

Quiz: Atomic Structure 1

Q1: The de Broglie wavelength of an electron accelerated through a potential difference of 150 V is closest to:

- A) 1.0 Å
- B) 0.5 Å
- C) 0.1 Å
- D) 2.0 Å

Q2: If the uncertainty in position of an electron is 1 Å, the minimum uncertainty in its velocity is (mass of electron = 9.1×10^{-31} kg, $h = 6.6 \times 10^{-34}$ J s):

- A) 5.8×10^5 m s⁻¹
- B) 1.2×10^6 m s⁻¹
- C) 3.6×10^5 m s⁻¹
- D) 7.2×10^5 m s⁻¹

Q3: The ratio of wavelengths of two photons having energies in the ratio 1:4 is:

- A) 1:4
- B) 4:1
- C) 1:2
- D) 2:1

Q4: The maximum number of electrons having $n = 4$ and $l = 2$ is:

- A) 6
- B) 10
- C) 14
- D) 18

Q5: Which transition in hydrogen atom emits radiation of maximum wavelength?

- A) $n = 5 \rightarrow 4$
- B) $n = 4 \rightarrow 3$
- C) $n = 3 \rightarrow 2$
- D) $n = 2 \rightarrow 1$

Q6: The number of radial nodes in 3p orbital is:

- A) 0
- B) 1
- C) 2
- D) 3

Q7: The energy of an electron in the third orbit of hydrogen atom is:

- A) -1.51 eV
- B) -3.4 eV
- C) -13.6 eV
- D) -0.85 eV

Q8: Which of the following sets of quantum numbers is NOT allowed?

- A) $n=3, l=2, m=0, s=+1/2$
- B) $n=2, l=1, m=1, s=-1/2$
- C) $n=2, l=2, m=0, s=+1/2$
- D) $n=4, l=0, m=0, s=-1/2$

Q9: The frequency of radiation emitted when an electron jumps from $n = 4$ to $n = 2$ in hydrogen atom is ($R = 1.097 \times 10^7 \text{ m}^{-1}$, $c = 3 \times 10^8 \text{ m s}^{-1}$):

- A) $6.17 \times 10^{14} \text{ Hz}$
- B) $1.23 \times 10^{15} \text{ Hz}$
- C) $4.57 \times 10^{14} \text{ Hz}$
- D) $9.14 \times 10^{14} \text{ Hz}$

Q10: The shape of 2p orbital is best described as:

- A) Spherical
- B) Dumbbell
- C) Double dumbbell
- D) Circular

Q11: If the wavelength of a photon is doubled, its energy becomes:

- A) Double
- B) Half
- C) Four times
- D) One-fourth

Q12: The orbital angular momentum of an electron in 2p orbital is:

- A) $\sqrt{2} \hbar$
- B) $\sqrt{6} \hbar$
- C) $\sqrt{3} \hbar$
- D) Zero

Q13: Which of the following spectral series lies in the infrared region?

- A) Lyman
- B) Balmer
- C) Paschen
- D) Brackett

Q14: Total number of orbitals present in the third shell is:

- A) 5
- B) 7
- C) 9
- D) 13

Q15: Which quantum number determines the orientation of orbital in space?

- A) n
- B) l
- C) m
- D) s

Q16: The minimum energy required to remove an electron from ground state of hydrogen atom is:

- A) 3.4 eV
- B) 10.2 eV
- C) 13.6 eV
- D) 1.51 eV

Q17: The number of nodal planes in a p-orbital is:

- A) 0
- B) 1
- C) 2
- D) 3

Q18: Which transition corresponds to Balmer series?

- A) $n \rightarrow 1$
- B) $n \rightarrow 2$
- C) $n \rightarrow 3$
- D) $n \rightarrow 4$

Q19: The speed of an electron having de Broglie wavelength 1 Å is approximately:

- A) $7.3 \times 10^6 \text{ m s}^{-1}$
- B) $1.2 \times 10^6 \text{ m s}^{-1}$
- C) $3.6 \times 10^5 \text{ m s}^{-1}$
- D) $9.1 \times 10^5 \text{ m s}^{-1}$

Q20: Which orbital has zero probability density at the nucleus?

