PHYSICS

FOR IIT JEE ASPIRANTS OF CLASS 12 FOR PHYSICS

NUCLEI

Illustration

1. Compare the radii of the nuclei of mass numbers 27 and 64.

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2. The radius of the oxygen nucleus $._{8}^{16}O$ is $2.8 \times 10^{-15}m$. Find the radius of lead nucleus $._{82}^{205}Pb$.

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3. Find the binding energy of ${}_{26}^{56}Fe$. Atomic mass of Fe is 55.9349u and that of Hydrogen is 1.00783u and mass of neutron is 1.00876u.

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4. Find the energy required to split ${}_{8}^{16}O$ nucleus into for α - particles. The mass of α- particle is $4.002603u$ and that of oxygen is $15.994915u$.

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5. Calculate the binding energy per nucleon of ${}_{20}^{40}Ca$. Given that mass of ${}_{20}^{40}Ca$ nucleus = 39.962589 u, mass of a proton = 1.007825 u,, mass of Neutron = 1.008665 u and 1 u is equivalent to 931 MeV.

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6. The binding energies per nucleon for deuterium and helium are $1.1MeV$ and $7.0MeV$ respectively. What energy in joules will be liberated when 2 deuterons take part in the reaction.

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7. The kinetic energy of α- particles emiited in the decay of $._{88}Ra^{226}$ into $._{86}Rn^{222}$ is measured to be $4.78MeV$. What is the total disintegration energy or the $'Q'$-value of this process ?

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8. A nucleus X, initially at rest , undergoes alpha dacay according to the equation ,

$$_(92)^{A}X \rightarrow_{Z}^{228} Y + \alpha$$

(a) Find the value of A and Z in the above process.

(b) The alpha particle produced in the above process is found to move in a circular track of radius $0.11m$ in a uniform magnetic field of 3 Tesla find the energy (in MeV) released during the process and the binding energy of the parent nucleus X

Given that : $m(Y) = 228.03u, m\left({}_{}(0)^{1}n \right) = 1.0029u.$

$m\left({}_{}(2)^{4}He \right) = 4.003u, m\left({}_{}(1)^{1}H \right) = 1.008u$

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9. The nucleus $.^{23}Ne$ decays by β-emission into the nucleus $.^{23}Na.$ Write down the β-decay equation and determine the maximum kinetic energy of the electrons emitted. Given, $\left(m(.^{23}_{11}Ne\right) = 22.994466amu$ and $m(.^{23}_{11}Na = 22.989770amu.$ Ignore the mass of antineutrino $(\bar{v})$.

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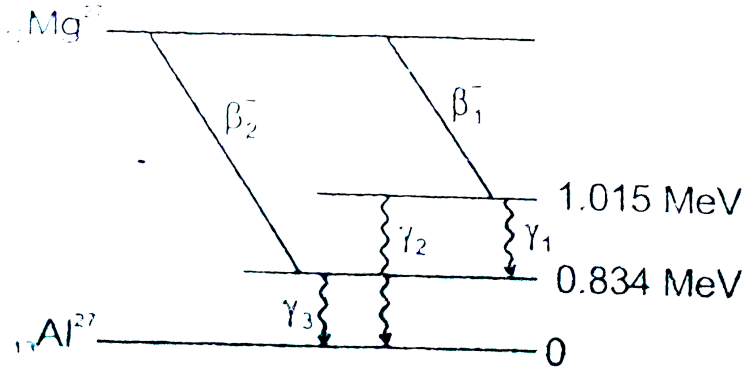
10. Calculate the kinetic energy of β-particles and the radiation frequencies corresponding to the γ-decays shown in figure.

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



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11. How many α and β-particles are emitted when uranium nucleus $\left({}_{92}U^{238}\right)$ decay to ${}_{82}Pb^{214}$?

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12. A radioactive sample has an activity of $5.13 \times 10^7 Ci$. Express its activity in 'becqueral' and 'rutherford'.

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13. A radioactive substance has 6.0×10^{18} active nuclei initially. What time is required for the active nuclei of the same substance to become 1.0×10^{18} if its half-life is $40s$.

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14. A radioactive nucleus can decay by two different processes. The half-life for the first process is t_1 and that for the second process is t_2. Show that the effective half-life t of the nucleus is given by $\frac{1}{t} = \frac{1}{t_1} + \frac{1}{t_2}$.

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15. Plutonium decays with half life of 24000 years. If plutonium is stored for 72000 years, the fraction of it that remains is

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16. A certain substance decays to $1/32$ of its initial activity in 25 days. Calculate its half-life.

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17. The half-life period of a radioactive substance is 20 days. What is the time taken for $7/8th$ of its original mass to disintergrate?

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18. How many disintegrations per second will Occur in one gram of ${}_{92}^{238}U$, if its half-life against α- decay is $1.42 \times 10^{-17}s$?

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19. One gram of radium is reduced by 2 milligram in 5 years by α-decay. Calculate the half-life of radium.

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20. The half life of a radioactive substance is 5×10^3yrs. In how many years will its activity decay to 0.2 times its initial activity? Take $\log_{10} 5 = 0.6990$.

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21. Obtain the amount of $.^{60}Co$ necessary to provide a radioactive source of $8.0Ci$ strength. The half-life of $.^{60}Co$ is 5.3 years?

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22. An explosion of atomic bomb releases an energy of $7.6 \times 10^{13} J$. If $200MeV$ energy is released on fission of one $.^{235}U$ atom calculate (i) the number of uranium atoms undergoing fission. (ii) the mass of uranium used in the atom bomb

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23. Calculate the energy released by fission from 2g of $._{92}^{235}U$ in kWh. Given that the energy released per fission is 200 MeV.

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24. 200 MeV energy is released when one nnucleus of $.^{235}U$ undergoes fission. Find the number of fissions per second required for fissions per second required for producing a power of 1 megawatt.

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25. How much $.^{235}U$ is consumed in a day in an atomic powder house operating at $400MW$, provided the whole of mass $.^{235}U$ is converted into energy?

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26. How long an electric lamp of 100 W can be kept glowing by fusion of 2.0 kg of deuterium ? The fusion reaction can be taken as $._1^2H + ._1^2H \rightarrow ._2^3He + n + 3.2MeV$

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27. Suppose India has a target of producing by $2020AD, 200, 000MW$ of electric power, ten percent of which was to be obtained from nuclear power plants. Suppose we are given that, on an avedrage, the efficiency of utilization(i.e conversion to electric energy) of thermal energy produced in a reactor was 25%. How much amount of fissionable uranium would our country need per year by 2020? Take the heat energy per fission of $.^{235}U$ to be about $200MeV$.

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28. Calculate the energy released by the fission $1g$ of $.^{235}U$ in joule, given that the energy released per fission is $200MeV$.

(Avogadro's number $= 6.023 \times 10^{23}$)

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29. In the process of nuclear fission of $1g$ uranium, the mass lost is $0.92mg$. The efficiency of power house run by the fission reactor is $10\,\%$ .To obtain 400 megawatt power from the power house, how much uranium will be required per hour? $\left(c = 3 \times 10^8 ms^{-1}\right)$.

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30. An electron-positron pair is produced when a γ-ray photon of energy $2.36MeV$ passes close to a heavy nucleus. Find the kinetic energy carried by each particle produced, as well as the total energy with each.

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31. A gamma ray photon of energy $1896MeV$ annihilates to produce a photon-antiproton pair. If the rest mass of each of the particles involved be $1.007276a.\,m.\,u$ aapproximately, find how much $K.\,E$ these will carry?

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Evaluate Yourself 1

1. If the mass of proton= 1.008 a.m.u. and mass of neutron=1.009a.m.u. then binding energy per nucleon for ${}_{4}Be^{9}$ (mass=9.012 amu) would be-

A. $0.06772MeV$

B. $0.672MeV$

C. $6.724MeV$

D. $67.2MeV$

Answer: C

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2. Given, mass of a neutron $= 1.00866u$, mass of a proton $= 1.00727u$, mass of $\begin{matrix}16\\8\end{matrix}O = 15.99053u$. Then, the energy required to separate $\begin{matrix}16\\8\end{matrix}O$ into its constituents is

A. 12.7

B. cannot be estimated from given data

C. $1.49 \times 10^{-10}J$

D. $127.5MeV$

Answer: D

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3. Equivalent energy of mass equal to 1 amu is...A... and rest energy of an electron is ...B... Here A and B refer to

A. $913keV, 10MeV$

B. $931eV, 931MeV$

C. $931.5MeV, 510keV$

D. $931MeV, 931KeV$

Answer: C

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4. Given $\begin{pmatrix} 56 \\ 26 \end{pmatrix} Fe = 55.934939u$ and $m \begin{pmatrix} 209 \\ 83 \end{pmatrix} Bi = 208.980388u8$

$m_{\text{proton}} = 1.007825u$, $m_{\text{nutron}} = 1.008665u$

Then, BE per nucleon of Fe and Bi are respectively

A. $9.\ 790MeV$, $7.848MeV$

B. $7.75MeV$, $6.84MeV$

C. $7.5MeV$, $6.5MeV$

D. data insufficient

Answer: A

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5. If R is the radius and A is the mass number, then log R versus log A graph will be

A. a straight linje

B. a parabola

C. an ellipse

D. none of these

Answer: A

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6. The binding energy per nucleon for C^{12} is 7.68 MeV and that for C^{13} is 7.5 MeV. The energy required to remove a neutron from C^{13} is

A. $0.21MeV$

B. $2.52MeV$

C. $4.95MeV$

D. $2.74MeV$

Answer: C

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7. If the binding energy per nucleon of deuterium is 1.115 MeV, its mass defect in atomic mass unit is

A. 0.0048

B. 0.0024

C. 0.0012

D. 0.0006

Answer: B

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8. The binding energies of a deutron and an α-particle are $1.125, 7.2MeV/\text{nucleon}$ respectively. The more stable of the two, is

A. deutron

B. alpha particle

C. both 1 and 2

D. sometimes deuteron and sometimes alpha particle

Answer: B

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9. How much energy is released when 1 amu of mass is annihilated ?

A. $931.5eV$

B. $1.49 \times 10^{-3}J$

C. $14.138 \times 10^{-17}kWh$

D. all of these

Answer: C

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Evaluate Yourself 2

1. The half life of $._{92}U^{238}$ against α -decay is 4.5×10^9 years. What is the activity of 1g sample of $._{92}U^{238}$?

A. $2.23 \times 10^4 Bq$

B. $2.23 \times 10^2 Bq$

C. $1.23 \times 10^4 Bq$

D. $1.23 \times 10^4 Bq$

Answer: D

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2. The activity of a radioactive sample falls from `600 s^(-1) to 500 s^(-1) in 40 minutes. Calculate its half-life.

A. 225 min

B. 145 min

C. 135 min

D. 152 min

Answer: D

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

A. ${}_{A}X_{z+r \to {}^{A}Z_{z-1}+a+b}$

B. ${}^{A}Z_{z} + {}_{1}n_{0} \to {}^{A-3}X_{z-2} + c$

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

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

Answer: C

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4. A radioactive isotope has a half-life of T years. After how much time is its activity reduced to 6.25% of its original activity ? Given $T_{1/2} = T$

A. 6T

B. 8T

C. 4T

D. 5 T

Answer: B

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

A. $37\ \%$

B. $50\ \%$

C. $63\ \%$

D. $69.3\ \%$

Answer: C

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6. A radioactive nuclide can decay simultaneously by two different processes which have decay constants λ_1 and λ_2. The effective

decay constant of the nuclides is λ.

A. $\lambda = \lambda_1 + \lambda_2$

B. $\lambda = \frac{1}{2}(\lambda_1 + \lambda_2)$

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

D. $\lambda = \sqrt{\lambda_1 \lambda_2}$

Answer: A

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

A. $N_0 / 8$

B. $N_0 / 16$

C. $N_0 / 2$

D. $N_0 / 4$

Answer: A

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8. If half life of a radioactive substnace is 1 month, then which of these are true ?

A. 7/8 part of substance disintegrate in 3 months

B. 1/8 part of substance disintegrate in 4 months

C. Substance disintegrates completely in 4 months

D. the substence disintegrates completely in 2 months

Answer: A

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9. A radioactive isotope has a half life of T years. It radius to $3.125\ \%$ of its original value in

A. 2T

B. 3T

C. 5T

D. 15T

Answer: C

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Evaluate Yourself 3

1. A 1000 MW fission reactor consumes half of its fuel in 5.00y. How much $._{92}U^{235}$ did it contain initially? Assume that the reactor

operates 80% of the time and that all the energy generated arises form the fission of ${}_{92}U^{235}$ and that this nuclide is consumed by the fission process.

