30.(C) Transition energy $(\Delta E) = kZ^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right) = \frac{hc}{\lambda}$ i.e., $\Delta E \propto \frac{1}{\lambda}$

31.(C) $Cl(17) = 1s^2\,2s^2\,2p^6\,3s^2\,3p^5$

The last, unpaired electron has, $n = 3, l = 1(p)$ and m can have any of the three value $(-1, 0, +1)$

32.(A) $Cr(24) = \underbrace{1s^2\,2s^2\,2p^6\,3s^2\,3p^6}_{Ar}\;3d^5\;4s^1$

The above configuration is exception to Aufbau's principle.

33.(C) X-rays is electrically neutral, not deflected in electric or magnetic fields.

34. Orbital

35. **(Orientation in space)**

$2p_x$, $2p_y$ and $2p_z$ have different orientation in space.

36.(True) Very large mass of alpha particles than beta particles is responsible for less deflection in former case.

37. $Cr = [Ar]3d^5, 4s^1$

38.(C) Total number of nodes $= (n - 1)$

For 3p orbital, total nodes $= 3 - 1 = 2$

Number of radial nodes $= n - l - 1$

For 3p orbital, radial nodes $= 3 - 1 - 1 = 1$

Number of angular nodes = l

For 3p orbital number of angular nodes $= 1$

[For 3p orbital, n = 3, l = 1].

39.(D) Diffraction is property of wave, $E = mc^2$ determine energy of particle and $E = h\nu$ determine energy of photon.

40.(B) Expression for orbital angular momentum (*L*) is $L = \sqrt{l(l+1)}\,\frac{h}{2\pi} = 0$ for 3s-electrons

$\because$ For s-orbital, $l = 0$

41.(D) $Mg^{2+} = 1s^2\,2s^2\,2p^6$ no unpaired electron

$Ti^{3+} = 1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^1$ one unpaired electron

$V^{3+} = 1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^2$ two unpaired electrons

$Fe^{2+} = 1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^6$ four unpaired electrons

42.(A) The orbital angular momentum $(L) = \sqrt{l(l+1)}\,\frac{h}{2\pi} = \sqrt{6}\,\frac{h}{2\pi}$ ($l = 2$ for d-orbital)

43.(B) Bohr first made use of quantum theory to explain the structure of atom and proposed that energy of electron in an atom is quantised.

44. **(Heisenberg, de-Broglie)**

Heisenberg proposed uncertainty principle and de-Broglie proposed wave nature of electron.

45.(ABC) **(a)** $Cr = [Ar]\,3d^5\,4s^1$, an exception to Aufbau principle.

(b) For a given value of *l*, *m* can have any value from (–*l* to + *l*), so can have negative value.

(c) Ag is in copper group with $d^{10}s^1$ configuration, i.e. 46 electrons are spin paired.