta-$ particle next and then a gamma photon. The final nucleus formed has an atomic number

A. 200

B. 199

C. 83

D. 198

Answer: C

Watch Video Solution

36. An atomic nucleus $._{90} Th^{232}$ emits several α and β radiations and finally reduces to $._{82} Pb^{208}$. It must have emitted.

A. 4α and 2β

B. 6α and 4β

C. 8α and 24β

D. 4α and 16β

Answer: B

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37. 1 Curie is equal to.

A. 3×10^{10} disintegrations/sec

B. 3.7×10^{7} disintegrations/sec

C. 5×10^{7} disintegrations/sec

D. 3.7×10^{10}disintegrations/sec

Answer: D

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38. In the given nuclear reaction, how many α and β particle are emitted $._{92} X^{235} ._{82} Y^{207}$?

A. 3α particles and 3β particle

B. 4α particle and 3β particle

C. 6α particle and 4β particle

D. 7α particle and 4β particle

Answer: D

Watch Video Solution

39. A nucleus $._{Z}^{A}X$ emits an α-particel. The resultant nucleus emits a β^{+} particle. The respective atomic and mass numbers of the final nucleus will be

A. $Z-3, A-4$

B. $Z-1, A-4$

C. $Z-2, A-4$

D. $Z, A-2$

Answer: A

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40. The electron emitted in beta radiation originates from

A. Inner orbits of atoms

B. Free electrons existing in nuclei

C. Decay of a neutron in a nucleus

D. Photon escaping from the nucleus

Answer: C

Watch Video Solution

41. A radioactive nucleus with Z protons and N neutrons emits an $\alpha -$ particle, $2\beta -$ particle and 2γ rays. The number of protons and neutrons in the nucleus left after the decay respectively, are

A. $Z - 3, N - 1$

B. $Z - 2, N - 2$

C. $Z - 1, N - 3$

D. $Z, N - 4$

Answer: D

Watch Video Solution

Watch Video Solution

42. In the disintegration series

$._{92}^{238}U\overrightarrow{\alpha}X\overrightarrow{\beta^{-}}._{Z}^{A}Y$ the values of Z and A, respectively, will be

A. 92236

B. 88230

C. 90234

D. 91234

Answer: D

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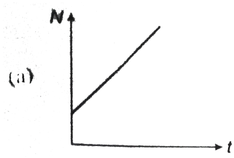
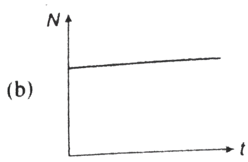
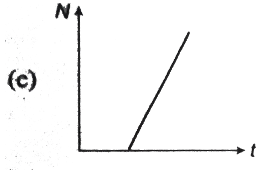
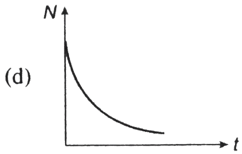
Radioactive Disintegration

1. The graph between the instantaneous concentration (N) of a radioactive element and time (t) is.

A. 

B. 

C. 

D. 

Answer: D

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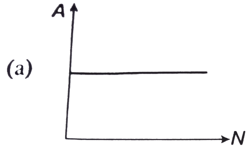
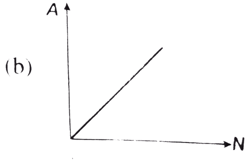
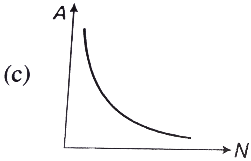
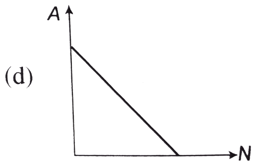
2. The curve between the activity A of a radioactive sample and the number of active atoms N is.

A. 

B. 

C. 

D. 

Answer: B

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3. 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.

A. 9 years

B. 8 years

C. 6 years

D. 24 years

Answer: A

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4. The half-life period of radium is 1600 years. The fraction of a sample of radium that would remain after 6400 years is.

A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. $\frac{1}{8}$

D. $\frac{1}{16}$

Answer: D

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5. The percentage of quantity of a radioactive material that remains after 5 half-lives will be .

A. $0.3\,\%$

B. 0.01

C. 0.31

D. $3.125\,\%$

Answer: D

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6. The radioactivity of a certain radioactive element drops to $1/64$ of its initial value in 30 seconds. Its half-life is.

A. 2 seconds

B. 4 seconds

C. 5 seconds

D. 6 seconds

Answer: C

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7. The average life T and the decay constant λ of a radioactive nucleus are related as

A. $T\lambda = 1$

B. $T = \frac{0.693}{\lambda}$

C. $\frac{T}{\lambda} = 1$

D. $T = \frac{c}{\lambda}$

Answer: A

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8. If T is the half-life of a radioactive material, then the fraction that would remain after a time $\frac{T}{2}$ is

A. $\frac{1}{2}$

B. $\frac{3}{4}$

C. $\frac{1}{\sqrt{2}}$

D. $\frac{\sqrt{2}-1}{\sqrt{2}}$

Answer: C

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9. The half-life of a radioactive element which has only $\frac{1}{32}$ of its original mass left after a lapse of 60 days is

A. 12 days

B. 32 days

C. 60 days

D. 64 days

Answer: A

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10. The life-life of Bi^{210} is 5 days. What time is taken by $(7/8)^t h$ part of the sample of decay ?

A. `3.4 days

B. 10 days

C. 15 days

D. 20 days

Answer: C

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11. A sample contains $16gm$ of radioactive material, the half-life of which is two days. After 32 days, the amount of radioactive material left in the sample is

A. Less than $1mg$

B. $\frac{1}{4}gm$

C. $\frac{1}{2}gm$

D. 1 gm

Answer: A

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12. A radio-isotope has a half-life of 5 year. The fraction of the atoms of this material that would decay in 15 years will be

A. $1/8$

B. $2/3$

C. $7/8$

D. $5/8$

Answer: C

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13. The half-life of pononium is 140 days. After how many days. $16gm$ polonium will be reduced to $1gm$ (or $15gm$ will decay) ?

A. 700 days

B. 280 days

C. 560 days

D. 420 days

Answer: C

Watch Video Solution

14. An archaeologist analyses the wood in a phehistoric structure and finds that C^{14} (Half-life $= 5700$ years) to C^{12} only one-fourth of that found in the cells buried plants. The age of the wood is about

A. 5700 years

B. 2850 years

C. 11,400 years

D. 22,800 years

Answer: C

Watch Video Solution

15. A radioactive element emits 200 particle per second. After three hours 25 particle per second are emitted. The half-life period of element will be

A. 50 minutes

B. 60 minutes

C. 70 minutes

D. 80 minutes

Answer: B

Watch Video Solution

16. The half-life of the isotope $._{11} Na^{24}$ is 15 hrs. How much time does it take for $\frac{7}{8}th$ of a sample of this isotope to decay ?

A. 75 hrs

B. 65 hrs

C. 55 hrs

D. 45 hrs

Answer: D

Watch Video Solution

17. If $20gm$ of a radioactive substance due to radioactive decay reduces to $10gm$ in 4 minutes, then in what time $80gm$ of the same substance will reduce to $10gm$?

A. 8 minutes

B. 12 minutes

C. 16 minutes

D. 20 minutes

Answer: B

Watch Video Solution

18. A radioactive substance has a half life of 60 minutes. After 3 hours, the fraction of atom that have decayed would be.

A. $12.5\,\%$

B. $87.5\,\%$

C. 8.5%

D. 25.1%

Answer: B

Watch Video Solution

19. After two hours, one-sixteenth of the starting amount if a certain radioactive isotope remained undecayed . The half-life of the isotope is

A. 15 minutes

B. 30 minutes

C. 45 minutes

D. 1 hour

Answer: B

Watch Video Solution

20. N atoms of a radioactive element emit n alpha particles per second. The half-life of tge element is.

A. $\frac{n}{N}\sec$

B. $\frac{N}{n}\sec$

C. $\frac{0.693N}{n}\sec$

D. $\frac{0.693n}{N}\sec$

Answer: C

Watch Video Solution

21. The half-life (T) and the disintegration constant (λ) of a radioactive substance are related as

A. $\lambda T = 1$

B. $\lambda T = 0.693$

C. $\frac{T}{\lambda} = 0.693$

D. $\frac{\lambda}{T} = 0.693$

Answer: B

Watch Video Solution

22. The half-life period of a radioactive substance is $5 \min$. The amount of substance decayed in $20 \min$ will be

A. $93.75\ \%$

B. 0.75

C. 0.25

D. $6.25\ \%$

Answer: A

Watch Video Solution

23. Radon (Ra) decays into Polonium (P_0) by emitting an $\alpha -$ particle with half-life of 4 days. A sample contains 6.4×10^{10} atoms of R_n.

After 12 days, the number of atoms of R_n left in the sample will be

A. 3.2×10^{10}

B. 0.53×10^{10}

C. 2.1×10^{10}

D. 0.8×10^{10}

Answer: D

Watch Video Solution

24. Decay constant of radiun is λ. By a suitable process its compound radium bromide is obtained. The decay constant of radium bromide will be

A. λ

B. More than λ

C. Less than λ

D. Zero

Answer: A

Watch Video Solution

25. Half-life of a radioactive substance A and B are, respectively, $20 \mathrm{~min}$ and $40 \mathrm{~min}$. Initially, the samples of A and B have equal number of nuclei. After $80 \mathrm{~min}$, the ratio of the remaining number of A and B nuclei is

A. $1: 16$

B. $4: 1$

C. $1: 4$

D. $1: 1$

Answer: C

Watch Video Solution

26. The half - life ofI ^ (131) $is8days. Givenasamp \le of$I^(131)$attime$t = 0\`

, we can assert that

A. No nucleus will decay before $t = 4$ days

B. No nucleus will decay before $t = 8$ days

C. All nuclei will decay before $t = 16$ days

D. A given nucleus may decay at any time after $t = 0$

Answer: D

Watch Video Solution

27. Carbon -14 decays with half-life of about $5, 800$ years. In a sample of bone, the ratio of carbon -14 to carbon -12 is found to be $\frac{1}{4}$ of what it is in free air. This bone may belong to a period about x centuries ago. Where x nearest to

A. 2×58

B. 58

C. $58 / 2$

D. 3×58

Answer: A

Watch Video Solution

28. Half-life of a radioacitve element is 10 days. The time during which quantity remains $1/10$ of initial mass will be

A. 100 days

B. 50 days

C. 33 days

D. 16 days

Answer: C

Watch Video Solution

29. If half-life of a radioactive element is 3 hours. After 9 hours its activity becomes

A. $1/9$

B. $1/27$

C. $1/6$

D. $1/8$

Answer: D

Watch Video Solution

30. At any instant, the ratio of the amounts of two radioactive substance is $2:1$. If their half-lives be, respectively, $12h$ and $16h$, then after two days, what will be the ratio of the substances?

A. $1:1$

B. $2:1$

C. $1:2$

D. $1:4$

Answer: A

Watch Video Solution

31. A ratio isotope has a half-life of 75 years. The fraction the atoms of this material that would decay in 150 years. Will be.