A. 3480 kg

B. 3280 kg

C. 3380 kg

D. 3840 kg

Answer: D

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2. 10^{14} Fission per second are taking place in a nuclear reactor having efficiency 25%. The energy released per fission in $200MeV$. The power output of the nuclear reactor

A. 20KW

B. 40KW

C. 60KW

D. 80KW

Answer: D

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3. The fission properties of ${}_{94}^{239}Pu$ are very similar to those of ${}_{92}^{235}$ U. The average energy released per fission is 180 MeV. If all the atoms in 1 kg of pure ${}_{94}^{239}Pu$ undergo fission, then the total energy released in MeV is

A. $4.53 \times 10^{26} MeV$

B. $2.21 \times 10^{14} MeV$

C. $10 \times 10^{13} MeV$

D. $6.33 \times 10^{24} MeV$

Answer: A

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4. If one microgram of ${}_{92}^{235}U$ is completely destroyed in an atom bomb, how much energy will be released ?

A. $9x10^7J$

B. $9x10^8J$

C. $9x10^9$

D. $9x10^{10}J$

Answer: A

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

A. $30x10^{25}$

B. $4x10^{22}$

C. $10x10^{20}$

D. $5x10^{15}$

Answer: B

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

A. $9x10^{-14}$

B. $9x10^{7}$

C. $9x10^{8}$

D. $9x10^{12}$

Answer: B

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

A. released energy is of order 200 MeV

B. fission nucleus $^{235}_{92}U$ is formed

C. more neutrons are released than consumed

D. excessive amount of heat is released

Answer: C

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CUQ

1. The particle A is converted to C via following reactions then

$A \rightarrow B + {}_2He^4, B \rightarrow C + 2\,{}_{-1}e^0$

A. A and C are isobars

B. A and C are isotopes

C. A and B are isobars

D. A and B are isotopes

Answer: B

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2. The particles which can be added to the nucleus of an atom without changing its chemical properties are

A. electrons

B. protons

C. neutrons

D. position

Answer: C

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3. The radius of the nuclues is proprtional to, (if A is the atomic mass number)

A. A

B. A^3

C. $A^{1/3}$

D. $A^{2/3}$

Answer: C

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4. The radius of a nucleus mainly depends on

A. Proton number

B. Electron Number

C. Mass number

D. Neutron number

Answer: C

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5. The nuclei ${}_6C^{13}\&{}_7N^{14}$ can be described as

A. isotones

B. isobars

C. isomers

D. isotopes

Answer: A

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6. The graph of $1n\left(\frac{R}{R_0}\right)$ versus $1nA(R = radius$ of a nucleus and $A =$ its mass number) is

A. Straight line

B. Parabola

C. Ellipse

D. Circle

Answer: A

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7. The nucleus of $._{56}Ba^{141}$ contains

A. 85 protons, 56 neutrons

B. 55 protons, 86 neutrons

C. 56 protons, 85 neutrons

D. 86 protons, 55 neutrons.

Answer: C

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8. The nuclear size is measured in units of

A. Angstrom

B. Fermi

C. Bar

D. Light-year

Answer: B

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9. Nuclides which have the same mass number are called

A. Istopes

B. isobars

C. Istones

D. Isomers

Answer: B

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10. Observe the following statements regarding isotones i) $.^{59}K_{19}$ and $.^{40}Ca_{20}$ are isotones

ii) Nuclides having different atomic numbers (z) and mass number (A) but same number of neutrons (n) are called Isotones iii) $.^{19}F_9$ and $.^{23}Na_{11}$ are isotones The correct answer is

A. I,ii and iii are correct

B. only I and ii are correct

C. only I and iii are correct

D. only ii and iii are correct

Answer: B

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11. A and B are isotopes. B and C are isobars. All three are radioactive. Which one of the following is true.

A. A,B and C must belong to the same element

B. A,B and C may belong to the same element

C. It is possible that A will change to B through a radioactive-decay process

D. It is possible that B will change to C through a radioactive-decay process

Answer: D

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12. $M, M_n \& M_p$ denotes the masses of a nucleous of ${}_Z X^A$ a neutron, and a proton respectively. If the nucleus is separated in to its individual protons and neutrons then

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

B. $M = ZM_n + (A - Z)M_p$

C. $M > (A - Z)M_n + ZM_p$

D. $M < (A - Z)M_n + ZM_p$

Answer: D

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13. The difference between the mass of a nucleus and the combined mass of its nucleons is

A. zero

B. positive

C. negative

D. zero, positive or negative

Answer: C

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14. The mass number of a nucleus is

A. Always less than atomic number

B. Always more than atomic number

C. Equal jto atomic number

D. Sometimes more or equal to atomic number.

Answer: D

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15. If M is atomic weight, A is mass number then $(M-A)/A$ represents

A. Mass defect

B. Packing fraction

C. Binding Engergy

D. Chain Reaction

Answer: B

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16. The difference between mass of the nucleus and total mass of its constituents is called

A. Packing fraction

B. Mass defect

C. Binding energy

D. Binding energy per neucleon

Answer: B

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17. The parameter used to measure the stability of the nucleus is

A. Average binding energy

B. No of protons

C. No of neutrons

D. No of electrons

Answer: A

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18. When the number of nucleons in a nuclues increases the binding energy per nucleon

A. Incrase continously with mass number

B. Decreases continuously with mass number

C. Rrmains constnat with mass number

D. First increases and then decreases with increase in mass number

Answer: D

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19. Maximum value of binding energy per nucleon for most stable nuclei is

A. 8MeV 2

B. $8.8meV3$

C. $7.6MeV4$

D. $1.1MeV$

Answer: B

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20. The binding energy per nucleon is maximum at $A = 56$ and its value is around $\_\ MeV$/Nculeon

A. 8.4

B. 8.7

C. 9

D. 7.8

Answer: B

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21. Average binding energy per nucleon over a wide range is

A. 8 MeV

B. $8.8MeV$

C. $7.6MeV$

D. $1.1MeV$

Answer: A

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22. The wrong statement about the binding energy is

A. It is the sum of the rest mass energies of nucleons minus the rest mass energy of the nucleus

B. It is thet energy released when the nucleons combine to form a nucleus.

C. It is the energy required to break a given nucleus into its constituent nucleons.

D. It is the sum of the kinetic energies of all the nucleons in the nucleus.

Answer: D

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23. The binding energies of a deutron and an α-particle are $1.125, 7.2MeV/\text{nucleon}$ respectively. The more stable of the two, is

A. deutron

B. $\alpha -$ particle

C. both

D. sometimes deutron and sometimes $\alpha -$ particle

Answer: B

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24. Mass defect of an atom refers to

A. inaccurate measurement of mass of neutrons

B. mass annihilated to produce energy to bind the nucleons

C. packing fraction

D. differnece in the number of neturons and protons in the nucleus

Answer: B

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25. The stability of a nucleus can be measured by

A. Average binding energy

B. Packing fraction

C. Ratio of number of neutrons and protons

D. All the above.

Answer: D

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26. In a nuclear reaction some mass converts into energy. In this reaction total $B.E$ of reactants when compared with that of product is

A. always greateer

B. always les

C. either greater or less

D. always equal

Answer: D

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27. The age of pottery is determind by archeologists using a radiosotope of

A. carbon

B. cobalt

C. iodine

D. phosphorus .

Answer: A

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28. During an artificial transmutation the nucleus emits

A. β-particles

B. α- particles

C. always neutrons

D. may emit protons of neutrons

Answer: D

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

A. neutron

B. deutron

C. alpha particle

D. proton

Answer: D

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30. Identify the correct statement / statements

a) Radiation causes genetic mutation

b)Restriction is blood circulation can be detected using radio-iodine

c)Hydrocarbon plastics are used as moderators in a nuclear reactor

d)The damage caused due to α-radiation is small due to its small penetrating power

A. a,b,c

B. a,c,d

C. b,c,d

D. a,b,d

Answer: B

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31. Identify the correct ascending order of α, β and γ with reference to their ioninzing power

(I) α-ray (II) γ-ray (III) β-ray

A. II, III, I

B. I, III,II

C. II,I,III

D. I,II,III

Answer: A

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32. Two identical nuclei A and B of the same radioactive element undergo β^- decay. A emits a β^- particle and changes to A'. B emits a β^- particle and then a γ-photon immediately afterwards, and changes to B.

A. A' and B' have the same atomic number and mass number

B. A' and B' have the same atomic number and different mass numbers

C. A' and B' have different atomic numbers but the same mass number

D. A' and B' are isotopes

Answer: A

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33. Arrange in increasing order of:

a. The mass of α, β, and γ

b. The penetration power of α, β, and γ

c. The speed of α, β, and γ

d. The ionization capacity of gases of α, β, and γ

A. II,III,I

B. II,I,III

C. I,II,III

D. III,I,III

Answer: B

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34. If a beam consisiting of α, β and γ radiation is passed through an electric field perpendicular to the beam, the deflections suffered by the components, in decreasing ordre are,

A. α, β, γ

B. α, γ, β

C. β, α, γ

D. β, γ, α

Answer: C

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35. Decrease in atomic number is observed during

A) α-emission B) β-emission

C) Positron emission D) electron capture

A. B is correct

B. A and B are correct

C. A, C and D are correct

D. Only C

Answer: C

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36. When ${}_{15}P^{30}$ decays to become ${}_{14}Si^{30}$ the particle released is,

A. electron

B. α-particle

C. neutron

D. positron

Answer: D

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37. During β^--decay, a neutron inside nucleus converts into proton, electron and x. Then the paritcle x is

A. π^+-meson

B. neutrons

C. anti-neutrino

D. π^{-}-meson

Answer: C

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38. If a nucleus emits a gamma-ray, its atomic and mass number _____but there will be _____in the energy of the nucleus. Select suitable pair

A. Remain same, increase

B. Remain same, decrease

C. Decrease, increase

D. increase, decrease

Answer: B

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39. In the following nuclear reaction

$_{\cdot 13}Al^{27} + _{\cdot 2}He^{4} \rightarrow _{\cdot 15}P^{30} + X$, X will be

A. Proton

B. Electron

C. Neturon

D. α-particle

Answer: C

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40. In nuclear reaction $_{\cdot 4}Be^{9} + _{\cdot 2}He^{4} \rightarrow _{\cdot 6}C^{12} + X$, X will be

A. Proton

B. Neutron

C. β- particle

D. $\alpha -$ particle

Answer: B

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41. In nuclear reaction ${}_2He^4 + {}_zX^A \rightarrow {}_{z+2}Y^{A+3} + R$ R denotes

A. electron

B. positron

C. proton

D. Neutron

Answer: D

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42. A positron is emitted by radioactive nucleus of proton no 90. The product nucleus will have proton number

A. 91

B. 90

C. 89

D. 88

Answer: C

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43. ${}_{13}Al^{27} + \alpha -$ particle $\rightarrow$ neutron $+ 'X'$ then $'X'$ is

A. ${}_{15}P^{31}$

B. $_{14}Si^{30}$

C. $_{15}P^{30}$

D. $_{15}Si^{30}$

Answer: C

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44. The penentrating powder of beta particle compared to alpha particle is

A. Less

B. More

C. Equal

D. Can be more or less

Answer: B

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45. In a nuclear reactor, heavy water is used as a

A. Controlling material

B. Moderator

C. Fuel

D. Meat exchanger

Answer: B

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46. The units of radioactivity is

A. Fermi

B. Farad

C. Curie

D. Hertz

Answer: C

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47. The half-life of a radioactive isotope is 3 hours. The value of its disintegration constant is

A. $0.3hour^{-1}$

B. 0.693hour^{-1}

C. 0.231hour^{-1}

D. 0.231min^{-1}

Answer: C

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48. $._{92}U^{238} \rightarrow ._{82}Pb^{206} + 8._{2}^{4}He$. The number of β particles releaased in this reaction is

A. 6

B. 3

C. 1

D. 10

Answer: A

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49. The activity in any nucleus is measured in

A. Curie

B. Rutherford

C. Both 1 & 2

D. Newton

Answer: C

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50. Alpha particles are

A. high energy electrons

B. positively charged hydrogen ions

C. high energy α-radiation

D. doubly positively charged helium nuclei

Answer: D

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51. α-particles carries

A. Mass 1

B. Mass 2

C. Mass 3

D. Mass 4

Answer: D

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52. At a specific instant emission of radioactive compound is deflected in a magnetic field. The compound cannot emit

A. I,ii,iii

B. I,ii,iii,iv

C. iv

D. ii,iii

Answer: A

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53. The atomic number (A) and mass number (M) of the nuclide formed where three alpha (α) and two (β) particles are emitted from $._{92}^{238}U$

A. $A = 87, M = 233$

B. $A = 86, M = 226$

C. $A = 88, M = 227$

D. $A = 88, M = 226$

Answer: D

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54. Element ${}_{z}M^{A}$ emits one α (alpha) particle followed by two β(beta) particles. Among the following the daughter element is

A. ${}_{z-2}M^{A-4}$

B. ${}_{z-2}M^{A}$

C. ${}_{z}M^{A-4}$

D. ${}_{z+2}M^{A-4}$

Answer: C

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55. The particles which can be added to the nucleus of an atom without changing its chemical properties are

A. Neutrons

B. Electrons

C. Protons

D. Alpha Particles

Answer: A

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56. An Electric field can deflect

A. $\alpha -$ particles

B. X-rays

C. Neutrons

D. γ-rays

Answer: A

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

A. ${}_6C^{12}$

B. ${}_2Li^6$

C. ${}_3Li^8$

D. ${}_4Be^9$

Answer: D

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58. The one has maximum activity

A. Uranium

B. Plutonium

C. Radium

D. Thorium

Answer: C

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59. Which is not emitted by radioactive substance ?

