DPP

DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 8

Topic :- NUCLEI

1 **(a)**

From Rutherford-Soddy law

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

$n = \frac{38}{3.8} = 10$

The initial quantity of radon $N_0 = 1024\ mg$.

Therefore, the mass of radon left after 10 half-lives is

$N = 1024 \times \left(\frac{1}{2}\right)^{10} = \frac{1024}{1024} = 1\text{mg}.$

2 **(b)**

$N = N_0 e^{-\lambda t}$

$N = ne^{-\lambda t}$

The number of decay between 0 and t $N_0 - N$

$= n - ne^{-\lambda t} = n(1 - e^{-\lambda t}) = n(1 - e^{-t/T})$

3 **(c)**

The nuclear reactions is as follows

${}_7\text{N}^{14} + {}_2\text{He}^4 \rightarrow {}_8\text{O}^{17} + {}_qX^p$

Conservation of mass number gives

$P = 14 + 4 - 17 = 1$

Conservation of atomic number gives

$a = 7 + 2 - 8 = 1$

Hence, particle is a proton ${}_1\text{H}^1$.

4 **(b)**

${}_1H^2 + {}_1H^2 \rightarrow {}_2He^4 + Q$

5 **(a)**

For isotopes Z is same and A is different. Therefore the number of neutrons $A - Z$ will also be different

8 **(b)**

$\text{Power} = \frac{\text{energy}}{\text{time}} = 300 \times 10^6 \text{ watt}$

$= 3 \times 10^8\ \text{J/s}$

$$170 \text{ MeV} = 170 \times 10^{6} \times 1.6 \times 10^{-19}$$
$$= 27.2 \times 10^{-12} \text{ J}$$

Number of atoms fissioned per second

$$= \frac{3 \times 10^{8}}{27.2 \times 10^{-12}}$$
$$= \frac{3 \times 10^{20}}{27.2}$$

Number of atoms fissioned per hour

$$= \frac{3 \times 10^{20} \times 3600}{27.2}$$
$$= \frac{3 \times 36}{27.2} \times 10^{22} = 4 \times 10^{22} \text{ m}$$

9 **(a)**

K.E. $= -$ (T.E.)

10 **(c)**

'Rad' is used to measure biological effect of radiation.

12 **(a)**

$$\frac{1}{\lambda_{\text{Balmer}}} = R\left[\frac{1}{2^2} - \frac{1}{3^2}\right] = \frac{5R}{36}, \frac{1}{\lambda_{\text{Lyman}}} = R\left[\frac{1}{1^2} - \frac{1}{2^2}\right] = \frac{3R}{4}$$

$$\therefore \lambda_{\text{Lyman}} = \lambda_{\text{Balmer}} \times \frac{5}{27} = 1215.4 \text{ Å}$$

14 **(a)**

$$N = N_0\left(\frac{1}{2}\right)^{\frac{t}{T_{1/2}}} = N_0\left(\frac{1}{2}\right)^{\frac{15}{5}} = \frac{N_0}{8}$$

15 **(b)**

Half life of neutron $T_{1/2} = 12$ min

Mean life $= T_{1/2} + 44\% \ of \ T_{1/2}$

$\approx$ 17 min $\approx$ 1000sec

16 **(a)**

A and C are isotopes as their charge number is same

18 **(c)**

Energy in excited state $= -13.6 + 12.1 = -1.5$ eV

$$\therefore \frac{-13.6}{n^2} = -1.5$$

$$\therefore n = \sqrt{\frac{13.6}{1.5}} = 3$$

Number of spectral lines

$$= \frac{n(n-1)}{2} = \frac{3(3-1)}{2} = 3$$

19 **(b)**

Heavy water is used in certain type of nuclear where it acts as a neutron moderator to slow down neutrons so that they can react with uranium in the reactor.

20 **(b)**

$N = N_0 e^{-\lambda t}$

Variation of N is exponential

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