Daily Tutorial Sheet 1	Level – 1

1.(C) In lightest nuclei i.e. ${}_1^1H$ there is only one proton and zero neutrons and $m_p = (1836)m_e$

2.(A) N contains $7e^-$ which on removal of $1e^-$ converts into N^+, so, N^+ contains $6e^-$ which is equal to number of e^-s in carbon atom.

3.(C) Isodiaphers have same value of (n - p) or (A - 2Z).

4.(B) Cathode Rays – consists of e^-s and e^-s have a fixed e/m ratio.

5.(A) Number of photoelectrons emitted is proportional to intensity of incident light (only if frequency of light is greater than threshold frequency).

6.(D) E_k refers to maximum kinetic energy of emitted electrons.

7.(B) $K.E_{max} = h\nu - h\nu_0$

$$\nu - \nu_0 = \frac{K.E_{max}}{h} = \frac{6.63 \times 10^{-19} J}{6.63 \times 10^{-34} J.sec} = 10^{15}\ sec^{-1} \quad \Rightarrow \quad \nu_0 = (2-1) \times 10^{15} Hz = 10^{15} Hz$$

8.(B) Bohr's theory is applicable to single electron species.

9.(A) $r_n\ \alpha\ \frac{n^2}{Z}$; for H, $r_n\ \alpha\ n^2$

For $n = 1$, $r = k(1)^2$

For n^{th} orbit ; $r_n = kn^2 = rn^2$

10.(B) $E_n = -13.6\frac{Z^2}{n^2}$ i.e. $-3.4 = -13.6 \times \frac{1^2}{n^2} \quad \Rightarrow \quad n = \sqrt{\frac{13.6}{3.4}} = 2$

11.(C) $\Delta E = 13.6\left[\frac{1}{(n_1)^2} - \frac{1}{(n_2)^2}\right] eV$,

ΔE is maximum when $n_2 \to \infty$ and $n_1 = 1$.

12.(C) $K.E. = eV$ [V : Potential difference]

$\frac{1}{2}mv^2 = eV$ (e : charge] $\Rightarrow \quad v = \sqrt{\frac{2eV}{m}}$

13.(D) Shortest wavelength is given when highest energy change is there. $\frac{1}{\lambda} = RZ^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$

For Lyman series in H, it is $n = \infty \to 1 \quad \Rightarrow \quad \frac{1}{x} = R \times (1)^2\left[\frac{1}{(1)^2} - \frac{1}{(\infty)^2}\right] = R$

And for longest wavelength of Balmer series in He^+, transition is from n = 3 to n = 2. Let wavelength is y.

$$\Rightarrow \quad \frac{1}{y} = R \times (2)^2\left[\frac{1}{(2)^2} - \frac{1}{(3)^2}\right] = R \times 4\ \frac{(5)}{4 \times 9} \quad \Rightarrow \quad \frac{x}{y} = \frac{5}{9} \quad \Rightarrow \quad y = \frac{9x}{5}$$

14.(D) Angular momentum = $\frac{nh}{2\pi}$

For 5th orbit, n = 5 $\Rightarrow$ A.M. = $\frac{5h}{2\pi} = 2.5\frac{h}{\pi}$

15.(D) Wavelength (λ) = $\frac{hc}{E} = \frac{6.63\times10^{-34}\times3\times10^{8}}{4.4\times10^{-14}}$

$\lambda = 4.52\times10^{-12}\text{m}$