A. Electrons

B. β-rays

C. Positron

D. Protons

Answer: D

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60. ${}_{90}{}^{228}Th \rightarrow {}_{83}{}^{212}Bi + \alpha + \beta$. The no. of α and β given out during the process are a)4α, 7β b)4α, 1β c)4α d)7β

A. $4\alpha, 7\beta$

B. $4\alpha, 1\beta$

C. 4α

D. 7β

Answer: B

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61. The reciprocal of radioactive decay constant is called

A. Half life period

B. Whole life period

C. Average life period

D. Avagadro number

Answer: C

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62. The missing particle in the reaction ${}_{1}^{1}p \rightarrow \quad + {}_{-1}^{0}e$

A. deuteron

B. proton

C. neutron

D. β-particel

Answer: C

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63. In the Radioactive transformation

$R \xrightarrow{\alpha} X \xrightarrow{\beta} Y \xrightarrow{\beta} Z$, the nucllii R and Z are

A. Isotopes

B. Isobars

C. Isomers

D. Isotones

Answer: A

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64. In the reaction $._{15}P^{30} \rightarrow ._{14}Si^{30}$, The change requires the emission of

A. α-particle

B. β- particle

C. neutron

D. position

Answer: D

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65. When a radioactive substances is subjected to a vacuum, the rate of disintergration per second

A. increases considerably

B. is not affected

C. increases only if the products are gases

D. suffers a slight decrease

Answer: B

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66. A radioactive nuclide can decay simultaneously by two different processes which have decay constants λ_1 and λ_2. The effective decay constant of the nuclides is λ.

A. $\lambda = \lambda_1 + \lambda_2$

B. $\lambda = \frac{1}{2}(\lambda_1 + \lambda_2)$

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

D. $\lambda = \sqrt{\lambda_1 \lambda_2}$

Answer: A

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67. A sample of radioactive material is used to provide desired doses of radiation for medical purposes. The total time for which the sample can be used will depend

A. only on the number of times radiation is drawn from it

B. only on the intensity of doses drawn from it

C. on boht (a) and (b)

D. neither on (a) nor on (b)

Answer: D

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68. A fraction f_1 of a radioactive sample decays in one mean lie and a fraction f_2 decays in one half-life

A. $f_1 > f_2$

B. $f_1 < f_2$

C. $f_1 = f_2$

D. May be (a), (b) or (c) depending on the values of the mean life and half-life.

Answer: A

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69. The short range attractive nuclear forces that are responsible for the binding of nucleons in a nucleus ae supposed to be caused by the role played by the particles called

A. Position

B. m-Meson

C. K-Meson

D. π-Meson

Answer: D

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70. The strong interaction exists in

A. Gravitational forces

B. Electrostatic force of attraction

C. Nuclear forces

D. Magnetic force on a moving change

Answer: C

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71. Nuclear forces are

A. Non-central forces

B. saturated

C. Spin dependent

D. All the above

Answer: D

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72. Identify the correct statement / statements

a) At greater distances nuclear forces are negligible

b) Nuclear forces are non central forces

c) Nuclear forces are weakest in nature

d)Nuclear forces are charge dependent forces

A. a,b

B. b,c

C. c,d

D. a,d

Answer: A

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73. Which of the following is not correct about nuclear forces?

A. They are short range attractive forces

B. They are independent of charge

C. They change to repulsion at very close distance

D. They obey inverse square law

Answer: D

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74. Among the following, short ranges, charge independent and spin dependent forces are

A. Grativational forces

B. Nuclear forces

C. Eleactromagnetic forces

D. Weak forces

Answer: B

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75. Let F_pp, F_pn and $F_\cap$ denote the magnitudes of the nuclear force by a proton on a proton, by a proton on a neutron and by a neutron on a neutron respectively. When the separation is $1fm$,

A. $F_{pp} > F_{pn} = F_\cap$

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

C. $F_{pp} > F_{pn} > F_\cap$

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

Answer: B

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76. Two protons are kept at a separation of $10nm$. Let F_n and F_e be the nuclear force and the electromagnetic force between them.

A. $F_e = F_n)$

B. $F_e > > F_n$

C. $F_e < < F_n$

D. $F_n = 3F_e$

Answer: C

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77. Two nucleons are at a separation of $1 \times 10^{-15} m$. The net force between them is F_1, if both are neutrons, F_2 if both are protons and F_3 if one is a proton and other is a neutron. In such a case.

A. $F_2 > F_1 > F_3$

B. $F_1 = F_2 > F_3$

C. $F_1 = F_2 = F_3$

D. $F_1 = F_3 > F_2$

Answer: D

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78. Two protons attract each other when

A. the distnce between them is $10^{-10}m$

B. the distnce between them is 10^{-1}m

C. the distance between them is 10^{-15} m

D. the distance between them is 10^{-6} m

Answer: C

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79. Among gravitational, electrostatic and nuclear forces, the two attractive forces between two neutrons are

A. Electrostatic and nuclear

B. Electrostatic and gravitationla

C. Gravitational and nuclear

D. Electrostatic

Answer: C

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80. Among the following interactions one is of least significant in nuclear physics is

A. nuclear interaction

B. gravitational interaction

C. electronstatic interaction

D. electromagnetic interaction

Answer: B

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81. The origin of nuclear force between nucleons is due to the exchange of

A. Mesons

B. Photons

C. Positions

D. Eleactrons

Answer: A

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82. Which of the following is most unstable ?

A. Neutron

B. Proton

C. Electron

D. α-particle

Answer: A

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83. A free neutron decays spontaneously into

A. a proton, an electron and a neutrion

B. a proton, an electron and a neutrino

C. a proton and electron

D. aproton, an electron, a neutrion and an anti-neutrino

Answer: A

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84. Neutron was discovered by the experiment of

A. Artificial transmutation of $\left({}_4Be^9\right) by \alpha$- particles

B. Artificial transmutation of $\left({}_7N^{11}\right) by \alpha$- particles

C. Rutherfored scattering of alpha particles by heavy nuclei

D. Bequerel with radio activity

Answer: A

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85. The average life of an isolated neutrons is

A. 1500 s

B. 1000 s

C. 1200 s

D. 3 minutes

Answer: B

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86. The energy of thermal neutrons is

A. < 1 ev

B. > 1 ev

C. $= 2Mev$

D. $= 4$ Mev `

Answer: A

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87. A nucleus with an excess of neutrons may decay with the emission of

A. a neutron

B. a proton

C. an electron

D. a positron

Answer: C

Watch Video Solution

88. The most penetrating atom smashing particles is

A. neutron

B. proton

C. alpha particle

D. deuteron

Answer: A

Watch Video Solution

89. Which of the follwing is formed by decay of a free neutron?

A. A number of electrons

B. Two Protons

C. A protons and an electron

D. An α-particle

Answer: C

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90. In neutron discovery experiment Beryllium target is bombarded by

A. Protons

B. Alpha particles

C. Neutrons

D. Deutrons

Answer: B

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91. Slow neutron are sometimes refer to as thermal neutrons because

A. they are sort of heat radiations

B. they are in thermal equilibrium

C. they are capable of generating heat

D. their energies are of same order as that of molecular eneergies at ambient temperatures.

Answer: D

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92. Thermal neutrons are

A. Prompt neutrons

B. Slow neutrons

C. Neutrons which are in the nucleus

D. Neutrons from the sun

Answer: B

Watch Video Solution

93. In neutron discovery experiment, Be is bombarded with

A. Proton

B. Deutrons

C. $\alpha -$ particle

D. β-particel

Answer: C

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94. The process of producing a new stable nucleus from the other stable nucleus is called

A. Nuclear reaction

B. Artificial transmutation

C. Nuclear fusion

D. Nuclear fission

Answer: B

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95. At least how many thermal neutrons should be available to strat a fission reaction

A. 2

B. 3

C. 1

D. 4

Answer: C

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96. Which of the following changes in the artificial transmutation of elements?

A. number of neutrons

B. number of electrons

C. atomic weight

D. nucleus

Answer: D

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97. During the fission process of Uranium, the amount of energy liberated per fission is nearly

A. 1000 MeV

B. 200 MeV

C. 150 MeV

D. 300 MeV

Answer: B

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98. The number of neutrons that are released on an average during the fission of U^{235} nucleus is

A. 3

B. 1

C. 2.5

D. 5

Answer: C

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99. Nuclear fission can be explained by

A. Optical model of the nucleus

B. Shell model of nucleus

C. Collective model of the nucleus

D. Liquid drop model of the nucleus

Answer: D

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100. Percentage of mass lost during the fission of $._{92}U^{235}$ approximately is

A. 0.01%

B. 0.1%

C. 0.7%

D. 0.9%

Answer: B

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101. Most of energy released in the fission is carried by

A. neutrons

B. fission fragments

C. neutrons and fragments carry equally

D. positrons

Answer: B

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102. Regarding Prompt neutrons

A. They are highly energetic

B. They constitute $99\ \%$

C. Cannot initiate chain reaction

D. $1, 2, 3$ are correct

Answer: D

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103. Nuclear reactios obey the law of conservation of

A. Mass and energy

B. Charge

C. Momentum

D. All the above

Answer: D

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104. The critical mass of a fissionable material is

A. $0.1kg$ equivalent

B. The minimum mass needed for chain reaction

C. The rest mass equvalent to 1020 joule

D. 0.5 kg

Answer: B

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105. For fast chain reaction, the size of U^{235} block, as compared to its critical size, must be

A. greater

B. smaller

C. same

D. anything.

Answer: A

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106. The critical mass of a fissionable uranium -235 can be reduced by

A. adding impurities

B. heating material

C. surrounding it by a neutron-reflecting material

D. surrounding it by a neutron-absorbing material

Answer: C

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107. Nuclear energy is released in fission since binding energy per nucleon is

A. smaller for fission fiagments than for parent nucleus

B. the same of fission fragments and parent nucleus

C. larger for fission fragments than for parent nucleus

D. sometimes larger and sometimes smaller

Answer: C

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108. In a critical chain reaction

A. energy is released at increasing rate

B. energy is released at steady rate

C. energy is released at decreasing rate

D. energy is not released.

Answer: B

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109. Among the following one is wrong

A. The energy of thermal neutrons is about 25 meV

B. In a nuclear reactor, when neutron multiplication factor, $K = 1$ then the reaction is said to be critical

C. ${}_{92}U^{235}$ undergoes fission by bombardment of high energy neutron

D. On average 2.5 neutrons are emitted per fission of ${}_{92}U^{235}$

Answer: C

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110. When $1gm$ of U^{235} is completely annihilated energy liberated is E_1 and when $1gm$ of U^{235} completely undergoes fission the energy liberated is E_2, then

A. $E_1 > E_2$

B. $E_1 = E_2$

C. $E_1 < E_2$

D. $E_1 \leq E_2$

Answer: A

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111. In the process of fission, the binding energy per nucleon

A. Increases

B. Decreases

C. Remains unchanged

D. Increases for mass number $A < 56$ nuclei but decreases for mass number $A > 56$

Answer: A

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112. Assertion (A) : Fragments produced in the fission of U^{235} are radioactive.

