Atomic structure Assignment

1. The charge of an electron is $-1.6\times10^{-19}\,C$. The value of free charge on Li^{+} ion will be

(a) $3.6\times10^{-19}\,C$ (b) $1\times10^{-19}\,C$ (c) $1.6\times10^{-19}\,C$ (d) $2.6\times10^{-19}\,C$

2. The charge on an electron is $4.8\times10^{-10}\,esu$. What is the value of charge in Li^{+} ion

(a) $4.8\times10^{-10}\,esu$ (b) $9.6\times10^{-10}\,esu$ (c) $1.44\times10^{-9}\,esu$ (d) $2.4\times10^{-10}\,esu$

3. The specific charge for positive rays is much less than the specific charge for cathode rays. This is because

(a) Positive rays are positively charged

(b) Charge on positive rays is less

(c) Positive rays comprise ionised atoms whose mass is much higher

(d) Experimental method for determination is wrong

4. The increasing order (lowest first) for the values of *e*/*m* (charge/mass) for

(a) *e*, *p*, *n*, α (b) *n*, *p*, *e*, α (c) *n*, *p*, α, *e* (d) *n*, α, *p*, *e*

5. The specific charge of proton is $9.6\times10^{7}\,C\,kg^{-1}$ then for an α-particle it will be

(a) $38.4\times10^{7}\,C\,kg^{-1}$ (b) $19.2\times10^{7}\,C\,kg^{-1}$ (c) $2.4\times10^{7}\,C\,kg^{-1}$ (d) $4.8\times10^{7}\,C\,kg^{-1}$

6. The number of atoms in 0.004 *g* of magnesium are

(a) 4×10^{20} (b) 8×10^{20} (c) 10^{20} (d) 6.02×10^{20}

7. When an electron jumps from '*L*' level to '*M*' level, there occurs

(a) Emission of energy (b) Emission of *X*-rays (c) Absorption of energy (d) Emission of γ-rays

8. In Balmer series of hydrogen atom spectrum which electronic transition causes third line

(a) Fifth Bohr orbit to second one (b) Fifth Bohr orbit to first one

(c) Fourth Bohr orbit to second one (d) Fourth Bohr orbit to first one

9. In which of the following transitions will the wavelength be minimum

(a) $n = 6$ to $n = 4$ (b) $n = 4$ to $n = 2$ (c) $n = 3$ to $n = 1$ (d) $n = 2$ to $n = 1$

10. The frequency of one of the lines in Paschen series of hydrogen atom is $2.340\times10^{14}\,Hz$. The quantum number n_2 which produces this transition is

(a) 6 (b) 5 (c) 4 (d) 3

11. Positronium consists of an electron and a positron (a particle which has the same mass as an electron, but opposite charge) orbiting round their common centre of mass. Calculate the value of the Rydberg constant for this system.

(a) $R_\infty/4$ (b) $R_\infty/2$ (c) $2R_\infty$ (d) R_∞

12. What are the average distance and the most probable distance of an electron from the nucleus in the 1s orbital of a hydrogen atom [$a_0 =$ the radius of the first Bohr orbit]

(a) $1.5a_0$ and a_0 (b) a_0 and $5a_0$ (c) $1.5a_0$ and $0.5a_0$ (d) a_0 and $0.5a_0$

13. Choose the correct relations on the basis of Bohr theory

(a) Velocity of electron $\propto \frac{1}{n}$ (b) Frequency of revolution $\propto \frac{1}{n^3}$

(c) Radius of orbit $\propto n^2 Z$ (d) Force on electron $\propto \frac{1}{n^4}$

14. For a hydrogen atom, what is the orbital degeneracy of the level that has energy $=\frac{-hcR_\infty}{9}$, where R_∞ is the Rydberg constant for the hydrogen atom

(a) 1 (b) 9 (c) 36 (d) 3

15. In a hydrogen atom, if energy of an electron in ground state is 13.6 *eV*, then that in the 2nd excited state is

(a) – 1.51 *eV* (b) – 3.4 *eV* (c) – 6.04 *eV* (d) – 13.6 *eV*

16. The ionization energy of hydrogen atom is – 13.6 *eV*. The energy required to excite the electron in a hydrogen atom from the ground state to the first excited state is (Avogadro's constant $= 6.022\times10^{23}$)

(a) $1.69\times10^{-20}\,J$ (b) $1.69\times10^{-23}\,J$ (c) $1.69\times10^{23}\,J$ (d) $1.69\times10^{25}\,J$

17. The value of the energy for the first excited state of hydrogen atom will be

(a) – 13.6 *eV* (b) – 3.40 *eV* (c) – 1.51 *eV* (d) – 0.85 *eV*

18. An atom has 2 electrons in *K* shell, 8 electrons in *L* shell and 6 electrons in *M* shell. The number of *s*-electrons present in that element is

(a) 6 (b) 5 (c) 7 (d) 10

19. In Bohr series of lines of hydrogen spectrum, the third line from the red end corresponds to which one of the following inter-orbit jumps of the electron for Bohr orbits in an atom of hydrogen