A. $66.6\ \%$

B. $85.5\ \%$

C. $62.5\ \%$

D. $75\ \%$

Answer: D

Watch Video Solution

32. The activity of a radioactive sample is measured as 9750 counts per minute at $t = 0$ and as 975 counts per minute at $t = 5$ minutes. The decay constant is approximately

A. 0.230 per minute

B. 0.461 per minute

C. 0.691 per minute

D. 0.922 per minute

Answer: B

Watch Video Solution

33. The acticity of a sample is $64 \times 10^{-5} Ci$. Its half-life is 3 days. The activity will become $5 \times 10^{-6} Ci$ after.

A. 12 days

B. 7 days

C. 18 days

D. 21 days

Answer: D

Watch Video Solution

34. The half-life of radon is 3.8 days. Three forth of a radon sample decay in.

A. 5.02 days

B. 15.2 days

C. 7.6 days

D. 11.4 days

Answer: C

Watch Video Solution

35. 3.8 days is the half-life period of a sample. After how many days. The sample will become $1/8th$ of the original substance ?

A. 11.4

B. 3.8

C. 3

D. None of these

Answer: A

Watch Video Solution

36. Plutonium decays with a half-life of 24000 years. If the plutonium is stored for 72000 years, then the fraction of plutonium that remains is.

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{4}$

D. $\frac{1}{8}$

Answer: D

Watch Video Solution

37. A radioactive substance has a half-life of 1 year. The fraction of this material, that would remain after 5 years will be.

A. $\frac{1}{32}$

B. $\frac{1}{5}$

C. $\frac{1}{2}$

D. $\frac{4}{5}$

Answer: A

Watch Video Solution

38. A radioactive sample has half-life of 5 years. Probability of decay in 10 years will be.

A. 1

B. 0.75

C. 0.5

D. 0.25

Answer: B

Watch Video Solution

39. If half-life of a substance is 3.8 days and its quantity is $10.38gm$. Then substance quantity remaining left after 19 days will be

A. $0.151gm$

B. $0.32gm$

C. $1.51gm$

D. $0.16gm$

Answer: B

Watch Video Solution

40. In a mean life of a radioactive sample

A. About $1/3$ of substance disintegrates

B. About $2/3$ of the substance disintegrates

C. About 90% of the substance disintegrates

D. Almost all the substance disintegrates

Answer: B

Watch Video Solution

41. Three fourth of the active decays in a radioactive sample in $3/4$ sec. The half-life of the sample is

A. $\frac{1}{2}$ sec

B. 1 sec

C. $\frac{3}{8}$ sec

D. $\frac{3}{4}$ sec

Answer: C

Watch Video Solution

42. During mean life of a radioactive element, the fraction that disintegrates is

A. e

B. $\dfrac{1}{e}$

C. $\dfrac{e-1}{e}$

D. $\dfrac{e}{e-1}$

Answer: C

Watch Video Solution

43. If a radioactive substance reduces to $\frac{1}{16}$ of its original mass in 40 days, what is its half-life ?

A. 10 days

B. 20 days

C. 40 days

D. None of these

Answer: A

Watch Video Solution

44. 99% of a radioactive element will decay between

A. 6 and 7 half-lives

B. 7 and 8 half-lives

C. 8 and 9 half-lives

D. 9 half-lives

Answer: A

Watch Video Solution

45. $1mg$ gold undergoes decay with 2.7 days half-life period, amount left after 8.1 days is

A. $0.91mg$

B. $0.25mg$

C. $0.5mg$

D. $0.125mg$

Answer: D

Watch Video Solution

46. Ceratain radioactive substance reduces to 25% of its value is $16 days$. Its half-life is

A. 32 days

B. 8 days

C. 64 days

D. 28 days

Answer: D

Watch Video Solution

47. The half-life of a radioactive substance against $\alpha -$ decay is $1.2 \times 10^7 s$. What is the decay rate for 4×10^{15} atoms of the substance ?

A. 4.6×10^{12} atoms/s

B. 2.3×10^{11} atoms/s

C. 4.6×10^{10} atoms/s

D. 2.3×10^{8} atoms/s

Answer: D

Watch Video Solution

48. $10gm$ of radioactive material of half-life 15 year is kept in store for 20 years, The disintegrated material is.

A. $12.5g$

B. $10.5g$

C. $6.03g$

D. $4.03g$

Answer: C

Watch Video Solution

49. In a sample of radioactive material, what percentage of the initial number of active nuclei will decay during one mean life ?

A. 69.3%

B. 0.63

C. 0.5

D. 0.37

Answer: B

Watch Video Solution

50. A radioactive material has an initial amount $16gm$ After 120 days it reduces to $1gm$. Then the half-life of radioactive material is

A. 60 days

B. 30 days

C. 40 days

D. 240 days

Answer: B

Watch Video Solution

51. Half-life of a substance is 10 years. In what time, it becomes $\frac{1}{4}th$ part of the initial amount ?

A. 5 years

B. 10 years

C. 20 years

D. None of these

Answer: C

Watch Video Solution

52. If N_0 is the original mass of the substance of half - life period $t_{1/2} = 5 year$ then the amount of substance left after 15 year is

A. $N_0/8$

B. $N_0/16$

C. $N_0/2$

D. $N_0/4$

Answer: A

Watch Video Solution

53. The ratio activity of an element becomes $1/64th$ of its original value in $60\sec$. Then the half-life period is

A. 5 sec

B. 10 sec

C. 20 sec

D. 30 sec

Answer: B

Watch Video Solution

54. The half-life of a radioactive substance is 48 hours. How much time will it take to disintegrate to its $\frac{1}{16}th$ parts ?

A. 12 th

B. 16 h

C. 48 h

D. 192 h

Answer: D

Watch Video Solution

55. A radioactive substance has an average life of 5 hours. In a time of 5 hours

A. Half of the active nuclei decay

B. Less than half of the active nuclei decay

C. More than half of the active nuclei decay

D. All active nuclie decay

Answer: C

Watch Video Solution

Watch Video Solution

56. A sample of a radioactive element has a mass of $10g$ at an instant $t = 0$. The approxiamte mass of this element in the sample after two mean lives is .

A. $2.50gm$

B. $3.70gm$

C. $6.30gm$

D. $1.35gm$

Answer: D

Watch Video Solution

57. The half-life of a sample of a radioactive substance is 1 hour. If 8×10^{10} atoms are present at $t = 0$, then the number of atoms decayed in the duration $t = 2$ hour to $t = 4$ hour will be

A. 2×10^{10}

B. 1.5×10^{10}

C. Zero

D. Infinity

Answer: B

Watch Video Solution

58. A count rate meter shows a count of 240 per minute from a given radioactive source. One hour later the meter shows a count rate of 30 per minute. The half-life of the source is.

A. 120 min

B. 80 min

C. 30 min

D. 20 min

Answer: D

Watch Video Solution

59. Activity of radioactive element decreased to one third of original activity R_0 in 9 years. After further 9 years, its activity will be

A. R_0

B. $\frac{2}{3}R_0$

C. $R_0 / 9$

D. $R_0 / 6$

Answer: C

Watch Video Solution

60. The half-life a radioacitve substance is 40 yeard. How long will it take to reduce to one fourth of its original amount and what is the value of decay constant ?

A. $40 years, 0.9173 / year$

B. $90 year, 9.017 / year$

C. $80 year, 0.0173 year$

D. None of these

Answer: C

Watch Video Solution

61. A nucleus of mass 218 amu in Free State decays to emit an α-particle. Kinetic energy of the $\beta -$ particle emitted is $6.7 MeV$. The recoil energy (in MeV) of the daughter nucleus is

A. 1.0

B. 0.5

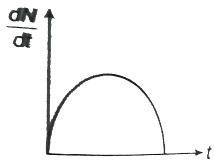
C. 0.25

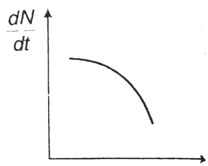
D. 0.125

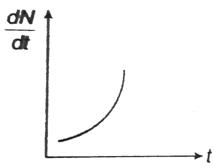
Answer: D

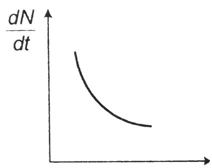
Watch Video Solution

62. Radioactive element decays to form a stable nuclide, then the rate of decay of reactant $\left(\frac{dN}{dt}\right)$ will vary with time (t) as shown in figure.

A. (a) .

B. (b) .

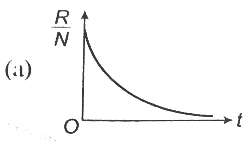
C. (c) .

D. (d) .

Answer: C

Watch Video Solution

63. A radioactive sample has N_0 active at $t=0$. If the rate of disintegration at any time is R and the number of atoms is N, them the ratio R/N varies with time as.

A. 

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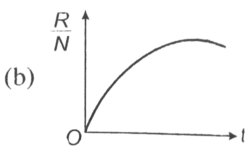
B. 

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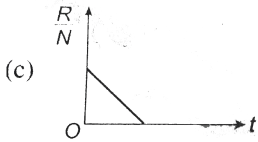
C. 

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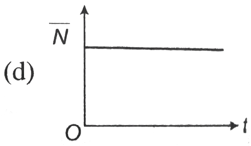
D. 

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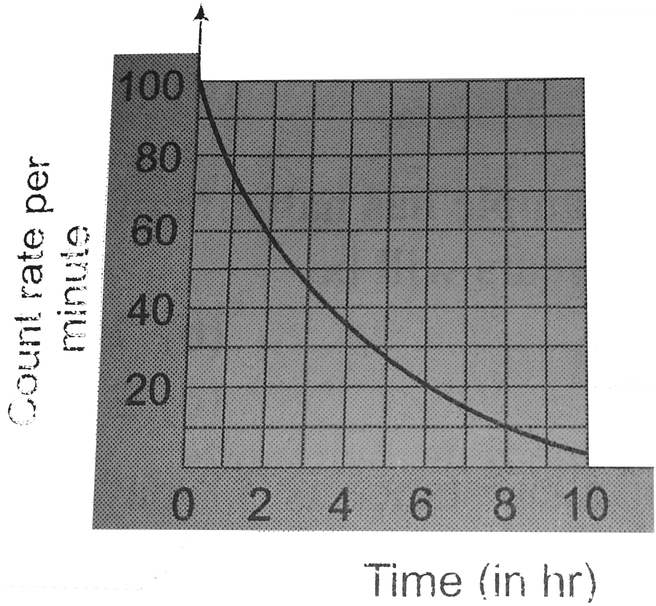
Answer: D

Watch Video Solution

64. The count rate of $10g$ of radioactive material was measured at different times and times has been shown in the figure. The half-life of material and the total counts (approximately) in the first half life period, respectively are.