- A) 1s
- B) 2s
- C) 2p
- D) 3s

Q21: The number of electrons that can have $n=3$ and $l=1$ is:

- A) 2
- B) 6
- C) 10
- D) 14

Q22: The energy difference between first and second orbit of hydrogen atom is:

- A) 10.2 eV
- B) 13.6 eV
- C) 3.4 eV
- D) 1.51 eV

Q23: Which of the following orbitals penetrates closest to the nucleus?

- A) 3s
- B) 3p
- C) 3d
- D) 4p

Q24: The wavelength associated with a particle of mass m moving with velocity v is:

- A) h/mv
- B) mv/h
- C) $h\nu/m$
- D) $m/h\nu$

Q25: Which spectral line corresponds to highest energy?

- A) Infrared
- B) Visible
- C) Ultraviolet
- D) Microwave

Q26: The azimuthal quantum number for f-orbital is:

- A) 0
- B) 1
- C) 2
- D) 3

Q27: The number of subshells in the fifth shell is:

- A) 3
- B) 4
- C) 5
- D) 6

Q28: Which postulate of Bohr's model explains line spectra?

- A) Quantized orbits
- B) Fixed nucleus
- C) Circular orbits
- D) Electrostatic force

Q29: The ratio of energies of electrons in first and second orbit of hydrogen atom is:

- A) 1:2
- B) 2:1
- C) 4:1
- D) 1:4

Q30: The number of orbitals in d-subshell is:

- A) 3
- B) 5
- C) 7
- D) 10

Q31: Which quantum number has only two possible values?

- A) n
- B) l
- C) m
- D) s

Q32: The radius of second orbit of hydrogen atom compared to first is:

- A) Same
- B) Twice
- C) Four times
- D) Half

Q33: Which orbital has two radial nodes?

- A) 3s
- B) 3p
- C) 4p
- D) 4s

Q34: The line spectrum of hydrogen is due to:

- A) Electron diffraction
- B) Quantized energy levels
- C) Wave nature of light
- D) Nuclear reactions

Q35: The maximum number of electrons in an orbital is:

- A) 1
- B) 2
- C) 3
- D) 4

Q36: Which series of hydrogen spectrum corresponds to transitions ending at $n = 1$?

- A) Balmer
- B) Paschen
- C) Lyman
- D) Brackett

Q37: The total number of electrons in all orbitals having $n = 3$ is:

- A) 8
- B) 18
- C) 32
- D) 9

Q38: Which has the longest wavelength?

- A) X-rays
- B) UV
- C) Visible
- D) Infrared

Q39: The number of angular nodes in d-orbital is:

- A) 0
- B) 1
- C) 2
- D) 3

Q40: If the velocity of an electron is doubled, its de Broglie wavelength becomes:

- A) Double
- B) Half
- C) Four times
- D) Unchanged

Q41: An electron is accelerated through a potential difference of 400 V. Its de Broglie wavelength (in Å) is closest to:

- A) 0.61
- B) 0.97
- C) 1.23
- D) 0.31

Q42: The uncertainty in momentum of a particle is $1.0 \times 10^{-25} \text{ kg m s}^{-1}$. The minimum uncertainty in its position ($h = 6.6 \times 10^{-34} \text{ J s}$) is:

- A) $5.2 \times 10^{-10} \text{ m}$
- B) $1.05 \times 10^{-9} \text{ m}$
- C) $2.6 \times 10^{-10} \text{ m}$
- D) $3.3 \times 10^{-10} \text{ m}$

Q43: The wavelength of radiation emitted when an electron falls from $n = 5$ to $n = 3$ in hydrogen atom is closest to:

- A) 1282 nm
- B) 1880 nm
- C) 656 nm
- D) 434 nm

Q44: The total number of orbitals having $n = 4$ and $l = 1$ is:

- A) 3
- B) 5
- C) 7
- D) 9

Q45: The energy required to excite an electron in hydrogen atom from $n = 2$ to $n = 4$ is:

- A) 2.55 eV
- B) 1.89 eV
- C) 10.2 eV
- D) 3.4 eV

Q46: Which of the following orbitals has maximum penetration power?

