ANSWERS

I. Multiple Choice Questions (Type-I)

1. (iii)	2. (ii)	3. (iv)	4. (iv)	5. (ii)	6. (i)
7. (iv)	8. (iv)	9. (iii)	10. (ii)	11. (iii)	12. (i)
13. (iii)	14. (ii)	15. (iv)	16. (ii)		

II. Multiple Choice Questions (Type-II)

17. (iii), (iv)	18. (i), (iv)	19. (ii), (iii)
20. (i), (iii)	21. (i), (iv)	

III. Short Answer Type

22. $d < p < s$

23. | ↑↓ | ↑↓ | ↑↓ ↑ ↑ |
|---|---|---|
| $1s$ | $2s$ | $2p$ |

24. $4s$

25. $3d_{xy}$, $3d_{z^2}$, $3d_{yz}$ and $4d_{xy}$, $4d_{yz}$, $4d_{z^2}$

26. For $3p$ orbital $n = 3, l = 1$
Number of angular nodes = $l = 1$
Number of radial nodes = $n - l - 1 = 3-1-1=1$

27. I. (a) Is $< 2s < 2p < 3s$ II. (a) $5s$ (b) $5f$
(b) $3s < 3p < 4s < 4d$
(c) $4d < 5p < 6s < 4f < 5d$
(d) $7s < 5f < 6d < 7p$

28. neutron

29. A = 13, A – Z = 7 ∴ Z = 6
atomic number = 6

30. B < A < C = D
$\left(\textbf{Hint:}\ E\ \alpha \frac{1}{\lambda}\right)$

31. Completely filled and half filled orbitals have extra stability. In $3d^{10}4s^1$, d orbital is completely filled and s is half filled. So it is more stable configuration.

32. $$\bar{\nu} = 109677\left[\frac{1}{n_i^2} - \frac{1}{n_f^2}\right] \text{cm}^{-1}$$

For $n_i = 2$ to $n_f = 4$ transition in Balmer series.

$$\therefore \quad \bar{\nu} = 109677\left(\frac{1}{2^2} - \frac{1}{4^2}\right) \text{cm}^{-1}$$

$$= 109677\left(\frac{1}{4} - \frac{1}{16}\right) \text{cm}^{-1} = 20564.44 \text{ cm}^{-1}$$

33. $$\lambda = \frac{h}{\text{mv}}$$

m = 100 g = 0.1 kg.

$$\text{v} = 100 \text{ km/hr} = \frac{100 \times 1000 \text{ m}}{60 \times 60 \text{ s}} = \frac{1000}{36} \text{ m s}^{-1}$$

$h = 6.626 \times 10^{-34}$ J s

$$\lambda = \frac{6.626 \times 10^{-34} \text{ Js}}{0.1 \text{ kg} \times \frac{1000}{36} \text{ ms}^{-1}} = 6.626 \times 10^{-36} \times 36 \text{ m}^{-1} = 238.5 \times 10^{-36} \text{m}^{-1}$$

Since the wavelength is very small, the wave nature cannot be detected.

35. Being lighter particles, electrons will have higher velocity.

Hint : $\left(\lambda = \frac{h}{\text{mv}}\right)$

36. Wavelength is the distance between two successive peaks or two successive troughs of a wave. So $\lambda = 4 \times 2.16$ pm = 8.64 pm

37. $$\lambda = \frac{c}{\nu} = \frac{3.0 \times 10^8 \text{ ms}^{-1}}{4.620 \times 10^{14} \text{ Hz}} = 0.6494 \times 10^{-6} \text{ m} = 649.4 \text{ nm; Visible light.}$$

39. Uncertainty in the speed of ball = $\frac{90 \times 4}{100} = \frac{360}{100} = 3.6 \text{ ms}^{-1}$

Uncertainty in position = $\frac{h}{4\pi \text{m}\Delta\text{v}}$

$$= \frac{6.626 \times 10^{-34} \text{ Js}}{4 \times 3.14 \times 10 \times 10^{-3} \text{ kg g}^{-1} \times 3.6 \text{ ms}^{-1}}$$

$= 1.46 \times 10^{-33}$ m

41. The energy of electron is determined by the value of n in hydrogen atom and by $n + l$ in multielectron atom. So for a given principal quantum number electrons of s, p, d and f orbitals have different energy.

IV. Matching Type

42.	(i) → (c)	(ii) → (d)	(iii) → (a)	(iv) → (e)
43.	(i) → (b)	(ii) → (d)	(iii) → (a)	(iv) → (c)
44.	(i) → (c)	(ii) → (e)	(iii) → (a)	(iv) → (d)
45.	(i) → (d)	(ii) → (c)	(iii) → (a)	(iv) → (b)
46.	(i) → (d)	(ii) → (d)	(iii) → (b), (c)	(iv) → (a), (c)
47.	(i) → (d)	(ii) → (c)	(iii) → (a)	(iv) → (b)

V. Assertion and Reason Type

48. (i) 49. (ii) 50. (iii)

VI. Long Answer Type

52. $\left(\textbf{Hint:} \; h\nu = h\nu_0 + \frac{1}{2}mv^2\right)$

54. $\Delta E = -3.052 \times 10^{-19}$ J, $\nu = 4.606 \times 10^{16}$ Hz