

Atomic Structure

Q.1. 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

Q.2. A gas absorbs a photon of 355 nm and emits at two wavelengths. If one of the emissions is at 680 nm, the other is at:

- a) 518 nm
- b) 1035 nm
- c) 325 nm
- d) 743 nm

Q.3. In the Bohr's model of the hydrogen atom, the ratio of the kinetic energy to the total energy of the electron in a quantum state n is:

- a) 1
- b) 2
- c) -1
- d) -2

Q.4. In hydrogen atom the ratio of $(E_2 - E_1)$ and $(E_4 - E_3)$ is

- a) 9
- b) 12
- c) 18
- d) 15

Q.5. Which of the following radiations has highest energy?

- a) $\lambda = 30 \text{ nm}$
- b) $\lambda = 300 \text{ nm}$
- c) $\nu = 3 \times 10^{12} \text{ s}^{-1}$
- d) $\nu = 3 \times 10^{10} \text{ s}^{-1}$

Q.6. If radius of first orbit of Hydrogen atom is 0.53 \AA then radius of second orbit will be

- a) 1.06 \AA
- b) 0.26 \AA
- c) 0.53 \AA
- d) 2.12 \AA

Q.7. Uncertainty in position of a minute particle of mass 25 g in space is 10^{-5} m.

What is the uncertainty in its velocity (in ms^{-1})? ($h = 6.6 \times 10^{-34}$ Js)

- a) 2.1×10^{-34}
- b) 0.5×10^{-34}
- c) 2.1×10^{-28}
- d) 0.5×10^{-24}

Q.8. A 0.66 kg ball is moving with a speed of 100 m/s. The associated wavelength will be ($h = 6.6 \times 10^{-34}$ Js)

- a) 1.0×10^{-32} m
- b) 6.6×10^{-32} m
- c) 6.6×10^{-34} m
- d) 1.0×10^{-35} m

Q.9. 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

Q.10. The ionization enthalpy of hydrogen atom is 1.312×10^6 J mol^{-1} . The energy required to excite the electron in the atom from $n = 1$ to $n = 2$ is

- a) 9.84×10^5 J mol^{-1}
- b) 6.56×10^5 J mol^{-1}
- c) 7.56×10^5 J mol^{-1}
- d) 8.51×10^5 J mol^{-1}

Q.11. Which of the following statements is not correct?

- a) The shape of an atomic orbital depends on the azimuthal quantum number.
- b) The orientation of an atomic orbital depends on the magnetic quantum number.
- c) The energy of an electron in an atomic orbital of multi-electron atom depends on principal quantum number.
- d) The number of degenerate atomic orbitals of one type depends on the values of azimuthal and magnetic quantum numbers.

Q.12. Few electrons have following quantum numbers,

(i) $n = 4, l = 1$ (ii) $n = 4, l = 0$

(iii) $n = 3, l = 2$ (iv) $n = 3, l = 1$

Arrange them in the order of increasing energy from lowest to highest.

- a) (iv) < (ii) < (iii) < (i)
- b) (ii) < (iv) < (i) < (iii)
- c) (i) < (iii) < (ii) < (iv)
- d) (iii) < (i) < (iv) < (ii)

Q.13. What is the maximum number of emission lines obtained when the excited electron of a H atom in $n = 5$ drops to the ground state?

- a) 12
- b) 15
- c) 21
- d) 10

Q.14. Photoelectric emission is observed from a surface for frequencies ν_1 and ν_2 of incident radiations ($\nu_1 > \nu_2$). If the maximum kinetic energy of photoelectrons in the two cases are in the ratio of 1 : 2, then threshold frequency ν_0 is given by

- a) $\nu_2 - \nu_1$
- b) $2\nu_2 - \nu_1$
- c) $2\nu_1 - \nu_2$
- d) $(\nu_2 - \nu_1)/2$

Q.15. The number of electrons having $n = 3$ and $m_l = 0$, in chromium atom is

- a) 2
- b) 5
- c) 4
- d) 1

Q.16. Which orbital of carbon can absorb photon but not emit it?

- a) 1S
- b) 2S
- c) 3P
- d) 2P

Q.17. In hydrogen spectrum which of the following lies in the wavelength range 350–700 nm?

- a) Balmer series
- b) Lyman series
- c) Brackett series
- d) paschen series

Q.18. The ratio of ionization energy of H and Be^{3+} is

- a) 1:1
- b) 1:3
- c) 1:9
- d) 1:16

Q.19. Azimuthal quantum number determines the

- a) size
- b) spin
- c) orientation
- d) orbital angular momentum

Q.20. The total number of orbitals in a shell with principal quantum number 'n' is

- a) $2n$
- b) $2n^2$
- c) n^2
- d) n

Q.21. The number of nodal planes 'd' orbital has

- a) 0
- b) 1
- c) 2
- d) 3

Q.22. According to the Bohr Theory, which of the following transitions in the hydrogen atom will give rise to the least energetic photon ?

- a) $n = 6$ to $n = 1$
- b) $n = 5$ to $n = 4$
- c) $n = 6$ to $n = 5$
- d) $n = 5$ to $n = 3$

Q.23. 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) $5 \rightarrow 2$
- b) $4 \rightarrow 1$
- c) $2 \rightarrow 5$
- d) $3 \rightarrow 2$

Q.24. The photoelectric current decreases if

- a) the intensity of the source of light is decreased
- b) the frequency of incident radiation decreases below threshold frequency
- c) the exposure time decreases
- d) None of these

Q.25. The number of concentric spherical surfaces for 3s orbital at which the probability of finding electrons is zero, are

- a) 3
- b) 2
- c) 1
- d) 0