PHYSICS

AAKASH INSTITUTE ENGLISH

NUCLEI

Example

1. How many electrons, protons, and neutrons are there in an atom of atomic number 11 and mass number 24?

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2. select the point of isotones from the following nuclei ${}_{.12}Mg^{24}, {}_{.1}H^{3}, {}_{.2}He^{4}, {}_{.11}Na^{23}$.

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3. Name the isotopes of hydrogen.

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4. The three stable isotopes of neon: $_{(10)}{}^{20}Ne, {}^{21}_{10}Ne$ and ${}^{22}_{10}Ne$ have respective abundances of $90.51\,\%, 0.27\,\%$ and $9.22\,\%$. The atomic masses of the three isotopes are 19.99 u, 20.99 u and 21.99 u, respectively. Obtain the average atomic mass of neon.

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5. What is the ratio of nuclear densities of the two nuclei having mass numbers in the ratio 1:4 ?

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6. What is the nuclear radius of Fe^{125}, if that of Al^{27} is 3.6 fermi.

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7. Express 1 mg mass equivalent in eV.

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8. What is the binding energy per nucleon in $._2 He^4$

Given , Mass of $._2 He^4$=4.002604 amu

Mass of proton =1.007825 amu

Mass of neutron =1.008665 amu

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9. Obtain the binding energy of the nuclei $_(26)^{56}Fe$ and $^{209}_{83}Bi$ in units of MeV from the following data:

$m\left({}_{26}^{56}Fe\right) = 55.934939 \quad u \quad m\left({}_{83}^{209}Bi\right) = 208.9803388 \quad u$

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10. A certain element has half life period of 30 days. Find its average life

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11. A radioactive isotope X has a half-life of 3s. At t = 0 s, a given sample of this isotope X contains 8000 atoms. Find the time t_1, when 1000 atoms of isotope X remains in the sample.

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12. Radon has 3.8 days as its half-life . How much radon will be left out of 15 mg mass after 38 days ?

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13. Find the half-life period of a radioactive material if its activity drops of $\left(\frac{1}{16}\right)^{th}$ of its initial value in 40 years.

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

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15. Calculate the energy released in the following reaction

$._3 Li^6 + ._0 n^1 \rightarrow ._2 He^4 + ._1 H^3$

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16. The nucleus of an atom of $._{92} Y^{235}$ initially at rest decays by emitting an α particle. The binding energy per nucleon of parent and daughter

nuclei are $7.8MeV$ and $7.835MeV$ respectively and that of α particles is $7.07MeV/\text{nucleon}$. Assuming the daughter nucleus to be formed in the unexcited state and neglecting its share of energy in the reaction, calculate speed of emitted alpha particle. Take mass of α particle to be $6.68 \times 10^{-27} kg$.

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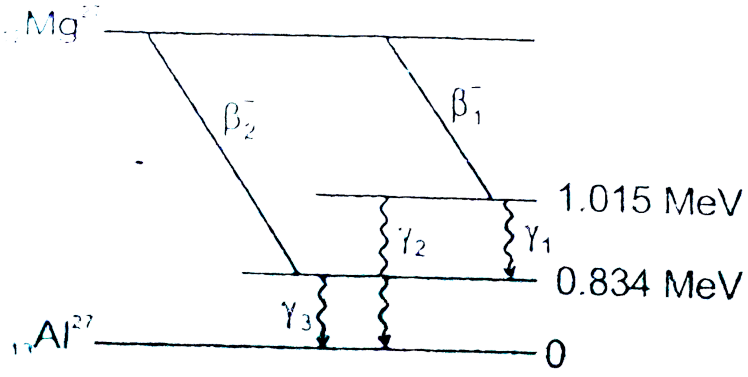
17. Calculate the kinetic energy of β-particles and the radiation frequencies corresponding to the γ-decays shown in figure.

Given, mass of ${}_{12}Mg^{27}$ atom =26.991425 amu and mass of ${}_{13}Al^{27}$ atom = 26.990080 amu



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18. Assuming that about 20 MeV of energy is released per fusion reaction

$1^{H^2} + 1^{H^2} \rightarrow 2^{He^4}$

then the mass 1^{H^2} consumed per day in a jfusion rector of power 1 MW wll apporximately be :

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19. Calculate the energy released when three alpha particles combine to form a $\_^{12}\,C$ nucleus. The atomic mass of $\_^{4}\,He$ is $4.002603u$.

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20. $\xrightarrow{10^{21}\text{per sec}} A \xrightarrow{\lambda=\frac{1}{30}} B.$

A shows radioactivity disintegration and it is continuosuly produced at the rate of 10^{21} per sec. Find maximum number of nuclei of A.

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21. The age of a rock containing lead and uranium is equal to 1.5×10^9 years. The uranium is decaying into lead with half life equal to 4.5×10^9 years. Find the ratio of lead to uranium present in the rock, assuming that initially no lead was present in the rock (given $2^{\frac{1}{3}}$=1.259)

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22. A radioactive substance (A) is produced at a constant rate which decays with a decay constant λ to form stable substance (B).If production of A starts at t=0 . Find (i)The number of nuclei of A and (ii)Number of nuclei of B at any time t.

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23. A nucleus has atomic number 11 and mass number 24. State the number of electrons, protons and neutrons in the nucleus

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24. select the point of isotones from the following nuclei $._{12}Mg^{24}, ._1H^3, ._2He^4, ._{11}Na^{23}$.

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25. Write a short note on the isotopes of hydrogen.

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26. The three stable isotopes of neon: $_(10)^{20}Ne,{}^{21}_{10}Ne$ and ${}^{22}_{10}Ne$ have respective abundances of $90.51\%, 0.27\%$ and 9.22%. The atomic masses of the three isotopes are 19.99 u, 20.99 u and 21.99 u, respectively. Obtain the average atomic mass of neon.

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$m\left(^{56}_{26}Fe\right) = 55.934939 \quad u \quad m\left(^{209}_{83}Bi\right) = 208.9803388 \quad u$

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32. The energy required to separate the typical middle mass nucleus $.^{120}_{50}Sn$ into its constituent nucleons (Mass of $.^{120}_{50}sn = 119.902199u$, mass of proton $= 1.007825u$ and mass of neutron $= 1.008665u$)

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33. Binding energy of $_2He^4$ and $_3Li^7$ are 27.37 MeV and 39.3 MeV respectively. Which of the two nuclei is more stable ?

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34. A certain element has half life period of 30 days. Find its average life

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35. A radioactive isotope X has a half-life of 3s. At t = 0 s, a given sample of this isotope X contains 8000 atoms. Find the time t_1, when 1000 atoms of isotope X remains in the sample.

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$._3 Li^6 + ._0 n^1 \rightarrow ._2 He^4 + ._1 H^3$

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40. The nucleus of an atom is $._{92}^{235} Y$, initially at rest, decays by emitting an α-particle as per the equation

$._{92}^{235} Y \rightarrow ._{90}^{231} X + ._2^4 He$+ Energy

It is given that the binding energies per nucleon of the parent and the daughter nuclei are 7.8 MeV and 7.835 MeV respectively and that of α-

particle is 7.07 MeV/nucleon. Assuming the daughter nucleus to be formed in the unexcited state and neglecting its share in the energy of the reaction, calculate the speed of the emitted α-particle . Take mass of α-particle to be 6.68×10^{-27} kg.

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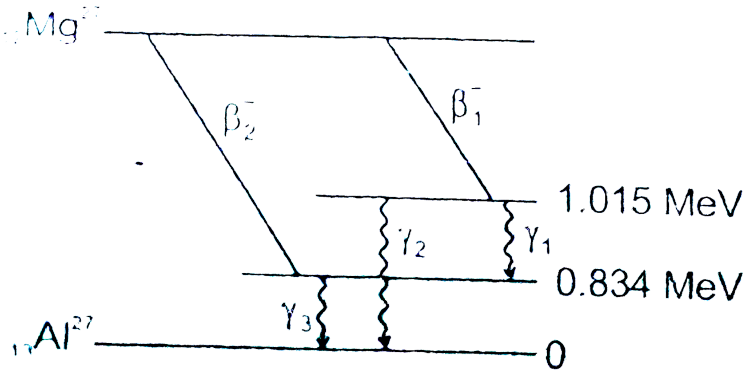

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43. Calculate the energy released when three alpha particles combine to form a $_^{12} C$ nucleus. The atomic mass of $_^{4} He$ is $4.002603u$.

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Try Yourself

1. Select the pairs of isobars and isotones from the following nuclei $_{\cdot 11} Na^{22}, _{\cdot 12} Mg^{24}, _{\cdot 11} Na^{24}, _{\cdot 10} Ne^{23}$.

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2. A nucleus has atomic number 11 and mass number 24. State the number of electrons, protons and neutrons in the nucleus.

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3. Two stable isotopes of lithium $._3^6Li$ and $._3^7Li$ have respective abundances of 7.5% and 92.5% . These isotopes have masses 6.0152 u and 7.016004 u respectively. Find the atomic weight of lithium

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4. Compare the radii of two nuclei with mass number 1 and 27 respectively.

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5. Assuming the nuclei to be spherical in shape, how does the surface area of a nucleus of mass number A_1 compare with that of a nucleus of mass number A_2?

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6. Obtain the approximate value of the radius of (a)a nucleus of $._2^4 He$

(b)a nucleus of $._{92}^{238} U$

(c)What is the ratio of these radii ?

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7. Concrete is produced form a mixture of cement, water and small stones. Small amount of gypsum, $CaSO_4.2H_2O$ is added in cement production to improve the subsequent hardening of concrete. The elevated temperature during the production of cement may lead to the formation of unwanted hemihydrate $CaSO_4.\frac{1}{2}H_2O$ according to reaction.

$CaSO_4.2H_2O(s) \rightarrow CaSO_4.\frac{1}{2}H_2O(s) + \frac{3}{2}H_2O(g)$

The $\Delta_f H^{\Theta} of CaSO_2.2H_2O(s), CaSO_4\frac{1}{2}H_2O(s), H_2O(g)$

are $-2021.0kJmol^{-1}$, $-1575.0kJmol^{-1}$ and $-241.8kJmol^{-1}$, respectively. The respective values of their standard entropies are $194.0, 130.0$ and $188.0JK^{-1}mol^{-1}$. The values of $R = 8.314JK^{-1}mol^{-1} = 0.0831L$ bar $mol^{-1}K^{-1}$.

Answer the following questions on the basis of above information.

The value of ΔG^{Θ} for the reaction at $298K$ is

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8. Calculate the packing fraction of α-particle from the following data :

Mass of helium nucleus =4.0028 amu

Mass of free proton =1.00758 amu

Mass of free neutron =1.00897 amu

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9. The binding energy per nucleon for C^{12} is $7.68MeV$ and that for C^{13} is 7.47 MeV. What is the energy required to remove a neutron from C^{13} ?

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10. After a certain laps of time , fraction of radioactive -potonium undecays is found to be 12.5% of the initial quantity. What is the duration of this time lapse if half life of potonum is 139 days ?

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11. The half life of radon is 3,8 days . After how many hdays $\frac{19}{20}$ of the sample will decay ?

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12. A radioactive element reduces to 25% of its initial value in 1000 years. What is half-life of the element ?

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13. Complete the decay reaction ${}_{10}Na^{23} \rightarrow ? + {}_{-1}e^{0} + ?$

Also, find the maximum KE of electrons emitted during this decay. Given mass of ${}_{10}Na^{23} = 22.994465u$. mass of ${}_{11}Na^{23} = 22.989768u$.

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14. Calculate the maximum energy that a β particle can have in the following decay:

${}_{8}O^{19} \rightarrow {}_{9}F^{19} + {}_{-1}e^{0} + \bar{\nu}$

Given,

$m\left({}_{8}O^{19}\right) = 19.003576u, m\left({}_{9}F^{19}\right) = 18.998403u, m\left({}_{-1}e^{0}\right) = 0.000549u$

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15. A body weighs 64 N on the surface of the Earth. What is the gravitational force on it (in N) due to the Earth at a height equal to one-third of the radius of the Earth?

