DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 5

Topic :-NUCLEI

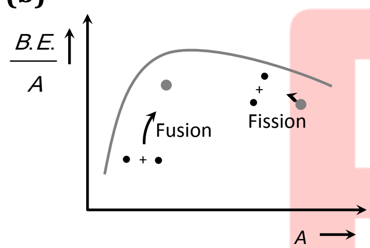
1 **(c)**

$$N = N_0\left(\frac{1}{2}\right)^{\frac{t}{T_{1/2}}} \Rightarrow \frac{N}{N_0} = \left(\frac{1}{2}\right)^{\frac{30}{10}} = \frac{1}{8} = 0.125$$

2 **(d)**

${}_4Be^9 + {}_2He^4 \rightarrow {}_6C^{12} + {}_0n^1$

3 **(b)**



4 **(b)**

Bohr postulated that the angular momentum of the electron is conserved

5 **(d)**

After emitting β-particle (${}_{-1}e^0$) mass of nucleus doesn't change

6 **(c)**

In nuclear fission, neutrons are released

7 **(a)**

In Lyman series $(\lambda_{\min})_L = \frac{1}{R}$ and $(\lambda_{\min})_B = \frac{4}{R}$

$\Rightarrow (\lambda_{\min})_B = 4 \times (\lambda_{\min})_L = 4 \times 912 = 3648$ Å

8 **(c)**

$$\Delta E = mc^2 - m_0c^2 = \frac{m_0c^2}{\sqrt{1-(v^2/c^2)}} - m_0c^2$$

$$= m_0c^2\left(\frac{1}{\sqrt{1-(v^2/c^2)}} - 1\right) = 0.511\left(\frac{1}{\sqrt{0.75}} - 1\right)$$

$$= 0.079\ MeV$$

9 **(a)**

In fission process, when a parent nucleus breaks into daughter products, then some mass is lost in the form of energy. Thus, mass of fission products < mass of parent nucleus

$\Rightarrow \qquad \frac{\text{Mass of fission products}}{\text{Mass of parent nucleus}} < 1$

10 **(c)**

$\frac{N}{N_0} = \left(\frac{1}{2}\right)^{\frac{t}{t_{1/2}}} \Rightarrow \frac{1}{4} = \left(\frac{1}{2}\right)^{\frac{t}{10}}$

$\Rightarrow \frac{t}{10} = 2 \Rightarrow t = 20$

11 **(d)**

Suppose closest distance is r, according to conservation of energy

$400 \times 10^3 \times 1.6 \times 10^{-19} = 9 \times 10^9 \frac{(ze)(2e)}{r}$

$\Rightarrow 6.4 \times 10^{-14} = \frac{9 \times 10^9 \times (82 \times 1.6 \times 10^{-19}) \times (2 \times 1.6 \times 10^{-19})}{r}$

$\Rightarrow r = 5.9 \times 10^{-13} m = 0.59\ pm$

13 **(a)**

$\frac{R_1}{R_2} = \left(\frac{A_1}{A_2}\right)^{1/3} = \left(\frac{27}{125}\right)^{1/3} = \frac{3}{5} = 6:10$

14 **(a)**

$N = \frac{N_0}{2^n} = \frac{N_0}{2^{1/2}} = \frac{N_0}{\sqrt{2}}$

15 **(d)**

${}_{48}Cd^{115} \xrightarrow{2({}_{-1}\beta^0)} {}_{50}Sn^{115}$

16 **(b)**

In positive beta decay a proton is transformed into a neutron and a positron is emitted.

$p^+ \rightarrow n^0 + e^+$

Number of neutrons initially was $A - Z$.

Number of neutrons after decay $(A - Z) - 3 \times 2$(due to alpha particles) $+ 2 \times 1$(due to positive beta decay).

The number of protons will reduce by 8 [as 3×2 (due to alpha particles) $+ 2$(due to positive beta decay)].

Hence, atomic number reduces by 8.

So, the ratio number of neutrons to that of protons

$= \frac{A - Z - 4}{Z - 8}$

17 **(a)**

The activity or decay rate R of radioactive substance is the number of decays per second.

$\therefore \quad R = \lambda N$

or $R = \lambda N_0 \left(\frac{1}{2}\right)^{t/T_{1/2}}$

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where $R_0 = \lambda N_0$ is the activity of radioactive substance at time $t = 0$.

According to question,

$$\frac{R}{R_0} = 1 - \frac{75}{100} = 25\%$$

$\therefore \quad \frac{25}{100} = \left(\frac{1}{2}\right)^{t/T_{1/2}}$

or $\left(\frac{1}{2}\right)^2 = \left(\frac{1}{2}\right)^{t/T_{1/2}}$

or $\frac{t}{T_{1/2}} = 2$

$\therefore \quad t = 2T_{1/2} = 2 \times 3.20 = 6.40\ h$

or $\quad t \approx 6.38$ h

18 **(b)**

In the spectral series of the hydrogen atom, Lyman series is in the ultraviolet region, Balmer series is in the visible region, paschen, Brackett and pfund are in the infrared region of the electromagnetic spectrum

19 **(d)**

${}_4^9Be + {}_2^4He \rightarrow {}_6^{12}C + {}_0^1x$

Clearly, it is a neutron

20 **(a)**

Let initial activity of both substances are same.

$$R = R_0\left(\frac{1}{2}\right)^n = R_0\left(\frac{1}{2}\right)^{t/t_{1/2}}$$

$\therefore \quad \frac{R_1}{R_2} = \frac{\left(\frac{1}{2}\right)^{4/1}}{\left(\frac{1}{2}\right)^{4/2}} = \frac{\left(\frac{1}{2}\right)^4}{\left(\frac{1}{2}\right)^2} = \left(\frac{1}{2}\right)^2$

$\Rightarrow \quad \frac{R_1}{R_2} = \frac{1}{4}$

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