PHYSICS

BOOKS - SAI PHYSICS (TELUGU ENGLISH)

NUCLEAR PHYSICS

Mcq

1. A radioactive nucleus can decay by two different processes. The half lives of the first

and second decay processes are 5×10^3 and 10^5 years respectively, Then, the effective half-life of the nucleus is,

A. 105×10^5

B. 4762 yrs

C. 104 yrs

D. 47.6 yrs

Answer: B

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2. In the following nuclear reaction 'x' stands for $n \rightarrow p + e^{-} + x$.

A. α particle

B. Position

C. Nutrino

D. Antinutrino

Answer: D

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3. If the radius of a nucleus with mass number 125 is 1.5 fermi then radius of nucleus with mass number 64 is

A. 0.48 fermi

B. 0.96 fermi

C. 1.92 fermi

D. 1.2 fermi

Answer: D

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4. The radius of ${}_{72}Te^{125}$ nucleus is 6 fermi. The radius of ${}_{13}Al^{27}$ nucleus in meters is

A. $3.6 \times 10^{-12} m$

B. $3.6 \times 10^{-15} m$

C. $7.2 \times 10^{-8} m$

D. $7.2 \times 10^{-15} m$

Answer: B

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5. A U^{235} nuclear reactor generates energy at a rate of $3.70xx10^{7}\frac{J}{s}$. Each fission liberates 185 MeV useful energy. If the reactor has to operate for $144 \times 10^{4}S$, then, the mass of the fuel needed is (Assume Avogadro's number = $6x10^{23}mol^{-1}$, $1eV = 1.6x10^{-19}J$).

A. 70.5 kg

B. 0.705 kg

C. 13.1 kg

D. 1.31 kg

Answer: B

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6. The half-life of Ra^{226} is 1620 years. Then the number of atoms decay in one second in 1 g of radium(Avogadro number = $6.023 \times \omega \times 10^{23}$).

A. 4.23×10^9

B. 3.16×10^{10}

C. 3.61×10^{10}

D. 2.16×10^{10}

Answer: C

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7. The half-life of a radioactive element is 10 h. The fraction of initial radioactivity of the clement that will remain after 40 h is,

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

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

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

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

Answer: B

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8. If 200 MeV of energy is released in the fission of one nucleus of $^{236}\_(92)U$, the number of nuclei that must undergo fission to release an energy of 1000 J is,

A. 3.125×10^{13}

B. 6.25×10^{13}

C. 12.5×10^{13}

D. 3.125×10^{14}

Answer: A

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9. Two radiouctive materials X_1 and X_2 have decayconstants 10λ and λ respectively. If initially they have the same number of nuclei, then the ratio of the number of nuclei ofX_1, to that of X_2 will be $\frac{1}{e}$ after a time,

A. $(1/(10\lambda))$

B. $(1/(11\lambda))$

C. $11/(10\lambda)$

D. $1/9\lambda)$

Answer: D

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10. F_{pp},$F_{\cap}$ and $F_{np}$are the nuclear forces between proton, neutron-neutron and neutron-proton respectively. Then, relation between them is,

A. $F_{pp} = F_{nn} != F_{np}$

B. $F_{pp} != F_{nn} = F_{np}$

C. $F_{pp} = F_{nn} = F_{np}$

D. $F_{pp} != F_{nn} != F_{np}$

Answer: C

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11. In sun, the important source of energy is,

A. Proton-proton cycle

B. Carbon-nitrogen cycle

C. Carbon-carbon cycle

D. Nitrogen-nitrogen cycle

Answer: A

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12. A free neutron decays spontaneously into,

A. A proton, an electron and anti-neutrino

B. A proton, an electron and a-neutrino

C. A proton and an electron

D. A proton, and an electron, a neutrino and an anti-neutrino.

Answer: A

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13. Particles and their anti-particles have,

A. The same masses but opposite spins

B. The same masses but opposite magnetic moments

C. The same masses and same magnetic moments

D. Opposite spins and some magnetic moments

Answer: B

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14. Consider the following two statements 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 $\sqrt{A}\alpha R^{\frac{1}{6}}$.

A. Both A and B are true

B. Both A and B are false

C. A is true but B is false

D. A is false but B is true

Answer: C

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15. The mass defect in a particular nuclear reaction is 0.3 g. The amount of energy liberated, in kWh is (velocity of light = $3 \times 10^8 ms^{-1}$.

A. 1.5×10^6

B. 2.5×10^6

C. 3×10^6

D. 7.5×10^6

Answer: D

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16. The masses of neutron, proton and deuteron in amu are 1.00893,1.00813 and 2.01473 respectively .The packing of the deuteron in amu is

A. 11.65×10^{-4}

B. 23.5×10^{-4}

C. 33.5×10^{-4}

D. 47.15×10^{-4}

Answer: A

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17. A heavy nucleus at rest breaks into two fragments which fly off with velocities in the ratio 3: 1. The ratio of radii of the fragments is,

A. $1:3^{\frac{1}{3}}$

B. $3^{\frac{1}{3}}:4$

C. $4:1$

D. $2:1$

Answer: A

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18. To generate power of 3.2 MW, the number of fissions of U^{235} per minute is (Energy

released per fission 200 MeV, $1eV = 1.6 \times 10^{-13}$ J.