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A. $4h$, 9000

B. $3h$, 14000

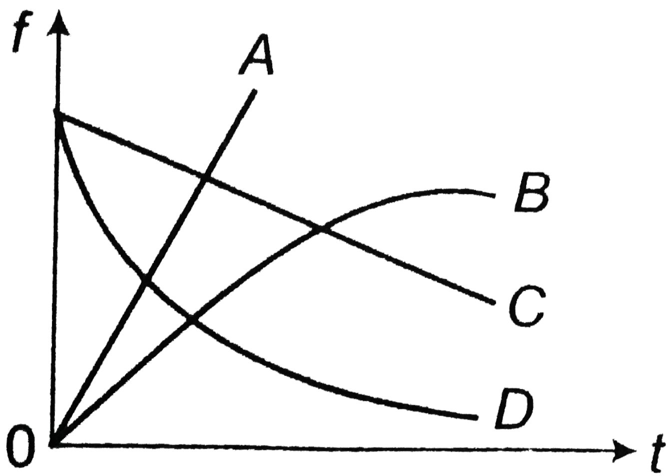
C. $3h$, 235

D. $3h$, 50

Answer: B

Watch Video Solution

65. The fraction f of radioactive material that has decayed in time t, varies with time t. The correct variation id given by the curve.



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A. A

B. B

C. C

D. D

Answer: B

Watch Video Solution

Problems Based On Mixed Concepts

1. The binding energy per nucleon of O^{16} is $7.97 MeV$ and that of O^{17} is $7.75 MeV$. The energy (in MeV) required to remove a neutron from O^{17} is.

A. 3.52

B. 3.64

C. 4.23

D. 7.86

Answer: C

Watch Video Solution

2. A heavy nucleus at rest breaks into two fragments which fly off with velocities in the ratio $8:1$. The ratio of radii of the fragments is.

A. $1:2$

B. $1:4$

C. $4:1$

D. $2:1$

Answer: A

Watch Video Solution

Watch Video Solution

3. A star initially has 10^{40} deuterons. It produces energy via the processes $._1 H^2 +_1 H^2 \rightarrow_1 H^3 + p$ and $._1 H^2 +_1 H^3 \rightarrow_2 He^4 + n$. If the average power radiated by the star is 10^{16} W, the deuteron supply of the star is exhausted in a time of the order of

(a) $10^6 s$ (b) $10^8 s$ (c) $10^{12} s$

The masses of the nuclei are as follows

$M(H^2) = 2.014$ amu, $M(n) = 1.008$ amu,

$M(p) = 1.007$ amu, $M(He^4) = 4.001$amu

A. 10^6 sec

B. 10^8 sec

C. 10^{12} sec

D. 10^{16} sec

Answer: C

Watch Video Solution

4. If 10% of a radioactive material decays in 5 days, then the amount of original material left after 20 days is approximately.

A. $60\ \%$

B. $65\ \%$

C. $70\ \%$

D. $75\ \%$

Answer: B

Watch Video Solution

5. A radioactive isotope X with a half-life of 1.37×109 years decays to Y which is stable. A sample of rock from the moon was found to contain both the elements X and Y which were in the ratio of $1:7$. The age of the rock is.

A. $1.96 \times 10^8 years$

B. $3.85 \times 10^9 years$

C. $4.11 \times 10^9 years$

D. $9.59 \times 10^9 years$

Answer: C

Watch Video Solution

6. The half-life of radium is $1620 years$ and its atomic weight is 226. The number of atoms that will decay from its $1g$ sample per second will be .

A. 3.61×10^{10}

B. 3.6×10^{12}

C. 3.11×10^{15}

D. 31.1×10^{15}

Answer: A

Watch Video Solution

7. The half-life period of a radioactive element x is same as the mean life time of another radioactive element y. Initially, both of them have the same number of atoms. Then,

(a) x and y have the same decay rate initially

(b) x and y decay at the same rate always

(c) y will decay at a faster rate than x

(d) x will decay at a faster rate than y

A. X and Y have the same decay rate initially

B. X and Y decay at the same rate always

C. Y will decay at a faster rate than X

D. X will decay at a faster rate then Y.

Answer: C

Watch Video Solution

8. For a substance the average life for $\alpha-$ emission is 1620 years and for $\beta-$ emission is 405 years. After how much time the $1/4$ of the material remains after α and β emission ?

A. 1500 years

B. 300 years

C. 449 years

D. 810 years

Answer: C

Watch Video Solution

9. The half-life of radioactive Polonium (Po) is 138.6 days. For ten lakh Polonium atoms, the number of disintegrations in 24 hours is

A. 2000

B. 3000

C. 4000

D. 5000

Answer: D

Watch Video Solution

10. A radioactive nucleus undergoes $\alpha -$ emission to form a stable element. What will be the recoil velocity of the daughter nucleus is V

is the velocity of α-emission and A is the atomic mass of radioactive nucleus ?

A. $\frac{4V}{A-4}$

B. $\frac{2V}{A-4}$

C. $\frac{4V}{A+4}$

D. $\frac{2V}{A+4}$

Answer: A

Watch Video Solution

11. Half-life of a radioactive substance is 20 minutes. Difference between points of time when it is 33% disintegrated and 67% disintegrated is approximate.

A. 10 min

B. 20 min

C. 30 min

D. 40 min

Answer: B

Watch Video Solution

12. Two radioactive X_1 and X_2 have decay constants 10λ and λ respectively . If initially they have the same number of nuclei, then the ratio of the number of nuclei of X_1 to that of X_2will be $1/e$ after a time .

A. $1/(10\lambda)$

B. $1/(11\lambda)$

C. $11/(10\lambda)$

D. $1/(9\lambda)$

Answer: D

Watch Video Solution

13. A and B are two radioactive substances whose half lives are 1 and 2 years respectively. Initially $10gm$ of A and $1gm$ of B is taken. The time (approximate) after which they will have same quantity remaining is.

A. $6.62 years$

B. 5 years

C. $3.2 years$

D. 7 years

Answer: A

Watch Video Solution

14. Half life of a radio-active substance is 20 minutes. The time between 20% and 80% decay will be

A. 20 minutes

B. 40 minutes

C. 30 minutes

D. 25 minutes

Answer: B

Watch Video Solution

15. After 280 days, the activity of a radioactive sample is 6000 dps. The activity reduces to 3000 dps after another 140 days. The initial activity of the sample in dps is

A. 6000

B. 9000

C. 3000

D. 24000

Answer: D

Watch Video Solution

16. The rate of disintegration was observed to be 1017 disintegrations per sec when its half life period is 1445 years. The original number of particles are.

A. 8.9×10^{27}

B. 6.6×10^{27}

C. 1.4×10^{16}

D. 1.2×10^{17}

Answer: B

Watch Video Solution

17. A small quantity of solution containing Na^{24} radio nuclide $(half-l \quad if \quad e=15h)$ of activity $1.0 microcurie$ is injected into the blood of a person. A sample of the blood of volume $1cm^3$ taken after $5h$ shows an activity of 296 disintegrations per minute. Determine the total volume of the blood in the body of the person. Assume that the radioactive solution mixes uniformly in the blood of person.

(1 curie $=3.7\times10^{10}$ disintegrations per second)

A. 5.94 litres

B. 2 litres

C. 317 litres

D. 1 litres

Answer: A

Watch Video Solution

18. A radioactive sample of $\hat{}(238)U$ decay to Pb through a process for which the half is 4.5×10^9 year. Find the ratio of number of nuclei of Pb to $\hat{}(238)U$after a time of 1.5×10^{9} year Given $(2)^{1/3} = 1.26$

A. 0.12

B. 0.26

C. 1.2

D. 0.37

Answer: B

Watch Video Solution

19. A radioactive sample is $\alpha -$ emitter with half life 138.6 days is observed by a student to have 2000 disintegration/sec. The number of radioactive nuclei for given activity are.

A. 3.45×10^{10}

B. 1×10^{10}

C. 3.45×10^{15}

D. 2.75×10^{11}

Answer: A

Watch Video Solution

20. A radioactive nucleus is being produced at a constant rate α per second. Its decay constant is λ. If N_0 are the number of nuclei at time $t = 0$, then maximum number of nuclei possible are.

A. $\frac{\alpha}{\lambda}$

B. $N_0 + \frac{\alpha}{\lambda}$

C. N_0

D. $\frac{\lambda}{\alpha} + N_0$

Answer: A

Watch Video Solution

21. The ratio of radii of nuclei $._{13}A1^{27}$ and $._{52}X^{A}$ is $3:5$. The number of neutrons in the nuclei of X will be

A. 52

B. 73

C. 125

D. 13

Answer: B

Watch Video Solution

22. If one starts with one curie of radioactive substance $\left(T_{1/2} = 12hrs\right)$ the activity left after a period of 1 week will be about

A. 1 curie

B. 120 micro curie

C. 60 micro curie

D. 8 mili curie

Answer: C

Watch Video Solution

23. A nucleus $._Z X^A$ emits $9\alpha -$ particles and $5p$ particle. The ratio of total protons and neutrons in the final nucleus is.

A. $\dfrac{(Z-13)}{(A-Z-23)}$

B. $\dfrac{(Z-18)}{(A-36)}$

C. $\dfrac{(Z-13)}{(A-36)}$

D. $\dfrac{(Z-13)}{(A-Z-13)}$

Answer: A

Watch Video Solution

24. The nuclide $.^{131}I$ is radioactive, with a half-life of 8.04 days. At noon on January 1, the activity of a certain sample is 60089. The activity at noon on January 24 will be

A. 75 Bq

B. Less than $75Bq$

C. More than $75Bq$

D. $150 Bq$

Answer: C

Watch Video Solution

25. U^{238} decays into Th^{234} by the emission of an a-particle. There follows a chain of further radioactive decays, either by α-decay or by $\beta -$ decay. Eventually a stable nuclide is reached and after that, no further radioactive decay is possible. which of the following stable nuclides is the end product of the U^{238} radioactive decay chain ?

A. Pb^{206}

B. Pb^{207}

C. Pb^{208}

D. Pb^{209}

Answer: A

Watch Video Solution

26. When a sample of solid lithium is placed in a flask of hydrogen gas then following reaction happened $\cdot_1^1 H + \cdot_3 Li^7 \rightarrow \cdot_2 He^4 + \cdot_2 He^4$.

This statement is.

.

A. $True$

B. $False$

C. May be true at a particular pressure

D. None of these

Answer: B

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27. Consider an initially pure $M gm$ sample of X, an isotope that has a half-life of T hour, what is its initial decay rate (N_A = Avogadro No, atomic weight of X is A)

A. $\frac{MN_A}{T}$

B. $\frac{0.693MN_A}{T}$

C. $\frac{0.693MN_A}{AT}$

D. $\frac{2.303MN_A}{AT}$

Answer: C

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28. At a given instant there are 25% undecayed radioactive nuclei in a same. After

$10\,\mathrm{sec}$ the number of undecayed nuclei reduces to $6.25\,\%$, the mean life of the nuclei is.

A. 14.43 sec

B. 7.21 sec

C. 5 sec

D. 10 sec

Answer: B

Watch Video Solution

29. Highly energetic electrons are bombarded on a target of an element containing 30 neutrons. The ratio of radii of nucleus to that of Helium nucleus is $141/3$. The atomic number of nucleus will be.