(a) $3 \rightarrow 2$ (b) $5 \rightarrow 2$ (c) $4 \rightarrow 1$ (d) $2 \rightarrow 5$

20. If electron falls from *n* = 3 to *n* = 2, then emitted energy is

(a) 10.2 *eV* (b) 12.09 *eV* (c) 1.9 *eV* (d) 0.65 *eV*

21. The emission spectrum of hydrogen is found to satisfy the expression for the energy change. ΔE (in joules) such that $\Delta E = 2.18 \times 10 \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right) J$ where $n_1 = 1, 2, 3....$ and $n_2 = 2, 3, 4....$ The spectral lines correspond to Paschen series to

(a) $n_1 = 1$ and $n_2 = 2, 3, 4$ (b) $n_1 = 3$ and $n_2 = 4, 5, 6$ (c) $n_1 = 1$ and $n_2 = 3, 4, 5$ (d) $n_1 = 1$ and $n_2 =$ infinity

22. The energy required to dislodge electron from excited isolated *H*-atom., $IE_1 = 13.6\, eV$ is

(a) = 13.6 *eV* (b) > 13.6 *eV* (c) < 13.6 and > 3.4 *eV* (d) $\le 3.4\, eV$

23. If change in energy, $(\Delta E) = 3 \times 10^{-8}\, J, h = 6.64 \times 10^{-34}\, J - s$ and $c = 3 \times 10^{8}\, m/s$, then wavelength of the light is

(a) 6.36×10^{3} Å (b) 6.36×10^{5} Å (c) 6.64×10^{-18} Å (d) 6.36×10^{18} Å

24. The value of Planck's constant is $6.63 \times 10^{-34}\, Js$. The velocity of light is $3.0 \times 10^{8}\, ms^{-1}$. Which value is closest to the wavelength in nanometres of a quantum of light with frequency of $8 \times 10^{15}\, s^{-1}$

(a) 3×10^{7} (b) 2×10^{-25} (c) 5×10^{-18} (d) 4×10^{1}

25. The wavelength of a spectral line for an electronic transition is inversely related to

(a) The number of electrons undergoing the transition

(b) The nuclear charge of the atom

(c) The difference in the energy of the energy levels involved in the transition

(d) The velocity of the electron undergoing the transition

26. If wavelength of photon is $2.2 \times 10^{-11}\, m$, $h = 6.6 \times 10^{-34}\, Js$, then momentum of photon is

(a) $3 \times 10^{-23}\, kg\, ms^{-1}$ (b) $3.33 \times 10^{22}\, kg\, ms^{-1}$ (c) $1.452 \times 10^{-44}\, kg\, ms^{-1}$ (d) $6.89 \times 10^{43}\, kg\, ms^{-1}$

27. The ratio of the energy of a photon of 2000 Å wavelength radiation to that of 4000 Å radiation is

(a) 1/4 (b) 4 (c) 1/2 (d) 2

28. Wavelength associated with electron motion

(a) Increases with increase in speed of electron (b) Remains same irrespective of speed of electron

(c) Decreases with increase in speed of e^- (d) Is zero

29. A 200 *g* golf ball is moving with a speed of 5 *m* per hour. The associated wave length is $(h = 6.625 \times 10^{-34}\, J - \text{sec})$

(a) $2.38 \times 10^{-10}\, m$ (b) $2.38 \times 10^{-20}\, m$ (c) $2.38 \times 10^{-30}\, m$ (d) $2.38 \times 10^{-40}\, m$

30. The frequency of a wave of light is $12 \times 10^{14}\, s^{-1}$. The wave number associated with this light is

(a) $5 \times 10^{-7}\, m$ (b) $4 \times 10^{-8}\, cm^{-1}$ (c) $2 \times 10^{-7}\, m^{-1}$ (d) $4 \times 10^{4}\, cm^{-1}$

31. The energy of a 700 – *nm* photon is

(a) 1.77 *eV* (b) 2.47 *eV* (c) 700 *eV* (d) 3.57 *eV*

32. The de–Brolglie wavelength of a particle with mass 1 *g* and velocity 100 *m*/*s* is

(a) $6.63 \times 10^{-33}\, m$ (b) $6.63 \times 10^{-34}\, m$ (c) $6.63 \times 10^{-35}\, m$ (d) $6.65 \times 10^{-35}\, m$

33. The de–Broglie wavelength associated with a material particle is

(a) Directly proportional to its energy (b) Directly proportional to momentum

(c) Inversely proportional to its energy (d) Inversely proportional to momentum

34. What is the de–Broglie wavelength associated with the hydrogen electron in its third orbit

(a) $9.96 \times 10^{-10}\, cm$ (b) $9.96 \times 10^{-8}\, cm$ (c) $9.96 \times 10^{4}\, cm$ (d) $9.96 \times 10^{8}\, cm$

35. What will be de–Broglie wavelength of an electron moving with a velocity of $1.2 \times 10^{5}\, ms^{-1}$

(a) 6.068×10^{-9} (b) 3.133×10^{-37} (c) 6.626×10^{-9} (d) 6.018×10^{-7}

36. An electron has kinetic energy $2.8 \times 10^{-23}\, J$. de–Broglie wavelength will be nearly $(m_e = 9.1 \times 10^{-31}\, kg)$