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16. What is the approximate percentage of mass converted into energy in the following thermonuclear reaction ?

$$._1H^2 + ._1H^2 + ._1H^2 \rightarrow ._2He^4 + ._1H^1 + ._0n^1 + 21.6 \text{ MeV}$$

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17. Select the pairs of isotopes and isotones form the following nuclei:

$$._{11}Na^{22}, ._{12}Mg^{24}, ._{11}Na^{24}, ._{10}Ne^{23}$$

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18. A nucleus has atomic number 11 and mass number 24. State the number of electrons, protons and neutrons in the nucleus

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19. Two stable isotopes $._3^6 Li$ and $._3^7 Li$ have respective abundances of 7.5% and 92.5% . These isotopes have masses 6.01512 u and 7.01600 u respectively. The atomic weight of lithium is

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24. in a fission reaction of X and Y is 8.5 MeV , whereas of ^{236}U is 7.6 MeV the total energy liberated will be about

A. 400 MeV

B. 200 Mev

C. 300 Mev

D. 200 KeV

Answer:

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25. The mass of proton is 1.0073 u and that of neutron is 1.0087 u (u = atomic mass unit). The binding energy of $._2^4He$ is (Given : helium nucleus mass $\approx$ 4.0015 u)

A. 28.4 MeV

B. 62.4 MeV

C. 42.4 MeV

D. 10.2 MeV

Answer:

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26. Binding energy of a nucleus is of the order of:

A. 8 eV

B. 8 J

C. 8 KeV

D. 8 MeV

Answer:

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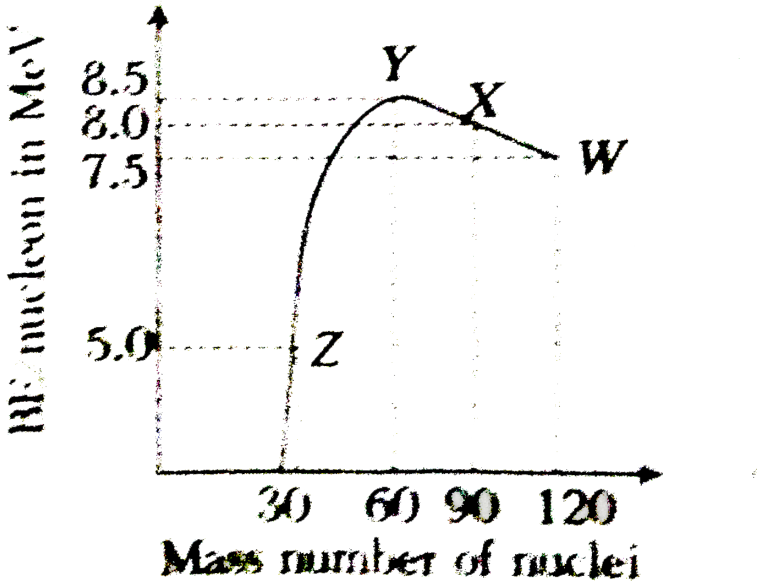
27. Binding energy per nucleon versus mass number curve for nuclei is shown in the figure W,X, Y and Z are four nuclei indicated on the curved. The process that would release energy is



A. $C \rightarrow 2D$

B. $A \rightarrow C + D$

C. $A \rightarrow 2C$

D. $B \rightarrow C + D$

Answer:

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28. After a certain lapse of time , fraction of radioactive polonium undecayed is found to be 12.5 % of the initial quantity. What is the duration of this time lapse, if half-life of polonium is 139 days?

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29. The half-life of radon is 3.8 days. After how many days $\frac{19}{20}$ of the sample will decay ?

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30. A radioactive element reducess to $32st$ of its initial value in 1000 years . What is half life of the element ?

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

A. 1

B. 2

C. 4

D. 6

Answer: A

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32. What is the respective number of α and β-particles emitted in the following radiactive decay

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

A. 6 and 8

B. 6 and 6

C. 8 and 8

D. 8 and 6

Answer:

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33. Which of the following is used as a moderator in nuclear reactors?

A. Uranium

B. Heavy water

C. Cadmium

D. Plutonium

Answer:

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34. Nuclear - Fission is best explained by:

A. Proton proton cycle

B. Liquid drop model of nucleus

C. independent of nuclear particle model

D. Nuclear shell model

Answer:

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35. A chain reaction in fission of Uranium is possible because

A. Fragments in fission are radioactive

B. More than one neutron is given out

C. Small amount of energy is released

D. large amount of energy is released

Answer:

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36. On bombardment of U^{235} by slow neutrons, $200MeV$ energy is released. If the power output of atomic reactor is $1.6MW$, then the rate of fission will be

A. 5×10^{10}

B. 5×10^{12}

C. 5×10^{4}

D. 5×10^{16}

Answer:

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Assignment Section A Objective One Option Is Correct

1. Size of nucleus is in the order of

A. 10^{-15} m

B. 10^{-10} m

C. 10^{-12} m

D. 10^{-19} m

Answer: A

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2. the masses of neutron and prtons are 1.0087anmu and 1.0073 amu , respectivley ,if the neutrons and protons combine to form a heilum nucles (alpha particles) of mass 4.00 15 amu the binding energy of the heilum nucleus will be (1amu =931 MeV)

A. 24.8 MeV

B. 28.4 Mev

C. 14.2 MeV

D. 42.8 MeV

Answer: B

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3. The average binding energy of a nucleon inside an atomic nucleus is about

A. 8 J

B. 8 KeV

C. 8 ev

D. 8 Mev

Answer: D

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4. The binding energy of α particle ${}_{2}^{4}He$ is 7.047 MeV per nucleon and the binding energy of deutron ${}_{1}^{2}H$ is 1.112 MeV per nucleon. Then in the fusion

reaction ${}_1^2H + {}_1^2H \rightarrow {}_2^4He + Q$, the energy Q released is

A. 23.74 MeV

B. 32.82 MeV

C. 11.9 MeV

D. 4.94 MeV

Answer: A

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5. 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. $E_n > E_e$

B. $E_n < E_e$

C. $E_n = E_e$

D. $E_n \leq E_e$

Answer: A

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6. The mass number of a nucleus is equal to

A. Electrons it contains

B. Neutrons it contains

C. Protons it contains

D. Nucleons it contains

Answer: D

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7. Outside a nucleus.

A. Neutron is unstable

B. Proton and neutron both are stable

C. Neutron is stable

D. Neither neutron nor proton is stable

Answer: A

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8. Radius of ${}_{2}^{4}he$ nucleus is 3 Fermi. The radius of ${}_{16}^{32}S$ nucleus will be

A. 6 Fermi

B. 4 Fermi

C. 5 Fermi

D. 8 Fermi

Answer: A

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

A. Coulomb

B. Nuclear

C. Neither coulombic or nuclear

D. Both coulombic & nuclear

Answer: D

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

A. N=Z

B. $N \geq Z$

C. N lt Z

D. N gt Z

Answer: B

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11. In the nucleus of helium if F_1 is the net force between two protons, F_2 is the net force between two neutrons and F_3 is the net force between a proton and a neutron. Then,

A. $F_1 = F_2 = F_3$

B. $F_1 = F_2 > F_3$

C. $F_1 = F_3 > F_2$

D. $F_2 > F_1 > F_3$

Answer: A

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12. If m, m_n and m_p are the masses of ${}_zX^A$ nucleus, neutron and proton respectively

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

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

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

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

Answer: C

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13. Average $K.E$ of thermal neutron is of the order of (in KeV)

A. 3 eV

B. 0.03 eV

C. 3 KeV

D. 3 Mev

Answer: B

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14. The control rod in a nuclear reactor is made of

A. Graphite

B. Plutonium

C. Cadmium

D. Uranium

Answer: C

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15. Fusion reaction takes place at high tamperature because

A. At high temperature atoms are ionised

B. Al high temperature molecules break-up

C. At high temperature nuclei break-up

D. To overcome repulsion between nuclei kinetic energy should be high enough

Answer: D

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16. Nucleus A divides into two nuclei B and C in a fission process, 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: A

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17. Fast neutrons can easily be slowed down by

A. Passing them through water

B. Applying a strong electric field

C. The use of lead shielding

D. Elastic collisions with heavy nude

Answer: A

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

A. 3.125×10^{16}

B. 1.253×10^{16}

C. 2×10^{8}

D. 931

Answer: A

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19. 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=238, Z=90

C. Z=238, Z=94

D. A=234 , Z=90

Answer: D

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20. 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. 2

B. 3

C. 1

D. 0

Answer: B

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21. Neutrino is a particle, which is

A. Charge less and has spin

B. Charged and has spin

C. Charged and has no spin

D. Charge less and has no spin

Answer: A

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22. The binding energy of nucleus is a measure of its.

A. Mass

B. Stability

C. Charge

D. Momentum

Answer: B

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23. Heavy water is

A. Compound of helium and oxygen

B. Water at $4^{\circ} C$

C. Compound of heavy oxygen and heavy hydrogen

D. Water in which soup does not lather

Answer: A

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24. 1 atomic mass unit is equal to

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

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

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

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

Answer: C

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25. 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. $\frac{v}{210}$

B. $\frac{v}{84}$

C. $\frac{4v}{206}$

D. $\frac{3v}{214}$

Answer: C

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26. 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. Is very stable

B. Is radioactive

C. Can easily be broken up

D. Can be used as fissionable material

Answer: A

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27. The atoms of same element having same chemical properties but different masses are called

A. isotones

B. Isomers

C. Isotopes

D. Isobars

Answer: C

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28. Which of the following is most unstable

A. α-particle

B. Neutrons

C. β-particle

D. β^+-particle

Answer: B

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29. In any fission process the ratio $\frac{\text{mass of fission products}}{\text{mass of parent nucleus}}$ is -

A. Less than 1

B. Greater than 1

C. Equal to 1

D. Depends on the mass of fission products

Answer: B

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30. 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. 6 years

B. 24 years

C. 3 years

D. 9 years

Answer: D

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31. Some radioactive nucleus may emit.

