# DPP
DAILY PRACTICE PROBLEMS

**Class : XIIth** | **Solutions** | **Subject : PHYSICS**
**Date :** | | **DPP No. : 6**

## Topic :- NUCLEI

1 **(b)**

By using $R = R_0 A^{1/3} \Rightarrow \frac{R_1}{R_2} = \left(\frac{A_1}{A_2}\right)^{1/3}$

$\Rightarrow \frac{R}{R_{He}} = \left(\frac{A}{4}\right)^{1/3} \Rightarrow (14)^{1/3} = \left(\frac{A}{4}\right)^{1/3}$

$\Rightarrow A = 56$ so $Z = 56 - 30 = 26$

2 **(d)**

Extremely high temperature needed for fusion make KE large enough to overcome repulsion between nuclei.

3 **(c)**

Number of lines in absorption spectrum $= (n-1)$

$\Rightarrow 5 = n - 1 \Rightarrow n = 6$

$\therefore$ Number of bright lines in the emission spectrum

$= \frac{n(n-1)}{2} = \frac{6(6-1)}{2} = 15$

4 **(c)**

From conservation of momentum

$4v = (A-4)v_1$

$v_1 = \left(\frac{4v}{A-4}\right)$

5 **(d)**

Number of $\alpha -$ particles emitted $= \frac{238 - 222}{4} = 4$

This decreases atomic number to $90 - 4 \times 2 = 82$

Since atomic number of ${}_{83}Y^{222}$ is 83, this is possible of one $\beta -$ particle is emitted

6 **(a)**

${}_{92}X^{235} \xrightarrow{\alpha} {}_{90}X^{231} \xrightarrow{{}_{-1}e^0} {}_{91}Y^{231}$

7 **(b)**

By using $N = N_0 e^{-\lambda t}$ and $t = \tau = \frac{1}{\lambda}$

Substance remains $= N = \frac{N_0}{e} = 0.37 N_0 \simeq \frac{N_0}{3}$

$\therefore$ Substance disintegrated $= N_0 - \frac{N_0}{3} = \frac{2N_0}{3}$

8 **(c)**

After $t$ second fractional amount of $X$ left is $\frac{1}{16}$ or $\left(\frac{1}{2}\right)^4$

$\therefore t = 4 \times T_{1/2} = 4 \times 50 = 200\ years$

9 **(d)**

${}_{72}A^{100} \xrightarrow{-\alpha} {}_{70}A_1^{176} \xrightarrow{-\beta} {}_{71}A_2^{176} \xrightarrow{-\alpha}$

${}_{69}A_3^{172} \xrightarrow{\gamma} {}_{69}A_4^{172}$

10 **(c)**

Charge density is uniform inside and then falls rapidly near the surface of the nucleus

11 **(a)**

Number of protons $= 2 + 2 + 6 + 2 + 6 = 18$

Number of neutrons $= 40 - 18 = 22$

12 **(d)**

By using $N = N_0 e^{-\lambda t}$ and $\frac{dN}{dt} = -\lambda N$

It shows that $N$ decreases exponentially with time

13 **(c)**

In critical condition, $k$=1. The chain reaction will be steady. The size of the fissionable material used is said to be critical size and its mas the critical mass.

14 **(c)**

Radius of $n^{\text{th}}$ orbit for any hydrogen like atom

$r_n = r_0\left(\frac{n^2}{Z}\right)$ ($r_0 =$ radius of first orbit of $H_2$-atom)

If $r_n = r_0 \Rightarrow n = \sqrt{2}$. For $Be^{+++}$,$Z = 4 \Rightarrow n = 2$

16 **(a)**

For $n = 1$, maximum number of states $= 2n^2 = 2$ and for $n = 2, 3, 4$, maximum number of states would be 8, 18, 32 respectively, Hence number of possible elements

$= 2 + 8 + 18 + 32 = 60$

17 **(b)**

After one α- emission, the daughter Nucleus reduces in mass number by 4 unit and in atomic number by 2 unit. In β- emission the atomic number of daughter nucleus increases by 1 unit.

The reaction can be written as

${}_{92}\text{U}^{238} \xrightarrow{-8\alpha} {}_{76}X^{206} \xrightarrow{-6\beta} {}_{82}Y^{206}$

Thus, the resulting nucleus is ${}_{82}Y^{206}$ie, ${}_{82}\text{Pb}^{206}$.

19 **(d)**

In the given case, 12 days = 3 half lives Number of atoms left after 3 half live

$= 6.4 \times 10^{10} \times \frac{1}{2^3} = 0.8 \times 10^{10}$

20 **(d)**

Radioactive decay does not depend upon the time of creation.

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