DPP

DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 2

Topic :- NUCLEI

1 **(b)**

β −decay from nuclei is based on this process only

2 **(c)**

The binding energy of nucleus may be defined as the energy equivalent to the mass defect of the nucleus.

If Δm is mass defect than according to Einstein's mass energy relation.

Binding Energy

$= \Delta mc^2 = [\{Zm_p + (A-Z)m_n] - M]c^2$

$= (7 \times 1.00783 + 7 \times 1.00867 - 14.00307)c^2$

or BE $= 0.1124 \times 931.5\ MeV$

or BE $= 104.6$

3 **(a)**

Ionisation energy of $Li^{++} = 9hcR$

Ionization energy $= RchZ^2 = Rch(3)^2$ (as $Z = 3$ for Li^{++})

$= 9hcR$

4 **(b)**

$E_b + E_c > E_a$

5 **(b)**

$r = \frac{n^2}{Z}(r_0); \Rightarrow r_{(n=2)} = \frac{(2)^2}{2} \times 0.53 = 1.06$ Å

6 **(b)**

Linear momentum $= mv = 9.1 \times 10^{-31} \times 2.2 \times 10^6$

$= 2.0 \times 10^{-24} kg - m/s$

7 **(c)**

According to the quark model, it is possible to build all hadrons using 3 quarks and 3 antiquarks

Mesons and baryons are collectively known as hadrons

8 **(a)**

$N = M - Z =$ Total no. of nucleons – no. of protons

10 **(a)**

Nuclear density is constant hence, mass ∝ volume

Or $m \propto V$

11 **(c)**

$_{92}U^{235}$ is normally fissionable

13 **(c)**

Out side the nucleus, neutron is unstable (life $-932\ s$)

14 **(a)**

The mass of nucleus formed is always less than the sum of the masses of the constituent protons and neutrons $i.e., m < (A-Z)m_n + Zm_p$

15 **(c)**

Binding energy per nucleon increases with atomic number. The greater the binding energy per nucleon the more stable is the nucleus

For $_{26}Fe^{56}$ number of nucleons is 56

This is most stable nucleus, since maximum energy is needed to pull a nucleon away from it

16 **(a)**

$X(n,\alpha)\,{}_3^7Li \Rightarrow {}_ZX^A + {}_0n^1 \rightarrow 3^{Li^7} + {}_2He^4$

$Z = 3 + 2 = 5$ and $A = 7 + 4 - 1 = 10$

$\therefore {}_5X^{10} = {}_5B^{10}$

17 **(a)**

$$\frac{N}{N_0} = \left(\frac{1}{2}\right)^n \Rightarrow \frac{1}{8} = \left(\frac{1}{2}\right)^n \Rightarrow n = 3$$

Now $t = n \times T_{1/2} = 3 \times 3.8 = 11.4\ days$

18 **(c)**

Experimental measurements show that volume of a nucleus is proportional to its mass number A. If R is the radius of the nucleus assumed to be spherical, then its volume

$$\left(\frac{4}{3}\pi R^3\right) \propto A$$

or $R \propto A^{1/3}$

or $R = R_0 A^{1/3}$

where R_0 is an empirical constant whose value is found to be 1.1×10^{-15} m.

20 **(a)**

Rest energy of an electron $= m_e c^2$

Here $m_e = 9.1 \times 10^{-31} kg$ and $c =$ velocity of light

$\therefore$ Rest energy $= 9.1 \times 10^{-31} \times (3 \times 10^8)^2 joule$

$$= \frac{9.1 \times 10^{-31} \times (3 \times 10^8)^2}{1.6 \times 10^{-19}} eV = 510\ keV$$

ANSWER-KEY

Q.	1	2	3	4	5	6	7	8	9	10
A.	B	C	A	B	B	B	C	A	B	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	C	A	C	A	C	A	A	C	A	A