

# DPP

DAILY PRACTICE PROBLEMS

Class : XII<sup>th</sup>  
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  $N_0 = 1024 \text{ mg}$ .

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)

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

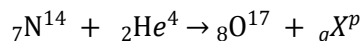
$$N = n e^{-\lambda t}$$

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

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

3 (c)

The nuclear reactions is as follows



Conservation of mass number gives

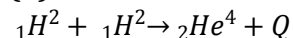
$$P = 14 + 4 - 17 = 1$$

Conservation of atomic number gives

$$a = 7 + 2 - 8 = 1$$

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

4 (b)



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)**

$$\text{K.E.} = - (\text{T.E.})$$

10

**(c)**

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

12

**(a)**

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

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

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**(a)**

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

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**(b)**

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

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

$$\approx 17 \text{ min} \approx 1000 \text{ sec}$$

16

**(a)**

A and C are isotopes as their charge number is same

18

**(c)**

Energy in excited state =  $-13.6 + 12.1 = -1.5 \text{ eV}$

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

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

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

PE

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

PE