Atomic Structure Solution

2. (c)
   \( l = 1 \), therefore p orbitals

3. (a)
   \( 1s^2, 2s^2, 2p_x^1 2p_y^1 2p_z^1 \) (Pauli’s exclusion principle)

5. (b)
   \( \psi = \) wave function

9. (a)
   Atomic number = 24
   Configuration is [Ar] 3d\(^{10}\), 4s\(^{1}\), n = 6
   Total spin = \( \pm \frac{1}{2} \times 6 = \pm 3 \)
   Magnetic moment = \( \sqrt{n(n+2)} = \sqrt{6(6+2)} \)
   = \( \sqrt{48} \) BM

11. (b, d)
    Species having the same number of neutrons are called isotones.

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<th>(^{76})Ge</th>
<th>(^{77})As</th>
<th>(^{78})Se</th>
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<tbody>
<tr>
<td>Neutrons</td>
<td>34</td>
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12. (a, b)
    The atomic nucleus contains protons and neutrons.

14. (b, c)
    \( E(\text{He}^+) = \frac{-13.6 \times 4}{n^2} \)
    \( n = 2, 3, 4 \ldots \) for excited state

15. (a, b)
    Exp: Number of dark lines (in absorption), i.e.,
    excitation = Number of bright lines (in emission), i.e., de-excitation
    It is possible only when the \( e^- \) is excited to \( n = 2 \) from ground state.
    Clearly, \( \Delta E = 91.8 \text{eV} \) and \( 40.8 \text{eV} \) are possible:
    \( (\text{Li}^{2+}) \quad (\text{He}^0) \)
19. (a) 
\[ \sqrt{v} = 4.9 \times 10^7 \left( Z - 0.75 \right) \Rightarrow Z = \frac{\sqrt{v}}{4.9 \times 10^7} + 0.75 \]

[You will get to know about this]

For \( \lambda = 9.87 \, \text{Å} \) \( \Rightarrow v = \frac{c}{\lambda} = \frac{3 \times 10^8}{9.87 \times 10^{-10}} = 0.3 \times 10^{18} \)

\( \Rightarrow Z_x = \frac{\sqrt{0.3 \times 10^{18}}}{4.9 \times 10^7} + 0.75 = 12 \)

For \( \lambda = 14.6 \, \text{Å} \) \( \Rightarrow v = \frac{3 \times 10^8}{14.6 \times 10^{-10}} = 0.2 \times 10^{18} \)

\( \Rightarrow Z_y = \frac{\sqrt{0.2 \times 10^{18}}}{4.9 \times 10^7} + 0.75 = 10 \)

20. 1

He = 1s\(^2\); n = 1; l = 0; m = 0; s = 1/2, -1/2

Sum = \( 1 + \frac{1}{2} - \frac{1}{2} = 1 \)