- A) 4s
- B) 4p
- C) 4d
- D) 4f

Q47: The number of electrons that can have the same set of quantum numbers $n = 3, l = 2, m = -1$ is:

- A) 1
- B) 2

- C) 6
- D) 10

Q48: The frequency of radiation corresponding to a transition with $\Delta E = 6.8 \text{ eV}$ is ($h = 6.6 \times 10^{-34} \text{ J s}$):

- A) $1.6 \times 10^{15} \text{ Hz}$
- B) $1.0 \times 10^{15} \text{ Hz}$
- C) $3.3 \times 10^{14} \text{ Hz}$
- D) $6.6 \times 10^{14} \text{ Hz}$

Q49: The maximum number of electrons in all orbitals having $l = 2$ is:

- A) 6
- B) 10
- C) 14
- D) 18

Q50: Which transition in hydrogen atom corresponds to the shortest wavelength?

- A) $n = 2 \rightarrow 1$
- B) $n = 3 \rightarrow 1$
- C) $n = 4 \rightarrow 1$
- D) $n = 5 \rightarrow 1$

Q51: The angular momentum of an electron in 3d orbital is:

- A) $\sqrt{2} \hbar$
- B) $\sqrt{6} \hbar$
- C) $\sqrt{12} \hbar$
- D) Zero

Q52: The number of nodal planes in 3d orbital is:

- A) 1
- B) 2
- C) 3
- D) 4

Q53: Which of the following has zero radial nodes?

- A) 2s
- B) 2p
- C) 3p
- D) 3s

Q54: The energy of a photon of wavelength 400 nm is closest to:

- A) 3.1 eV
- B) 2.5 eV
- C) 1.8 eV
- D) 4.5 eV

Q55: The maximum number of electrons with $n = 5$ and $l = 3$ is:

- A) 6
- B) 10
- C) 14
- D) 18

Q56: The spectral series observed when electrons fall to $n = 3$ is:

- A) Balmer
- B) Paschen
- C) Lyman
- D) Brackett

Q57: If the kinetic energy of an electron is increased four times, its de Broglie wavelength becomes:

- A) Four times
- B) Twice
- C) Half
- D) One-fourth

Q58: The ratio of radii of first and third Bohr orbit of hydrogen atom is:

- A) 1:3
- B) 1:9
- C) 1:4
- D) 1:2

Q59: Which orbital has one radial node and one angular node?

- A) 2p
- B) 3p
- C) 3s
- D) 3d

Q60: The minimum velocity of an electron whose de Broglie wavelength is 2 Å is:

- A) $3.6 \times 10^6 \text{ m s}^{-1}$
- B) $7.3 \times 10^6 \text{ m s}^{-1}$
- C) $1.8 \times 10^6 \text{ m s}^{-1}$
- D) $9.1 \times 10^5 \text{ m s}^{-1}$

Q61: Which quantum number decides the size of the orbital?

- A) n
- B) l
- C) m
- D) s

Q62: The total number of nodal surfaces in 4d orbital is:

- A) 2
- B) 3
- C) 4
- D) 5

Q63: The emission spectrum of hydrogen supports:

- A) Rutherford model
- B) Bohr model
- C) Thomson model
- D) Dalton model

Q64: The shortest wavelength line in Balmer series corresponds to:

- A) $n = 3 \rightarrow 2$
- B) $n = 4 \rightarrow 2$
- C) $n = 5 \rightarrow 2$
- D) $n = \infty \rightarrow 2$

Q65: Which orbital has spherical symmetry?

- A) s
- B) p
- C) d
- D) f

Q66: The uncertainty principle is significant for:

- A) Macroscopic objects
- B) Microscopic particles
- C) Heavy bodies
- D) Stationary objects

Q67: Which quantum number distinguishes orbitals of same subshell?