Reason (R) : The fragments have abnormally high proton to neutron ratio

A. Both A and R are true and R is not correct explanation of A

B. Both A and R are true and R is not correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: C

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113. The product of the fission of U^{235} by thermal neutron are

A. Ba^{141} and Kr^{92} and 3 neutron always

B. Xe^{140}, Sr^{94} and 2_0n^1 always

C. can be different in each fission

D. should have same mass number

Answer: C

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114. Consider the following statements A and B. Identify for correct in the given answer.

A) $p-n, p-p, n-n$ forces between nucleons are not equal and charge dependent.

B) In nuclear reactor the fission reaction will be in accelerating state if the value of neutron reproduction factor $K>1$

A. Both A and B are correct

B. Both A and B are wrong

C. A is wrong B is correct

D. A is correct B is wrong

Answer: C

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115. The process of fission is responsible for the release of energy in

A. The hydrogen bomb

B. The atom bomb

C. The sun

D. The star

Answer: B

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116. The working principle in atom bomb is

A. under-critical chain rcaction

B. Crtical chain reaction

C. super-critical chain reaction

D. All the above

Answer: C

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117. Heavy water is

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

B. Watercontaining various salts

C. Compound of heavy oxygen and hydrogenn

D. Compound of oxygen and deuterium.

Answer: D

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118. Nuclear reactor is surrounded by concrete walls to

A. Strengthen the construction

B. Control the chain reaction

C. from a protective shield

D. as moderator

Answer: C

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

A. 1

B. 1.5

C. 2.1

D. 2.5

Answer: A

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120. Cadmium and Broron rods are used in a nuclear reactor to

A. Slow down the neutrons

B. Absorb excess number of thermal neutrons

C. speed up neutrons

D. absorb fast neutrons

Answer: B

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121. The coolant in the nuclear reactor is

A. Liquid sodium

B. cadmium

C. Deuterium

D. Liquid hydrogen

Answer: A

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122. Substance used to slow down the fast neutrons released during nuclear fission is called?

A. Fuel

B. Moderator

C. Controlling rods

D. Reflecting rods

Answer: B

Watch Video Solution

123. If the neutrons reproduction factor K is

a) greater than 1 the fission rection is accelerated

b)less than 1 the fission reaction retards

c) equal to 1 the fission reaction is at steady state

A. only a,b are ture

B. only b,c are true

C. only a,c are true

D. only a,b,c true

Answer: D

Watch Video Solution

124. Ustable fission fragments decay by emitting neutrons and electrons, neutrons so emitted are called

A. prompt nuetrons

B. delayed neutrons

C. stray neutrons

D. sustained neutrons

Answer: C

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125. Chain reaction can be initiated by

A. prompt neutrons

B. delayed neutrons

C. slowed prompt neutrons

D. 2 or 3

Answer: D

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126. The man-made element which was made in the nuclear reactor is

A. polonium

B. plutonium

C. thorium

D. uranium

Answer: B

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127. In a fast breeder factor, the main charm is that the nuclear ash is that it is

A. more fissile than parent fuel

B. not dangerous as a potential pollutant

C. easily disposed off

D. stable in terms of further decay

Answer: A

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128. If $'X'gm$ of a nuclear fuel of mass number A undergoes fission inside a reactor then the number of fissions will be (N-Avagadro number)

A. NA/x

B. Nax

C. Nx/A

D. Ax/N

Answer: C

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129. The reactor which produces power due to fission by fast neutron and at the same time regenerates more fissionable material than it consumes is

A. Thermal rreactor

B. Breeder reactor

C. Both the above

D. Neither 1 & 2

Answer: B

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130. The reactor in which the number of fissionable nuclides produced are more than the used it called

A. breeder reactor

B. Pressurised reactor

C. Homogenerous reactor

D. Homogenerous reactor

Answer: A

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131. A good moderator should

A. be a gas

B. have appetite for neutrons

C. be lighter in mass number

D. heavier in mass number

Answer: A

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132. Who designed the atomic reactor ?

A. Wilson

B. Fermi

C. Rutherford

D. Teller

Answer: B

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133. From the following that are conserved in nuclear reactions are

A. mass number and energy

B. mass number and change number

C. change number and mass

D. mass number, charge number and energy

Answer: D

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134. (A) Fission is a thermonuclear process

(B) Fusion is exothermic

(C) Fission is exothermic

(D) none of these

A. A and B are correct

B. B and C are correct

C. A and C are correct

D. B,C and D are correct

Answer: D

Watch Video Solution

135. Consider the following statements A and B. Identify for correct in the given answer.

A) $p-n, p-p, n-n$ forces between nucleons are not equal and charge dependent.

B) In nuclear reactor the fission reaction will be in accelerating state if the value of neutron reproduction factor $K>1$

A. Both A and B are correct

B. Both A and B are wrong

C. A is wrong B is correct

D. A is correct B is wrong

Answer: C

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

A. Large amount of energy is released

B. Two intermediate size nuclear fragments are formed

C. More than one neutron is given out in each fission

D. Fragments in fission are radaioactive

Answer: C

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137. A slow neutron can cause fission in

A. U^{238}

B. U^{235}

C. Pb^{206}

D. Sr^{90}

Answer: B

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

A. To show down the neutrons to thermal energies

B. To control the enrgy released in the reactor

C. To cool the reactor faster

D. To absorb neutrons and stop chain reaction

Answer: A

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139. To control fission process of the reactor, the following material is used _____

A. Graphite

B. Cadmium

C. Gold

D. Uranium

Answer: B

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140. Nuclear fission is caused by

A. fast protons

B. fast neutrons

C. Slow protons

D. slow neutrons

Answer: D

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141. The liquid drop model of nucleus was proposed by

A. Bohr, Wheeler

B. Fermi

C. Rutherford

D. Chadwick

Answer: A

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142. Cadmium and Broron rods are used in a nuclear reactor to

A. Fuel

B. Moderator

C. Control Rods

D. None

Answer: C

Watch Video Solution

143. The material used to slow neutrons in a reactor is called

A. Controlrod

B. Moderator

C. Fuel

D. Heat exchanger

Answer: B

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144. Atomic mass of the most useful material for fusion reaction is

A. 1

B. 4

C. 235

D. 292

Answer: A

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

A. 3.0

B. 0.03

C. 0.3

D. 0.003

Answer: B

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146. Inside the sun

A. Four nuclei of hydrogen combine to form two nuclei of helium

B. Four nuclei of hydrogen combine to form four nuclei of helium

C. Four nuclei of hydrogen combine to form one nucleus of helium

D. Four nuclei of hydrogen is transformed into one nucleus of helium

Answer: C

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147. As the age of star increases

A. Helium quantity increases

B. Helium quantity decreases

C. Helium quantity does not charge

D. Helium, Hydrogen both quantities increases

Answer: A

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148. In the carbon cycle of nuclear fussion carbon acts like a

A. Moderator

B. Activator

C. Catalyst

D. Controller

Answer: C

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149. In a fusion process a proton and neutron combine to give a deuterium nucleus. If m_o and m_p be the mass of neutron and proton respectively the mass of deuterium nucleus is

A. equal to $m_0 + m_p$

B. more than $m_0 + m_p$

C. less than $m_0 + m_p$

D. can be less than or more than $(m_0 + m_p)$

Answer: C

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150. The binding energies of the atom of elements P and Q are E_P and E_Q respectively. There atoms of element Q fuse on atom of element P. The correct relation between E_P, E_Q and e will be

A. $E_Q = 3E_p + e$

B. $E_Q = 3E_p - e$

C. $E_p = 3E_Q + e$

D. $E_p = 3E_Q - e$

Answer: C

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151. The $\frac{B.E}{A}$ for deutron and an α-particle are X_1 and X_2 respectively. The energy released α-particle is

A. $4(X_2 - X_1)$

B. $2(X_2 - X_1)$

C. $4(X_2 + X_1)$

D. $\frac{X_2 - X_1}{4}$

Answer: A

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152. If Q_1 and Q_2 are the energies released in the fusion of hydrogen in Carbon-nitrogen cycle and proton-proton cycle respectively then cycle repespectively then

A. $Q_1 > Q_2$

B. $Q_1 = Q_2$

C. $Q_1 < Q_2$

D. $Q_1 > Q_2$

Answer: B

Watch Video Solution

153. Fusion reaction is initiated with the help of

A. low temperature

B. high temperature

C. neutrons

D. any paticle

Answer: B

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154. In an exo-ergic reaction the binding energies of reactants and products are E_1, E_2 respectively then

A. $E_1 < E_2$

B. $E_1 = E_2$

C. $E_1 > E_2$

D. $E_1 \geq E_2$

Answer: A

Watch Video Solution

155. In an endo-ergic reaction the binding energies of reactants and products are E_1, E_2 respectively

A. $E_1 < E_2$

B. $E_1 = E_2$

C. $E_1 > E_2$

D. $E_1 \geq E_2$

Answer: C

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156. Among the following reactions which is impossible

A. ${}_2He^4 + {}_4Be^9 = {}_0n^1 + {}_6C^{12}$

B. ${}_2He^4 + {}_7N^{14} = {}_1H^1 + {}_8O^{17}$

C. $4({}_1H^1) = {}_2He^4 + 2({}_1e^0)$

D. ${}_3Li^7 + {}_1H^1 = {}_4Be^8$

Answer: C

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157. 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: C

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158. Fusion reactions take place at about

A. $3 \times 10^2 K$

B. $3 \times 10^3 k$

C. $3 \times 10^4 K$

D. $3 \times 10^6 K$

Answer: D

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159. The percentage of mass lost during nuclear fusion is

A. $0.1\ \%$

B. $0.4\ \%$

C. $0.5\ \%$

D. $0.65\ \%$

Answer: D

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160. Fusion reaction takes place at high temperature because

A. All nuclear reactions absord heat

B. The particles can not come together unless they are moving rapidly

C. The binding energy must be supplied from an external source

D. The mass defect must be supplied

Answer: B

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161. Among the following true option is

A. Energy released per nucleon is same in both fission and fusion reactions

B. Energy released per nucleon is more in fission than in fusion reaction

C. Energy released per nucleon is less in fission than in fusion reaction

D. No energy in released in fusioin reaction

Answer: C

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162. Fusion reaction takes place at high temperature because

A. atoms are ionized at high temperature

B. molecules brak up at high temperatures

C. nuclei break up at high temperature

D. kinetic energy is high enough to overcome repulsion between nuclei

Answer: D

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163. In the carbon cycle from which stars hotter than the sun obtain their energy the $._6 C^{12}$ isotope

A. splits up into three alpha particles

B. fuses with another ${}_6C^{12}$ nucleus to form ${}_{12}Mg^{24}$

C. is completely converted into energy

D. is regenerated at the end of the cycle

Answer: D

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164. Source of solar energy can be said to be due to natural fusion in which hydrogen gets converted into helium with carbon serving as a natural catalyst. This carbon cycle was proposed by

A. Bethe

B. Yukawa

C. Fermi

D. Soddy

Answer: A

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165. In carbon-Nitrogen fusion cycle, protons are fused to from a helium nucleus, positrons and release some energy. The number of protons fused and the number of positrons released in this process respectively are

A. $4, 4$

B. $4, 2$

C. $2, 4$

D. $4, 6$

Answer: B

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166. Nuclear fission and fusion can be explained on the basis of _____

A. Einstein throury of relativity

B. Einstein specific heat equation

C. Einstein mass-energy relation

D. Einstein photo electric equation

Answer: C

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167. Energy in the sun is due to

A. Fossil fuels

B. Radioactivity

C. Fission

D. Fusion

Answer: D

Watch Video Solution

168. The overall process of carbon nitrogen fusion cycle results in the fission of 4 protons to yield helium nucleus and_____

A. positron

B. two electrons

C. two positrons

D. An electron.

Answer: C

Watch Video Solution

169. The nucleus finally formed in fusion of protons in proton-proton cycle is that of

A. Heavy hydrogen

B. Carbon

C. Helium

D. Lithium

Answer: C

Watch Video Solution

170. $4._1 H^1 \rightarrow ._2 He^4 + 2e^+ +$ 26 MeV : this is an equation of

A. Fusion

B. Fission

C. b-decay

D. g-decay

Answer: A

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171. The source of steller energy is___ process

A. Nuclear fission

B. Nuclear fusion

C. Nuclear fission & fusion

D. Nuclear decay

Answer: B

Watch Video Solution

172. Fusion reaction takes place at high temperature because

A. atmos are ionised at high temperatures.

B. molecules breackup at high tempeerature.

C. nuclei break up at high temperature.

D. kinetic energy is high enough to overcome repulsion between nuclei

Answer: D

Watch Video Solution

173. In the carbon cycle from which stars hotter than the sun obtain their energy the $._6C^{12}$ isotope

A. splits into three alpha particles

B. fuse with another ${}_6C^{12}$ nucleus to form ${}_{12}Mg^{24}$

C. is completely converted into energy

D. is regenerated at the end of the cycle

Answer: D

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174. The phenomenon of pair production is the