A. All the three α, β and γ simultaneously

B. Only α and β simultaneously

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

D. γ along with α or β particles

Answer: D

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

A. $1\ \%$

B. $0.3\ \%$

C. $3.125\ \%$

D. $0.2\ \%$

Answer: C

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33. Beta rays emitted by a radicactive material are

A. Electromagnetic radiation

B. Neutral particles

C. The electrons orbiting around the nucleus

D. Charged particles emitted by nucleus

Answer: D

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34. Alpha rays emitted from a radioactive substance are

A. Uncharged particles having the mass equal to electron

B. Uncharged particles having the mass equal to proton

C. Ionised hydrogen nuclei

D. Doubly ionised helium atom

Answer: D

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35. In a given reaction,

$${}_{Z}X^{A} \rightarrow_{Z+1} Y^{A} \rightarrow_{Z-1} K^{A-4} \rightarrow_{Z-1} K^{A-4}$$

The radioactive radiations are emitted in the sequence of

A. α, β, γ

B. γ, α, β

C. β, α, γ

D. β, γ, α

Answer: C

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36. The radioactivity of a certain radioactive elements drops to $\frac{1}{64}$ of its initial value in 30 seconds. Its half life is

A. 8 seconds

B. 15 seconds

C. 7.5 seconds

D. 5 seconds

Answer: D

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

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

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

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

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

Answer: A

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38. The half-life of a radioactive element which has only $1/32$ of its original mass left after a lapse of 60 days is

A. 18days

B. 24 days

C. 12days

D. 36 days

Answer: C

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

A. 7.5 days

B. 15 days

C. 10days

D. 20 days

Answer: B

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

$$A \xrightarrow{\alpha} A_1 \xrightarrow{\beta} A_2 \xrightarrow{\alpha} A_3 \xrightarrow{\gamma} A_4$$

if the mass number and atomic number of A are 180 and 72 respectively, then what are these number for A_3

A. 174 and 70

B. 172 and 69

C. 176 and 69

D. 176 and 70

Answer: B

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41. Half-life of radioactive element depend upon

A. Nature of element

B. Temperature

C. Pressure

D. Amount of element present

Answer: A

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

A. $25\ \%$

B. $6.25\ \%$

C. $93.75\ \%$

D. $75\ \%$

Answer: C

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43. Half-lives of two radioactive substances A and B are respectively 20 min and 40 min. Initially, the samples of A and B have equal number of nuclei. After 80 min the raatio of remaining number of A and B nuclei is

A. $1:4$

B. $1:2$

C. $1:1$

D. $1:8$

Answer: A

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

A. 99 days

B. 33 days

C. 16 days

D. 70 days

Answer: B

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45. An element A decays into an element C by a two step process $A \to B + {}_2He^4$ and $B \to C + 2e^-$ .Then,

A. A and B are isobars

B. A and C are isobars

C. A and B are isotopes

D. A and C are isotopes

Answer: D

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

A. e

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

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

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

Answer: B

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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. 2.3×10^8 atom/s

B. 3.2×10^8 atom/s

C. 2.3×10^{11} atom/s

D. 3.2×10^{11} atom/s

Answer: A

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48. The activity of a sample of radioactive material is R_1 at time t_1 and R_2at time$t_2(t_2 > t_1)$. Its mean life is T. Then,

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

B. $A_1 - A_2 = t_2 - t_1$

C. $A_1 t_1 = A_2 t_2$

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

Answer: A

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

A. Less than half of the active nuclei decay

B. More than half of the active nuclei decay

C. Half of the active nuclei decay

D. All active nuclei decay

Answer: B

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

A. 2.50 gm

B. 1.35 gm

C. 6.30 gm

D. 3.70 gm

Answer: B

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

A. 2×10^{10}

B. 0.75×10^{10}

C. 1.5×10^{10}

D. Zero

Answer: C

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52. A nucleus of mass 220 amu in the free state decays to emit an α-particle . Kinetic energy of the α-particle emitted is 5.4 MeV. The recoil energy of the daughter nucleus is

A. 0.25 MeV

B. 0.5 MeV

C. 0.1 MeV

D. 0.75 MeV

Answer: C

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Assignment Section B Objective One Option Is Correct

1. At a given instant, 60% of the radioactive nuclei in a sample are left undecayed. After 20 s, 85% nuclei have disintegrated , mean life of nuclei

A. 10 s

B. 6.93 s

C. 14.43 s

D. 12.86 s

Answer: C

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2. Two radio active nuclei X and Y decay into stable nucleus Z

$X \to Z + 2\alpha + \beta^-$

$Y \to Z + \alpha + 2\beta^+$

if Z_1 and Z_2 are atomic numbers of X and Y then

A. $Z_1 = Z_2$

B. $Z_2 - Z_1 = 1$

C. $Z_1 - Z_2 = 1$

D. $2Z_1 - Z_2 = 2$

Answer: B

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3. The escape velocity at the surface of Earth is approximately 8 km/s. What is the escape velocity for a planet whose radius is 4 times and

whose mass is 100 times that of Earth?

A. 600 years

B. 900 years

C. 200 years

D. 400 years

Answer: D

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4. The probability of nucleus to decay in two mean lives is

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

B. $\frac{e^2 - 1}{e^2}$

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

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

Answer: B

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5. A radioactive substances decays so that 3% of its initial nuclei remain after 60 seconds. The half life period of the substances is nearly

A. 17.3 s

B. 12 s

C. 30 s

D. 60 s

Answer: B

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6. The radius of $._{32}X$ nuclide is measured to be twice the radius of $._4^9Be$. The number of neutrons in X is

A. 40

B. 72

C. 32

D. 36

Answer: A

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7. Two wavelengths of light λ_1 and λ_2 are sent through Young's double-slit apparatus simultaneously. If the third-order bright fringe coincides with the fourth-order bright fringe, then

A. $3\lambda_1 = 5\lambda_2$

B. $2\lambda_1 = 3\lambda_2$

C. $3\lambda_1 = 2\lambda_2$

D. $5\lambda_1 = 3\lambda_2$

Answer: B

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8. What is the probability of a radioactive nucleus to survive one mean life?

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

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

C. $\frac{\text{In } 2}{e}$

D. $\frac{\text{1-In } 2}{e}$

Answer: A

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9. When a deuterium is bombarded on $._8O^{16}$ nucleus, an α-particle is emitted, then the product nucleus is

A. $._7N^{13}$

B. ${}_5B^{10}$

C. ${}_4Be^9$

D. ${}_7N^{14}$

Answer: D

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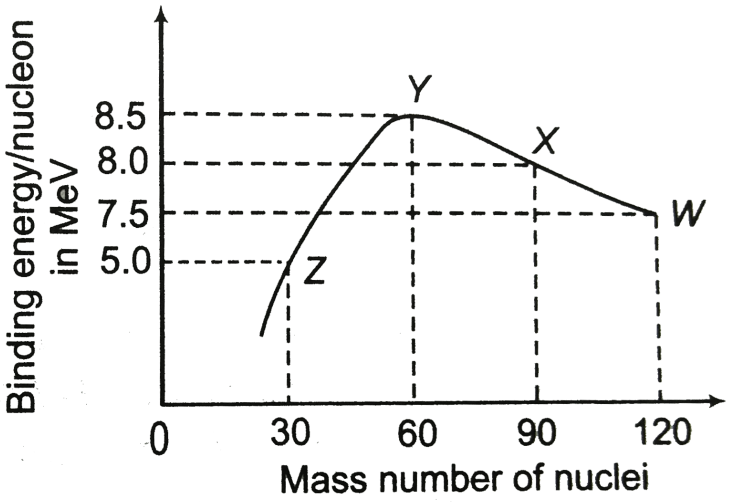
10. Binding energy per nucleon versus mass number curve for nuclei is shown in figure. W, X, Y, and Z are four nuclei indicated on the curve. The process that would release energy is

(a) $Y \rightarrow 2Z$

(b) $W \rightarrow X + Z$

(c) $W \rightarrow 2Y$

(d) $X \rightarrow Y + Z$



A. $Y \rightarrow 2Z$

B. $W \rightarrow X + Z$

C. $W \rightarrow 2Y$

D. $X \rightarrow Y + Z$

Answer: C

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Assignment Section C Objective More Than One Option Are Correct

1. Choose the correct alternative

A. During the nuclear fusion reaction, two light nuclei combine to give a heavier nucleus and possibly other products `

B. In a working nuclear reactor, control rods are used to slow down neutrons

C. Fusion reaction takes place at high temperature because atoms at ionised at high temperature

D. Energy in the sun is generated mainly by fusion by hydrogen atoms

Answer: A::D

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2. Disintegration constant of a radioactive material is λ:

A. Its half life equal $\frac{\log_e^2}{\lambda}$

B. its means life equals $\frac{1}{\lambda}$

C. At time equal to mean life, 63% of the initial radioactive material is left undecayed

D. After 3-half lives, $\frac{1}{3}$rd of the initial radioactive material is left undecayed

Answer: A::B

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3. A nucleus undergoes a series of decay according to the scheme $A \xrightarrow{\alpha} B \xrightarrow{\beta} C \xrightarrow{\alpha} D \xrightarrow{\gamma} E$

Atomic number and mass number of E are 69 and 172

A. Atomic number of A is 72

B. Mass number of B is 176

C. Atomic number of D is 69

D. Atomic number of C is 69

Answer: A::B::C

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4. A nitrogen nucleus $7^{N^{14}}$ absorbs a neutron and can transfrom into lithium nucleus $3^{Li^{7}}$ under suitable conditions, after emitting :

A. 4 protons and 3 neutrons

B. 1α particle, 4 protons and 2 negative β particle

C. 4 protons and 4 neutrons

D. 5 protons and 1 negative β particle

Answer: B::C

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

A. $._{Z}^{A}X + r \rightarrow ._{Z-1}^{A}X + a + b$

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

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

D. $._{Z}^{A}X + e_{-1} \rightarrow ._{Z-1}^{A}X + g$

Answer: A::B::D

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6. Thalassemia and sickle cell anemia are caued due to problem in globin molecule synthesis . Select the correct statement.

A. a.The number of nuclei decayed in time interval 0-t is $N_0 e^{-\lambda t}$

B. b.The number of nuclei decayed in time interval 0-t is $N_0\left(1 - e^{-\lambda t}\right)$

C. c.The probability that a radioactive nucleus does not decay in interval 0-t is $e^{-\lambda t}$

D. d.The probability that a radioactive nucleus does not decay in interval 0-t is $1 - e^{-\lambda t}$

Answer: B::C

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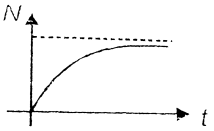
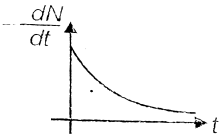
7. Radioactive nuclei are being generated at a constant rate by some kind of nuclear reaction. If the decay constant for the radioactive nuclei is λ, which of the following graphical representation is correct ? (initially, there are no radioactive nuclei present)

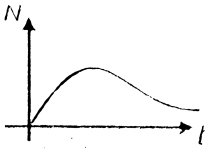
A. (1)

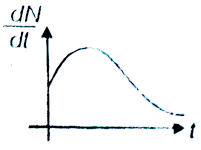


B. (2)



C. (3)



D. (4) 

Answer: A::B

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8. The count rate of a radioactive sample was 1600 count/s at t=0 and 100 count/s at t=8s.Select the correct option.

A. Its count rate was 200 counts at t=6 s

B. Its count rate was 200 counts at t=4 s

C. Half life of the sample is 4s

D. Mean life of the sample is 2.88 s

Answer: A::D

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9. Which of the following is correct for a nuclear reaction ?

A. A fission represented by $._{92}U^{235} + ._0 n^1 \rightarrow ._{56}Ba^{143} + ._{36}Kr^{93}$ +energy

B. heavy water is used as moderator in preference to ordinary water because H-atom may capture neutrons, while D-atom would not

C. Cadmium rods increase the reactor power when they go in, decrease when they go outward

D. Slower neutrons are more effective in causing fission than faster neutrons in case of U^{235}

Answer: A::B::D

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10. The probability disintegration per second of a nucleus in a given radio-active sample

A. Increases in proportion to life time lived by the nucleus

B. Decreases with the life time lived

C. Is independent of life time lived

D. Depends on the total number of identical nuclei present in the sample

Answer: C

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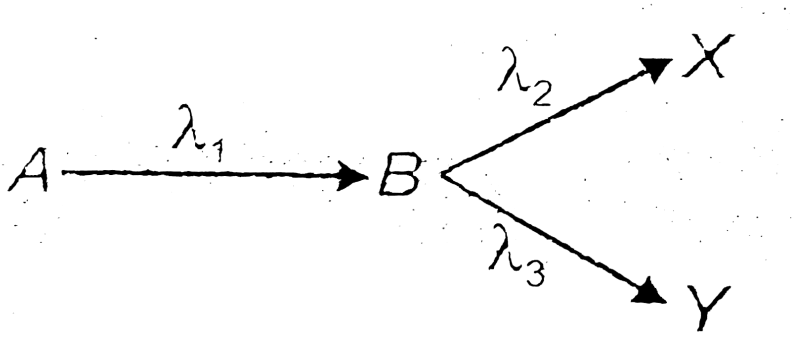
Assignment Section D Linked Comprehension

1. The rate at which a particular decay process occurs in a radio sample, is proportional to the number of radio active nuclei present . If N is the number of radio active nuclei present at some instant, the rate of change of N is $\frac{dN}{dt} = -\lambda N$. Consider radioactive decay of A to B which may further decay either to X or to Y, λ_1, λ_2 and λ_3 are decay constants for A to B decay , B to X decay and B of Y decay respectively. if at t=0 number of

nuclei of A,B , X and Y are N_0, N_0,zero and zero respectively



and N_1, N_2, N_3, N_4 are number of nuclei A,B , X and Y at any instant.