- A) n
- B) l
- C) m
- D) s

Q68: The number of photons emitted when 100 atoms make transition from $n = 4$ to $n = 2$ is:

- A) 100
- B) 200
- C) 50
- D) 400

Q69: Which has maximum energy?

- A) Photon of 700 nm
- B) Photon of 500 nm
- C) Photon of 400 nm
- D) Photon of 300 nm

Q70: The number of electrons that can have $n = 4$ is:

- A) 16
- B) 18
- C) 32
- D) 8

Q71: Which transition releases maximum energy?

- A) $n = 2 \rightarrow 1$
- B) $n = 3 \rightarrow 1$
- C) $n = 4 \rightarrow 1$
- D) $n = 5 \rightarrow 1$

Q72: The de Broglie wavelength associated with a cricket ball is negligible because:

- A) High velocity
- B) Large mass
- C) Large size
- D) Low momentum

Q73: The shape of 3d orbital is best described as:

- A) Spherical
- B) Dumbbell
- C) Double dumbbell
- D) Complex clover

Q74: The number of orbitals in f-subshell is:

- A) 5
- B) 7
- C) 9
- D) 14

Q75: The energy of electron increases when it moves:

- A) Closer to nucleus
- B) To lower n
- C) To higher n
- D) In circular orbit

Q76: Which postulate explains stability of atom in Bohr model?

- A) Quantized orbits
- B) Angular momentum quantization
- C) No radiation in stationary state
- D) Fixed nucleus

Q77: The wavelength of photon emitted when electron falls from $n = 3$ to $n = 1$ is approximately:

- A) 656 nm
- B) 121.6 nm
- C) 434 nm
- D) 97 nm

Q78: Which orbital has maximum angular nodes?

- A) s
- B) p
- C) d
- D) f

Q79: The value of spin quantum number of an electron is:

- A) 0 or 1
- B) -1 or +1
- C) -1/2 or +1/2
- D) Only +1/2

Q80: The atomic spectrum provides direct evidence of:

- A) Wave nature of electrons
- B) Quantized energy levels
- C) Particle nature of light
- D) Nuclear structure

Q81: The de Broglie wavelength of a proton accelerated through 100 V is closest to ($m_p = 1.67 \times 10^{-27}$ kg):

- A) 0.028 Å
- B) 0.0028 Å
- C) 0.28 Å
- D) 2.8 Å

Q82: The uncertainty in velocity of an electron confined within a nucleus of radius 1.0×10^{-15} m is closest to:

- A) 5.8×10^9 m s⁻¹
- B) 5.8×10^7 m s⁻¹
- C) 5.8×10^5 m s⁻¹
- D) 5.8×10^3 m s⁻¹

Q83: The wavelength of radiation emitted when an electron falls from $n = 6$ to $n = 2$ in hydrogen atom lies in:

- A) Ultraviolet region
- B) Visible region
- C) Infrared region
- D) Microwave region

Q84: The maximum number of electrons that can have the same principal quantum number $n = 3$ is:

- A) 6
- B) 10
- C) 18
- D) 32

Q85: The ratio of energies of photons of wavelengths 300 nm and 600 nm is:

- A) 1:2
- B) 2:1
- C) 1:4
- D) 4:1

Q86: Which of the following orbitals has the highest energy in a multi-electron atom?

- A) 4s
- B) 3d
- C) 4p
- D) 4d

Q87: The number of radial nodes present in 4p orbital is:

- A) 0
- B) 1
- C) 2
- D) 3

Q88: The minimum energy required to remove an electron from $n = 3$ level of hydrogen atom is:

- A) 1.51 eV
- B) 3.4 eV
- C) 0.85 eV
- D) 13.6 eV

Q89: Which quantum number is directly related to the shape of the orbital?

- A) n
- B) l
- C) m
- D) s

Q90: The total number of angular nodes present in 5f orbital is:

- A) 3
- B) 4
- C) 5
- D) 6

Q91: The speed of an electron accelerated through 900 V is approximately:

- A) $1.8 \times 10^6 \text{ m s}^{-1}$
- B) $3.6 \times 10^6 \text{ m s}^{-1}$
- C) $1.0 \times 10^7 \text{ m s}^{-1}$
- D) $5.4 \times 10^6 \text{ m s}^{-1}$

Q92: Which of the following transitions will produce radiation of minimum frequency?