A. The production of an electron and a positron from γ radiations

B. Ejection of an electron from a metal surface when exposed to ultraviolet light

C. Ejection of an electron from a nucleus

D. Ionization of a neutral atom

Answer: A

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175. When the particle and its antiparticle unite, the result is

A. a heavier particle

B. two or more smaller particles

C. photons

D. partly matter and partly photons.

Answer: C

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176. Particles and their antiparticles have

A. The same masses but opposite spins

B. The same masses but opposite magnetic moment

C. The same masses and same magnetic moment

D. Opposite spins and same magnetic moment

Answer: B

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177. To produce an electron-position pair, the minimum energy of γ-ray photon must be

A. 0.15

B. 1

C. 1.02

D. 1.5

Answer: C

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178. The rest mass energy of electron or positron is (in MeV)

A. 0.51

B. 1

C. 1.02

D. 1.5

Answer: A

Watch Video Solution

179. A positron and an electron come close together to give a neutral one called

A. Electronium

B. Positronium

C. γ-photon

D. β-particle

Answer: B

Watch Video Solution

180. Positronium is converted into

A. 2 Photons each of energy $0.51MeV$

B. 1 Photon of energy $1.02MeV$

C. 2Photons each of energy $1.02MeV$

D. One Photon of energy $0.5MeV$

Answer: A

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181. In pair annihiliation two γ-ray photons are produced it is due to

A. Low of conservation of energy

B. Law of conservation of mass

C. Law of conservation of momentum

D. Law of conservation of angular momentum

Answer: C

Watch Video Solution

182. In pair annihiliation the least number of γ-ray photons produced is

A. 2

B. 3

C. 4

D. 1

Answer: A

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183. The number of protons, electrons and neutrons in the nucleus of $._{13}Al^{27}$ is

A. $13, 13, 14$

B. $13, 0, 14$

C. $14, 14, 13$

D. $14, 0, 13$

Answer: B

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184. ${}_{19}^{39}K$ and ${}_{20}^{40}Ca$ are

A. Istopes

B. Isobars

C. Isotones

D. Isodiaphers

Answer: C

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185. K^{40}, Ar^{40}, Ca^{40} are

A. Isobars

B. Istopes

C. Isotones

D. Isogonals

Answer: A

Watch Video Solution

186. Of the following atoms

$_{\cdot 6}C^{14}, _{\cdot 7}N^{13}, _{\cdot 88}Ra^{236}, _{\cdot 7}N^{14}, _{\cdot 8}O^{16}$ and $_{\cdot 86}Rn^{232}$ a pair of isobars is:

A. $_5C^{11}, _7N^{13}$

B. $_7N^{13}, _7N^{14}$

C. ${}_6C^{14}, {}_7N^{14}$

D. ${}_6N^{14}, {}_8O^{16}$

Answer: C

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187. Of the following pair of isotones is

A. ${}_6C^{11}, {}_7N^{13}$

B. ${}_7N^{13}, {}_7N^{14}$

C. ${}_6C^{14}, {}_7N^{14}$

D. ${}_6N^{14}, {}_8O^{14}$

Answer: D

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188. Of the following pair of isotones is

A. ${}_6C^{11}, {}_7N^3$

B. ${}_7N^{13}, {}_7N^{14}$

C. ${}_6C^{14}, {}_7N^{14}$

D. ${}_6C^{14}, {}_8O^{16}$

Answer: B

Watch Video Solution

189. Of the following a pair of of isodiaphers is

A. ${}_{88}Ra^{236}, {}_{86}Ra^{232}$

B. ${}_7N^{13}, {}_7N^{14}$

C. ${}_5C^{14}, {}_7C^{14}$

D. ${}_6C^{14}, {}_8O^{16}$

Answer: A

Watch Video Solution

Exercise 1 C W

1. The desity of a nucleus in which mass of each nucleon is $1.67 \times 10^{-27} kg$ and $R_0 = 1.4 \times 10^{-15} m$ is

A. $1.453 \times 10^{7} kg/m^3$

B. $1.453 \times 10^{16} kg/m^3$

C. $1.453 \times 10^{21} kg/m^3$

D. $1.453 \times 10^{21} kg/m^3$

Answer: A

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2. r_1 and r_2 are the radii of atomic nuclei of mass numbers 64 and 27 repsectively. The ratio (r_1 / r_2) is

A. $64/27$

B. $27/64$

C. $4/3$

D. 1

Answer: C

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3. The mass number of a nucleus is 216. The size of an atom or redius.

A. $7.2x10^{-13}cm$

B. $7.2 \times 10^{-11}cm$

C. $7.2 \times 10^{-10}cm$

D. $3.6 \times 10^{-11}cm$

Answer: A

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4. Energy released as mass of 2amu is converted into energy is

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

B. $3x10^{-10}J$

C. $1863J$

D. $931.5Mev$

Answer: B

Watch Video Solution

5. A $1MeV$ positron encounters a $1MeV$ electron travelling in opposite direction. The total energy released is (In MeV)

A. 2

B. 30.2

C. 1.02

D. 2.04

Answer: B

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6. The binding energies of the nuclei A and B are E_α and E_α respectively. Three atoms of the element B fuse to give one atom of

element A and an energy Q is released. Then, E_a, E_b Q are relaetd as

A. $E_1 + 3E_a = Q$

B. $3E_b - E_a = Q$

C. $E_a + 3E_a = Q$

D. $E_b + 3E_a = Q$

Answer: A

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7. The binding energies per nucleon for deutrium and helium are $1.1MeV$ and 7.0 MeV respectively. The energy in joules will be liberated when 10^6 deuterons take part in the reaction

A. $18.88 \times 10^{-3} J$

B. $18.88 \times 10^{-5} J$

C. $18.88 \times 10^{-7} J$

D. $18.8810^{-10} J$

Answer: C

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8. $1kg$ of iron (specific heat $120CalKg^{-1}C^{-1}$) is heated by $1000^{\circ}C$. The increases in its mass is

A. Zero

B. $5.6x10^{-8}Kg$

C. $5.6x10 -^{-16} Kg$

D. $5.6x10^{-12}Kg$

Answer: D

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9. In nuclear fission , 0.1% mass in converted into energy. The energy released in the fission of $1Kg$ mass is

A. $2.5x10^5KWH$

B. $2.5x10^7KWH$

C. $2.5x10^9KWH$

D. $2.5x10^{-7}KWH$

Answer: B

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10. After the emission of one α- particle followed by two β-particles from $_{92}^{238}U$, the number of neutrons in the newly formed nucleus is

A. 140

B. 142

C. 144

D. 146

Answer: A

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11. A radioactive nucleus undergoes a series of decays according to the sequence :

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

If the mass number and atomic number of A_3 are 172 and 69 respectively, what are the mass number and atomic number of A ?

A. $56, 23$

B. $180, 72$

C. $120, 52$

D. $84, 38$

Answer: B

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12. How may $\alpha -$ and $\beta -$ particles will be emitted when $._{90} Th^{232}$ changes into $._{82} Pb^{208}$?

A. $6, 4$

B. $4, 6$

C. $8, 6$

D. $6, 8$

Answer: A

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13. The decay constant of a radio active element, which disintergrates to $10gms$ from $20gms$ in 10 minutes is

A. $0.693\ \text{min}^{-1}$

B. $6.93\ \text{min}^{-1}$

C. $0.693\,\text{sec}^{-1}$

D. $0.0693\ \text{min}^{-1}$

Answer: D

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14. Half life period of radium is 1600 years. $2gm$ of radium undergoes decay and gets reduced to $0.125gms$ in

A. 3200 years

B. 25600 years

C. 800 years

D. 6400 years

Answer: D

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15. 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 lapsed if the half life of polonium is 138 days ?

A. 414 days

B. 407 days

C. 421 days

D. 410 days

Answer: A

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16. Two radioactive substances X and Y initially contain an equal number of atoms. Their half-lives are 1 hour and 2 hours respectively. Then the ratio of their rates of disintergration after two hours is

A. $1:1$

B. $2:1$

C. $1:2$

D. $2:3$

Answer: A

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17. 1g of a radioactive substance disintegrates at the rate of 3.7×10^{10} disintegrations per second. The atomic massof the substance is 226. Calculate its mean life.

A. $1.2 \times 10^5 s$

B. 1.39×10^{11}

C. $2.1 \times 10^5 s$

D. $7.194 \times 10^{10} s$

Answer: D

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18. No. of uranium 235 nuclei required to undergo fission to give 9×10^{13} joule of energy is

A. $2.8125x10^{24}$

B. $28.\ 125x10^{24}$

C. $281.\ 25x10^{24}$

D. $28215x10^{24}$

Answer: A

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19. The energy supplied by a power plant is 40 million kilowatt hour. It is supplied by annihilation of matter, the mass that is annihilated is.

A. $1.6gm$

B. $1.6kg$

C. $1.6mg$

D. 1.6 amu.

Answer: A

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20. The amount of energy released in the fusion of two $._1H^2$ to form a $._2He^4$ nucleus will be {Binding energy per nucleon of $._1He^2 = 1.1MeV$ Binding energy per nucleon of $._2He^4 = 7MeV$]

A. $8.1MeV$

B. $5.9MeV$

C. $23.6MeV$

D. $2MeV$

Answer: C

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21. The miniumum amount of energy released in annihilation of electron-Positron is

A. $1.02MeV$

B. $0.58MeV$

C. $185MeV$

D. $200MeV$

Answer: A

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Exercise 1 H W

1. Assume that the nuclear mass is of the order of $10^{-27}kg$ and the nuclear radius is of the order of $10^{-15}m$. The nuclear density is of

the order of

A. $10^2 Kg/n^3$

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

C. $10^{17} Kg/m^3$

D. $10^{31} Kg/m^3$

Answer: C

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2. Given the mass of iron nucleus as $55.85u$ and $A = 56$, the nuclear density is

$(u = 1.66 \times 10^{-27} kg, r = 1.2 \times 10^{-15} m)$

A. $1.29 \times 10^{-7} kgm^{-3}$

B. $2.29 \times 10^{17 kgm^{-3}}$

C. $2.29 \times 10^{-7kgm^{-3}}$

D. $1.29 \times 10^{-27kgm^{-3}}$

Answer: B

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3. Sun radiates energy at the rate of $3.6 \times 10^{26} J/s$. The rate of decrease in mass of sun is $\left(Kgs^{1}\right)$.

A. $12x10^{10}$

B. $1.3x10^{20}$

C. $4x10^{9}$

D. $3.6x10^{36}$

Answer: C

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4. A slow neutron strikes a nucleus of ${}_{92}^{235}U$ splitting it into lighter nuclei of ${}_{56}^{141}Ba$ and ${}_{36}^{92}Kr$ along with three neutrons. The energy released in this reaction is (The masses of uranium, barium and krypton of this reaction are $235.043933, 140.917700$ and $91.895400u$ respectively. The mass of a neutron is $1.008665u$

A. $740.69MeV$

B. $156.0MeV$

C. $186.9MeV$

D. $198.8MeV$

Answer: D

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

A. 951 MeV

B. 805 MeV

C. 1021 MeV

D. 1212 MeV

Answer: C

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6. The mass defect in a nucleus is 3.5amu. Then the binding energy of the nucelus is

A. $32.58 MeV$

B. $325.85 MeV$

C. $3260.25 MeV$

D. $3.258 MeV$

Answer: C

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7. True or False Statements :

In the nuclear reaction $X^{200} \rightarrow A^{110} + B^{90}$. If the binding energy per nucleon for X, A and B is 7.4 MeV, 8.2.MeV and 8.2 MeV respectively, the energy released is 160 MeV.

A. 200 MeV

B. 160 MeV

C. 110 MeV

D. 90 MeV

Answer: B

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8. An isotope $._{92}U^{238}$ decays successively to form $._{90}Th^{234}$, $._{91}Pa^{234}$, $._{92}Th^{234}$, $._{90}Th^{230}$ and $._{88}Ra^{226}$. What are the radiations emitted in these five steps?

