PHYSICS

BOOKS - CENGAGE PHYSICS

ATOMIC AND NUCLEAR PHYSICS

Worked Examples

1. Calculate the binding energy of $^{6}_{3}Li$ assuming the mass of $^{6}_{3}Li$ atom as 6.01512 amu.

2. Calculate the binding energy of an a-particle if rest mass of a is $_2^4He = 4.002603$ amu.

Mandatory Exercise Exercise Set I

1. Calculate the radius of $^\wedge 70Ge$

Consolidated Exercise Multiple Choice Questions With One Or More Than One Correct Answer

1. Who discovered radioactivity?

    A. Henry Becquerel

    B. Albert Einstein

    C. Rutherford

    D. Richard Feynman

Answer:

2. Which of the following particles was discovered earliest?

    A. Protons

    B. Neutrons

    C. Electrons

    D. Quarks

Answer:

3. Nuclei having same number of protons but different number of neutrons are known as

    A. Isobars

    B. Isotones

    C. Isotopes

    D. Isotherms

Answer:

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4. Which of the following is the lightest particle?

    A. Nucleus

    B. Proton

    C. Neutron

    D. Electron

Answer:

5. Most of the mass of an atom is located

    A. at periphery

    B. orbits of electrons

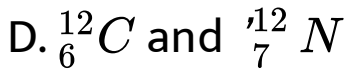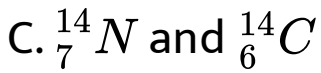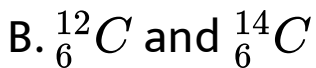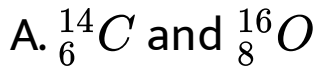   C. centre

    D. uniformly distributed

Answer:

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6. Which of the following are pairs of isotopes?

A. $^{14}_{6}C$ and $^{16}_{8}O$

B. $^{12}_{6}C$ and $^{14}_{6}C$

C. $^{14}_{7}N$ and $^{14}_{6}C$

D. $^{12}_{6}C$ and $^{'12}_{7}N$

Answer:

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7. Who discovered electron?

A. Rutherford

B. J.J.Thomson

C. Chadwick

D. Goldstein

Answer:

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8. What are nucleons?

A. Electrons and Protons

B. Electrons and Neutrons

C. Protons and Neutrons

D. Electrons, Protons and Neutrons

Answer:

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9. 1 MeV =_____ J

A. 6.67×10^{-12}

B. 1.66×10^{-27}

C. 1.6×10^{-19}

D. 1.6×10^{-13}

Answer:

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10. Who discovered neutral particles inside atoms?

A. Henri Becquerel

B. Chadwick

C. Thomson

D. Enrico Fermi

Answer:

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11. The mass defect in the nucleus is explained by the formula

A. $E = \dfrac{1}{2}mv^2$

B. E=mgh

C. $E = mc^2$

D. None of these

Answer:

12. A nucleus of an atom is stable due to

A. electrostatic force

B. gravitational force

C. elastic force

D. nuclear force

Answer:

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13. Nuclear force acts between

A. proton and proton

B. neutron and neutron

C. proton and neutron

D. all of these

Answer:

14. Which of the following nucleus are unstable?

A. Z=25

B. Z=50

C. Z= 75

D. Z=100

Answer:

15. How much energy equivalents 1 amu mass?

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

B. $1.6 \times 10^{-19} MeV$

C. 931 MeV

D. 3×10^6 J

Answer:

16. Electron-Volt is a unit of

    A. charge

    B. current

    C. voltage

    D. energy

Answer:

17. For stability in nucleus of atoms with lower atomic number:

    A. Number of neutrons = Number of protons

    B. Number of neutrons gt Number of protons

    C. Number of neutrons lt Number of protons

D. None of these

Answer:

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18. Specific binding energy is

A. binding energy per electrons

B. binding energy per protons
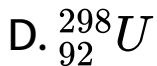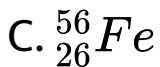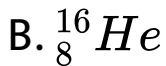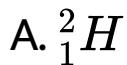
C. binding energy per neutrons

D. binding energy per nucleons

Answer:

19. Which of the following is the most stable nucleus?

A. $_1^2H$

B. $_8^{16}He$

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

D. $_{92}^{298}U$

Answer:

20. The size of a nucleus is of the order of-

A. $10^{-5}m$

B. $10^{-10}m$

C. $10^{-15}m$

D. $10^{-20}m$

Answer:

21. The size of an atom is of the order of

A. $10^{-5}m$

B. $10^{-10}m$

C. $10^{-15}m$

D. $10^{-20}m$

Answer:

22. The shape of a nucleus is almost

A. spherical

B. cubodial

C. tetrahedral

D. planar

Answer:

23. All nucleus have the same

A. volume

B. mass

C. density

D. stability

Answer:

24. $R = R_0 A^{1/3}$, where R_0 has the value:

A. $1.3 \times 10^{-6} m$

B. $1.3 \times 10^{-9} m$

C. $1.3 \times 10^{-12} m$

D. $1.3 \times 10^{-15} m$

Answer:

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25. Which of the following nucleus is not suitable for nuclear fission?

A. Uranium 238

B. Iron 56

C. Uranium 235

D. Platinum 195

Answer:

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26. Which particle is bombarded on a heavy nucleus during nuclear fission?

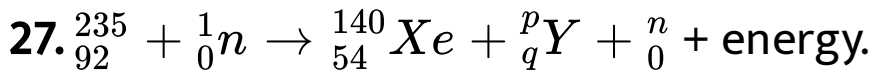   A. α -Particle

    B. Neutron

    C. Proton

    D. Electron

Answer:

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27. $^{235}_{92} + ^1_0 n \rightarrow ^{140}_{54} Xe + ^p_q Y + ^n_0$ + energy.