At $t = \infty$, which of the following is incorrect ?

A. $N_1\lambda_1 + N_2\lambda_2 + N_3\lambda_3$

B. $N_1\lambda_1 - N_3\lambda_2 - N_4\lambda_3$

C. $N_1\lambda_1 - N_2\lambda_2 - N_2\lambda_3$

D. $N_1\lambda_1 + N_2\lambda_2 - N_2\lambda_3$

Answer: C

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2. The rate of biomass production by consumers is called :

A. $\lambda_1 > \lambda_2 + \lambda_3$

B. $\lambda_2 = \lambda_2 = \lambda_3$

C. $\lambda_1 = \lambda_2 + \lambda_3$

D. For any values if λ_1, λ_2 and λ_3

Answer: A

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3. Replum is present in the ovary of flowers of

A. 1.$N_2 = 0$

B. 2.$N_3 = \frac{N_0\lambda_2}{\lambda_2 + \lambda_3}$

C. 3.$N_4 = \frac{2N_0\lambda_3}{\lambda_2 + \lambda_3}$

D. 4.$N_3 + N_4 + N_1 + N_2 = 2N_0$

Answer: B

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4. The heat of neutralization for a strong acid by a strong base is a constant

A. V

B. $\sqrt{V}$

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

D. $\frac{1}{\sqrt{V}}$

Answer: D

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5. The limit of resolution of a microscope is the least distance between two point objects which can be seen clearly and distinctively with it. For a naked eye, limit of resolution is about 10^{-4} m or 0.1 mm. The limit of resolution for a microscope is of the order of $\frac{\lambda}{2}$, where λ is wavelength of light used. For an optical microscope , using visible light, limit of

resolution is $\frac{500\text{ nm}}{2}$=250 mm. This is 400 times smaller than naked eye. So the useful magnification produced by it is 400. Smaller is the limit of resolution, greater is the magnification that can be achieved. By using shorter wavelengths , we can improve resolution. For examination of a microorganism, much higher limit of resolution is needed, the Wave nature of electron provides a means for probes of very small size organisms. An electron beam accelerated by a high potential difference possess a very short wavelength. In an electron microscope magnetic lenses are used to control the path of electrons. The image of object is obtained on a fluorescent screen or on a photographic plate. The electron microscope with its high magnifying power and resolving power , is one of the most indispensable and powerful tool for research in science , medicine and industry.

For an electron beam accelerated through a high potential difference V, limit of resolution is proportional to

A. Only wave nature of electron

B. Only particle nature of electron

C. Both particle nature as well as wave nature

D. None of these

Answer: C

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6. The limit of resolution of a microscope is the least distance between two point objects which can be seen clearly and distinctively with it. For a naked eye, limit of resolution is about 10^{-4} m or 0.1 mm. The limit of resolution for a microscope is of the order of $\frac{\lambda}{2}$, where λ is wavelength of light used. For an optical microscope , using visible light, limit of resolution is $\frac{500\ \text{nm}}{2}$=250 mm. This is 400 times smaller than naked eye. So the useful magnification produced by it is 400. Smaller is the limit of resolution, greater is the magnification that can be achieved. By using shorter wavelengths , we can improve resolution. For examination of a microorganism, much higher limit of resolution is needed, the Wave nature of electron provides a means for probes of very small size organisms. An electron beam accelerated by a high potential difference possess a very short wavelength. In an electron microscope magnetic

lenses are used to control the path of electrons. The image of object is obtained on a fluorescent screen or on a photographic plate. The electron microscope with its high magnifying power and resolving power , is one of the most indispensable and powerful tool for research in science , medicine and industry.

For an electron beam accelerated through a high potential difference V, limit of resolution is proportional to

A. It gives images which can be directly seen with naked eye

B. It gives a better resolution and magnification

C. It is very simple in its working

D. It uses magnetic lens in place of glass lens

Answer: B,D

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7. During alpha-decay , a nucleus decays by emitting an α-particle (a helium nucleus ${}_2He^4$) according to the equation

$._{Z}^{A}X \rightarrow ._{Z-2}^{A-4}Y + ._{2}^{4}He + Q$

In this process, the energy released Q is shared by the emitted α-particle and daughter nucleus in the form of kinetic energy .

The energy Q is divided in a definite ratio among the α-particle and the daughter nucleus .

A nucleus that decays spontaneously by emitting an electron or a positron is said to undergo β-decay .This process also involves a release of definite energy . Initially, the β-decay was represented as

$._{Z}^{A}X \rightarrow ._{Z+1}^{A}Y + e^{-}(\text{electron}) + Q$

According to this reaction, the energy released during each decay must be divided in definite ratio by the emitted e' (β-particle) and the daughter nucleus. While , in alpha decay, it has been found that every emitted α-particle has the same sharply defined kinetic energy. It is not so in case of β-decay . The energy of emitted electrons or positrons is found to vary between zero to a certain maximum value. Wolfgang Pauli first suggested the existence of neutrinoes in 1930. He suggested that during β-decay, a third particle is also emitted. It shares energy with the emitted β particles and thus accounts for the energy distribution.

When a nucleus of mass number A at rest decays emitting an α-particle ,

the daugther nucleus recoils with energy K . What is the Q value of the reaction ?

A. K

B. 2K

C. $\frac{4K}{A}$

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

Answer: D

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8. During alpha-decay , a nucleus decays by emitting an α-particle (a helium nucleus $._2He^4$) according to the equation

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The beta particles (positron) are emitted with different kinetic energies because

A. Neutrino shares a definite amount of energy with positron

B. The disintegration energy is shared between positron and neutrino in varying proportions

C. Neutrino is massless and carries no energy

D. Neutrino possesses very high kinetic energy

Answer: B

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9. During alpha-decay , a nucleus decays by emitting an α-particle (a helium nucleus $._2He^4$) according to the equation

$$._Z^AX \rightarrow ._{Z-2}^{A-4}Y + ._2^4He + Q$$

In this process, the energy released Q is shared by the emitted α-particle and daughter nucleus in the form of kinetic energy .

The energy Q is divided in a definite ratio among the α-particle and the daughter nucleus .

A nucleus that decays spontaneously by emitting an electron or a positron is said to undergo β-decay .This process also involves a release of definite energy . Initially, the β-decay was represented as

$$._Z^AX \rightarrow ._{Z+1}^AY + e^-(\text{electron}) + Q$$

According to this reaction, the energy released during each decay must

be divided in definite ratio by the emitted e' (β-particle) and the daughter nucleus. While , in alpha decay, it has been found that every emitted α-particle has the same sharply defined kinetic energy. It is not so in case of β-decay . The energy of emitted electrons or positrons is found to vary between zero to a certain maximum value. Wolfgang Pauli first suggested the existence of neutrinoes in 1930. He suggested that during β-decay, a third particle is also emitted. It shares energy with the emitted β particles and thus accounts for the energy distribution.

During β^+ decay (positron emission) a proton in the nucleus is converted into a neutron, positron and neutrino. The reaction is correctly represented as

A. $._Z^A X \rightarrow ._{Z-1}^{A-1} Y + e^+ + v$+ Energy

B. $._Z^A X \rightarrow ._{Z-1}{}^A X + e^+ + v$+ Energy

C. $._Z^A X \rightarrow ._{Z-1}^A Y + e^+ + v$+ Energy

D. $._Z^A X \rightarrow ._Z^{A-1} X + e^+ + v +$ Energy

Answer: C

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Assignment Section E Assertion Reason

1. Statement-1: An isolated radioactive atom may not decay at all whatever be its half life

Statement-2:Radioactive decay is a statistical phenomenon.

A. a.Statement-1 is True , Statement-2 is True ,Statement-2 is a correct explanation for Statement-1

B. b.Statement-1 is True , Statement-2 is True ,Statement-2 is NOT a correct explanation for Statement-1

C. c.Statement-1 is True , Statement-2 is False

D. d.Statement-1 is False, Statement-2 is True

Answer: A

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2. Assertion: Isotopes of an element can be separated by using a mass spectrometer.

Reason: Separation of isotopes is possible because of difference in electron numbers of isotope.

A. Statement-1 is True , Statement-2 is True ,Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True , Statement-2 is True ,Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True , Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: C

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3. Statement-1:In a spontaneous fission reaction a heavy nucleus is split into two medium sized ones, each of the new nuclei will have more

binding energy per nucleon than the original nucleus

Statement-2:Joining two light nuclei together to give a single nucleus of medium size means more binding energy per nucleon in the new nucleus

.

A. a. Statement-1 is True , Statement-2 is True ,Statement-2 is a correct explanation for Statement-1

B. b. Statement-1 is True , Statement-2 is True ,Statement-2 is NOT a correct explanation for Statement-1

C. c. Statement-1 is True , Statement-2 is False

D. d. Statement-1 is False, Statement-2 is True

Answer: C

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4. Assertion: In the process of nuclear fission, the fragments emit two or three neutrons as soon as they are formed and subsequently emit

particles.

Reason : As the fragments contain an excess of neutrons over protons, emission of neutrons and particles bring their neutron/proton ratio the to stable values

A. Statement-1 is True , Statement-2 is True ,Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True , Statement-2 is True ,Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True , Statement-2 is False

D. Statement-1 is False, Statement-2 is True

A. Statement-1 is True , Statement-2 is True ,Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True , Statement-2 is True ,Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True , Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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5. Statement-1:Light nuclei having equal number of protons and neutrons are more stable

Statement-2:In heavy nuclei, there is an excess of neutrons due to comlomb repulsion between protons .

A. Statement-1 is True , Statement-2 is True ,Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True , Statement-2 is True ,Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True , Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: B

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Assignment Section F Matrix Match

1. A nuclear reactor consists of five main elements . Four elements out of these five elements are given in the column-I and the commonly used material for these elements are given in column-II

Column-I	Column-II
(A) Fuel	(p) Heavy water
(B) Moderator	(q) Boron
(C) Control rods	(r) Graphite
(D) Coolants	(s) Cadmium
	(t) Isotopes of uranium

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2. Let R_t represents activity of a sample at an insant and N_t represent number of active nuclei in the sample at the instant. $T_{1/2}$ represents the

half life.

	Column I		Column II
(A)	$t = T_{1/2}$	(p)	$R_t = \frac{R_0}{2}$
(B)	$t = \frac{T_{1/2}}{\ln 2}$	(q)	$N_0 - N_t = \frac{N_0}{2}$
(C)	$t = \frac{3}{2}T_{1/2}$	(r)	$\frac{R_t - R_0}{R_0} = \frac{1-e}{e}$
		(s)	$N_t = \frac{N_0}{2\sqrt{2}}$

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3. In Column-I , name of radiation is given and in column-II, reaction for radiation and nucleus phenomena .

Column-I	Column-II
(A) Alpha decay	(p) Atomic number (Z) of nucleus changes
(B) Beta decay (β^-)	(q) Mass number does not change
(C) Beta decay (β^+)	(r) ${}^{A}_{Z}X \longrightarrow {}^{A}_{Z-1}Y + B + \nu$
(D) Gamma decay	(s) ${}^{A}_{Z}X \longrightarrow {}^{A-4}_{Z-2}Y + A$
	(t) ${}^{A}_{Z}X \longrightarrow {}^{A}_{Z-1}Y + C + \bar{\nu}$

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Assignment Section G Integer

1. The energy of an excited hydrogen atom is 0.38 eV. Its angular momentum is $n.\ \frac{h}{2\pi}$. Find n

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2. A single electron orbits around a stationary nucleus of charge +Ze. It requires 47.2 eV to excite the electron from the 2^{nd} to 3^{rd} Bohr orbit. Find atomic number 'Z' of atom .

