DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 4

Topic :-NUCLEI

1 **(d)**

Because sound waves require medium to travel through and there is no medium (air) on moon's surface

2 **(c)**

By using $v = Rc\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

$\Rightarrow v = 10^7 \times (3 \times 10^8)\left[\frac{1}{4^2} - \frac{1}{5^2}\right] = 6.75 \times 10^{13} Hz$

4 **(a)**

For Bracket series $\frac{1}{\lambda_{\max}} = R\left[\frac{1}{4^2} - \frac{1}{5^2}\right] = \frac{9}{25 \times 16} R$

and $\frac{1}{\lambda_{\min}} = R\left[\frac{1}{4^2} - \frac{1}{\infty^2}\right] = \frac{R}{16} \Rightarrow \frac{\lambda_{\max}}{\lambda_{\min}} = \frac{25}{9}$

5 **(b)**

$\frac{N}{N_0} = \left(\frac{1}{2}\right)^{t/T} \Rightarrow \left(\frac{1}{16}\right) = \left(\frac{1}{2}\right)^{2/T} \Rightarrow \left(\frac{1}{2}\right)^4 = \left(\frac{1}{2}\right)^{2/T}$

$\Rightarrow T = 0.5\ hour = 30\ minutes$

6 **(a)**

${}_8O^{18} + {}_1H^1 \rightarrow {}_9F^{18} + {}_0n^1$

7 **(d)**

In time $t = T$, $N = \frac{N_0}{2}$

In another half-life,(ie, after 2 half-lives)

$N = \frac{1}{2}\frac{N_0}{2} = \frac{N_0}{4} = N_0\left(\frac{1}{2}\right)^2$

After yet another half-life ,(ie, after 3 half-lives)

$N = \frac{1}{2}\left(\frac{N_0}{4}\right) = \frac{N_0}{8} = N_0\left(\frac{1}{2}\right)^3$ and so on. Hence, after n half-lives

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

$= N_0\left(\frac{1}{2}\right)^{t/T}$

where $t = n \times T$ = total time of n half-lives.

Here, $n = \frac{t}{T} = \frac{19}{3.8}$

$= 5$

$\therefore$ The fraction left

$$\frac{N}{N_0} = \left(\frac{1}{2}\right)^n = \left(\frac{1}{2}\right)^5 = \frac{1}{32}$$

$$= 0.031$$

9 **(c)**

$$N = N_0\, e^{-\lambda t} \Rightarrow \ln\frac{N_0}{N} = \lambda t$$

$$t = \frac{1}{\lambda}\ln\frac{N_0}{N} \Rightarrow t = \frac{2.303 \times T_{1/2}}{0.693}\log_{10}\frac{N_0}{N}$$

$$\frac{N_0}{N} = 10, T_{1/2} = 10\ day \Rightarrow t = 33.23\ days$$

10 **(d)**

In vector form of Coulomb's law proves that the forces $\mathbf{F}_{12}$ and $\mathbf{F}_{21}$ are equal and opposite.

or $\mathbf{F}_{21} = \mathbf{F}_{12}$

$\mathbf{F}_{pe} = \mathbf{F}_{ep}$

$\mathbf{F'}_{pe} = \mathbf{F'}_{ep}$

And $\mathbf{F}_{pe} + \mathbf{F}_{ep} = -\mathbf{F'}_{ep} + \mathbf{F'}_{pe}$

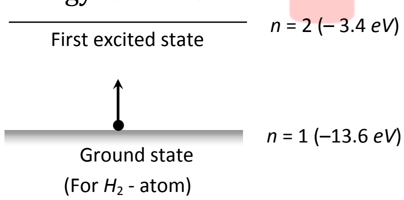
So option (d) is incorrect.

11 **(b)**

$$\frac{1}{\lambda} = R\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right] = R\left[\frac{1}{(2)^2} - \frac{1}{(4)^2}\right] \Rightarrow \lambda = \frac{16}{3R}$$

13 **(c)**

Energy to excite the e^- from $n = 1$ to $n = 2$



$$E = -3.4 - (-13.6) = 10.2eV = 10.2 \times 1.6 \times 10^{-19}$$

$$= 1.632 \times 10^{-18} J$$

14 **(b)**

The mass excess per nucleon of isotopes of atom is known as packing fraction given by

$$P = \frac{M - A}{A}$$

Where M is the actual mass of isotope and A is its atomic mass.

Packing fraction is positive for isotope having very low or very high mass number and negative for all others.

15 **(d)**

$$N_1 = \frac{N_{01}}{(2)^{t/20}}, N_2 = \frac{N_{02}}{(2)^{t/10}}$$

$$N_1 = N_2$$

$$\frac{40}{(2)^{t/20}} = \frac{160}{(2)^{t/10}} \Rightarrow 2^{t/20} = 2^{\left(\frac{t}{10}-2\right)}$$

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

$$\Rightarrow \frac{t}{20} = 2 \Rightarrow t = 40$$

18 **(b)**

Conserving the momentum

$$0 = \frac{M}{2}v_1 - \frac{M}{2}v_2$$

$$v_1 = v_2 \quad \ldots(i)$$

$$\Delta mc^2 = \frac{1}{2}\cdot\frac{M}{2}v_1^2 + \frac{1}{2}\cdot\frac{M}{2}v_2^2 \quad \ldots(ii)$$

$$\Delta mc^2 = \frac{M}{2}v_1^2$$

$$\frac{2\Delta mc^2}{M} = v_1^2$$

$$v_1 = c\sqrt{\frac{2\Delta m}{M}}$$

19 **(a)**

The proton is the most stable in the Baryon group

20 **(a)**

Activity of substance that has 2000 disintegrations/sec

$$= \frac{2000}{3.7 \times 10^{10}} = 0.054 \times 10^{-6} ci = 0.054\ \mu ci$$

The number of radioactive nuclei having activity A

$$N = \frac{A}{\lambda} = \frac{2000 \times T_{1/2}}{\log_e 2}$$

$$= \frac{2000 \times 138.6 \times 24 \times 3600}{0.693} = 3.45 \times 10^{10}$$

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