A. 25

B. 26

C. 56

D. 30

Answer: B

Watch Video Solution

30. Number of nuclei of a radioactive substance are 1000 and 900 at times $t = 0$ and time $t = 2s$. Then, number of nuclei at time $t = 4s$ will be

A. 800

B. 810

C. 790

D. 700

Answer: B

Watch Video Solution

31. Which sample contains greater number of nuclei ?

a $5.00 - \mu Ci$ sample of $.^{240} Pu$ (half-life $6560y$) or $a4.45 - \mu Ci$ sample of $.^{243} Am$ (half-life $7370y$).

A. $.^{240} Pu$

B. $.^{243} Am$

C. Equal in both

D. None of these

Answer: C

Watch Video Solution

32. The radioactivity of a given sample of whisky due to tritium (half life 12.3 years) was found to be only 3% of that measured in a recently purchased bottle marked $''7$ years old". The sample must have been prepared about.

A. 220 years back

B. 300 years back

C. 400 years back

D. 70 years back

Answer: D

Watch Video Solution

33. Transition between three energy energy levels in a particular atom give rise to three Spectral line of wevelength , in increasing magnitudes. λ_1, λ_2 and λ_3. Which one of the following equations correctly ralates λ_1, λ_2 and λ_3?

A. $\lambda_1 = \lambda_2 - \lambda_3$

B. $\lambda_1 = \lambda_3 - \lambda_2$

C. $\frac{1}{\lambda_1} = \frac{1}{\lambda_2} + \frac{1}{\lambda_3}$

D. $\frac{1}{\lambda_1} = \frac{1}{\lambda_3} - \frac{1}{\lambda_2}$

Answer: A

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34. Samples of two radioactive nuclides, X and Y, each have equal activity A at time $t = 0$. X has a half-life of $24 years$ and Y a half-life of $16 years$. The samples are mixed together. What will be the total activity of the mixture at $t = 48$ years?

A. $\frac{1}{2}A_0$

B. $\frac{1}{4}A_0$

C. $\frac{3}{16}A_0$

D. $\frac{3}{8}A_0$

Answer: D

Watch Video Solution

35. A stationery thorium nucleus $(A = 200, Z = 90)$ emits an alpha particle with kinetic energy E_α. What is the kinetic energy of the recoilling nucleus

A. $\frac{E_a}{108}$

B. $\frac{E_a}{110}$

C. $\frac{E_a}{55}$

D. $\frac{E_a}{54}$

Answer: D

Watch Video Solution

36. A hydrogen-like atom emits rediationof frequency 2.7×10^{15} Hz $when$ if $makesatransitionomn$ = 2 to n = 1

. $The\varepsilon quencyemi\in d \in atransition\circ m$n = 3 to

n = 1` will be

A. $1.8 \times 10^{15} Hz$

B. $3.2 \times 10^{15} Hz$

C. $4.7 \times 10^{5} Hz$

D. $6.9 \times 10^{15} Hz.$

Answer: D

Watch Video Solution

37. Stationery nucleus $._{}^{238}U$ decays by a emission generaring a total kinetic energy T:

$._{92}^{238} \rightarrow ._{90}^{234}Th + ._{2}^{4}\alpha$

What is the kinetic energy of the α-particle?

A. slightly less than T

B. $T/2$

C. slightly less than T

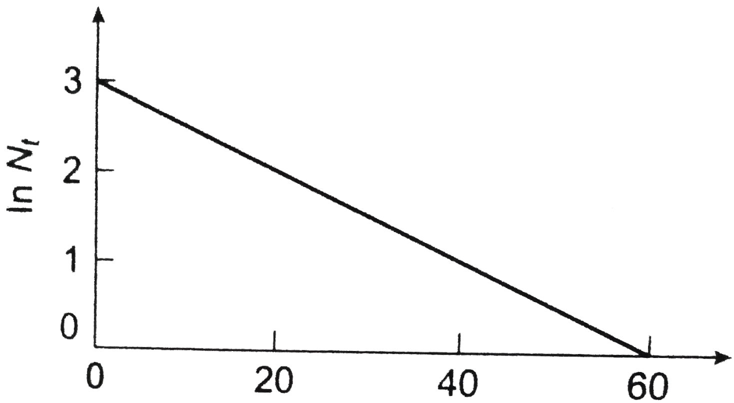
D. slightly greater than T

Answer: C

Watch Video Solution

38. The ground (Fig.) shows the number of particles Nt emitted per second by a radioactive source as a function of time t

The relationship between N_t and t is.



.

A. $N_t = 1000e^{-(20t/s)}$

B. $N_t = 20e^{-(20t/s)}$

C. $N_t = 3e^{-(0.05t/s)}$

D. $N_t = 20e^{-(0.05t/s)}$

Answer: D

View Text Solution

39. The activity of a radioative element decreases to one third of the original activity I_0 in a period of nine years. After a further 1apse of nine years, its activity will be

A. t_0

B. $(2/3)t_0$

C. $(t_0/9)$

D. $(t_0/6)$

Answer: C

Watch Video Solution

40. A radioactive element A with a half-value period of 2 hours decays giving a stable element Y. After a time t the ratio of X and Y atoms is $1:7$ then t is :

A. 6 hours

B. 4 hours

C. between 4 and 5 hours

D. 14 hours

Answer: A

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41. The half-life period of RaB $\left(._{82} Pb^{214}\right)$ is 26.8 min. The mass of one curie of RaB is

A. $3.71 \times 10^{10} g$

B. $3.71 \times 10^{-10} g$

C. $8.61 \times 10^{10} g$

D. $3.064 \times 10^{-8} g$

Answer: D

Watch Video Solution

42. The count rate for $10g$ of radioactive material was measured at different times and this has been shown in the above graph with scale given. The half-life of the material and the total count in the first half-value period, respectively are.

A. 4 hours and 9000 (approximately)

B. 3 hours and 14100 (approximately)

C. 3 hours and 235 (approximately)

D. 10 hours and 150 (approximately)

Answer: B

Watch Video Solution

43. If 10% of a radioactive material decays in 5 days, then the amount of original material left after 20 days is approximately.

A. 0.6

B. 0.65

C. 0.7

D. 0.75

Answer: B

Watch Video Solution

44. A freshly prepared radioactive source of half life 2 hr emits radiation of intensity which is 64 times the permissible safe level . The minimum time after which it would be possible to work safely with this source is

A. 6 hours

B. 12 hours

C. 24 hours

D. 128 hours

Answer: B

Watch Video Solution

45. Uranium ores contain one radium -226 atom for every 2.8×106 uranium -238 atoms. Calculate the half-life of $._{92} U6238$ given that the half-life of $._{88} Ra^{226}$ is 1600 years $\left(._{88} Ra^{226}\right.$ is a decay product of $._{92} U^{238}$) :

A. $1.75 \times 10^3 years$

B. $1600 \times \frac{238}{92} years$

C. $4.5 \times 10^9 years$

D. $1600 years$

Answer: C

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46. The radioactivity of a sample is A_1 at time t_1 and A_2 at time t_2 If the mean life of the specimen is T, the number of atoms that have disintegrated in the time interval of $(t_2 - t_1)$ is :

A. $(A_1 - A_2)$

B. $\dfrac{(A_1 - A_2)}{T}$

C. $(A_1 - A_2)T$

D. $A_1 t_1 - A_2 t_2$

Answer: C

Watch Video Solution

47. Plutinium has atomic mass 210 and a decay constant equal to $5.8 \times 10^{-8} s^{-1}$. The number of α-particles emitted per second by $1mg$ plutonium is

(Avagadro's constant =6.0×10^{23}).

A. 1.7×10^9

B. 1.7×10^{11}

C. 2.9×10^{11}

D. 3.4×10^9

Answer: B

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48. At any instant, the ratio of the amounts of two radioactive substance is $2:1$. If their half-lives be, respectively, $12h$ and $16h$, then after two days, what will be the ratio of the substances?

A. $1:1$

B. $2:1$

C. $1:2$

D. $1:4$

Answer: A

Watch Video Solution

49. The radioactivity of a sample is R_1 at a time T_1 and R_2 at time T_2. If the half-life of the specimen is T, the number of atoms that have disintegrated in the time $(T_2 - T_1)$ is proporational to

A. $R_1 T_1 = R_2 T_2$

B. $R_1 - R_2$

C. $\frac{(R_1 - R_2)}{T}$

D. $(R_1 - R_2)$

Answer: D

Watch Video Solution

50. Half-lives of two radioactive substances A and B are respectively 20 minutes and 40 minutes. Initially, he sample of A and B have equal number of nuclei. After 80 minutes the ratio of the remaining number of A and B nuclei is :

A. $1:16$

B. $4:1$

C. $1:4$

D. $1:1$

Answer: C

Watch Video Solution

51. A radioactive nucleus can decay by two differnet processess. The mean value period for the first process is t_1 and that the second process is t_2 .The effective mean value period for the two processes is .

A. $\frac{t_1 + t_2}{2}$

B. $t_1 + t_2$

C. $\sqrt{t_1 t_2}$

D. $\dfrac{t_1 t_2}{t_1 + t_2}$

Answer: D

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52. The half-life of radium is $1620 years$ and its atomic weight is 226. The number of atoms that will decay from its $1g$ sample per second will be .

A. 3.6×10^{10}

B. 3.6×10^{12}

C. 3.1×10^{15}

D. 31.1×10^{15}

Answer: A

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53. What would be the energy required to dissociate completely $1g$ of $Ca - 40$ into its constituent, particles? Given: Mass of proton

$= 1.00866 amu,$

Mass of neutron $= 1.00866 amu,$

Mass of $Ca - 40 = 39.97454 amu,$ (Take $1 amu = 931 MeV$).

A. $4.831 \times 10^{24} MeV$

B. $4.813 \times 10^{24} eV$

C. $4.813 \times 10^{23} MeV$

D. None of these

Answer: A

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54. A star initially has 10^{40} deuterons. It produces energy via the processes $._{1}^{2} H +_{1}^{2} H \rightarrow_{1}^{3} H + p$ and $._{1}^{2} H +_{1}^{3} H \rightarrow_{2}^{4} He + n$, where the masses of the nuclei are $m\left(.^{2} H\right) = 2.014$ amu, $m(p) = 1.007$ amu, $m(n) = 1.008$ amu and $m\left(.^{4} He\right) = 4.001$ amu. If the average power radiated by the star is $10^{16} W$, the deuteron supply of the star is exhausted in a time of the order of

A. 10^{6} second

B. 10^{8} second

C. 10^{12} second

D. 10^{16} second

Answer: C

Watch Video Solution

55. In the nuclear reaction $._1H^2 + ._1H^2 \rightarrow ._2He^3 + ._0n^1$ if the mass of the deuterium atom $= 2.014741amu$, mass of $._2He^3$ atom $= 3.016977amu$, and mass of neutron $= 1.008987 amu$, then the Q value of the reaction is nearly .