Watch Video Solution

Assignment Section H Multiple True False

1. Statement-1:In a nuclear reaction energy is released , if total binding energy is increasing.

Statement-2:For a stability of a nucleus, total binding energy is more important than binding energy per nucleon.

Statement-3:Nuclear force is different for different nucleons and it dependent on charge .

A. TFT

B. FFF

C. TTF

D. TFF

Answer: D

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2. Statement-1:A particular radioactive element can emit either α-particle or β-particle but never simultaneously.

Statement-2:Rest mass of γ-rays is zero

Statement-3:The β-particle is the fast moving electron ejected from the nucleus .

A. TTT

B. TTF

C. FTT

D. TFT

A. a. TTT

B. b. TTF

C. c. FTT

D. d. TFT

Answer: A

Watch Video Solution

Assignment Section I Subjective

1. A radioactive nuclide is produced at a constant rate x nuclei per second. During each decay, E_0 energy is released ,50% of this energy is utilised in melting ice at 0°C. Find mass of ice that will melt in one mean life. (λ =decay consant, L_f=Latent heat of fusion)

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2. A nucleus X^{232} initially at rest undergoes α decay, the α-particle produced in above process is found to move in a circular track of radius 0.22 m in a uniform magnetic field of 1.5 T. Find Q value of reaction.

Watch Video Solution

Assignment Section J Aakash Challengers Questions

1. Almost all of naturally occurring uranium is ${}_{92}^{238}U$ with a half-life of 4.468×10^9 yr. Most of the rest of natural uranium is ${}_{92}^{235}$ U with a half-life of 7.038×10^8 yr.Today a sample contains 0.72% ${}_{92}^{235}$ U

(a)What was this percentage 1.0 billion years ago ?

(b)What percentage of the sample would be ${}_{92}^{235}$ U in 100 million years ?

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2. The ${}_{1}^{3}H$ isotope of hydrogen, which is called tritium (because it contains three nucleons), has a half-life of 12.33 yr.It can be used to measure the age of objects up to about 100 yr. It is produced in the upper atmosphere by cosmic rays and brought to Earth by rain. As an application , determine approximately the age of a bottle of wine whose ${}_{1}^{3}H$ radiation is about $\frac{1}{10}$ that present in new wine .

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3. Some elementary particle theories suggest that the proton may be unstable , with a half life $\geq 10^{32}$ yr. How long woud you expect to wait for one proton in your body to decay (consider that your body is all water) ?

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Exercise

1. Size of nucleus is of the order of

A. 10^{-15} m

B. 10^{-10}m

C. 10^{12} m

D. 10^{-19} m

Answer: A

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2. the masses of neutron and prtons are 1.0087anmu and 1.0073 amu , respectivley ,if the neutrons and protons combine to form a heilum nucles (alpha particles) of mass 4.00 15 amu the binding energy of the heilum nucleus will be (1amu =931 MeV)

A. 24.8 MeV

B. 28.4 MeV

C. 14.2 MeV

D. 42.8 MeV

Answer: B

Watch Video Solution

3. 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. 23.74 Mev

B. 32.82 MeV

C. 11.9 MeV

D. 4.94 MeV

Answer: A

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4. In the nucleus of helium if F_1 is the net force between two protons, F_2 is the net force between two neutrons and F_3 is the net force between a proton and a neutron. Then,

A. $F_1 = F_2 = F_3$

B. $F_1 = F_2 > F_3$

C. $F_1 = F_3 > F_2$

D. $F_2 > F_1 > F_3$

Answer: A

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5. The average kinetic energy of the thermal neutron is of the order of

A. 3 eV

B. 0.03 eV

C. 3 keV

D. 3 MeV

Answer: B

Watch Video Solution

6. 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: A

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7. Radius of ${}_{2}^{4}He$The nucleus is 3 Fermi. The radius of ${}_{16}^{32}S$ nucleus will be

A. 6 fermi

B. 4 fermi

C. 5 fermi

D. 8 fermi

Answer: A

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8. 1 atomic mass unit is equal to

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

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

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

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

Answer: C

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9. Binding energy per nucleon curve as a function of atomic mass number has a sharp peak for helium nucleus. We can conclude from this that helium nucleus

A. is very stable

B. is radioactive

C. can easily be broken up

D. Can be used as fissionable material

Answer: A

Watch Video Solution

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

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

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

Answer: C

Watch Video Solution

11. A nucleus of ${}_{84} Po^{210}$ originally at rest emit α particle with speed v . Recoil speed of the daughter nucleus is

A. $\frac{v}{210}$

B. $\frac{v}{84}$

C. $\frac{4v}{206}$

D. $\frac{3v}{214}$

Answer: C

Watch Video Solution

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

A. 3.125×10^{16}

B. 1.253×10^{16}

C. 2×10^{8}

D. 931

Answer: A

Watch Video Solution

13. When ${}_{92}U^{235}$ undergoes fission by absorbing ${}_{0}n^{1}$ and ${}_{56}Ba^{144}$ and ${}_{36}Kr^{89}$ are formed. The number of neutrons produced will be

A. 2

B. 3

C. 1

D. 0

Answer: B

Watch Video Solution

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

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

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

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

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

Answer: A

Watch Video Solution

15. 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. 7.5 days

B. 15 days

C. 10 days

D. 20 days

Answer: B

Watch Video Solution

16. In the nuclear decay given below

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

the particle emitted in the sequence are

A. $\alpha, \beta, \gamma(2)$

B. γ, α, β

C. $\beta, \alpha, \gamma(4)$

D. β, γ, α

Answer: C

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17. The activity of a sample of radioactive material is R_1 at time t_1 and R_2at time$t_2(t_2 > t_1)$. Its mean life is T. Then,

A. $A_2 = A_1 e^{t_1 - t_2}/T$

B. $A_1 - A_2 = t_2 - t_1$

C. $A_1 t_1 = A_2 t_2$

D. $A_2 = A_1 e^{t_1 / t_2 T}$

Answer: A

Watch Video Solution

18. A nucleus of mass 220 amu in the free state decays to emit an α-particle . Kinetic energy of the α-particle emitted is 5.4 MeV. The recoil energy of the daughter nucleus is

A. 0.25 MeV

B. 0.5 Mev

C. 01. MeV

D. 0.75 MeV

Answer: C

Watch Video Solution

19. Half-lives of two radioactive substances A and B are respectively 20 min and 40 min. Initially, the samples of A and B have equal number of nuclei. After 80 min the raatio of remaining number of A and B nuclei is

A. $1:4$

B. $1:2$

C. $1:1$

D. $1:8$

Answer: A

Watch Video Solution

20. Name a material which is used in making control rods in a nuclear reactor.

A. Graphite

B. Plutonium

C. Cadmium

D. Uranium

Answer: C

Watch Video Solution

Assignment Section A

1. The nuclear radius as compared to the atomic radius, is of the order of

A. 10^{-3}

B. 10^{-5}

C. 10^{-7}

D. 10^{-9}

Answer: B

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2. Two nuclei are not identical but have the same number of nucleons. These are

A. isotones

B. isobars

C. isotopes

D. isodiapher

Answer: B

Watch Video Solution

3. In a nuclear fusion reaction, if the energy is released then

A. $BE_{\text{products}} = BE_{\text{reactants}}$

B. $BE_{\text{reactants}} > BE_{\text{products}}$

C. $BE_{\text{products}} > BE_{\text{reactants}}$

D. Mass of product $>$ mass of reactant

Answer: C

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4. What is the binding energy per nucleon of ${}_6C^{12}$ nucleus?

Given, mass of $C^{12}(m_c) = 12.000u$

Mass of proton $(m_p) = 1.0078u$

Mass of neutron $(m_n) = 1.0087u$

and 1 amu $= 931.4\frac{MeV}{c^2}$

A. 2.675 MeV

B. 7.675 MeV

C. 0 MeV

D. 3.675 MeV

Answer: B

Watch Video Solution

5. Which of the following pairs particles cannot exert nuclear force on each other ?

A. proton and electron

B. Neutron and electron

C. Electron and neutron

D. All of these

Answer: D

Watch Video Solution

6. If the nuclei of masess X and Y are fused together to form a nucleus of mass m and some energy is released, then

A. $X + Y > m$

B. $X - Y = m$

C. $X + Y = m$

D. $X + Y < m$

Answer: A

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7. The nuclear force between two nucleons is explained by

A. Quark exchange theory

B. Meson exchange theory

C. Photon exchange theory

D. Gravitation exchange theory

Answer: B

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8. If the nuclear force between two protons, two neutrons and between proton and neutron is denoted by F_{pp}, F_{nn} and F_{pn} respectively, then

A. $F_{pp} = F_{fn} = F_{\cap}$

B. $f_{pp} < F_{pn} = F_{\cap}$

C. $F_{pp} > F_{pn} > F_{nn}$

D. $F_{pp} < F_{pn} < F_{nn}$

Answer: A

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9. The atomic mass of ${}_{7}N^{15}$ is 15.000108amu and that of ${}_{8}O^{16}$ is 15.994915amu. The minimum energy required to remove the least tightly bound proton is (mass of proton is 1.007825amu)

A. 0.013018 MeV

B. 12.13 MeV

C. 13.018 MeV

D. 12.13 eV

Answer: B

Watch Video Solution

10. Nuclear energy is released in fusion reaction, since binding energy per nucleon is

A. Smaller of fusion products than for fusing nuclei

B. same for fusion products as for fusing nuclei

C. Larger for fusion products than for fusion nuclei

D. Sometimes larger and sometimes smaller

Answer: C

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11. A nucleus X undergoes following transformation $X \xrightarrow{\alpha} Y$

$Y \xrightarrow[2\beta]{} Z$, then

A. X and Y are isotopes

B. X and Z are isobars

C. X and Y are isobars

D. X and Z are isotopes

Answer: D

Watch Video Solution

12. Consider the nuclear reaction

$X^{200} \rightarrow A^{110} + B^{90}$

If the binding energy per cunleon for X, A and B is 7.4 MeV. 8.2 MeV and 8.2 MeV respectively, what is the energy released?

A. 200 MeV

B. 160 MeV

C. 110 MeV

D. 90 MeV

Answer: B

Watch Video Solution

13. The nuclei ${}_6A^{13}$ and ${}_7B^{14}$ can be described as

A. isotones

B. isobars

C. isotopes of carbon

D. isotopes of nitrogen

Answer: A

Watch Video Solution

14. Ratio of nuclear radii of ^{135}Cs to ^{40}Ca is

A. 1.40

B. 1.50

C. 2.750

D. 3.375

Answer: B

Watch Video Solution

15. A nucleus with Z =92 emits the following in a sequence:

$\alpha, \beta^-, \beta^-, \alpha, \alpha, \alpha, \alpha, \beta^-, \beta^-, \alpha, \beta^+, \beta^+, \alpha$. The Z of the resulting nucleus is

A. 74

B. 76

C. 78

D. 82

Answer: C

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16. In nuclear reactions, we have the conservation of

A. Mass only

B. Energy only

C. Momentum only

D. Charge , total energy and momentum

Answer: D

Watch Video Solution

17. Why are heavy nuclei usually unstable?

A. Electrostatic repulsion dominate over nuclear attraction

B. Nuclear repulsion dominate over nuclear attration

C. Nuclear forces are absent in heave nuleus

D. Nuclear force is long range force

Answer: A

Watch Video Solution

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

A. $4\alpha, 7\beta$

B. $4\alpha, 1\beta$

C. $8\alpha, 7\beta$

D. $4\beta, 4\alpha$

Answer: B

Watch Video Solution

19. In the radioactive decay of an element it is found that the count rate reduces from 1024 to 128 in 3 minutes. Its half life will be

A. 1 minute

B. 2 minutes

C. 3 minute

D. 5 minute

Answer: A

Watch Video Solution

20. If a radioactive material remains 25% after 16 days, then its half life will be

A. 32 days

B. 8 days

C. 64 days

D. 28 days

Answer: B

Watch Video Solution

21. Using a nuclear counter the count rate of emitted particles from a radioactive source is measured. At t=0 it was 1600 counts per second and t = 8 seconds it was 100 counts per second. The count rate observed, as counts per seconds, at t=6, seconds is close to :

A. 150

B. 200

C. 300

D. 400

Answer: B

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22. Radioactivity of a sample at T_1 time is R_1 and at time T_2 is R_2. If half-life of sample is T, then in time $(T_2 - T_1)$, the number of decayed atoms is proportional to

A. $(R_1T_1 - R_2T_2)$

B. $(R_1 - R_2)$

C. $(R_1 - R_2)/T$

D. $(R_1 - R_2)T$

Answer: D

Watch Video Solution

23. 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 In 2

B. 0.4 In 2

C. 0.2 In 2

D. 0.1 In 2

Answer: B

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24. At time t=O, some radioactive gas is injected into a sealed vessel. At time T. some more mass of the sam gas is injected into the same vessel. Which one of the following graphs best represetns the variation of the logarithm of the acitivity A of the gas with time t?

