DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 10

Topic :-NUCLEI

1 **(b)**

$F = kq_1\, q_2/r^2$,i.e.,

$$F = \frac{9 \times 10^9 \times 1.6 \times 10^{-19} \times 1.6 \times 10^{-19}}{(2.5 \times 10^{-11})^2} = 3.7 \times 10^{-7} N$$

4 **(d)**

Helium atom has 2 electrons. When one electron is removed, the remaining atom is hydrogen like atom, whose energy in first orbit is

$E_1 = -\,(2)^2(13.6 \text{ eV}) = -54.4 \text{ eV}$

Therefore, to remove the second electron from the atom, the additional energy of 54.4 eV is required. Hence, total energy required to remove both the electrons

$= 24.6 + 54.4 = 79.0$ eV

5 **(a)**

This is due to mass defect because a part of mass is used in keeping the neutrons and protons bound as $\alpha -$ particle

6 **(a)**

From Rutherford-Soddy law

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

$n = \frac{t}{T}$

$$\therefore\ 10^6 = 1.414 \times 10^6\left(\frac{1}{2}\right)^{t/T}$$

$\Rightarrow\ \frac{1000}{1414} = \left(\frac{1}{2}\right)^{t/T}$

$\Rightarrow \left(\frac{1}{2}\right)^2 = \left(\frac{10}{12}\right)^2$ (Approximately)

$\Rightarrow\ n = 2$

$\Rightarrow\ \text{n} = \frac{t}{T} = 2$

$\Rightarrow\ T = \frac{10}{2} = 5 \text{ min}$

7 **(d)**

$E = \Delta mc^2 = 1 \times (3 \times 10^8)^2 = 9 \times 10^{16} J$

$\Rightarrow E = \dfrac{9 \times 10^{16}}{1.6 \times 10^{-19}} = 5.625 \times 10^{35} eV = 5.625 \times 10^{29} MeV$

9 **(c)**

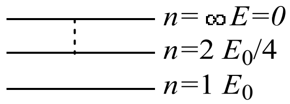
${}_{85}X^{297} \rightarrow {}_{77}Y^{281} + 4({}_{2}He^4)$

10 **(d)**

Minimum wavelength is for highest energy

$n = 1 \rightarrow n = \infty$, energy $= E_0$

$n = 2 \rightarrow n = \infty$, energy $= E_0/4$



$\therefore$ Balmer line has 4 times the wavelength

$\therefore$ Ratio of minimum wavelength is $1/4 = 0.25$

12 **(d)**

Activity reduces from 6000dps to 3000dps in 140 days. It implies that half-life of the radioactive sample is 140 days. In 280 days (or two half-lives)activity will remain $\frac{1}{4}$ th of the initial activity . Hence the initial activity of the sample is

4×6000 dps $= 24000$ dps

13 **(b)**

The working of hydrogen bomb is based upon nuclear fusion.

15 **(a)**

(i) ${}_{16}S^{32} + {}_{0}n^1 \rightarrow {}_{15}p^{32} + {}_{1}H^1$

(ii) ${}_{9}F^{19} + {}_{1}H^1 \rightarrow {}_{2}He^4 + {}_{8}O^{16}$

(iii) ${}_{7}N^{14} + {}_{0}n^1 \rightarrow {}_{6}C^{14} + {}_{1}H^1$

16 **(b)**

Number of atoms remains undecayed $N = N_0 e^{-\lambda t}$

Number of atoms decayed $= N_0(1 - e^{-\lambda t})$

$= N_0\left(1 - e^{-\lambda \times \frac{1}{\lambda}}\right) = N_0\left(1 - \frac{1}{e}\right) = 0.63\, N_0 = 63\%$ of N_0

17 **(d)**

By using $A = A_0\left(\frac{1}{2}\right)^{\frac{1}{T_{1/2}}} \Rightarrow \frac{A}{A_0} = \left(\frac{1}{2}\right)^{9/3} = \frac{1}{8}$

19 **(d)**

Decrease in mass number $= 4$

Decreases in charge number $= 2 - 1 = 1$

20 **(c)**

$T \propto n^3$

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