A. $0.00352 MeV$

B. $3.27 MeV$

C. $0.82 MeV$

D. $2.45 MeV$

Answer: B

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56. If mass of $U^{235} = 235.12142 a.m.u.$, mass of $U^{236} = 236.1205 a\mu$, and mass of neutron $= 1.008665 amu$, then the energy required to remove one neutron from the nucleus of U^{236} is nearly about.

A. 75 MeV

B. 6.5 MeV

C. 1 eV

D. zero

Answer: B

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57. The binding energies per nucleon for deuteron $(._1 H^2)$ and helium $(._2 He^4)$ are $1.1 MeV$ and $7.0 MeV$ respectively. The energy released when two deutrons fuse to form a helium nucleus $(._2 He^4)$ is........

A. $13.9 MeV$

B. $26.9 MeV$

C. $23.9 MeV$

D. $19.2MeV$

Answer: C

Watch Video Solution

58. In radioactive decay of a radioactive atom, its stability increases.

It is a spontaneous process.

A. If both assertion and reason are true and reason is the correct explanation of

assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A

Watch Video Solution

Section B - Assertion Reasoning

1. Assertion: For the scattering of α-particles at a large angles, only the nucleus of the atom is responsible.

Reason: Nucleus is very heavy in comparison to electrons.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: B

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2. Assertion : Though light of a single frequency (monochromatic) is incident on a metal , the energies of emitted photoelectrons are different.

Reason : The energy of electrons emitted from inside the metal surface is lost in collision with the other atoms in the metal.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A

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3. Amongst α, β and $\gamma -$ particles, $\alpha -$ particle has maximum penetrating power.

The $\alpha -$ particle is heavier than β and $\gamma -$ particle.

A. If both assertion and reason are true and reason is the correct explanation of

assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: D

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4. The ionising power of $\alpha -$ particle is less compared to $\alpha -$ particles but their penetrating power is more.

The mass of $\beta -$ particle is less than the mass of α-particle.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: B

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5. The mass of $\beta-$ particles when they are emitted is higher than the mass of electrons obtained by other means

$\beta -$ particle and electron, both are similar particles.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: B

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6. Radioactivity of 108 undecayed radioactive nuclei of half life of 50 days is equal to that of 1.2×108 number of undecayed nuclei of some material with half life of 60 days

Radioactivity is proportional to half-life.

A. If both assertion and reason are true and reason is the correct explanation of

assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: C

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7. Fragments produced on the fission of U^{235} are radioactive.

The fragments have abnormally high proton to neuton ratio.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: C

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8. Electron capture occurs more often than positron emission in heavy elements.

Heavy elements exhibit radioactivity.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: B

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9. The mass of a nucleus can be either less than or more than the sum of the masses of nucleons present in it.

The whole mass of the atom is considered in the nucleus.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: D

Watch Video Solution

10. Assertion: For the scattering of α-particles at a large angles, only the nucleus of the atom is responsible.

Reason: Nucleus is very heavy in comparison to electrons.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A

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11. All the radioactive elements are ultimately converted in lead.

All the elements above lead are unstable.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: C

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12. Staements I: $._{z} X^{4}$ undergoes 2α-decays, 2β-decays (negative β) and 2γ-decays. As a result, the daughter product is $._{z\,.\,-2} X^{A-B}$.

Staements II: In α-decay, the mass number decreases by 4 unit and atomic number decreases by 2 unit. In β-decay (negative β), the mass number remains unchanged and atomic number increases by 1 unit. In γ-decay, mass number and atomic number remain unchanged.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A

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13. Statement I:Heavy nuclides tend to have more number of neutrons than protons.

Staements II: In hevay nuclei, as there is coloumbic repulsion between protons, so excess of neutrons are preferable:

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A

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AIPMT/NEET Questions

1. During mean life of a radioactive element, the fraction that disintegrates is

A. e

B. $\frac{1}{e}$

C. $\frac{e-1}{e}$

D. $\frac{e}{e-1}$

Answer: C

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2. 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 :

A. $M < [NM_n + ZM_p]$

B. $M > [NM_n + ZM_p]$

C. $M = [NM_n + ZM_p]$

D. $M = N[M_n + M_p]$

Answer: A

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3. If the energy released in the fission of the nucleus is $200 MeV$. Then the number of nuclei required per second in a power plant of $6 kW$ will be.

A. 0.5×10^{14}

B. 0.5×10^{12}

C. 5×10^{12}

D. 5×10^{14}

Answer: D

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4. In the nuclear reaction : $X(n, \alpha)_3 Li^7$ the term X will be 3

A. $._5\ B^{10}$

B. $._5\ B^9$

C. $._5\ B^{11}$

D. $._2\ He^4$

Answer: A

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Watch Video Solution

5. 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.

A. $19.2 MeV$

B. $23.6 MeV$

C. $26.9 MeV$

D. $13.9 MeV$

Answer: B

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6. Which of the following are suitable for the fusion process ?

A. Heavy nuclei

B. Light nuclei

C. Atom bomb

D. Radioactive decay

Answer: B

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Watch Video Solution

7. A sample has 4×10^{16} radioactive nuclei of half-life 10 days. The number of atoms decaying in 30 days is.

A. $3.9x10^{16}$

B. 5×10^{15}

C. 10^{16}

D. 3.5×10^{16}

Answer: D

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Watch Video Solution

8. A deutron strikes $._8 O^{16}$ nucleus with subsequent emission of an alpha particle. Idenify the nucleus so produced.

A. $._3 Li^7$

B. $._5 B^{10}$

C. $._7 n^{13}$

D. $._7 N^{14}$

Answer: D

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9. A nuclear reaction given by

$$1_Z X^A \rightarrow .(Z+1) Y^A + ._{-1} e^0 + \overrightarrow{p}$$

represents.

A. gamma-decay

B. Fusion

C. Fission

D. beta-decay

Answer: D

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10. Solar energy is mainly caused due to

A. Fission of uranium present in the sun

B. Fusion of protons during synthesis of heavier elements

C. Gravitational contraction

D. Burning of hydrogen in the oxygen

Answer: B

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11. If m, m_n and m_p are masses of $._{Z}X^{A}$ nucleus, neutron and proton respectively.

A. $m < (A - Z)m_n + Zm_p$

B. $m = (A - Z)m_n + Zm_p$

C. $m = (A - Z)m_p + Zm_n$

D. $m > (A - Z)m_n + Zm_p$

Answer: A

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12. If $._{92}U^{238}$ undergoes successively $8\alpha-$ decays and $6\beta-$ decays, then resulting nucleus is.

A. $._{82}U^{206}$

B. $._{86}Pb^{206}$

C. $._{82}U^{210}$

D. $._{82}U^{214}$

Answer: B

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13. A sample of a radioactive element has a mass of $10g$ at an instant $t = 0$. The approxiamte mass of this element in the sample after two mean lives is .

A. $2.50gm$

B. $3.70gm$

C. $6.30gm$

D. $1.35gm$

Answer: D

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14. The mass number of a nucleus is.

A. Always less then its atomic number

B. Always more than its atomic number

C. Always equal to its atomic number

D. Sometimes more than and sometimes equal to its atomic number

Answer: D

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15. 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 particle) of mass 4.0015 a.m.u. The binding energy of the helium nucleus will be $(1 a.m.u. = 931 MeV)$.

A. $28.4 MeV$

B. $20.8 MeV$

C. $27.3 MeV$

D. $14.2 MeV$

Answer: A

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16. In the following reaction the value of 'X' is.

$$._{7}N^{14} + ._{2}He^{4} \rightarrow X + ._{1}H^{1}.$$

A. $._{8}N^{17}$

B. $._{8}O^{17}$

C. $._{7}O^{16}$

D. $._{7}N^{16}$

Answer: B

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17. A radioactive material has an initial amount $16gm$ After 120 days it reduces to $1gm$. Then the half-life of radioactive material is

A. 60 days

B. 30 days

C. 40 days

D. 240 days

Answer: B

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18. A nucleus represented by the symbol $._{Z}^{A}X$ has.

A. Z neutrons and $A-Z$ protons

B. Z protons and $A-Z$ neutrons

C. Z protons and A neutrons

D. A protons and $Z-A$ neutrons

Answer: B

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19. 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.

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

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

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

D. $M(N, Z) = NM, , + ZM_p + B/c^2$

Answer: C

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20. The nuclei of which one of the following pairs of nuclei are isotons ?

A. $._{34}Se^{74}, ._{31}Ga^{71}$

B. $._{42}Mo^{92}, ._{40}Zr^{92}$

C. $._{38}Sr^{84}, ._{38}Sr^{86}$

D. $._{20}Ca^{40}, ._{16}S^{32}$

Answer: A

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21. In the reaction $._1^2H + ._1^3H \rightarrow ._2^4He + ._0^1n$, if the binding 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.

A. $c + a - b$

B. $c - a - b$

C. $a+b+c$

D. $a+b-c$

Answer: B

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22. In any fission the ratio $\frac{\text{mass of fission produts}}{\text{mass of parent nucleus}}$ is

A. Less than 1

B. greater than 1

C. equal to 1

D. depends on the mass of parent nucleus

Answer: A

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23. Fission of nuclei is possible because the binding energy per nuclei in them

A. increases with mass number at high mass numbers

B. decreases with mass number at high mass numbers

C. increases with mass number at low mass numbers

D. decreases with mass number at low mass numbers

Answer: D

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24. The binding energy of deuteron is $2.2 MeV$ and that of $._2^4 He$ is $28 MeV$. If two deutrons are fused to form one $._2^4 He$, then the energy released is

A. $25.8 MeV$

B. $23.6 MeV$

C. $19.2 MeV$

D. $30.2 MeV$

Answer: B

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25. In a radioactive material the activity at time t_1 is R_1 and at a later time t_2, it is R_1. If the decay constant of the material is λ, then

A. $R_1 = R_2 e^{-\lambda(t_1 - t_2)}$

B. $R_1 = R_2 e^{\lambda(t_1 - t_2)}$

C. $R_1 = R_2(t_2 / t_1)$

D. $R_1 = R_2$

Answer: A

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26. Two radioactive materials have decay constant $5\lambda \& \lambda$. If initially they have same no. of nuclei. Find time when ratio of nuclei become $\left(\frac{1}{e}\right)^2$:

A. $\frac{1}{\lambda}$

B. 4λ

C. 2λ

D. $\frac{1}{2\lambda}$

Answer: D

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27. In radioactive decay process, the negatively changed emitted $\beta -$ particle are

A. the electrons present inside the nucleus

B. the electrons produces as a result of the decay of neutrons inside the nucleus

C. the electrons produces as a result of collisions between atoms

D. the electrons orbiting around the nucleus

Answer: B

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28. A nucleus $._{Z}^{A}X$ has mass represented by $M(A, Z)$. If M_p and M_p denote the mass of proton and neutron respectively and BE the binding energy (in MeV), then :

A.

$$BE = [M(A, Z) - ZM_p - (A - Z)M_n]c^2$$

B.

$$BE = [ZM_p + (A - Z)M_n - M(A, Z)]c^2$$

C. $BE = [ZM_p + AM_n - M(A, Z)]c^2$

D. $BE = M(A, Z) - ZM_p - (A - Z)M_n$

Answer: B

Watch Video Solution

29. If radius of the $_(13)^{27}Al$ necleus is estimated to be 3.6 fermi then the radius of $_(52)^{125}Te$ nucleus be nearly

A. 6.0 fm

B. 9.6 fm

C. 12.0 fm

D. 4.8 fm

Answer: A

Watch Video Solution

30. Two radioactive materials X_1 and X_2 have decay constants 10λ and λ respectively. If initially they have the same number of nuclei, then the ratio of the number of nuclei of X_1 to that of X_2 will be $1/e$ after a time.