A. 

B. 

C. 

D. 

Answer: C

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25. A radioactive isotope X with a half-life of 1.37×10^9 yr decays to Y which is satble. 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. 4.11×10^9 year

B. 2.74×10^9 year

C. 5.48×10^9 year

D. 1.37×10^9 year

Answer: A

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26. Two elements P and Q have half-line of 10 and 15 minutes repectively. Freshly preapared sample of mixuture containing equal number of atoms is allowed to decay for 30 minutes. The ratio of number of atoms of P and Q in left in mixture is:

A. 0.5

B. 2.0

C. 1.0

D. 3.0

Answer: A

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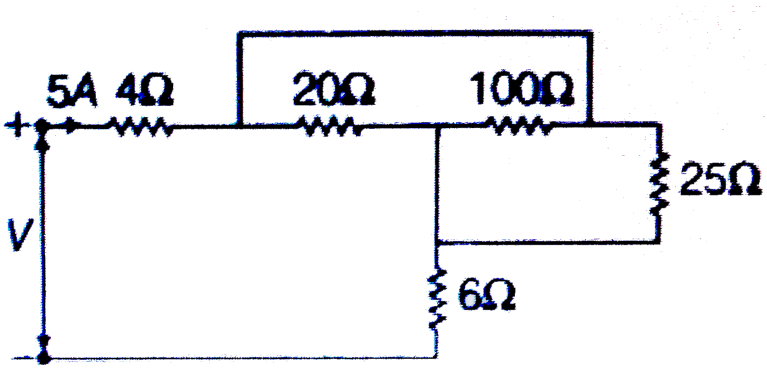
27. In the circuit shown below, V should be:



A. (i),(ii) and (iv)

B. (ii) (iii) and (iv)

C. (iii) (iv) and (i)

D. All of these

Answer: A

Watch Video Solution

28. A freshly prepared radioactive source of half-life 2 h 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 h

B. 12 h

C. 24 h

D. 128 h

Answer: B

Watch Video Solution

29. GAMMA DECAY

A. A.Pair anninilation takes place

B. B.Energy is released due to converstion of neutron into proton

C. C.Energy is released due to de-excitation of nucleus

D. D.None of these

Answer: C

Watch Video Solution

30. A sample of a radioactive substance has 10^6 radioactive nuclei. Its half life time is 20 s How many nuclei will remain after 10 s ?

A. 1×10^5

B. 2×10^5

C. 7×10^5

D. 11×10^5

Answer: C

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31. Half-life of radioactive element depend upon

A. Amount of element present

B. Temperature

C. Pressure

D. The nature of the element

Answer: D

Watch Video Solution

32. Neutrino is a particle, which is

A. Has no charge and no spin

B. Has no charge but has spin

C. is charged like an electron and has spin

D. Has no charge but has mass neary equal to that of a proton

Answer: B

Watch Video Solution

33. Ordinary water is not used as a moderator in nuclear reactors because

A. Cannot slow down neutron

B. Absorbs neutrons

C. is expensive

D. Accelerates neutron

Answer: B

Watch Video Solution

34. Out of the following , which one is not emitted by a natural radioactive substance ?

A. Electrons

B. Electronmagnetic radiations

C. Helium nuclei with charge equal to that of two protons

D. Neutrons

Answer: D

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35. If 200 MeV energy is released in the fission of a single nucleus of $._{92}^{235}U$, the fissions which are required to produce a power of 1 kW is

A. 3.1×10^{13}

B. 1.3×10^{16}

C. 1.3×10^{15}

D. 3.1×10^{16}

Answer: A

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36. 1g ofhydrogen is converted into 0.993 g of helium in a thermonucleart reaction . The energy released is

A. 63×10^7 J

B. 63×10^{10} J

C. 63×10^{14} J

D. 63×10^{20} J

Answer: B

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37. Thermal neutrons are those whose energy is about

A. 1 J

B. 0.03 eV

C. 1 MeV

D. 0.03 MeV

Answer: B

Watch Video Solution

38. A neutron strikes a $_{92}U^{235}$ nucleus and as a result $_{36}Kr^{93}$ and $_{56}Ba^{140}$ are produced with

A. α-particle

B. 1-neutron

C. 3-neutron

D. $2-\beta$- particle

Answer: C

Watch Video Solution

39. Name a material which is used in making control rods in a nuclear reactor.

A. Stainless steel

B. Graphite

C. Cadmium

D. Plutonium

Answer: C

Watch Video Solution

40. In the following nuclear reaction

$._{13}Al^{27} + ._2He^4 \rightarrow ._{15}P^{30} + X$, X will be

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

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

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

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

Answer: D

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Assignment Section B

1. A certain stable nucleide, after absorbing a neutron, emits β-particle and the new nucleide splits spontaneously into two α- particles. The nucleide is

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

B. ${}_{3}^{7}Li$

C. ${}_{4}^{6}Be$

D. ${}_{3}^{6}Li$

Answer: B

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2. After 3 hours, only 0.25 mg of a pure radioactive material is left, if initial mass was 2 mg than the half life of the substance is

A. 1.5 hr

B. 1 hr

C. 0.5 hr

D. 2 hr

Answer: B

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3. Pauli suggested the emission of nutrino during β^+ decay to explain

A. Continuous energy distribution position

B. Conservation of linear momentum

C. Conservation of mass -energy

D. All of these

Answer: A

Watch Video Solution

4. An unstable nuclide with N/P ratio more than that required for stability can attain stability by

A. it emits β^-

B. It emits β^+

C. It emits α particle

D. It will undergo K electron capture

Answer: A

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5. Half lives for α and β emission of a radioacative materila are 16 years and 48 years respectively. When material decays giving α and β emission simultaneously, time in which $3/4^{th}$ material decays is .

A. 29 years

B. 24 years

C. 64 years

D. 12 years

Answer: B

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6. Two radioactive samples of different elements (half-lives t_1 and t_2 respectively) have same number of nuclei at $t = 0$. The time after which their activities are same is

A. $\frac{T_1 T_2}{T_1 - T_2}$

B. $\frac{T_1 - T_2}{2}$

C. $\frac{T_1 + T_2}{2}$

D. $\frac{T_1 T_2}{T_1 + T_2}$

Answer: A

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7. Choose the correct statement

A. The nuclear force becomes strong if the nucleus contains too many protons compared to neutrons

B. The nuclear force becomes strong if the nucleus contains too many neutrons compared to protons

C. Nuclei with atomic number less than 82 shows a tendency to disintegrate

D. The nuclear force becomes weak if the nucleus contains a large number of nucleons

Answer: D

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

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

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

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

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

Answer: B

Watch Video Solution

9. $90\,\%$ of the active nuclei present in a radioactive sample are found to remain undecyayed after 1 day. The precentage of undecayed nuclei left after two days will be

A. 0.81

B. 0.19

C. 0.2

D. 1

Answer: B

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

A. 2.50 gm

B. 1.35 gm

C. 6.30 gm

D. 3.70 gm

Answer: B

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

A. e

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

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

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

Answer: B

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12. An element A decays into an element C by a two step process $A \rightarrow B + {}_2He^4$ and $B \rightarrow C + 2e^-$ .Then,

A. A and B are isobars

B. A and C are isobars

C. A and B are isotopes

D. A and C are isotopes

Answer: D

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13. After three half lives, the percentage of fraction of amount remain is a)35 b)12.5 c)50 d)75

A. 0.01

B. 0.003

C. 0.03125

D. 0.002

Answer: C

Watch Video Solution

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

A. 8 seconds

B. 15 seconds

C. 7.5 seconds

D. 5 seconds

Answer: D

Watch Video Solution

15. 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. 2.3×10^8 atom/s

B. 3.2×10^8 atom/s

C. 2.3×10^{11} atom/s

D. 3.2×10^{11} atom/s

Answer: A

Watch Video Solution

16. The value of binding energy per nucleon is

A. 8J

B. 8 KeV

C. 8 eV

D. 8 MeV

Answer: D

Watch Video Solution

17. In the nuclear fusion reaction ${}_1^2H + {}_1^3H \to {}_2^4He + {}_0^1n$, given that the repulsive potential energy between the two nuclei is $-7.7 \times 10^{14} J$. The temperature at which the gases must be heated to initiate the reaction is nearly, [Boltzmann's constant, $k = 1.38 \times 10^{23} J/K$]

A. $-10^{-10} J$

B. -10^{-12}J

C. -10^{-14}J

D. -10^{-10}J

Answer: D

Watch Video Solution

18. A nucleus ${}^{220}X$ at rest decays emitting an α-particle . If energy of daughter nucleus is 0.2 MeV, Q value of the reaction is

A. 10 MeV

B. 10.9 MeV

C. 11 MeV

D. 11.1 MeV

Answer: C

Watch Video Solution

19. Radioactive nuclei P and Q disintegrate into R with half lives 1 month and 2 months respectively. At time t=0 , number of nuclei of each P and Q is x.

Time at which rate of disintegration of P and Q are equal , number of nuclei of R is

A. x

B. 1.25 x

C. 1.5 x

D. 1.75 x

Answer: B

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20. A radioactive element X emits six α-particles and four β-particles leading to end product ${}_{82}^{208}Pb$. X is

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

B. ${}_{90}^{230}Th$

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

D. ${}_{92}^{239}U$

Answer: C

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21. In nature, ratio of isotopes Boron, ${}_5B^{10}$ and ${}_5B^{11}$, is (given that atomic weight of boron is 10.81)

A. $81:19$

B. $21:44$

C. $19:81$

D. $44:21$

Answer: C

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22. Q -value of the decay ${}^{22}_{11}Na \to {}^{22}_{10}Ne + e^+ + \nu$ is

A. $\left[m\left({}^{22}_{11}Na\right) - m\left({}^{22}_{10}Ne\right)\right]c^2$

B. $\left[m\left({}^{22}_{11}Na\right) - m\left({}^{22}_{10}Ne\right) - m_e\right]c^2$

C. $\left[m\left({}^{22}_{11}Na\right) - m\left({}^{22}_{10}Ne\right) - 2m_e\right]c^2$

D. $\left[m\left({}^{22}_{11}Na\right) - m\left({}^{22}_{10}Ne\right) - 3m_e\right]c^2$

Answer: C

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23. Which of the alternatives gives correct match of column_i with column-II ?