- A) $n = 3 \rightarrow 2$
- B) $n = 4 \rightarrow 3$
- C) $n = 5 \rightarrow 4$
- D) $n = 6 \rightarrow 5$

Q93: The orbital which has one angular node and two radial nodes is:

- A) 3p
- B) 4p
- C) 4d
- D) 5s

Q94: The Balmer series corresponds to electronic transitions ending at:

- A) $n = 1$
- B) $n = 2$
- C) $n = 3$
- D) $n = 4$

Q95: The number of orbitals in the fourth shell is:

- A) 9
- B) 13
- C) 16
- D) 18

Q96: Which of the following has the longest de Broglie wavelength?

- A) Electron moving at 106 m s^{-1}
- B) Electron moving at 107 m s^{-1}
- C) Proton moving at 106 m s^{-1}
- D) Proton moving at 107 m s^{-1}

Q97: The spectral line with wavelength 656 nm belongs to:

- A) Lyman series
- B) Balmer series
- C) Paschen series
- D) Brackett series

Q98: Which orbital has the maximum probability density at the nucleus?

- A) 1s
- B) 2s
- C) 2p
- D) 3s

Q99: The energy difference between successive higher orbits in hydrogen atom:

- A) Increases
- B) Decreases
- C) Remains constant
- D) First increases then decreases

Q100: The number of electrons that can have $m = 0$ in a p-subshell is:

- A) 2
- B) 4
- C) 6
- D) 8

Q101: Which radiation has the highest penetrating power?

- A) Infrared
- B) Visible
- C) Ultraviolet
- D) X-rays

Q102: The orbital angular momentum of an electron in s-orbital is:

- A) $\hbar/2\pi$
- B) $\sqrt{2} \hbar/2\pi$
- C) Zero
- D) $\sqrt{3} \hbar/2\pi$

Q103: The emission spectrum of hydrogen shows discrete lines because:

- A) Electrons revolve in circular orbits
- B) Energy levels are quantized
- C) Atoms are electrically neutral
- D) Electrons have wave nature

Q104: The number of radial nodes in 5s orbital is:

- A) 1
- B) 2
- C) 3
- D) 4

Q105: Which transition corresponds to the series limit of Lyman series?

- A) $n = 2 \rightarrow 1$
- B) $n = 3 \rightarrow 1$
- C) $n = \infty \rightarrow 1$
- D) $n = 5 \rightarrow 1$

Q106: The de Broglie wavelength of an electron and a proton having same kinetic energy are related as:

- A) $\lambda_e > \lambda_p$
- B) $\lambda_e < \lambda_p$
- C) $\lambda_e = \lambda_p$
- D) Cannot be compared

Q107: Which of the following orbitals has three angular nodes?

- A) d
- B) p
- C) f
- D) s

Q108: The number of subshells present in $n = 6$ shell is:

- A) 4
- B) 5
- C) 6
- D) 7

Q109: The maximum number of electrons in orbitals with $l = 1$ and $n = 3$ is:

- A) 2
- B) 6
- C) 10
- D) 14

Q110: Which of the following particles has the shortest de Broglie wavelength?

- A) Electron
- B) Proton
- C) Neutron
- D) Alpha particle

Q111: The principal quantum number mainly determines:

- A) Shape of orbital
- B) Orientation of orbital
- C) Size and energy of orbital
- D) Spin of electron

Q112: Which hydrogen spectral series lies completely in ultraviolet region?

- A) Balmer
- B) Lyman
- C) Paschen
- D) Brackett

Q113: The probability of finding electron at nucleus is zero for:

- A) 1s
- B) 2s
- C) 3s
- D) 2p

Q114: The shortest wavelength in hydrogen emission spectrum corresponds to:

- A) Balmer limit
- B) Paschen limit
- C) Lyman limit
- D) Brackett limit

Q115: Which orbital has maximum radial nodes among the following?