A. λ

B. $\frac{1}{2}\lambda$

C. $\frac{1}{4\lambda}$

D. $\frac{e}{\lambda}$

Answer: C

Watch Video Solution

31. 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.

A.

$$M(A, Z) = ZM_p + (A - Z)M_n - BE/C^2$$

B. $M(A, Z) = ZM_p + (A - Z)M_n + BE$

C. $M(A, Z) = ZM_p + (A - Z)M_n - BE$

D.

$$M(A, Z) = ZM_p + (A - Z)M_n + BE/C^2$$

Answer: A

Watch Video Solution

32. In the nuclear decay given below

$$._{Z}^{A}X \rightarrow ._{Z-1}.^{A}Y \rightarrow ._{Z-1}^{A-4}B^{*} \rightarrow ._{Z-1}^{A-1}B,$$

the particle emitted in the sequence are

A. β, α, γ

B. γ, β, α

C. β, γ, α

D. α, β, γ

Answer: A

Watch Video Solution

33. The mass of a a_3^7Li nucleus is $0.042u$ less than the sum of the masses of all its nucleons.

The binding energy per nucleon of $._{3}^{7}Li$ nucleus is nearly.

A. 46 MeV

B. 5.6 MeV

C. 3.9 MeV

D. 23 MeV

Answer: B

Watch Video Solution

34. The activity of a radioactive sample is measures as N_0 counts per minute at $t = 0$ and N_0 / e counts per minute at $t = 5 \text{ min}$. The time (in minute) at which the activity reduces to half its value is.

A. $\log_e 2 / 5$

B. $\dfrac{5}{\log_e 2}$

C. $5 \log_{10} 2$

D. $5 \log_e 2$

Answer: D

Watch Video Solution

35. The half-life of a radioactive isotope X is 50 years. It decays to another element Y which is stable. The two elements X and Y were found to be in the ratio of $1 : 15$ in a sample of a given rock. The age of the rock was estimated to be

A. 200 yr

B. 250 yr

C. 100 yr

D. 150 yr

Answer: A

Watch Video Solution

36. The power obtained in a reactor using U^{235} disintegration is $100kW$. The mas decay of U^{235} per hour is

A. $20\mu g$

B. $40\mu g$

C. $1\mu g$

D. $10\mu g$

Answer: B

Watch Video Solution

37. A radioactive nucleus of mass M emits a photon of frequency v and the nucleus recoils. The recoil energy will be

A. $h^2V^2 / 2Mc^2$

B. zero

C. hv

D. $Mc^2 - hv$

Answer: A

Watch Video Solution

38. A nucleus $._{n}^{m}X$ emits one $\alpha -$ particle and two $\beta -$ particles. The resulting nucleus is

A. $.^{m-6}._{n}Z$

B. . ${}^{m-4}{}_{n}Z$

C. . $l^{m-4}_{n-2}Y$

D. . ${}^{m-6}_{n-4}Z$

Answer: B

Watch Video Solution

39. Fusion reaction takes place at high temperature because

A. atoms get ionised at high temperature

B. kinetic energy is high enough to overcome the coulomb repulsion between nuclei

C. molecules break up at high temperature

D. nuclei break up at high temperature

Answer: B

Watch Video Solution

40. Two radioactive nuclei P and Q, in a given sample decay into a stable nucleus R. At time $t = 0$, number of P species are $4N_0$ and that of Q are N_0. Half-life of P (for conversation to R) is $1mm$ whereas that of Q is $2\ \min$. Initially there are no nuclei of R present in the sample. When number of nuclei of P and Q are equal, the number of nuclei of R present in the sample would be :

A. $3N_0$

B. $\frac{9N_0}{2}$

C. $\frac{5N_0}{2}$

D. $2N_0$

Answer: B

Watch Video Solution

41. If the nuclear radius of $.^{27}A1$ is 3.6 Fermi, the approximate nuclear radius of $64Cu$ in Fermi is :

A. 3.6

B. 2.4

C. 1.2

D. 4.8

Answer: D

Watch Video Solution

42. A mixture consists of two radioactive materials A_1 and A_2 with half-lives of $20s$ and $10s$ respectively. Initially the mixture has $40g$ of

A_1 and $160g$ of a_2. The amount the two in the mixture will become equal after

A. 40 s

B. 60s

C. 80 s

D. 20 s

Answer: A

Watch Video Solution

43. The half-life of a radioactive nucleus is 50 days. The time interval $(t_2 - t_1)$ between the time t_2 when $\frac{2}{3}$ of it has decayed and the time t_1 when $\frac{1}{3}$ of it had decayed is

A. 30 days

B. 50 days

C. 60 days

D. 15 days

Answer: B

Watch Video Solution

44. A certain mass of hydrogen is changes to helium by the process of fusion. The mass defect in fusion reaction is $0.02866u$. The energy liberated per u is (given $1u = 931MeV$)

A. 2.67 Mev

B. 26.7 MeV

C. 6.675 MeV

D. 13.35 MeV

Answer: C

Watch Video Solution

45. The half-life of a radioactive isotope X is 20 years. It decays to another element Y which is stable. The two elements X and Y were found to be in the ratio of $1:7$ in a sample of a given rock. The age of the rock was estimated to be.

A. 40 years

B. 60 years

C. 80 years

D. 100 years

Answer: B

Watch Video Solution

46. 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 $Li^7 + p \rightarrow 2_2 He^4$ is.

A. 19.6 MeV

B. $-2.4MeV$

C. 8.4 MeV

D. 17.3 MeV

Answer: D

Watch Video Solution

47. A radio isotope X with a half-life 1.4×10^9 years decays of Y which is stable. A sample of the rock from a cave was found to contain X and Y in the ratio $1:7$. The age of the rock is.

A. $1.96 \times 10^{9} years$

B. $3.92 \times 10^{9} years$

C. $4.20 \times 10^{9} years$

D. $8.40 \times 10^{9} years$

Answer: C

Watch Video Solution

48. If radius of the $._{13}^{27} A1$ nucleus is taken to be R_{A1} then the radius of $._{53}^{125} Te$ nucleus is nearly.

A. $\left(\frac{53}{13}\right)^{1/3} R_{A1}$

B. $\frac{5}{3} R_{A1}$

C. $\frac{3}{5} R_{A1}$

D. $\left(\frac{13}{53}\right)^{1/3} R_{A1}$

Answer: B

Watch Video Solution

49. When an $\alpha-$ particle of mass 'm' moving with velocity 'v' bombards on a heavy nucleus of charge 'Ze' its distance of closest approach from the nucleus depends on m as :

A. m

B. $\frac{1}{m}$

C. $\frac{1}{\sqrt{m}}$

D. $\frac{1}{m^2}$

Answer: B

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50. The half-life of a radioactive substance is 30 minutes, The time (in minutes) taken between 40% decay and 85% decay of the same radioactive substance is.

A. 45

B. 60

C. 15

D. 30

Answer: B

Watch Video Solution

51. Radioactive material 'A' has decay constant $'8\lambda'$ and material 'B' has decay constant 'lamda'. Initial they have same number of nuclei. After what time, the ratio of number of nuclei of material 'B' to that 'A' will be $\frac{1}{e}$?

A. $\frac{1}{7\lambda}$

B. $\frac{1}{8\lambda}$

C. $\frac{1}{9\lambda}$

D. $\frac{1}{\lambda}$

Answer: A

Watch Video Solution

52. For a radioactive material, half-life is 10 minutes. If initially there are 600 number of nuclei, the time taken (in minutes) for the disintegration of 450 nuclei is.

A. 15

B. 20

C. 30

D. 10

Answer: B

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AIIMS Questions

1. The fraction of heavy water in a nuclear reactor is to.

A. increase the neutrons

B. slow down the neutrons

C. stop the electrons

D. None of the above

Answer: B

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2. Which one of the following has the highest neutrons ratio ?

A. $._{8}O^{16}$

B. $._{2}He^{4}$

C. $._{92}U^{235}$

D. $._{26}Fe^{56}$

Answer: C

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3. When radioactive substance emits an $\alpha-$ particle, then its position in the periodic table is lowered by.

A. three places

B. one place

C. five places

D. two places

Answer: D

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4. In an atom bomb, the energy is released because of the.

A. chain reaction of neutrons and $._{92}U^{238}$

B. chain reaction of neutrons and $._{92}U^{236}$

C. chain reaction of neutrons and $._{92}U^{235}$

D. chain reaction of neutrons and $._{92}U^{240}$

Answer: C

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5. The flux of $\alpha -$ particle at 2° is 1×10^{6}. The flux of $\alpha -$ particle at angle 60° is

A. 5.5

B. 2.5

C. 0.5

D. 1.5

Answer: D

Watch Video Solution

6. A laser beam is used for carrying our surgery because it

A. is highly monochromatic

B. is highly coherent

C. can be sharply focussed

D. is highly directional

Answer: C

Watch Video Solution

7. If a radioactive substance reduces to $\frac{1}{16}$ of its original mass in 40 days, what is its half-life ?

A. 10

B. 5

C. 2.5

D. 20

Answer: A

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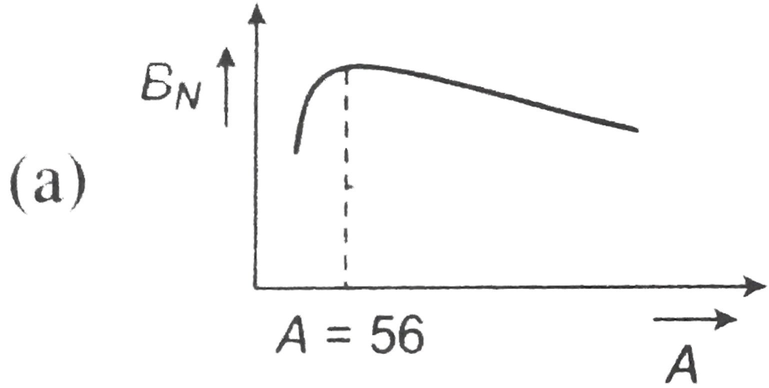
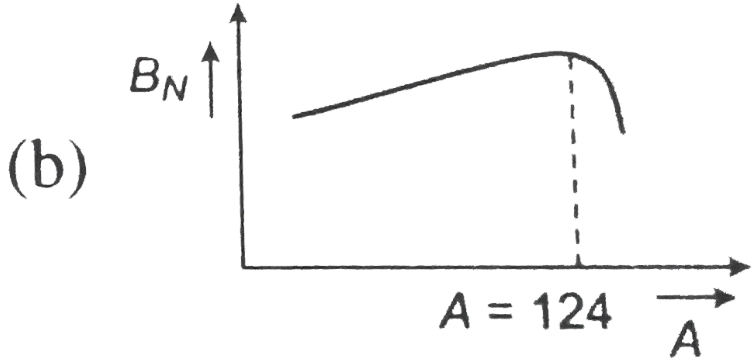
8. The dependence of binding energy per nucleon, B_N on the mass number, A is represented by.