	Column-I		Column-
(a)	Binding energy per nucleon for ^{56}Fe	(i)	$5.5MeV$
(b)	Energy of α – particle in geiger marsden experiment	(ii)	$200MeV$
(c)	Energy of photon of visible light	(iii)	$8.75MeV$
(d)	Energy released in fission of a uranium nucleus	(iv)	$2eV$

A. a(i),b(iii),c(iv),d(ii)

B. a(iii),b(i),c(ii),d(iv)

C. a(iii),b(i),c(iv),d(ii)

D. a(i),b(iv),c(ii),d(iii)

Answer: C

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24. Correct increasing order of penetrating powers of α, β particles and γ -rays, all moving with same kinetic energy is

A. α, β, γ

B. β, α, γ

C. γ, β, α

D. All have same penetrating power as all have same kinetic energy

Answer: A

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25. Calculated the energy required to excite one litre of hydrogen gas at $1atm$ and $298K$ to the first excited state of atomic hydorgen. The enegry for the dissociation of $H - H$ bond is $436kJmol^{-1}$.

A. 2.67 MeV

B. 2.67 KeV

C. 26.7 MeV

D. 26.7 KeV

Answer: C

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26. 37 Rutherford equals

A. 1 milli bacquerel

B. 1 milli curie

C. 1 micro bacquerel

D. 1 micro curie

Answer: A

Watch Video Solution

27. Which of these is incorrect about nuclear forces ?

A. they are independent of charge

B. Nuclear forces are derived from quark-quark interaction

C. Hadrons do not experience strong nuclear force

D. Nuclear force is not a central force

Answer: C

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Assignment Section C

1. Radioactive material A has decay constant 8λ and material B has decay constant λ.Initially,They have same number of nulei.After what time,the ratio of number of nuclei of material B to that A will be $\frac{1}{e}$?

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

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

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

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

Answer: B

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

A. 15

B. 30

C. 45

D. 60

Answer: D

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3. A nucleus of uranium decays at rest into nuclei of thorium and helium. Then,

A. The helium nucleus has less kinetic energy than the thorium nucleus

B. The helium nucleus has more kinetic energy than the thorium nucleus

C. The helium nucleus has less momentum than the thorium nucleus

D. The helium nucleus has more momentum than the thorium nucleus

Answer: B

Watch Video Solution

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

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

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

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

D. $\frac{3}{5} R_{AI}$

Answer: C

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5. The binding energy per nucleon of $^{7}_{3}Li$ and $^{4}_{2}He$ nuclei are 5.60 Me V and 7.06 MeV, respectively. In the nuclear reaction $^{7}_{3}Li + ^{1}_{1}H \rightarrow ^{4}_{2}He + ^{4}_{2}He + Q$, the value of energy Q released is

A. 19.6 MeV

B. -2.4 MeV

C. 8.4 MeV

D. 17.3 MeV

Answer: D

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6. A radio isotope X with a half life 1.4×10^9 yr 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. 1.96×10^9 years

B. 3.92×10^9 years

C. 4.20×10^9 years

D. 8.40×10^9 years

Answer: C

Watch Video Solution

7. A certain mass of hydrogen is changed to helium by the process of fusion. The mass defect in fusion reaction is $0.02866u$. The energy liberated per u is

$(\text{given} \quad 1u = 931MeV)$

(1.) 2.67 MeV

(2.)26.7 MeV

(3.)6.675 MeV

(4.)13.35 MeV

A. 26.7 MeV

B. 6.675 MeV

C. 13.35 MeV

D. 2.67 MeV

Answer: B

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

A. 60 years

B. 80 years

C. 100 years

D. 40 years

Answer: A

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9. If the nuclear radius of $.13Al^{27}$ is 3.6 Fermi, the approximate nuclear radius of $.29Cu^{64}$ in Fermi is :

A. 4.8

B. 3.6

C. 2.4

D. 1.2

Answer: A

Watch Video Solution

10. A mixture consists of two radioactiv materials A_1 and A_2 with half-lives of 20 s and 10 s, respectively. Initialy the mixture has 40 g of A_1 and 160 g of A_2. The amount of the two in the mixture will become equal after

A. 20 s

B. 40 s

C. 60 s

D. 80 s

Answer: B

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11. 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

12. The power obtained in a reactor using U^{235} disintergration is $1000kW$. The mass decay of U^{235} per hour is

A. 1 microgram

B. 10 microgram

C. 20 microgram

D. 40 microgram

Answer: D

Watch Video Solution

13. 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. 100 years

B. 150 years

C. 200 years

D. 250 years

Answer: C

Watch Video Solution

14. Fusion reaction takes place at high tamperature because

A. Molecules break up at high temperature

B. nuclei break up atg high temperature

C. Atoms get ionised at high temperature

D. Kinetic energy is high enough to overcome the coulomb repulsion between nuclei

Answer: D

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

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

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

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

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

Answer: D

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16. Two radioacitve nuclei P and Q, in a given sample decay into a stable nucleus R. At time t=0, number of P species are 4 N_0 and that of Q are N_0. Half-life of P (for conversion to R) is 1 min, where as 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, then the number of nuclei of R present in the sample would be

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

B. $2N_0$

C. $3N$

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

Answer: D

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17. The mass of ${}_3^7 Li$ is 0.042 amu less than the sum of masses of its constituents. The binding energy per nucleon is

A. 46 MeV

B. 5.6 MeV

C. 3.9 MeV

D. 23 MeV

Answer: B

Watch Video Solution

18. The activity of a radioavtive sample is measured as N_0 counts per minute at $t = 0$ and $\frac{N_0}{e}$ counts per minute at t=5 min. The time (in minutes) at which the activity reduces to half its value is

A. $\log_e 2/5$

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

C. $5\log_{10} 2$

D. $5\log_e 2$

Answer: D

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19. The decay constant of a radioactive isotope is λ. If A_1 and A_2 are its activites at time t_1 and t_2 respectively, then the number of nuclei which have decayed the time $(t_1 - t_2)$

A. $A_1 t_1 - A_2 t_2$

B. $A_1 - A_2$

C. $(A_1 - A_2)/\lambda$

D. $\lambda(A_1 - A_2)$

Answer: C

Watch Video Solution

20. The binding energy per nucleon of deuterium and helium nuclei are 1.1 MeV and 7.0 MeV respectively. When two deuterium nuclei fuse to form a helium nucleus the energy released in the fusion is

A. 23.6 MeV

B. 2.2 MeV

C. 28.0 MeV

D. 30.2 MeV

Answer: A

Watch Video Solution

21. In the nuclear decay given below

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

the particle emitted in the sequence are

A. γ, β, α

B. β, γ, α

C. α, β, γ

D. β, α, γ

Answer: D

Watch Video Solution

22. The number of beta particles emitted by a radioactive substance is twice the number of alpha particles emitted by it. The resulting daughter is an

A. Isomer of parent

B. Isotone of parent

C. Isotope of parent

D. isobar of parent

Answer: C

Watch Video Solution

23. In a Rutherford scattering experiment when a projectile of charge Z1 and mass M1 approaches a target nucleus of charge Z2 and mass M2, the distance of closest approach is r0. The energy of the projectile is :

A. Directly proportional to $z_1 z_2$

B. Inversely proportional to z_1

C. Directly proportional to mass M_1

D. $Directly \propto \text{ or } tional \rightarrow$ M_1xx M_2`

Answer: A

Watch Video Solution

24. Two radioactive materials X_1 and X_2 have decay constants 5λ 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 $\frac{1}{e}$ after a time

(1.) λ

(2.) 1/ 2 λ

(3.) 1/ 4 λ

(4.) e/ λ

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

B. λ

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

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

Answer: D

Watch Video Solution

25. Two nuclei have mass numbers in the ratio $1:3$. What is the ratio of their nuclear densities ?

A. $1:1$

B. $1:3$

C. $3:1$

D. $(3)^{1/3}:1$

Answer: A

Watch Video Solution

26. if m, m_n and m_p are the masses of ${}_zX^A$ nucleus neutron and prtons respectively then.

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

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

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

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

Answer: B

Watch Video Solution

27. If the nucleus of $._{13}Al^{27}$ has a nuclear radius of about 3.6 fm, then $._{52}Te^{125}$ would have its radius approximately as

A. 4.8 fm

B. 6.0 fm

C. 9.6 fm

D. 12.0 fm

Answer: B

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28. In radioactive decay process , the negatively charged emitted β-particles are

A. The electrons produced as a result of the decay of neutrons inside the nucleus

B. The electrons produced as a result of collisions between atoms

C. The electrons present inside the nucleus

D.

Answer: A

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29. A nucleus $._Z^A X$ has mass represented by $m(A, Z)$. If m_p and m_n denote the mass of proton and neutron respectively and BE the blinding energy (in MeV), then

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

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

C. $BE = [zM_p + (A, z)M_n - M(A, Z)]C^2$

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

Answer: C

Watch Video Solution

30. Two radioactive substance A and B have decay constants 5λ and λ, respectively. At t=0 they have the same number of nuclei. The ratio of number of nuclei of A to those of B will be $\left(\frac{1}{e}\right)^2$ efter a time interval.

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

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

C. 4λ

D. 2λ

Answer: A

Watch Video Solution

31. The binding energy of deuteron is 2.2 MeV and that of H_2^4He is 28MeV. If two deuterons are fused to form one $_2^4He$ then the energy released is:-

A. 25.8 MeV

B. 23.6 MeV

C. 19.2 MeV

D. 30.2 MeV

Answer: B

Watch Video Solution

32. In a radioactive material the acticity at time t_1 is R_1 and at a later time t_2, it is R_2. If the decay constant of the material is λ, then

A. $R_1 - R_2e^{(-\lambda(t_1-t_2))}$

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

C. $R_1 = R_2\left(\frac{t_2}{t_1}\right)$

D. $R_1 = R_2$

Answer: A

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33. The radius of germanium (Ge) nuclide is measured to be twice the radius of $._4^9 Be$. The number of nucleons in Ge are

A. 73

B. 74

C. 75

D. 72

Answer: D

Watch Video Solution

34. 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

35. The nuclei of which one of the following pairs of nuclei are isotones?

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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36. Fission of nuclei is possible because the binding energy per nucleon 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: B

Watch Video Solution

37. In any fission process the ratio $\frac{\text{mass of fission products}}{\text{mass of parent nucleus}}$ 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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38. The volume occupied by an atom is greater than the volume of the nucleus by a factor of about

A. 10^1

B. 10^5

C. 10^{10}

D. 10^{15}

Answer: D

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39. Alpha particles are

A. Neutrally charged

B. Positron

C. Protons

D. Ionized helium atoms

Answer: D

Watch Video Solution

40. The mass number of a nucleus is

A. Always less than its atomic number

B. Always more than its atomic number

C. Sometimes equal to its atomic number

D. Sometimes less than and sometimes more than its atomic number

Answer: C

Watch Video Solution

41. The radius of germanium (Ge) nuclide is measured to be twice the radius of ${}_{4}^{9}Be$. The number of nucleons in Ge are

A. 72

B. 73

C. 74

D. 75

Answer: A

Watch Video Solution

42. What is the respective number of α and β-particles emitted in the following radiactive decay

$.^{200}X_{90} \rightarrow .^{168}Y_{80}$?

A. 8 and 8

B. 8 and 6

C. 6 and 8

D. 6 and 6

Answer: B

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43. A nucleus ruptures into two nuclear parts, which have their velocity ratio equal to $2:1$. What will be the ratio of their nuclear size (nuclear radius)?