A. 6×10^{18}

B. 6×10^{17}

C. 10^{17}

D. 6×10^{16}

Answer: A

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19. In a nuclear reactor, material used for control rods is,

A. Uranium

B. Graphite

C. Liquid sodium

D. Cadmium

Answer: D

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20. 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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21. The number of α and β particles, respectiyely, emitted in the radioactive decay ${}_{90}X^{200} \rightarrow {}_{80}Y^{168}$ are,

A. 8α and 8β

B. 6α and 8β

C. 8α and 6β

D. 6α and 6β

Answer: C

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22. In the carbon cycle of fusion,

A. Four ${}_1H^1$ fuse to form ${}_2He^4$ and two positrons

B. Four ${}_1H^1$ fuse to form ${}_2He^4$ and two electrons

C. Two ${}_1H^2$ fuse to form ${}_2He^4$

D. Two ${}_1H^2$ fuse to form ${}_2He^4$ and two neutrons

Answer: A

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23. When a slow neutron is captured by U^{235} nucleus nuclear fission takes place, each fission releases an energy of 200 MeV. The number of fissions required to occur (per sec) to produce a power of 1 MW is

A. 6.2×10^{16}

B. 6.2×10^{15}

C. 1.56×10^{16}

D. 3.125×10^{16}

Answer: D

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24. In the following reaction, the energy released is

$4_1H^2 \rightarrow 2He^4 + 2e^+$ + Energy. (Given: Mass of $_(1)H^2 = 4.031300$ amu, mass of $He^4 = 4.0026603$ amu, mass of 2 , $_1e^0 = 0.001098$ amu).

A. 12.33 MeV

B. 24.67 MeV

C. 25.6 MeV

D. 40.34 MeV

Answer: C

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25. A nuclear reactor has power of 16 kW. If the energy per fussion is 200 MeV, the number of fissions per second are,

A. 5×10^{16}

B. 5×10^{17}

C. 5×10^{14}

D. 5×10^{15}

Answer: C

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26. The mass number of a nucleus is,

A. Always less thun alomic number

B. Always more than atomic number

C. Equal to atomic number

D. Sometimes more than and sometimes equal to atomic number

Answer: D

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27. In which of the following decays, the elements does not change?

A. $\alpha - decay$

B. $\beta^+ - decay$

C. $\beta - decay$

D. $\gamma - decay$

Answer: D

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28. The element which was first observed in the solar spectrum is,

A. Helium

B. Xenon

C. Neon

D. Argon

Answer: A

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29. The energy produced in the sun is by,

A. Burning of fossil fuel

B. Radioactivity

C. Fission

D. Fusion

Answer: D

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30. In a nuclear reactor the function of the moderator is,

A. To slow down neutrons

B. To absorb neutrons

C. To speed up neutrons

D. To catalyse the reaction

Answer: A

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31. Energy obtained when I mg mass is completely converted to energy is (in joule)

A. 3×10^2

B. 3×10^{10}

C. 9×10^{10}

D. 9×10^{2}

Answer: C

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32. Nuclear forces are,

A. Short range and charge dependent

B. Short range and charge independent

C. Long range and charge dependent

D. Long range and charge independent

Answer: B

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33. When two deuterium nuclei fuse together to form tritium. We get a,

A. Neutron

B. Proton

C. $\alpha - particle$

D. Deuteron

Answer: B

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34. After 2 h, $\frac{1}{16}$ of the initial amount of a certain radioactive isotope remains undecayed. The half life of the isotope is,

A. 15 min

B. 30 min

C. 45 min

D. 60 min

Answer: B

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35. Which of the following is more effective in inducing nuclear fission?

A. Fast neutron

B. Fast proton

C. Slow proton

D. Slow neutron

Answer: D

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36. A radioactive sample has half-life of 5 days. To decay from $8\mu Cu$ to $l\mu Cu$, the number of days taken will be,

A. 40

B. 25

C. 15

D. 10

Answer: C

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37. How many neutrons the nucleous of $_{56}Ba^{141}$ contains?

A. 75

B. 85

C. 95

D. 100

Answer: B

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38. The overall process of carbon-nitrogen fusion cycle results in fusion of four protons to yield the helium nucleus and two.

A. Positron

B. Electron

C. Neutron

D. Proton

Answer: A

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39. In two isotopes of an element, the number of protons in their nuclei will be and number of neutrons in their nuclei will,

A. Same, same

B. Same, different

C. Different, same

D. Different, different

Answer: B

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40. It is assumed that nuclear mass is of the order of 10^{-27} kg and nuclear radius is of the

order of 10^{-15} m. The nuclear density is of the order of,

A. 10^{15}

B. 10^{10}

C. 10^{18}

D. 10^{23}

Answer: C

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41. A radio station operates at a frequency of 10 MHz with a power output of 265.2 kW. Given that the Planck's constant h = 6.63×10^{-34} J-s. The rate of emission of photon from the station is,

A. 4×10^{20}

B. 4×10^{31}

C. 5×10^{18}

D. 5×10^{12}

Answer: B

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42. A radio active nucleus with mass number A splits into the nuclei whose mass numbers are in the ratio 3: 2, then ratio of their radii is,

A. $\left(\frac{3}{2}\right)$

B. $\left(\frac{3}{2}\right)^{\frac{1}{3}}$

C. $\left(\frac{3}{2}\right)^{\frac{1}{2}}$

D. 1

Answer: B

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43. A radioactive source has a half-life of 3 h. A freshly prepared sample of the same exhibits radioactivity 16 times the permissible safe value. The minimum time after which it would be possible to work safely with the source is,

A. 8h

B. 10h

C. 12h

D. 14h

Answer: C

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44. An element X decays first by positron emission and then two a-particles are emitted in successive radioactive decay. If the product nucleus has mass number 227 and atomic

number 89 the mass number and atomic number of element X are,

A. (273, 93)

B. (235, 94)

C. ((238, 93)

D. (237, 92)

Answer: B

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