(a) $9.28 \times 10^{-4}\ m$ (b) $9.28 \times 10^{-7}\ m$ (c) $9.28 \times 10^{-8}\ m$ (d) $9.28 \times 10^{-10}\ m$

37. Calculate the de–Broglie wavelength for a particle of mass $10^{-30}\ kg$, travelling with a speed of $10^{7}\ ms^{-1}$. ($h = 6.626 \times 10^{-34}\ kg\ m^2 s^{-1}$)

(a) $6.626 \times 10^{-4}\ m$ (b) $1.509 \times 10^{-4}\ m$ (c) $6.626 \times 10^{-11}\ m$ (d) $1.509 \times 10^{10}\ m$

38. The de–Broglie wavelength of a tennis ball of mass 60 *g* moving with a velocity of 10 *metres* per second is approximately

(a) 10^{-33} *metres* (b) 10^{-31} *metres* (c) 10^{-16} *metres* (d) 10^{-25} *metres*

39. De-Broglie wavelength is related to applied voltage as

(a) $\lambda = \frac{12.3}{\sqrt{h}} \mathring{A}$ (b) $\lambda = \frac{12.3}{\sqrt{V}} \mathring{A}$ (c) $\lambda = \frac{12.3}{\sqrt{E}} \mathring{A}$ (d) $\lambda \frac{12.3}{\sqrt{m}} \mathring{A}$

40. The correct set of quantum numbers for the unpaired electron of chlorine atom is

	n	*l*	*m*
(a)	2	1	0
(b)	2	1	1
(c)	3	1	1
(d)	3	0	0

41. **Assertion (*A*) :** Two electrons in an atom can have the same values of four quantum numbers.

Reason (*R*) : Two electrons in an atom can be present in the same shell, sub-shell and orbital and have the same spin

(a) Both *A* and *R* are true and *R* is a correct explanation of *A* (b)Both *A* and *R* are true but *R* is not a correct explanation of *A*

(c) *A* is true but *R* are false (d)Both *A* and *R* are false

(e) *A* is false but *R* is true

42. The magnitude of spin angular momentum of an electron is given by

(a) $S = \sqrt{s(s+1)}\frac{h}{2\pi}$ (b) $S = s\frac{h}{2\pi}$ (c) $S = \frac{\sqrt{3}}{2} \times \frac{h}{2\pi}$ (d) $S = \pm\frac{1}{2} \times \frac{h}{2\pi}$

43. If a magnetic field is applied to the electron of a hydrogen atom in the z-direction, the z- component of the spin angular momentum is given by

(a) $s_z = \sqrt{s(s+1)}$ (b) $s_z = \frac{\sqrt{3}}{2} \times \frac{h}{2\pi}$ (c) $s_z = m_s \frac{h}{4\pi}$ (d) $s_z = \pm\frac{1}{2} \times \frac{h}{2\pi}$

44. Which of the following pairs have identical values of magnetic moment

(a) Zn^{2+} and Cu^{+} (b) Co^{2+} and Ni^{2+} (c) Mn^{4+} and Co^{2+} (d) Mg^{2+} and Sc^{+}

45. Which set of quantum numbers for an electron of an atom is not possible

(a) *n* = 1, *l* = 0, *m* = 0, *s* = + 1/2 (b) *n* = 1, *l* = 1, *m* = 1, *s* = +1/2

(c) *n* = 1, *l* = 0, *m* = 0, *s* = – 1/2 (d) *n* = 2, *l* = 1, *m* = –1, *s* = + 1/2

46. From the given sets of quantum numbers the one that is inconsistent with the theory is

(a) *n* = 3; *l* = 2; *m* = – 3; *s* = + 1/2 (b) *n* = 4; *l* = 3; *m* = 3; *s* = + 1/2

(c) *n* = 2; *l* = 1; *m* = 0; *s* = – 1/2 (d) *n* = 4; *l* = 3; *m* = 2; *s* = + 1/2

47. When the value of azimuthal quantum number is 3, magnetic quantum number can have values

(a) + 1, 0, – 1 (b) + 2, +1, 0, – 1, – 2

(c) – 3, – 2, – 1, – 0, + 1, + 2, + 3 (d) + 1, – 1

48. The four quantum numbers of the outermost orbital of *K* (atomic no. = 19) are

(a) *n* = 2, *l* = 0, *m* = 0, $s = \frac{+1}{2}$ (b) *n* = 4, *l* = 0, *m* = 0, $s = \frac{+1}{2}$

(c) *n* = 3, *l* = 1, *m* = 1, $s = \frac{+1}{2}$ (d) *n* = 4, *l* = 2, *m* = – 1, $s = \frac{+1}{2}$

49. The total number of electrons that can be accommodated in all the orbitals having principal quantum number 2 and azimuthal quantum number 1 is

(a) 2 (b) 4 (c) 6 (d) 8

50. The set of quantum numbers *n* = 3, *l* = 0, *m* = 0 s = – 1/ 2 belongs to the element

(a) *Mg* (b) *Na* (c) *Ne* (d) *F*