A. $\alpha, \alpha, \beta, \beta$

B. $\alpha, \alpha, \beta, \beta, \alpha$

C. $\alpha, \beta, \beta, \alpha, \alpha$

D. $\beta, \beta, \alpha, \alpha, \alpha$

Answer: C

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9. The nuclide which disintergrates by emitting a β-particles to form $._{7}^{14}N$ contains

A. 8 neutrons

B. 10 neutrons

C. 7 neutrons

D. 6 neutrons.

Answer: A

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10. A nucleus X initially at rest, undergoes alpha decay according to the equation

$._{Z}^{232}X \rightarrow_{90}^{A} Y + \alpha$

What fraction of the total energy released in the decay will be the kinetic energy of the alpha particle?

A. $\frac{90}{92}$

B. $\frac{228}{232}$

C. $\sqrt{\frac{228}{232}}$

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

Answer: B

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11. A radio active sample contains 600 radio active atoms. Its half life period is 30 minutes. The no. of radio active atoms remaining, if the decay occurs for 90 minutes is

A. 300

B. 200

C. 400

D. 75

Answer: D

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12. Radio active carbon-14, in a wood sample decays with a half life of 5700 years. The fraction of the radio active carbon -14, that remains after a decay period of 17,100 year is

A. $1/4$

B. $3/4$

C. $1/8$

D. $7/8$

Answer: C

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13. The half - life of $._{92}U^{238}$ against $\alpha - decay$ is 4.5×10^9 years. How many disintegrations per second occur in 1 g of $._{92}U^{238}$?

A. $1.532 \times 10^4 s^{-1}$

B. $1.325 \times 10^4 s^{-1}$

C. $1.412 \times 10^4 s^{-1}$

D. $1.235 \times 10^4 s^{-1}$

Answer: D

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14. A certain substance decays to $1/32$ of its initial activity in 25 days. Calculate its half-life.

A. 1 day

B. 3 days

C. 5 days

D. 7 days

Answer: C

Watch Video Solution

15. Calculate the energy released by the fission $1g$ of $.^{235}U$ in joule, given that the energy released per fission is $200MeV$.

(Avogadro's number $= 6.023 \times 10^{23}$)

A. 8.202×10^{12}

B. 8.202×10^{8}

C. 8.202×10^{10}

D. 8.202×10^{14}

Answer: C

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16. The ratio of the amounts of energy released as a result of the fusion of $1kg$ hydrogen (E_1) and fission of $1kg$ of ${}_{92}U^{235}(E_2)$ will be

A. 1.28

B. 3.28

C. 5.28

D. 7.28

Answer: D

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Exercise 2 C W

1. A nucleus X^{235} splits into two nuclei having the mass numbers in the ratio $2:1$. The ratio of the radii of those two nuclei is

A. $2:1$

B. $1:2$

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

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

Answer: C

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2. A mathc box of $5cm \times 5cm \times 1cm$ dimensions is filled with nuclear matter. Its weight is in the order of

A. 10 g

B. $10^8 g$

C. $10^{12} g$

D. $10^{15} g$

Answer: D

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3. If the speed of light were $2/3$ of its present value, the energy released in a given atomic explosion will be decreased by a fraction.

A. $2/3$

B. $4/9$

C. $4/3$

D. $5/9$

Answer: B

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4. The binding energy per nucleon for C^{12} is 7.68 MeV and that for C^{13} is 7.5 MeV. The energy required to remove a neutron from C^{13} is

A. 495 MeV

B. 49.5 MeV

C. 4.95 MeV

D. 0.495 MeV

Answer: C

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5. The binding energy per each nucleon in the neighborhood of medium nuclei is 8.5 MeV and the binding energy per each nucleon is about 7.6 MeV and the neighborhood of Uranium. The energy released in the fission of U^{236} is

A. 212 eV

B. 212 MeV

C. 2.12 MeV

D. 0.9 MeV

Answer: B

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6. $.^{22}Ne$ nucleus after absorbing energy decays into two $\alpha -$ particles and an unknown nucleus. The unknown nucleus is.

A. Carbond

B. Nitrogen

C. Boron

D. oxygen

Answer: A

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7. The mass of one curie of U^{234} is

A. $3.7 \times 10^{10} g$

B. $3.7 \times 10^{-10} g$

C. $6.25 \times 10^{-34} g$

D. $1.438 \times 10^{-11} g$

Answer: D

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8. A radio active isotope having a half life of 3 days was received after 9 days. It was found that there was only $4gms$ of the isotope in the container. The initial weight of the isotope when packed was

A. 8 g

B. 64 g

C. 48 g

D. 32 g

Answer: D

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9. Half life of a radio active element is $5\ \min\ .\ 10\,\sec$. Time taken for $90\ \%$ of it to disintergrate is nearly

A. 100 min

B. 1000 sec

C. 10^4 sec

D. 10^4 min

Answer: B

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10. The half life of $._{92}^{238}U$ undergoing α-decay is 4.5×10^9 years. The activity of 1 g sample of $._{92}^{238}U$ is

A. $1.23 \times 10^4 Bq$

B. $2.4 \times 10^5 Bq$

C. $1.82 \times 10^6 Bq$

D. $4.02 \times 10^8 Bq$

Answer: A

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11. In a thermo nuclear reaction $10^{-3} Kg$ of hydrogen is converted into $0.99 \times 10^{-3} Kg$ of helium. If the efficiency of the generator is $50\ \%$, the electrical energy generated in KWH is

A. 10^5

B. 1.5×10^5

C. 1.25×10^5

D. 1.3×10^5

Answer: C

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12. A nuclear reactor generates power at 50% efficiency by fission of $._{92}^{235}U$ into two equal fragments of $._{46}^{116}U$ into two equal fragments of $._{46}^{116}Pd$ with the emission of two gamma rays of 5.2 MeV each and three neutrons. The average binding energies per particle of $._{92}^{235}U$ and $._{46}^{116}Pd$ are 7.2 MeV and 8.2MeV respectiveley. Calculate the energy released in one fission event. Also-estimate the amount to $.^{235}U$ consumed per hour to produce 1600 megawatt power.

A. 128 gm

B. $1.4kg$

C. $140.5gm$

D. `281 gm

Answer: A

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13. In nuclear fusion, One gram hydrogen is converted into $0.993gm$. If the efficiency of the generator be 5% , then energy obtained in KWH is

A. 8.75×10^3

B. 4.75×10^3

C. 5.75×10^3

D. 3.73×10^3

Answer: A

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14. A photon of energy $1.12MeV$ splits into electron positron pair.

The velocity of electron is (Neglect relativistic correction)

A. $3x10^8ms^{-1}$

B. $1.33x10^8ms^{-1}$

C. $6x10^8ms^{-1}$

D. $9x10^9ms^{-1}$

Answer: B

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Exercise 2 H W

1. A nucleus splits into two nuclear parts having radii in the ratio $1:2$ Their velocities are in the ratio

A. $6:1$

B. $4:1$

C. $2:1$

D. $8:1$

Answer: A

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2. 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 amu

B. 12.13 MeV

C. 13.018 meV

D. $12.13eV$

Answer: B

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3. Assume that a neutron breaks into a proton and an electron. The energy released during this process is (mass of neutron = 1.6725×10^{-27} kg, mass of proton = $1.6725 \times 10^{-27}kg$, mass of electron $= 9 \times 10^{-31}kg$)

A. 0.5

B. 7.10

C. 6.30

D. 5.4

Answer: A

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

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

A. 4.4

B. 5.4

C. 5.6

D. 6.5

Answer: B

Watch Video Solution

5. If the activity of $.^{108}Ag$ is 3 micro curie, the number of atoms present in it are $(\lambda = 0.005\,\sec^{-1})$

A. $2.2x10^7$

B. $2.2x10^6$

C. $2.2x10^5$

D. $2.2x10^4$

Answer: A

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6. The half life period of Pb^{210} is 22 years. If $2g$ of Pb^{210} is taken, then after 11 years the amount of Pb^{210} will be present is

A. $0.1414g$

B. $1.414g$

C. $2.828g$

D. $0.707g$

Answer: B

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7. $_{(87)}{}^{221}$Ra is a radioactive substance having half life of 4 days .Find the probability that a nucleus undergoes decay after two half lives

A. 1

B. $1/2$

C. $1/4$

D. $3/4$

Answer: D

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8. When $._{92}U^{235}U$ undergoes fission. About $0.1\,\%$ of the original mass is converted into energy. Then the amount of $._{92}U^{235}$ should undergo fission per day in a nuclear reactor so that it provides energy of 200 mega watt electric power is

A. $9.6 \times 10^{-2} kg$

B. $4.8 \times 10^{-2} kg$

C. $19.2 \times 10^{-2} kg$

D. $1.2 \times 10^{-2} kg$

Answer: C

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

A. 1.78

B. 0.28

C. 128

D. 0.14

Answer: A

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Exercise 3

1. In a radioactive material the activity 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. $R_1 = R_2$

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

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

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

Answer: B

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2. The binding energy of deuteron is 2.2 MeV and that of $._2^4 He$ is 28 MeV. If two deuterons are fused to form one $._2^4 He$, th n the energy released is

A. $30.2meV$

B. 25.8 MeV

C. 23.6 MeV

D. 19.2 MeV

Answer: C

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

A. 72

B. 73

C. 74

D. 75

Answer: A

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4. 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 nuclei of A to those of B will be $\left(\frac{1}{e}\right)^2$ after a time interval

A. 4λ

B. 2λ

C. $1/2\lambda$

D. $1/4\lambda$

Answer: C

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

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

B. the electron produced as a reslt of collision between atoms

C. the electrons obiting around the nucleus

D. the electrons present inside the nucleus

Answer: A

Watch Video Solution

6. 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. $B.\ E = [ZM_p + (A - Z)M_n - M()A, Z)C^2$

B. $B.\ E = [ZM_p + AM_n - M(A, Z)]C^2$

C. $B.\ E = M(A, Z) - ZM_p - (A - Z)M_n$

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

Answer: A

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7. 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. 9.6 fm

B. 12.0 fm

C. 4.8 fm

D. 6.0 fm

Answer: D

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8. If $M(A, Z)$, M_p and M_n denote the masses of the nucleus ${}_Z X^A$, proton and neutron respectively in units of U (where $1U = 931MeV/c^2$) and B.E. represents its B.E. in MeV, then

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

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

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

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

Answer: C

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9. Two nuclei have their mass numbers in the ratio of $1:3$. The ratio of their nuclear densities would be

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

B. $1:1$

C. $1:3$

D. $3:1$

Answer: B

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10. 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 muclei of X_1 to that of X_2 will be $\frac{1}{e}$ after a time

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

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

C. λ

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

Answer: A

Watch Video Solution

11. In the nuclear decay given below

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

the particle emitted in the sequence are

A. γ, β, α

B. β, γ, α

C. α, β, γ

D. β, α, γ

Answer: D

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12. The number of beta particles emitter by radioactive sustance is twice the number of alpha particles emitter 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

13. The mass of a $._3^7 Li$ nucleus is $0.042u$ less than the sum of the masses of all its nucleons. The binding energy per nucleon of $._3^7 Li$ nucleus is nearly

A. 46 MeV

B. 5.6 MeV

C. 3.9 MeV

D. 23 MeV

Answer: B

Watch Video Solution

14. The activity of a radioactive sample is measures as N_0 counts per minute at $t = 0$ and N_0 / e counts per minute at $t = 5 \min$.

The time (in minute) at which the activity reduces to half its value is.

