16.(D) **(a)** $K.E. \propto v^2$

$$K.E. \propto \left(\frac{Z}{n}\right)^2$$

(b) $$\text{Frequency} \propto \frac{1}{T} \propto \frac{v}{2\pi r} \propto \left(\frac{Z}{n}\right)\frac{Z}{n^2}$$

$$f \propto \left(\frac{Z^2}{n^3}\right)$$

(c) $$F \propto \frac{q_1 q_2}{r^2} \propto \left(\frac{Z^3}{n^4}\right)$$

(d) $$\text{momentum} \propto v \propto \left(\frac{Z}{n}\right)$$

17.(B) Hydrogen atom has 1 proton and 1 electron. $\therefore$ ionized hydrogen atom has only 1 proton.

18.(B) Most of the space is empty i.e. volume of atom is very large in comparison to volume of nucleus.

19.(C) $$\left(\frac{q}{m}\right)_\alpha = \frac{2q_p}{4m_p} = \frac{1}{2}\left(\frac{q}{m}\right)_p$$

20.(C) Tritium contains one proton and two neutrons.

21.(C) $r \propto \frac{n^2}{Z} \Rightarrow$ for Be^{3+}, $r \propto \frac{2^2}{4}$

22.(A) Angular Momentum = $\frac{nh}{2\pi} = n\hbar = 3\hbar$

23.(B) $K.E. = -\frac{1}{2}P.E. \Rightarrow T.E. = KE + PE = \frac{1}{2}P.E.$; So Ratio of K.E. to T.E. = –1

24.(D) $$x = \frac{60}{hc/\lambda} = \frac{60 \times 663 \times 10^{-9}}{6.63 \times 10^{-34} \times 3 \times 10^8} = 2 \times 10^{20}$$

25.(D) $E_n \propto \frac{1}{n^2}$; For ionisation $n = 1 \to \infty$

$$\Delta E \text{ (From } n = 1 \to 2) = 1.312 \times 10^6\left(1 - \frac{1}{4}\right) = 9.84 \times 10^5 \text{ J mol}^{-1}$$

26.(B) $T = \frac{1}{f}$ where f is frequency

27.(C) Transition of electron from lower energy orbit of higher energy orbit occurs upon absorbing fixed amount of energy (i.e. fixed frequency radiation) that corresponds to the energy gap between the two orbits.

28.(A) Isobars have equal mass number [protons + neutrons]
Isotopes have equal atomic no. [Protons]
Isotones have equal neutrons.

29.(D) $$\frac{E_4}{E_2} = \frac{2^2}{4^2} = \frac{1}{4} \quad \Rightarrow \quad E_4 = -82 \text{ kJ/mol}$$

30.(D) $r = 0.529\frac{n^2}{Z}$ for H-atom, Z = 1 $\therefore$ $r = 0.529 \times \frac{3^2}{1} = 4.76$ Å