(a) 

, (b) 

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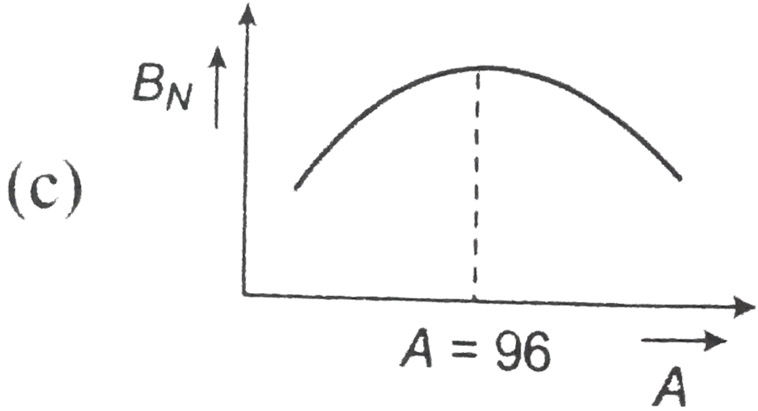
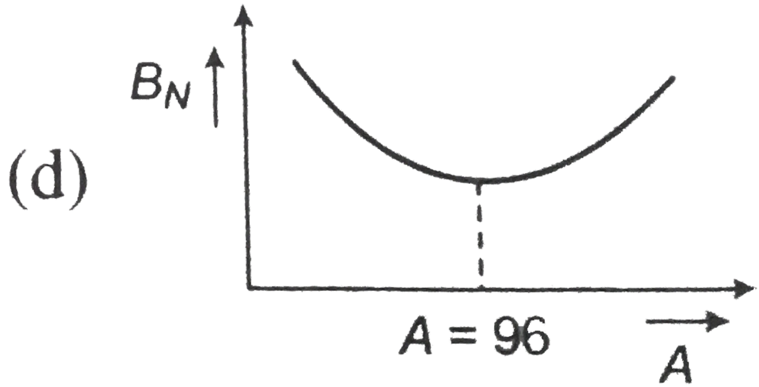
(c) 

, (d) 

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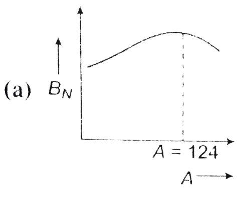
A. 

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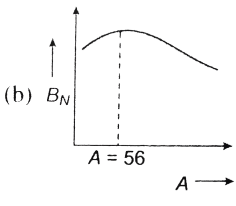
B. 

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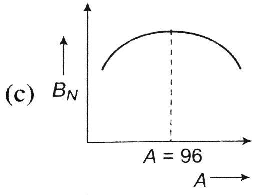
C. 

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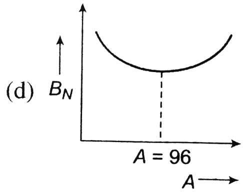
D. 

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Answer: B

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9. A radioactive nucleus undergoes $\alpha-$ emission to form a stable element. What will be the recoil velocity of the daughter nucleus is V

is the velocity of α-emission and A is the atomic mass of radioactive nucleus ?

A. $\dfrac{4v}{A-4}$

B. $\dfrac{4v}{A+4}$

C. $\dfrac{2v}{A+4}$

D. $\dfrac{2v}{A-4}$

Answer: A

Watch Video Solution

10. When and electron-positron pair annihilates, the energy released is about.

A. $0.8 \times 10^{-13} J$

B. $3.2 \times 10^{-13} J$

C. $1.6 \times 10^{-13} J$

D. $4.8 \times 10^{-13} J$

Answer: C

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11. A radioactive material has half-life of 10 days. What fraction of the material would remain after 30 days ?

A. 0.125

B. 0.25

C. 0.5

D. 0.33

Answer: A

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12. The operation of a nuclear reactor is said to be critical, if the multiplication factor (k) has a value

A. 1

B. 1.5

C. 2.1

D. 2.5

Answer: A

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13. $._{92}^{238}U$ has 92 protons and 238 nucleons. It decays by emitting an alpha particle and becomes:

A. $._{92}^{234}U$

B. $._{92}^{235}U$

C. $._{90}^{234}Th$

D. $._{93}^{237}Np$

Answer: C

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14. The fossil bone has a $.^{14}C : .^{12}C$ ratio, which is $\left[\frac{1}{16}\right]$ of that in a living animal bone. If the half -life of $.^{14}C$ is 5730 years, then the age of the fossil bone is :

A. 11460 years

B. 17190 years

C. 45840 years

D. 22921 years

Answer: D

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15. Which one of the following is a possible nuclear reaction ?

A. $._{5}^{10} B + ._{2}^{4} He \rightarrow ._{7}^{13} N + ._{1}^{1} H$

B. $._{93}^{239} Np \rightarrow ._{94}^{239} Pu + \beta^{-} + \bar{v}$

C. $._{11}^{23} Na + ._{1}^{1} H \rightarrow ._{10}^{20} Ne + ._{2}^{4} He$

D. $._{7}^{11} N + ._{1}^{1} H \rightarrow ._{6}^{12} C + \beta^{-} + v$

Answer: B

Watch Video Solution

16. Starting with a sample of pure $.^{66}Cu, 7/8$ of it decays into Zn in 15 min. The corresponding half-life is.

A. 10 min

B. 5 min

C. 15 min

D. $7\frac{1}{2} \text{ min}$

Answer: B

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17. A radioactive material decays by simulataneous emission of two particle from the with respective half - lives 1620 and 810 year . The time , in year , after which one - fourth of the material remains is

A. 4860

B. 2430

C. 3240

D. 1080

Answer: D

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18. $200MeV$ of energy may be obtained per fission of U^{235}. A reactor is generating $1000kW$ of power. The rate of nuclear fission in the reactor is.

A. 1000

B. 2×10^8

C. 3.125×10^{16}

D. 931

Answer: C

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19. In the reaction $._1^2 H + ._1^3 H \rightarrow ._2^4 He + ._0^1 n$, if the binding energies of $._1^2 H$, $._1^3 H$ and $._2^4 He$ are respectively a, b and c (in MeV), then the energy (in MeV) released in this reaction is.

A. $c + a - b$

B. $c - a - b$

C. $a + b + c$

D. $a+b-c$

Answer: B

Watch Video Solution

20. 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.

A. 9 years

B. 8 years

C. 6 years

D. 24 years

Answer: A

Watch Video Solution

21. Highly energetic electrons are bombarded on a target of an element containing 30 neutrons. The ratio of radii of nucleus to that of Helium nucleus is $141/3$. The atomic number of nucleus will be.

A. 25

B. 26

C. 56

D. 30

Answer: B

Watch Video Solution

22. Two radioactive X_1 and X_2 have decay constants 10λ and λ respectively . If initially they have the same number of nuclei, then the ratio of the number of nuclei of X_1 to that of X_2 will be $1/e$ after a time .

A. $1/(10\lambda)$

B. $1/(11\lambda)$

C. $11/(10\lambda)$

D. $1/(9\lambda)$

Answer: D

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Assertion- Reason

1. Staements I: $._{z}X^{4}$ undergoes 2α-decays, 2β-decays (negative β) and 2γ-decays. As a result, the daughter product is $._{z}\,._{-2}X^{A-B}$.

Staements II: In α-decay, the mass number decreases by 4 unit and atomic number decreases by 2 unit. In β-decay (negative β), the mass number remains unchanged and atomic number increases by 1 unit. In γ-decay, mass number and atomic number remain unchanged.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A

Watch Video Solution

2. Radioactive nuclei emit β^{-1} particles.

Electrons exist inside the nucleus.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: C

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3. $.^{90}Sr$ from the radioactive fall out from nuclear bomb ends up in the bones of human being through the milk consumed by them. It causes impairment of the production of res blood cells.

The energetics $\beta -$ particles emitted in the decay of $.^{90}Sr$ damage the bone marrow.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A

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4. Energy is released in nuclear fission.

Total binding energy of the fission fragments is large than the total binding energy of the parent nucleus.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A

Watch Video Solution

5. It is not possible to use $.^{35}C1$ as the fuel for fusion energy.

The binding energy of $.^{35}C1$ is too small.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: C

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6. The binding energy per nucleon, for nuclei with atomic mass number $A > 100$, decreases with A.

The nuclear forces are weak for heavier nuclei.

A. If both assertion and reason are true and reason is the correct explanation of

assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: C

7. Cabalt-60 is useful in cancer therapy.

Cabalt-60 is source of $Y - radiations$ capable of killing cancerous cell/

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A

Watch Video Solution

8. Density of all the nuclei is same.

Radius of nucleus is directly proportional to the cube root of mass number.

A. If both assertion and reason are true and reason is the correct explanation of

assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A

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9. The ionising power of $\alpha-$ particle is less compared to $\alpha-$ particles but their penetrating power is more.

The mass of $\beta-$ particle is less than the mass of α-particle.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: B

Watch Video Solution

10. Thermonuclear fusion reactions may becomes the source of untimited power for the mankind.

A single fusion event involving isotopes f hydrogen produces more energy then energy from nuclear fission of $._{93}^{235}U$.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. decreases with mass number at high mass numbers

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: C

Watch Video Solution

Section D - Chapter End Test

1. If N_0 is the original mass of the substance of half - life period $t_{1/2} = 5 year$ then the amount of substance left after 15 year is

A. $N_0/8$

B. $N_0/16$

C. $N_0/2$

D. $N_0 / 4$

Answer: A

Watch Video Solution

2. A radioactive sample at any instant has its disintegration rate 5000 disintegrations per minute After 5 minutes , the rate is 1250 disintegration per minute. Then , the decay constant (per minute)

A. 0.8 1n 2

B. 0.4 1n 2

C. 0.2 1n 2

D. 0.1 1n 2

Answer: B

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3. Which of the following atoms has the lowest ionization potential ?

A. $._{8}^{16}O$

B. $._{7}^{14}N$

C. $._{55}^{133}Cs$

D. $._{18}^{40}Ar$

Answer: C

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4. In the nuclear fusion reaction

$$_{-}(1)^{2}H+_{1}^{3}H\rightarrow_{2}^{4}He+n$$

given that the repulsive potential energy between the two nuclei is $-7.7\times10^{-14}J$, the temperature at which the gases must be heated the reaction is nearly

[Boltzmann's constant $k = 1.38 \times 10^{-23} J / K$]

A. $10^9 K$

B. $10^7 K$

C. $10^5 K$

D. $10^3 K$

Answer: A

Watch Video Solution

5. 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.

