Sri Chaitanya IIT Academy, India

A.P, TELANGANA, KARNATAKA, TAMILNADU, MAHARASHTRA, DELHI, RANCHI

A right Choice for the Real Aspirant

ICON CENTRAL OFFICE, MADHAPUR-HYD

Sec: Sr. IPLCO **JEE ADVANCED** **DATE : 27-12-15**
TIME : 3:00 **2014_P1 MODEL** **MAX MARKS : 180**

KEY & SOLUTIONS

PHYSICS

1	**AB**	2	**ABD**	3	**CD**	4	**BD**	5	**BD**	6	**D**
7	**AC**	8	**ABC**	9	**ACD**	10	**BCD**	11	**6**	12	**3**
13	**6**	14	**1**	15	**4**	16	**9**	17	**5**	18	**4**
19	**3**	20	**1**								

CHEMISTRY

21	**ACD**	22	**D**	23	**BD**	24	**AC**	25	**ABD**	26	**ABD**
27	**BD**	28	**BC**	29	**D**	30	**AC**	31	**2**	32	**5**
33	**3**	34	**9**	35	**5**	36	**6**	37	**1**	38	**2**
39	**0**	40	**1**								

MATHEMATICS

41	**AC**	42	**BCD**	43	**AB**	44	**ABD**	45	**ABC**	46	**ACD**
47	**ACD**	48	**ACD**	49	**ABCD**	50	**ABCD**	51	**0**	52	**8**
53	**2**	54	**9**	55	**6**	56	**4**	57	**3**	58	**6**
59	**7**	60	**6**								

PHYSICS

5. sol $\underset{z}{A_X} \rightarrow \underset{z-1}{A_Y} \quad +\beta^+ + \nu \quad \left(\beta^+ \text{ decay}\right)$

$\underset{z}{A_X} + \beta^- \rightarrow \quad \underset{z-1}{A_Y} \quad +\nu$

Q in the β decay $= \left[m\left(\underset{z}{A_X}\right) - m\left(\underset{z-1}{A_Y}\right) - 2m_e \right] C^2$

Q in EC $= \left[m\left(\underset{z}{A_X}\right) - m\left(\underset{z-1}{A_Y}\right) \right] C^2$

Since only two particles form from a single particle, the energy of ν is unique in EC.

6. Current at any cross section remains same as number of electrons coming out of cathode per unit time

Also velocity increases from A to B due to accelerating voltage.

11. At steady state energy released per sec

$= \eta \times r\left(E_1 + E_2\right)$

$\eta = 25\%$

$r = 10^{15}$

$E_1 = 100 \times 10^6 \times 1.6 \times 10^{-19} = 1.6 \times 10^{-11} J$

$E_2 = 50 \times 10^6 \times 1.6 \times 10^{-19} = 0.8 \times 10^{-11} J$

12. ans Minimum energy required $= BE \times \dfrac{m_D + m_p}{m_D} = 2 \times 10^6 \times \dfrac{3}{2}$

$= 3 \times 10^6 eV.$

13. sol Energy of a photon emitted for transition $n_2 \; to \; n_1$ is given by

$\Delta E = 13.6\left(\dfrac{1}{n_1^2} - \dfrac{1}{n_2^2}.\right) eV \qquad ...(1)$

$\Delta E = 13.6\left(\dfrac{1}{1^2} - \dfrac{1}{2^2}\right) eV = 40.8 eV \qquad ...(5)$

$\frac{1}{2}mv^2 = (40.8-13.6)eV = 27.2eV$

$\therefore \quad v = 3.1\times10^6 \ m/s$

$\therefore \quad x = 6$

14. sol $\frac{dN_A}{dt} = +C - \lambda N_A$

$\int_0^{N_A} \frac{dN_A}{C-\lambda N_A} = \int_0^t dt \Rightarrow \ln\frac{C-\lambda N_A}{C} = -\lambda t$

$N_A = \frac{C}{\lambda}\left(1-e^{-\lambda t}\right)$

$N_B = no.of\ N_A\ decayed = Ct - \frac{C}{\lambda}\left(1-e^{-\lambda t}\right)$

$at\ t = \frac{1}{\lambda} \Rightarrow\ N_B = \frac{C}{\lambda} - \frac{C}{\lambda} + \frac{Ce^{-1}}{\lambda}$

$= \frac{C}{\lambda}e^{-1} \Rightarrow \frac{100\times10^6}{37}\times0.37 = 1\times10^6$

$\therefore x = 1$

15. sol Let N_o be initial number of active nuclides of ^{238}U

Given $\frac{N(Pb)}{N(U)} = \frac{1}{2} \Rightarrow \frac{N_o - N_o e^{-\lambda t}}{N_o e^{-\lambda t}} = \frac{1}{2} \Rightarrow e^{-\lambda t} - 1 = \frac{1}{2}$

$\Rightarrow t = \frac{T_{1/2}\ln(1.5)}{\ln 2} = 4.5\times10^9 \frac{\ln\left(\frac{3}{2}\right)}{\ln 2}$ year

16. sol $128\ N = N_0 e^{-\lambda_1 t} \quad ...(i)$

$N = N_0 e^{-\lambda_2 t} \quad ...(ii)$

$128 = e^{-\lambda_2 t + \lambda_2 t}$

$\Rightarrow \quad l\text{n}\ 128 = \left(-\frac{l\text{n}\,2}{4.5\times10^9} + \frac{l\text{n}\,2}{7\times10^8}\right)t$

$\Rightarrow \quad 7l\text{n}\,2 = l\text{n}\,2\left[\frac{1}{7\times10^8} - \frac{1}{4.5\times10^9}\right]t$

$\Rightarrow \quad 7l\left[\frac{(45-7)}{7\times45\times10^8}\right]t \quad \Rightarrow \quad \frac{49\times9}{38\times2}\times10^9 = t$

Hence X = 9