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

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

C. $5 \log_{10} 2$

D. $5 \log_e 2$

Answer: D

Watch Video Solution

15. An alpha nucleus of energy $\frac{1}{2} m v^2$ bombards a heavy nucleus of charge Ze . Then the distance of closed approach for the alpha nucleus will be proportional to

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

B. v^2

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

D. $\frac{1}{v^4}$

Answer: C

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16. 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: B

Watch Video Solution

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

A. 10 microgram

B. 20 microgram

C. 40 migcrogram

D. 1 microgram

Answer: C

Watch Video Solution

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

A. $Mc^2 - hu$

B. $\frac{h^2u^3}{2Mc^2}$

C. zero

D. hu

Answer: B

Watch Video Solution

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

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

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

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

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

Answer: C

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20. Fusion reaction takes place at high temperature because

A. nuclei break up at high temperature

B. atoms get ioniside at high temperature

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

D. molecule break up at high temperature

Answer: C

Watch Video Solution

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

A. 4.8

B. 3.6

C. 2.4

D. 1.2

Answer: A

Watch Video Solution

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

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

A. 60s

B. 80s

C. 50s

D. 40s

Answer: D

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

A. 6.675 MeV

B. 13.35 MeV

C. 2.67 MeV

D. 26.7 MeV

Answer: A

Watch Video Solution

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

A. 80 years

B. 100 years

C. 40 years

D. 60 years

Answer: D

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

A. 8.40×10^9 years

B. 1.96×10^9 years

C. 3.92×10^9 years

D. 4.20×10^9 years

Answer: D

Watch Video Solution

26. The binding energy per nucleon of $._3^7 Li$ and $._2^4 He$ nuclei are 5.60 MeV and 7.06 MeV, respectively. In the nuclear reaction $._3^7 Li + ._1^1 H \rightarrow ._2^4 He + ._2^4 He + Q$, the value of energy Q released is

A. 17.3 MeV

B. 19.6 MeV

C. -2.4 MeV

D. 8.4 MeV

Answer: A

Watch Video Solution

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

A. $\frac{3}{5}R_{Al}$

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

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

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

Answer: D

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28. A nucleus of uranium decays at rest into nuclei of thorium and helium. Then :

A. the helium nucleus has more momentum than the thorium nucleus

B. the helium nucleus has less kinetic energy than the thorium nucleus

C. the helium nucleus has more kinetic energy than the thorium nucleus

D. the helium nucleus has less momentum than the thorium nccleus

Answer: C

Watch Video Solution

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

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

B. m

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

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

Answer: C

Watch Video Solution

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

A. 15

B. 30

C. 45

D. 60

Answer: D

Watch Video Solution

Exercise 4

1. Suppose we consider a large number of continers each containing initially 10000 atoms of a radioactive material with a half life of 1 year. After 1 year.

A. all the containers will have 5000 atoms of the material.

B. all the containers will contain the same nuber of atoms of the material but that nuber will only be approximately 5000.

C. the containers will in general have different number of the atoms of the material but their average will be close to 5000.

D. none of containers can have more than 5000 atoms.

Answer: C

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2. When a nucleus in an atom undergoes a radioactive decay, the electronic energy levels of the atom -

(A) Do no change for any type of radioactivity.

(B) Change for α and β -radioactivity but not for γ-radioactivity.

(C) Change for α-radioactivity but not for others.

(D) Change for β-radioactivity but not for others.

A. do not change for any tppe of radioactivity

B. change for α and β radioactivity but not for $\gamma -$ radioactivity.

C. change for α-radioactivity but not for others.

D. change for β-radioactivity but not for others

Answer: B

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3. M_x and M_y denote the atomic masses of the parent and the daughter nuclei respectively in a radioactive decay. The Q - value for a $\beta -$ decay is Q_1 and that for a β^+ decay is Q_2. If m_e denotes the mass of an electrons, then which of the following statements is correct?

A. $Q_1 = (M_x - M_y)c^2$ and $Q_2 = (M_x - M_y - 2m_e)c^2$

B. $Q_1 = (M_x - M_y)C^2$ and $Q_2 = (M_x - M_y)c^2$

C. $Q_1 = (M_x - M_y - 2m_e)C^2$ and $Q_2 = (MK_x - M_y + 2m_e)c^2$

D. $Q_1 = (M_x - M_y + 2m_e)C^2$ and $Q_2(M_x - M_y + 2m_e)c^2$

Answer: A

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4. Tritium is an isotope of hydrogen whose nucleus triton contains 2 neutrons and 1 proton . Free neutrons decay into $p + \bar{e} + \bar{n}$. If one of the neutrons in Triton decays , it would transform into He^3 nucleus. This does not happen. This is because

A. Triton energy is lessthan that of a He^3 nucleus.

B. The electron created in the beta decay process cannot remain in the nucleus.

C. Both the neutrons in triton have a decay simultaneously resulting in a nucleus with 3 protons, which is not a He^3 nucleus.

D. Because free neutrons decay due to external perturbations which is absent in a triton nucleus.

Answer: A

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5. Heavy stable nuclei have more neutrons than protons. This is because of the fact that

A. neutrons are heavier than protons.

B. electrostatic force between protons are repulsive

C. neutrons decay inyo protons through beta decay

D. nuclear forces between neutrons are walker than that between protons.

Answer: B

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6. In a nuclear reactor, moderators slow down the neutrons which come out in a fission process. The moderator used have light nuclei.

Heavy nuclei will not serve the purpose because

A. they will break up

B. elastic collision of neutrons with heavy nuclei will not slow them down.

C. the net weight of the reactor would be unbearably

D. substances with heavy nuclei do not occur in liquid or gaseous state at room temperature.

Answer: B

Watch Video Solution

7. 50% of a radio active substance decays in 5 hours. The time required for the 87.5% decays is

A. 10 hours

B. 15 hours

C. 12.5 hours

D. 17.5 hours

Answer: B

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8. 4 grams of radioactive substance A left $1/2gm$ after some time . 1 gram of another radioactive substance B left $1/4gm$ in the same period, If half life of B is 2 hours, the half life of A is (in hours)

A. $3/4$

B. $4/3$

C. $1/4$

D. $1/2$

Answer: B

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9. One mole of α emitter of half life equal to 2 days was placed in a sealed tube for 4 days at $S.T.P$ volume of helium collector is

A. 2.44 lit

B. 16.8 lit

C. 11.2 lit

D. 5.6 lit

Answer: B

Watch Video Solution

10. 3 ruthuerfords of a radio active isotope of half-life equal to 3 days was received after 12 days. Initial isotope packed was

A. 48 rutherfords

B. 12 rutherfords

C. 25 rutherfords

D. 36 rutherfords

Answer: A

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11. The half life of a radio active substance is 6 hours. The amount of the substance undergone disintegration when $36gms$ of it undergoes decay for 18 hours is

A. $31.5gm$

B. $2.5gm$

C. $18gm$

D. $9gm$

Answer: A

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12. The radio active nuclides A and B have half lives t and $2t$ respectivey. If we start an experiment with one mole of each of them, the mole ratio after time interval of $6t$ will be

A. $1:2$

B. $1:8$

C. $1:6$

D. $1:1$

Answer: B

Watch Video Solution

13. $20\,\%$ of a radio active element disintergrates in 1 hr. The percentage of the radio active element disintergrated in 2 hrs will be

A. $36\,\%$

B. $64\,\%$

C. $60\,\%$

D. $40\,\%$

Answer: A

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14. The C^{14} to C^{12} ratio in a certain piece of wood is $25\,\%$ of that in atmosphere. The half life period of C^{14} is $5,\,580$ years. The age of wood piece is (in years)

A. $5,\,580$

B. 2790

C. 1395

D. $11,\,160$

Answer: D

Watch Video Solution

15. A radiactive sample decays by two different processes .Half - life for the first process is t_1 and for the second process is t_2 . The effective half-life is

A. $T = T_1 + T_2$

B. $\frac{1}{T} = \frac{1}{T_1} + \frac{1}{T_2}$

C. $T = \frac{T_1 + T_2}{T_1 T_2}$

D. $T = \frac{T_1 - T_2}{T_1 T_2}$

Answer: B

Watch Video Solution

16. The age of the wood if only $1/16$ part of original C^{14} is present in its piece is (in years) (T of C^{14} is $5,580$ years)

A. 5580

B. 11160

C. 22320

D. 16740

Answer: C

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17. A piece of wood is found to have the $\frac{C^{14}}{C^{12}}$ ratio to be 0.5 times of that in a living plant The number of years back the plant died will be (T of $C^{14} = 5,580$ years)

A. $2,790$ years

B. $5,580$ years

C. $11,160$ years

D. $27,900$ years

Answer: B

Watch Video Solution

18. A piece of wood collected from cro-Magnon caves gave 4 disintergrations $/$ min. A freshly cut wood of the same weight gives 16 d.pm. The cro-magnon man lived about (Half life of C^{14} is 5760 years. Assume the activity is due to C^{14} only)

A. 5700 years ago

B. 2900 years ago

C. 11520 years ago

D. 1400 years ago

Answer: C

Watch Video Solution

19. The number of U^{238} nuclei in a rock sample equal to the number of Pb^{206} atoms. The half life of U^{238} is 4.5×10^9 years. The age of the rock is

A. $4.5 \times 10^9 y$

B. $9 \times 10^9 y$

C. $13.5 \times 10^9 y$

D. $18 \times 10^9 y$

Answer: A

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20. Equal masses of two samples of charcoal A and B are burnt separately and the resulting carbon dioxide are collected in two vessels. The radioactivity of $\hat{}\ 14C$ is measured for both the gas samples. The gas from the charcoal A gives $2100 counts$ per week and the gas from the charcoal A gives 2100 counts per week and the gas from the charcoal B gives 1400 counts per week. Find the age difference between the two samples. Half-life of $\hat{}\ 14C = 5730y.$

A. 5730y

B. 11460y

C. 17190y

D. 22920y

Answer: B

Watch Video Solution

21. The half life of a radioactive substance is 20 minutes . The approximate time interval $(t_2 - t_1)$ between the time t_2 when $\frac{2}{3}$ of it had decayed and time t_1 when $\frac{1}{3}$ of it had decay is

A. 14 min

B. 20 min

C. 28 min

D. 7 min

Answer: B

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22. A charged capacitor of capacitance C is discharged through a resistance R. A radioactive sample decays with an average-life τ.Find the value of R for which the ratio of the electrostatic field energy stored in the capacitor to the activity of the radioactive sample remains constant in time.

A. $\frac{2t}{C}$

B. $\frac{C}{2t}$

C. $2tC$

D. tC

Answer: A

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23. Uranium- 238 decays to thorium-234 with half-life $5 \times 10^9 yr$. The resulting nucleus is in the excited state and hence further emits γ-rays to come to the ground state. It emits 20γ-rays per second. The emission rate will drop to 5γ-rays per second in

A. $1.25 \times 10^9 yr$

B. $10^{10} yr$

C. $10^{-8} yr$

D. $1.25 \times 10^{-9} s$

Answer: B

Watch Video Solution

24. A sample of radioactive material has mass m, decay constant λ, and molecular weight M. Avogadro constant $= N_A$. The initial activity of the sample is:

A. λm

B. $\frac{\lambda m}{M}$

C. $\frac{\lambda m N_A}{M}$

D. $m N_A e^{\lambda}$

Answer: C

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25. If mg of a radioactive species (molar mass M) has decay constant λ The specis activity of sample at $t =$ is given by:

A. $\left(\frac{mN_A}{M}\right) e^{-\lambda t}$

B. $\left(\frac{mN_A\lambda}{M}\right)e^{-\lambda t}$

C. $\left(\frac{mN_A}{M\lambda}\right)e^{-\lambda t}$

D. $\frac{m}{\lambda}(1-e^{-\lambda t})$

Answer: B

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26. In moon rock sample the ratio of the number of stable argon-40 atoms present to the number of radioactive potassium-40 atoms is $7:1$. Assume that all the argon atoms were produced by the decay of potassium atoms, with a half-life of $2.5\times10^9 yr$. The age of the rock is

A. $2.5\times10^9 yr$

B. $5.0\times10^9 yr$

C. $7.5\times10^9 yr$

D. $10^{10} yr$

Answer: C

Watch Video Solution

27. The half-life of a radioactive sample is T. If the activities of the sample at time t_1 and t_2 $(t_1 < t_2)$ and R_1 and R_2 respectively, then the number of atoms disintergrated in time $t_2 - t_1$ is proportional to

A. $(R_1 - R_2)T$

B. $(R_1 + R_2)T$

C. $\frac{R_1 R_2}{R_1 + R_2} T$

D. $\frac{R_1 + R_2}{T}$

Answer: A

Watch Video Solution

28. Consider a hypothetical annihilation of a stationary electron with a stationary positron. What is the wavelength of the resulting radiation?

A. $\frac{h}{2m_0C}$

B. $\frac{2h}{m_0C}$

C. $\frac{h}{m_0C}$

D. $\frac{h\sqrt{2}}{m_0C}$

Answer: C

Watch Video Solution

29. A radioactive nucleus can decay by two different processes. The half life for the first process is $2t$ and that for the second process is

t. The effective disintergration constant of nucleus is

A. $\frac{3}{2t \ln 2}$

B. $\frac{3 \ln 2}{2t}$

C. $\frac{\ln 2}{3t}$

D. $\frac{3 \ln 2}{t}$

Answer: B

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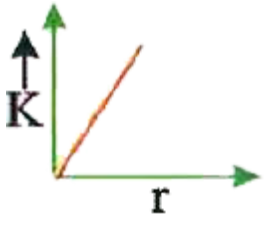
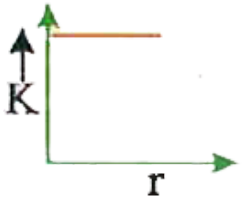
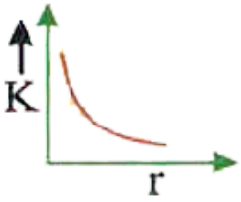
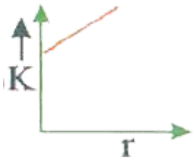
30. A proton with kinetic energy K, strikes another proton at rest. If the collision is head-on, find the correct graph between K and the distance of closest approach, r.