A. $3^{1/2}:1$

B. $1:3^{1/2}$

C. $2^{1/3}:1$

D. $1:2^{1/3}$

Answer: D

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44. The most pentrating radiation out of the following is

A. β-rays

B. γ-rays

C. X-rays

D. α-rays

Answer: B

Watch Video Solution

45. Complete the equation for the following fission process

$$_{\cdot 92}U^{235} + {}_{\cdot 0}n^{1} \rightarrow {}_{\cdot 38}Sr^{90} + \ldots\ldots$$

A. $_{57}X^{142} + 3_{0}n^{1}$

B. $_{54}X^{145} + 3_{0}n^{1}$

C. $_{54}X^{143} + 3_{0}n^{1}$

D. $_{54}X^{142} + {}_{0}n^{1}$

Answer: C

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46. In one α and 2β-emissions

A. Mass number reduces by 6

B. Mass number reduces by 4

C. Mass number reduces by 2

D. Atomic number reduces by 4

Answer: B

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47. A nuclear decay is expressed as '_.(6)C^(11) rarr ._(5)B^(11)+beta^(+)+X

$The the unknown partic \leq$ X` is

A. Neutron

B. Anti-neutrino

C. Neutrino

D. proton

Answer: C

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48. In compound $X(n, \alpha) \rightarrow {}_{.3}Li^{7}$, the element X is

A. ${}_{5}^{10}B$

B. ${}_{5}^{9}B$

C. ${}_{4}^{11}Be$

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

Answer: A

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49. M_n and M_p represet the mass of neutron and proton respectively. An element having mass M has N neutron and Z-protons, then the correct relation will be : -

A. $M < \{N.\ M_n + Z.\ M_p\}$

B. $M < \{N.\ M_n + Z.\ M_p\}$

C. $M = \{N.\ M_m + Z.\ M_p\}$

D. $M = N\{M_n + M_p\}$

Answer: A

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50. Which rays contain (+ Ve) charged particle : -

A. α-rays

B. β-rays

C. γ-rays

D. X-rays

Answer: A

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51. When a deuterium is bombarded on $._8O^{16}$ nucleus, an α-particle is emitted, then the product nucleus is

A. $_7N_{13}$

B. $_5B^{10}$

C. $_4Be^9$

D. $_7N^{14}$

Answer: D

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52. A nuclear reaction given by

$._ZX^A \rightarrow ._{Z+1}Y^A + ._{-1}e^0 + \bar{v}$ represents

A. β-decay

B. γ-decay

C. Fussion

D. Fission

Answer: A

Watch Video Solution

53. If in a nuclear fusion process, the masses of the fusing nuclei be m_1 and m_2 and the mass the resultant nucleus be m_3, then

A. $m_3 = m_1 + m_2$

B. $m_3 = |m_1 - m_2|$

C. $m_3 < (m_1 + m_2)$

D. $m_3 > (m_1 + m_2)$

Answer: C

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54. m_p denotes the mass of a proton and m_n that of a neutron. A given nucleus of binding energy BE, 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. $M(N, Z) = NM_n + ZM_p + B/c^2$

Answer: C

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55. The mass of proton is 1.0073 u and that of neutron is 1.0087 u (u = atomic mass unit). The binding energy of ${}_2^4He$ is (Given : helium nucleus mass $\approx$ 4.0015 u)

A. 0.o305 J

B. 0.0305 erg

C. 28.4 MeV

D. 0.061 n

Answer: C

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56. A nucleus represented by the symbol . Z^AX 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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57. How many elementary particles are emitted when ${}_{6}^{14}C$ transforms to ${}_{7}^{14}N$?

A. One

B. Two

C. Three

D. Four

Answer: B

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58. Q value of a nuclear reactions is positive . The reaction is

A. Exothermic

B. Endothermic

C. Elastic

D. Both exothermic and endothermic

Answer: A

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59. Choose the correct product of nuclear reaction ,

$_7N^{14} + _0n^1 \rightarrow _6C^{14} + ...$

A. proton and electron

B. Neutron

C. Deutron

D. Electron

Answer: A

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60. When two nuclei (with A=8) join to form a heavier nucleus , the binding energy (B.E) per nucleon of the heavier nuclei is

A. More than the B.E per nucleon of the lighter nuclei

B. less than the B.E per nucleon of the lighter nuclei

C. Double the B.E per nucleon of the lighter nuclei

D.

Answer: A

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61. When helium nuclei bombard beryllium nuclei ,then

A. Electrons are emitted

B. Protons are emitted

C. Neutrons are emitted

D. protons and neutrons are emitted

Answer: C

Watch Video Solution

62. 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 ?

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

A. $4(x_1 + x_2)$

B. $4(x_2 - x_1)$

C. $2(x_2 - x_1)$

D. $2(x_1 + x_2)$

Answer: B

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63. The count rate of a Geiger Muller counter for the radiation of a radioactive material of half-life 30 min decreases to $5s^{-1}$ after $2h$. The initial count rate was

A. 80second^{-1}

B. 625second^{-1}

C. 20second^{-1}

D. 25second^{-1}

Answer: A

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64. Half-lives of two radioactive substances A and B are respectively 20 min and 40 min. Initially, the samples of A and B have equal number of nuclei. After 80 min the raatio of remaining number of A and B nuclei is

A. $1:4$

B. $4:1$

C. $1:16$

D. $1:1$

Answer: A

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65. The correct relation between t_{av}=average life and $t_{1/2} =$ half life for a radioactive nuclei.

A. $T_{1/2} = \frac{\text{In}2}{\lambda}$

B. $T_{1/2}\text{In}2 = \lambda$

C. $T_{1/2} = \frac{1}{\lambda}$

D. $\left(\lambda + T_{1/2}\right) = \text{In}2$

Answer: A

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66. Nuclear - Fission is best explained by:

A. Liquid drop model

B. Yukawa π-meson theory

C. Independent particle model of the nucleus

D. proton -proton cycle

Answer: A

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67. Half life of radioactive element is 12.5 Hour and its quantity is 256 gm. After how much time its quantity will remain 1 gm : -

A. 50 hrs

B. 100 hrs

C. 150 hrs

D. 200 hrs

Answer: B

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68. Adssertion:Energy is released in nuclear fission.

Reason:Total binding energy of the fission fragment is larger than the total binding energy of the parent nucleus.

A. Some mass is converted into charge

B. Total binding energy of fragments is more than the binding energy of parental element

C. Total binding energy of fragments is less than the binding energy of parental element

D. Total binding energy of fragments is equal to the binding energy of parental element

Answer: B

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69. A sample of radioactive element containing 4×10^{16} active nuclei. Half life of element is 10 days, then number of decayed nuclei after 30 days : -

A. 0.5×10^{16}

B. 2×10^{16}

C. 3.5×10^{16}

D. 1×10^{16}

Answer: C

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

A. 1.35 g

B. 2.50 g

C. 3.70 g

D. 6.30 g

Answer: A

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71. The half-life of radium is about $1600yr$. Of $100g$ of radium existing now, $25g$ will remain unchanged after

A. 4800 years

B. 6400 years

C. 2400 years

D. 3200 years

Answer: D

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72. $._{90}Th^{232} \rightarrow ._{82}Pb^{208}$. The number of α and $\beta-$ particles emitted during the above reaction is

A. $4\alpha, 7\beta$

B. $6\alpha, 4\beta$

C. $8\alpha, 7\beta$

D. $4\alpha, 4\beta$

Answer: B

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73. A radioactive substance has 10^8 nuclei. Its half life is 30 s . The number of nuclei left after 15 s is nearly

A. 2×10^5

B. 3×10^6

C. 7×10^7

D. 5×10^8

Answer: B

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74. A certain stable nucleide, after absorbing a neutron, emits β-particle and the new nucleide splits spontaneously into two α- particles. The nucleide is

A. ${}_2^4He$

B. ${}_3^7Li$

C. ${}_4^6Be$

D. ${}_3^6Li$

Answer: B

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75. Pauli suggested the emission of nutrino during β^+ decay to explain

A. Continuous energy distribution positrons

B. Conservation of linear momentum

C. Conservation of mass -energy

D. All of these

Answer: A

Watch Video Solution

76. In a radioactive decay, a nucleus is transformed into another with the emission of a positron. In this process the neutron-proton ratio

A. Decreases

B. Increases

C. Remains same

D. May decreases or increases

Answer: B

Watch Video Solution

77. If a heavy nucleus has N/Z ratio higher than that required for stability then

A. it emits β^-

B. It emits β^+

C. It emits α particle

D. It will undergo K electron capture

Answer: A

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78. The half - life of I^{131} is 8 days. Given a sample of I^{131} at time $t = 0$, 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 t=0

Answer: D

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79. Which of the following is used as a moderator in nuclear reactors?

A. Cadmium

B. Plutonium

C. Uranium

D. Heavy water

Answer: D

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

A. Light nuclei

B. Heavy nuclei

C. Element must be lying in the middle of the periodic table

D. Middle elements, which are lying on binding energy curve

Answer: A

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81. Solar energy is due to

A. Burning of hydrogen in the oxygen

B. Fission of uranium present in the sun

C. Fusion of protons during synthesis of heavier elements

D. Gravitational contraction.

Answer: C

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Assignment Section D

1. A : Uncertainty principle demands that an electron confined to a nucleus must have very high energy so that the electron cannot reside in a nucleus.

R: The electrostatic attraction between electron and proton is large at such a small distance but is not enough to bind such a high -energy electron.

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2. A: A free proton is stable but inside a nucleus , a proton gets converted into a neutron, position and neutrino $\left(p \rightarrow n + e^{+} + v\right)$.

R: Inside a nucleus, neutron decay $\left(n \rightarrow p + e^{-} + \bar{v}\right)$ as well as proton decay are possible, since other nucleons can share energy nad momentum to conserve energy as well as momentum and both the decays are in dynamic equillibrium .

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3. A : Exothermic reactions are possible when two light nuclei fuse or when a heavy nucleus undergoes fission into intermediate mass nuclei.

R: The nature of nuclear binding energy curve is such that it rises lighter nuclei and slightly decreasing for heavier nuclei.

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4. A : For fusion, the light nuclei must have sufficient initial energy to cross the coulomb barrier.

Hence, fusion requires high temperature, however, the actual temperature required is somewhat less than expected clssically.

R: It is to mechanical tunneling of the potential barrier.

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5. Atomic number is the sum of number of protons and neutrons.

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6. A : Nuclear density is almost same for all nuclei .

R: The radius (r) of a nucleus depends only on the mass number (A) as $r \propto A^{1/3}$.

A. if both assertion & reason are true and the reason is correct explanation of the assertion then mark (1)

B. if both assertion & reason are true and the reason is not correct explanation of the assertion then mark (2)

C. if assertion is true statement but reason is false then mark (3)

D. if both assertion & reason are false then mark (4)

Answer: 1

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7. A : During radioactive disintegration an α-particle and a β-particle do not emit simultaneously from any nucleus.

R : An α-particle emits from a nucleus when the N/Z ratio is less than the stability range (where N=number of neutrons and Z=number of protons in a nucleus.)

A. if both assertion & reason are true and the reason is correct explanation of the assertion then mark (1)

B. if both assertion & reason are true and the reason is not correct explanation of the assertion then mark (2)

C. if assertion is true statement but reason is false then mark (3)

D. if both assertion & reason are false then mark (4)

Answer: 2

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8. A: In β-decay an electron is emitted by the nucleus

R: Electrons are not present inside the nucleus.

A. if both assertion & reason are true and the reason is correct explanation of the assertion then mark (1)

B. if both assertion & reason are true and the reason is not correct explanation of the assertion then mark (2)

C. if assertion is true statement but reason is false then mark (3)

D. if both assertion & reason are false then mark (4)

Answer: 2

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9. A: A radioactive substance has half life of 4 hour. Therefore, if two nuclei of the substance are present initially , after 1 hour only one will remain undissociated.

R: When a nucleus makes a transition from excited state to ground state, it emits a β-particle.

A. if both assertion & reason are true and the reason is correct explanation of the assertion then mark (1)

B. if both assertion & reason are true and the reason is not correct explanation of the assertion then mark (2)

C. if assertion is true statement but reason is false then mark (3)

D. if both assertion & reason are false then mark (4)

Answer: 4

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10. A : Fast moving neutrons do not cause fission of a uranium nucleus.

R: A fast moving neutron spends very little time inside the nucleus.

A. if both assertion & reason are true and the reason is correct explanation of the assertion then mark (1)

B. if both assertion & reason are true and the reason is not correct explanation of the assertion then mark (2)

C. if assertion is true statement but reason is false then mark (3)

D. if both assertion & reason are false then mark (4)

Answer: 1

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