What are the values of p and q?

    A. p = 94, q = 38

    B. p = 95, q = 38

    C. p = 95, q = 40

    D. p = 95, q = 40

Answer:

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28. How long does the intermediate stage exist in a nuclear fission?

A. $10^{-6}s$

B. $10^{-8}s$

C. $10^{-10}s$

D. $10^{-12}s$

Answer:

29. Atom bomb is due to

    A. controlled nuclear fission

    B. controlled nuclear fusion

    C. uncontrolled nuclear fission

    D. uncontrolled nuclear fusion

Answer:

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30. Which process takes place on the sun?

A. Nuclear fusion

B. Nucler fission

C. Both fusion and fission

D. Neither fusion norfission

Answer:

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31. Which nuclear reactor is used for producing radio isotopes and neutrons for research work?

    A. Research reactor

    B. Breeder reactor

    C. Power reactor

    D. None of these

Answer:

32. Which reactor is used for commercial electricity generations?

A. Heavy water

B. Beryllium

C. Graphite

D. Oxygen

Answer:

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33. Why is a moderator used in nuclear reactors?

A. To cool the reactor

B. As a fuel

C. To slow fission neutrons

D. To speed up fission process

Answer:

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34. Which component of a nuclear reactor carries the heat energy away from the reactor?

A. Nuclear fuel

B. Moderator

C. Coolant

D. Control rods

Answer:

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35. What is the purpose of control rods in nuclear reactor?

A. To provide energy

B. To slow fission neutrons

C. To transfer heat

D. Regulates number of neutrons

Answer:

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36. The binding energy per nucleon of a heavier nucleus is 6.8 MeV and binding energy per nucleon for the intermediate mass is 8.0 MeV during a nuclear fission. If the total number of nucleons is 270, what is the energy released during one fission?

    A. 316 MeV

    B. 324 MeV

    C. 328 MeV

    D. 332 MeV

Answer:

37. Which organization builds and manages reactors in India?

    A. Nuclear Power Corporation of India

    B. Tata Institute of Fundamental Research

    C. Homi Bhaba National Institute

    D. Indian Space Research Organisation

Answer:

38. The total binding energy for the nucleus of X and Y are 1.2 MeV and 4.5 MeV respectively. Calculate the energy released when two X fuse to form Y.

   A. 2.0 MeV

   B. 3.3 MeV

   C. 5.7 MeV

D. 2.1 MeV

Answer:

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Olympiad And Ntse Level Exercises

1. Mark the correct statement

A. Nuclei of different elements can have

the same number of neutrons

B. Every element has only two stable

isotopes

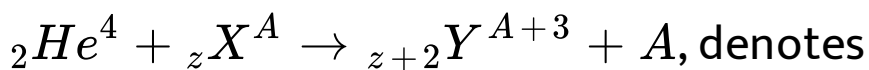C. Only one isotope of each element is

stable

D. All isotopes of every element are

radioactive

Answer:

2. In nuclear reaction

$$_2He^4 + {_z}X^A \rightarrow {_{z+2}}Y^{A+3} + A, \text{denotes}$$

A. Electron

B. Positron

C. Proton

D. Neutron

Answer:

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3. In the nuclear reaction

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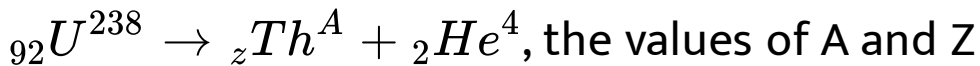
are

A. A=234, Z=94

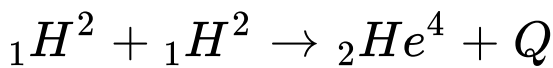B. A=234, Z=90

C. A=238, Z=94

D. A=238, Z= 90

Answer:

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4. The binding energies per nucleon for a deuteron and an α-particle are x_1 and x_2 respectively. What will be the energy Q released in the following reaction?
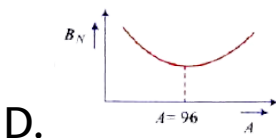
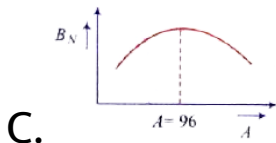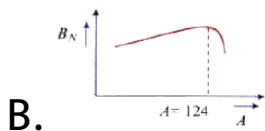$$_1H^2 + {}_1H^2 \rightarrow {}_2He^4 + Q$$
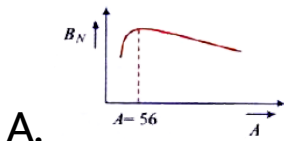
A. $4(x_1 + x_2)$

B. $4(x_2 - x_1)$

C. $2(x_1 + x_2)$

D. $2(x_2 - x_1)$

Answer:

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

A.

B.

C.

D.

Answer:

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

A. 28.4 MeV

B. 20.8 MeV

C. 27.3 MeV

D. 14.2 MeV

Answer:

7. The nuclear radius of $_8O^{16}$ is 3×10^{-15} metre. If an atomic mass unit is 1.67×10^{-27} kg, then the nuclear density is approximately:

A. 2.35×10^{17} g per cm^3

B. 2.35×10^{17} kg per m^3

C. 2.35×10^{17} g per m^3

D. 2.35×10^{17} kg per cm^3

Answer:

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8. Read assertion and reason carefully to mark the correct option.

Assertion: Heavy nuclides tend to have more

number of neutrons than protons.

Reason: In heavy nuclei, as there is coulomb repulsion between protons, so excess of neutrons are preferable.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer:

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