A.



B. 

C. 

D. 

Answer: C

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31. The fraction quantity of a radiactive sample will decay during half of its half-life period is

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

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

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

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

Answer: C

Watch Video Solution

32. A small quantity of a solution containing Na^{24} radio-nuclide of half-life T and activity R_0 is injected into blood of a person. $1cm^3$ of sample of blood taken from the blood of the person shows activity R_1. If the total volume of the blood in the body of the person is V, find the timer after which sample is taken.

A. $\frac{T}{\ln(2)}\left[1n\frac{R_0}{VR_1}\right]$

B. $\frac{T}{\ln(2)}\left[\ln\frac{VR_0}{R_1}\right]$

C. $\frac{T}{\ln(2)}\left[\ln\frac{VR_1}{R_0}\right]$

D. $\frac{T}{\ln(2)}\left[\ln\frac{R_1}{VR_0}\right]$

Answer: A

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

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

A. $4.4MeV$

B. $5.4MeV$

C. $5.6MeV$

D. $6.5MeV$

Answer: B

Watch Video Solution

34. Some amount of a radioactive substance (half-life= 10 days) is spread inside a room and consequently the level of radiation becomes 50 times the permissible level for normal occupancy of the room. After how many days the room will be safe for occupation?

A. 20 days

B. 34.8 days

C. 56.4 days

D. 62.9 days

Answer: C

Watch Video Solution

35. In the options given below, let E denote the rest mass energy of a nucleus and n a neutron. The correct option is:

A. $E\left({}_{92}^{226}U\right) > E\left({}_{53}^{137}I\right) + E\left({}_{39}^{97}Y\right) + 2E(n)$

B. $E\left({}_{92}^{226}U\right) < E\left({}_{53}^{137}I\right) + E\left({}_{39}^{97}Y\right) + 2E(n)$

C. $E\left({}_{92}^{226}U\right) < E\left({}_{56}^{140}Ba\right) + E\left({}_{36}^{94}Kr\right) + 2E(n)$

D. $E\left({}_{92}^{226}U\right) = E\left({}_{56}^{140}Ba\right) + E\left({}_{36}^{94}Kr\right) + 2E(n)$

Answer: A

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36. Four different radioactive elements are kept in separated containers. In the beginning the container A has $200g$-atom with half-life of 2 days, B has $20g$-atom with half-life of 20 days, C has $2g$-atom with half-life 200 days and D has $100g$-atoms wityh half-life of

10 days. In the begining the maximum activity exhibited by the container is

A. A

B. B

C. C

D. D

Answer: A

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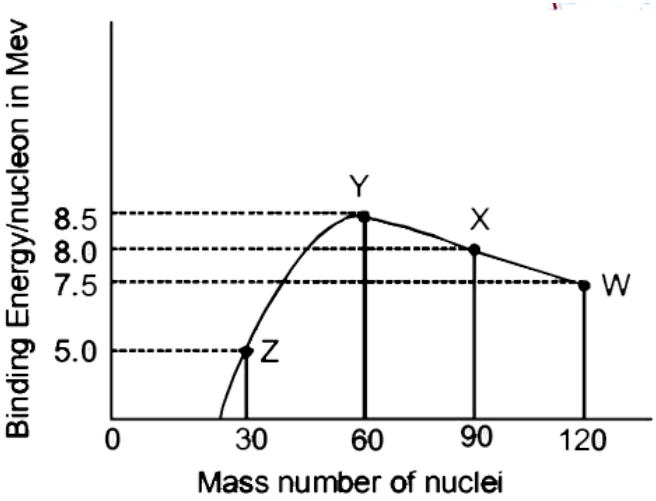
37. Binding energy per nucleons vs mass curve for nucleus is shown in the figure W, X, Y and Z are four nuclei indicated on the curve .

The process that would release energy is



A. $Y \rightarrow 2Z$

B. $W \rightarrow X + Z$

C. $X \rightarrow Y + Z$

D. $W \rightarrow 2Y$

Answer: D

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38. When $_{}(3)Li^{7}$ nuclei are bombarded by protons , and the resultant nuclei are $_{}(4)Be^{8}$, the emitted particle will be

A. alpha particles

B. beta particles

C. gamma photons

D. neutrons

Answer: C

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39. A sample of uranium is a mixture of three isotopes $_{92}U^{234}$, $_{92}U^{235}$ and $_{92}U^{238}$ present in the ratio $0.006\,\%$, $0.71\,\%$ and $99.284\,\%$ respectively. The half lives of then isotopes are 2.5×10^{5} years, 7.1×10^{8} years and 4.5×10^{9} years respectively.

The contribution to activity (in $\%$) of each isotope in the sample respectively

A. $51.41\ \%$, $2.13\ \%$, $46.46\ \%$

B. $51.41\ \%$, $46.46\ \%$, $2.13\ \%$

C. $2.13\ \%$, $51.41\ \%$, $46.46\ \%$

D. $46.46\ \%$, $2.13\ \%$, $51.41\ \%$

Answer: A

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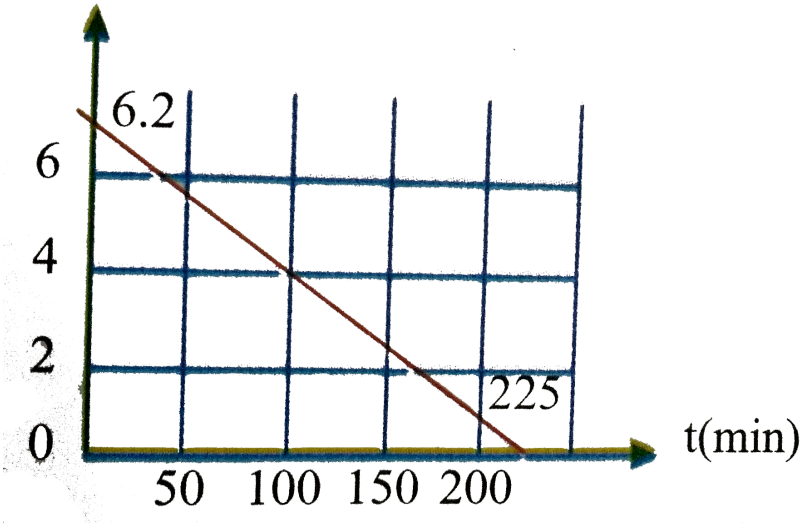
40. The table that follows shows some measurements of the decay rate of a sample of $.^{128}I$, a radio nuclide often used medically as a tracer to measure the rate at which iodine is absorbed by the thyroid gland.

Time(min)	$A(counts/s)$	Time(min)	$A(counts)/s$
4	392.2	132	10.9
36	161.4	164	4.56
68	65.5	196	1.86
10	26.8	218	1.00



The half life $t_{1/2}$ for this radio nuclide.

A. 25 min

B. 50 min

C. 2.5 min

D. 5 min

Answer: A

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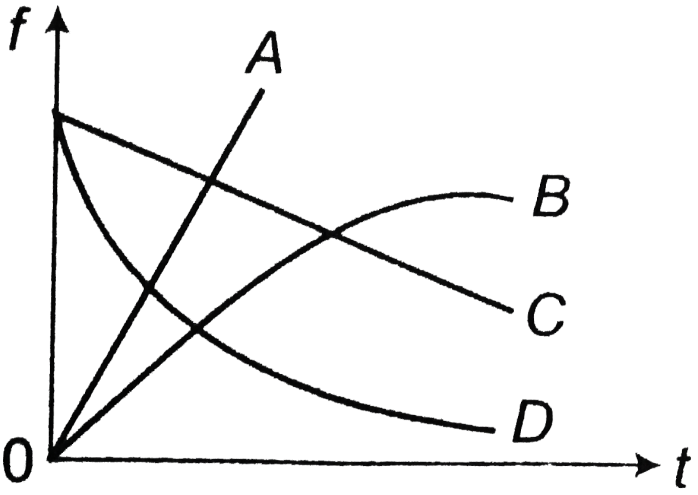
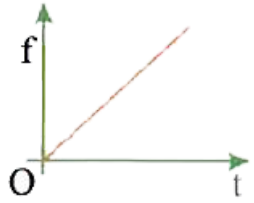
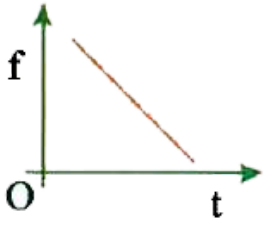
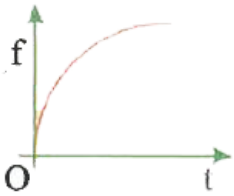
41. The fraction f of radioactive material that has decayed in time t, varies with time t. The correct variation id given by the curve.

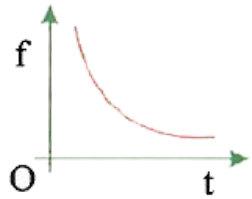




A.

B. 

C. 

D. 

Answer: C

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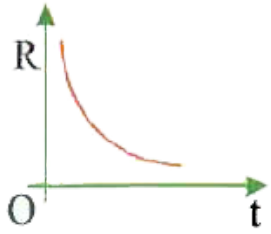
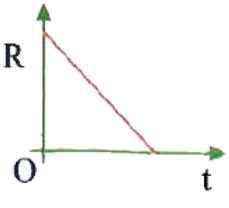
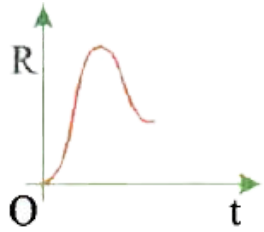
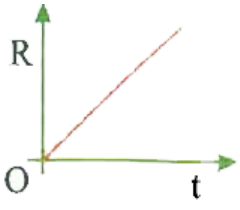
42. The rate of decay (R) of nuclei in a radioactive sample is plotted against time (t). Which of the following best represents the resulting curve ?

A. 

B. 

C. 

D. 

Answer: A

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

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

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

C. $\frac{\ln 2}{e}$

D. $-\frac{\ln 2}{e}$

Answer: A

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44. A radioactive isotope is being produced at a constant rate $dN/dt = R$ in an experiment. The isotope has a half-life $t_{1/2}$.Show that after a time $t > > t_{1/2}$,the number of active nuclei will become constant. Find the value of this constant.

A. A and R are ture and R is the correct explanation of A.

B. $\frac{A}{T}\ln$

C. $AT\ln$

D. $\frac{AT}{\ln(2)}$

Answer: D

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Assertion Reason

1. (A): Free Neutron decays into proton, electron, and antinuetrino

(R): Neutron is unstable outide the nucleus

A. A and R are ture and R is the correct explanation of A.

B. A and R are ttue and R is not the correct explanation of A.

C. A is true, R is false.

D. A is false, R is true

Answer: A

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2. (A): Nuclear forces arise from strong coulombic interactions between protons and neutrons

(R): Nuclear force are independent of charge of the nucleons

A. A and R are ture and R is the correct explanation of A.

B. A and R are ttue and R is not the correct explanation of A.

C. A is true, R is false.

D. A is false, R is true

Answer: D

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3. Consider the following statement A and B and identify the correct answer given below:

A) Nuclear density is same for all nuclei

B) Radius of the nucleus (R) and its mass number (A) are related as $\sqrt{A}\alpha R^{1/6}$

A. A and R are ture and R is the correct explanation of A.

B. A and R are ttue and R is not the correct explanation of A.

C. A is true, R is false.

D. A is false, R is true

Answer: C

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4. Cosider the following statements A, B and identify the correct choice in the given answers A : Density of a nucleus is independent of is mass number

B: Beryllium is used as moderator in nucleus reactors

A. A and R are ture and R is the correct explanation of A.

B. A and R are ttue and R is not the correct explanation of A.

C. A is true, R is false.

D. A is false, R is true

Answer: B

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5. Consider the following statements (A) and (B) and identify the correct answer given below. Statement (A): Positive values of packing fraction implies a large value of binding energy. Statement

(B): The difference between the mass of the nucleus and the mass number of the nucleus is called packing fraction

A. A and R are ture and R is the correct explanation of A.

B. A and R are ttue and R is not the correct explanation of A.

C. A is true, R is false.

D. A is false, R is true

Answer: C

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