A. $19.2 MeV$

B. $23.6 MeV$

C. $26.9 MeV$

D. $13.9 MeV$

Answer: B

Watch Video Solution

6. If radius of the $\_ (13)^{27} Al$ necleus is estimated to be 3.6 fermi then the radius of $\_ (52)^{125} Te$ nucleus be nearly

A. 4 Fermi

B. 5 Fermi

C. 6 Fermi

D. 8 Fermi

Answer: C

Watch Video Solution

7. Starting with a sample of pure $.^{66}Cu, 7/8$ of it decays into Zn in 15 min . The corresponding half-life is.

A. 5 min

B. $7\frac{1}{2} \text{ min}$

C. 10 min

D. 15 min

Answer: A

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8. Some radioactive nucleus may emit.

A. Only one α, β or γ at a time.

B. All the three α, β and γ one after another.

C. All the three α, β and γ simultaneously

D. Only α and β simultaneously

Answer: A

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9. Which of the following is a correct statement?

A. Beta rays are same as cathode rays

B. Gamma rays are high energy neutrons

C. Alpha particle are singly ionized helium atoms

D. Protons and neutrons have exactly the same mass.

Answer: A

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10. $.^{22}Ne$ nucleus after absorbing energy decays into two $\alpha -$ particles and an unknown nucleus. The unknown nucleus is.

A. Nitrogen

B. Carbon

C. Boron

D. Oxygen

Answer: B

Watch Video Solution

11. The half - life ofI ^ (131) $is8days. Givenasamp \leq of$I^(131)$attime$t = 0`

, we can assert that

A. No nucleus will decay before $t = 4$ days

B. No nucleus will decay before $t = 8$ days

C. All nuclei will decay before $t = 16$ days

D. A given nucleus may decay at any time after $t = 0$

Answer: D

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12. The binding energy per nucleon of O^{16} is $7.97 MeV$ and that of O^{17} is $7.75 MeV$. The energy (in MeV) required to remove a neutron from O^{17} is.

A. 3.52

B. 3.64

C. 4.23

D. 7.86

Answer: C

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13. A star initially has 10^{40} deuterons. It produces energy via the processes $._1^2H + _1^2H \rightarrow _1^3H + p$ and $._1^2H + _1^3H \rightarrow _2^4He + n$, where the masses of the nuclei are

$m(.^2H) = 2.014$ amu, $m(p) = 1.007$ amu,

$m(n) = 1.008$ amu and $m(.^4 He) = 4.001$ amu. If the average power radiated by the star is $10^{16} W$, the deuteron supply of the star is exhausted in a time of the order of

A. 10^6 sec

B. 10^8 sec

C. 10^{12} sec

D. 10^{16} sec

Answer: C

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14. A nucleus with mass number 220 initially at rest emits an α-particle. If the Q-value of the reaction is $5.5MeV$, calculate the kinetic energy of the α-particle.

(a) 4.4 MeV (b) 5.4 MeV (c) 5.6 MeV (d) 6.5 MeV

A. 4.4 MeV

B. 5.4 MeV

C. 5.6 MeV

D. 6.5 MeV

Answer: B

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15. The half life of radioactive Radon is $3.8 days$. The time at the end of which $\frac{1}{20}th$ of the radon sample will remain undecayed is $(given \log e = 0.4343)$

A. 3.8 days

B. 16.5 days

C. 33 days

D. 76 days

Answer: B

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16. A freshly prepared radioactive source of half-life $2h$ emits radiation of intensity which is 64 times the permissible safe level. The minimum time after which it would be possible to work safely with this source is

A. 6 hours

B. 12 hours

C. 24 hours

D. 128 hours

Answer: B

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17. A radioactive material decays by simulataneous emission of two particle from the with respective half - lives 1620 and 810 year . The time , in year , after which one - fourth of the material remains is

A. 1080

B. 2430

C. 3240

D. 4860

Answer: A

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18. The half-life period of a radioactive element x is same as the mean life time of another radioactive element y. Initially, both of them have the same number of atoms. Then,

(a) x and y have the same decay rate initially

(b) x and y decay at the same rate always

(c) y will decay at a faster rate than x

(d) x will decay at a faster rate than y

A. X and Y have the same decay rate initially

B. X and Y decay at the same rate always

C. Y will decay at a faster rate than X

D. X will decay at a faster rate then Y.

Answer: C

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19. Two radioactive X_1 and X_2 have decay constants 10λ and λ respectively . If initially they have the same number of nuclei, then the ratio of the number of nuclei of X_1 to that of X_2will be $1/e$ after a time .

A. $1/(10\lambda)$

B. $1/(11\lambda)$

C. $11/(10\lambda)$

D. $1/(9\lambda)$

Answer: D

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20. After 280 days, the activity of a radioactive sample is 6000 dps. The activity reduces to 3000 dps after another 140 days. The initial activity of the sample in dps is

A. 6000

B. 9000

C. 3000

D. 24000

Answer: D

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21. A radioactive sample of $\hat{} (238)U$ decay to Pb through a process for which the half is 4.5×10^9 year. Find the ratio of number of nuclei of Pb to $\hat{}\,(238)U$after a time of 1.5×10^9 year Given $(2)^{1/3} = 1.26$

A. 0.12

B. 0.26

C. 1.2

D. 0.37

Answer: B

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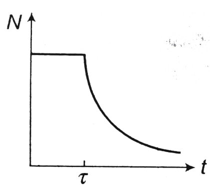
22. A radioactive sample consists of two distinct species having equal number of atoms initially. The mean life of one species is τ and that of the other is 5τ. The decay products in both cases are stable. A plot is made of the total number of radioactive nuclei as a function of time. Which of the following figure best represents the form of this plot?

(a), (b), (c), (d)

A. (a) 

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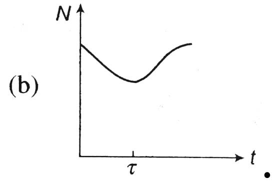
B. 

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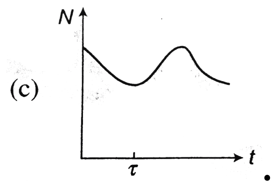
C. 

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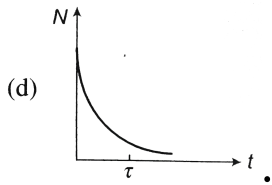
D. 

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Answer: D

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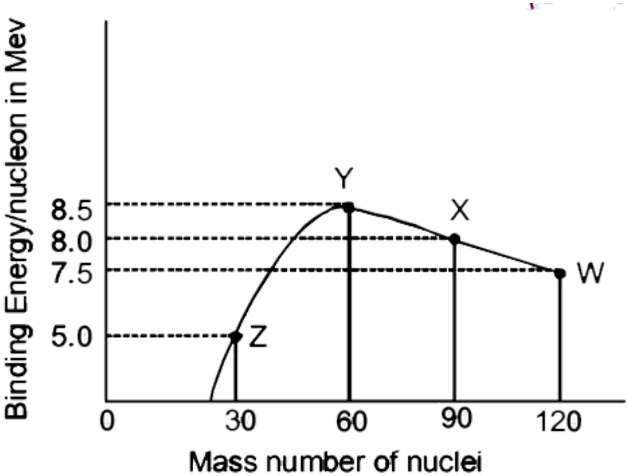
23. Binding energy per nucleons vs mass curve for nucleus is shown in the figure W, X, Y and

Z are four nuclei indicated on the curve . The process that would release energy is



A. $Y \rightarrow 2Z$

B. $W \rightarrow X+Z$

C. $W \rightarrow 2Y$

D. $X \rightarrow Y+Z$

Answer: C

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24. The nuclear radius of a nucelus with nucleon number 16 is $3 \times 10^{-15} m$. Then, the nuclear radius of a nucleus with nucleon number 128 is .

A. $3 \times 10^{-15} m$

B. $1.5 \times 10^{-15} m$

C. $6 \times 10^{-15} m$

D. $4.5 \times 10^{-15} m$

Answer: C

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25. The nuclear radius of $._8 O^{16}$ is $3 \times 10^{-15} m$. If an atomic mass unit is $1.67 \times 10^{-27} kg$, then the nuclear density is approximately.

A. $2.35 \times 10^{17} gmpercm^3$

B. $2.35 \times 10^{17} kgpercm^3$

C. $2.35 \times 10^{17} gmpermetre^3$

D. $2.35 \times 10^{17} kgpercm^3$

Answer: B

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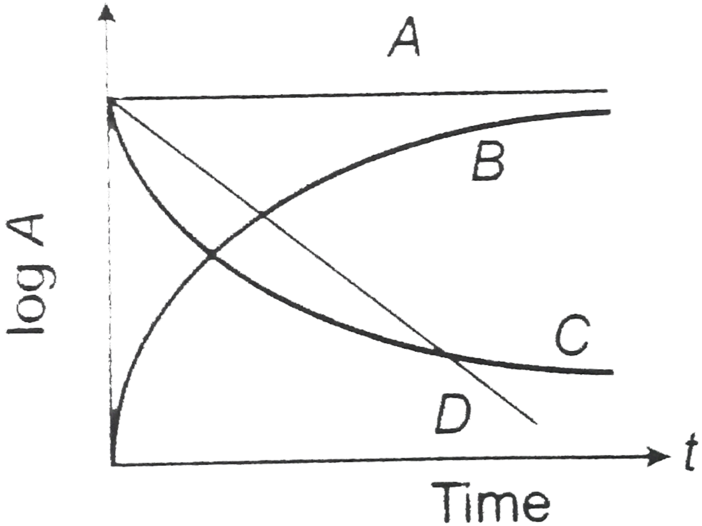
26. The graph which represents the correct variation of logarithm of activity (log A) versus time, in figure is.



A. A

B. B

C. C

D. D

Answer: D

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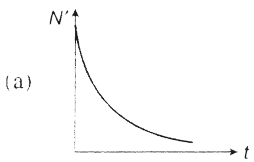
27. The graph between number of decayed atoms N' of a radioactive element and time t is.

A. 

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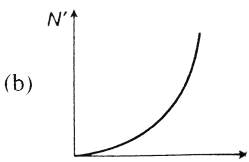
B. 

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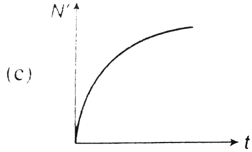
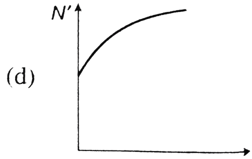
C.  .

D.  .

Answer: C

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28. Assertion: For the scattering of α-particles at a large angles, only the nucleus of the atom is responsible.

Reason: Nucleus is very heavy in comparison to electrons.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A

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29. In $\beta -$ decay, all the emitted electron do not have the same energy the same energy.

$\beta -$ decay is not a two body decay process.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A

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