- A) 4s
- B) 4p
- C) 4d
- D) 4f

Q116: The uncertainty principle is negligible for:

- A) Electron
- B) Proton
- C) Dust particle
- D) Neutron

Q117: Which transition produces radiation of maximum frequency?

- A) $n = 3 \rightarrow 2$
- B) $n = 4 \rightarrow 3$
- C) $n = 5 \rightarrow 1$
- D) $n = 2 \rightarrow 1$

Q118: The maximum number of electrons that can have $l = 3$ is:

- A) 6
- B) 10
- C) 14
- D) 18

Q119: The shape of the probability distribution for s-orbitals is:

- A) Dumbbell
- B) Spherical
- C) Cloverleaf
- D) Planar

Q120: The hydrogen spectrum is best explained by combining:

- A) Rutherford model and wave nature of light
- B) Bohr model and quantization
- C) de Broglie hypothesis and Bohr model
- D) Pauli principle and Hund rule

Q121: The de Broglie wavelength of an electron accelerated through a potential of 1000 V is closest to:

- A) 0.388 Å
- B) 0.122 Å
- C) 1.23 Å
- D) 0.012 Å

Q122: If the uncertainty in position of an electron is equal to its de Broglie wavelength, the uncertainty in its momentum is approximately:

- A) $h/2\pi\lambda$
- B) $h/4\pi\lambda$
- C) h/λ
- D) $2h/\lambda$

Q123: The wavelength of the photon emitted when an electron jumps from $n = 7$ to $n = 5$ in hydrogen atom lies in:

- A) Ultraviolet
- B) Visible
- C) Infrared
- D) Microwave

Q124: The number of electrons that can have $n = 4, l = 2$ is:

- A) 2
- B) 6
- C) 10
- D) 14

Q125: The energy required to remove an electron from $n = 4$ level of hydrogen atom is:

- A) 0.85 eV
- B) 3.4 eV
- C) 1.51 eV

D) 13.6 eV

Q126: Which of the following orbitals has the lowest energy in a multi-electron atom?

- A) 3d
- B) 4s
- C) 4p
- D) 4d

Q127: The number of angular nodes present in 6d orbital is:

- A) 1
- B) 2
- C) 3
- D) 4

Q128: The speed of an electron having kinetic energy 150 eV is approximately:

- A) $5.2 \times 10^6 \text{ m s}^{-1}$
- B) $7.3 \times 10^6 \text{ m s}^{-1}$
- C) $1.0 \times 10^7 \text{ m s}^{-1}$
- D) $3.6 \times 10^6 \text{ m s}^{-1}$

Q129: Which transition in hydrogen atom will emit radiation of maximum wavelength?

- A) $n = 6 \rightarrow 5$
- B) $n = 5 \rightarrow 4$
- C) $n = 4 \rightarrow 3$
- D) $n = 3 \rightarrow 2$

Q130: The number of radial nodes present in 6s orbital is:

- A) 3
- B) 4
- C) 5
- D) 6

Q131: The spectral series corresponding to transitions ending at $n = 4$ is:

- A) Brackett
- B) Pfund
- C) Paschen
- D) Balmer

Q132: The orbital angular momentum of an electron in 4f orbital is:

- A) $\sqrt{6} \hbar$
- B) $\sqrt{12} \hbar$
- C) $\sqrt{20} \hbar$
- D) $\sqrt{3} \hbar$

Q133: The number of orbitals present in all subshells of $n = 5$ shell is:

- A) 9
- B) 16
- C) 25
- D) 32

Q134: Which orbital has zero angular nodes?

- A) s
- B) p
- C) d
- D) f

Q135: The energy of a photon with frequency 8×10^{14} Hz is approximately:

- A) 5.3×10^{-19} J
- B) 3.2×10^{-19} J
- C) 6.6×10^{-20} J
- D) 1.3×10^{-18} J

Q136: Which quantum number determines the energy of an orbital in a hydrogen atom?

- A) n only
- B) l only
- C) n and l
- D) n, l and m

Q137: The probability density at the nucleus is maximum for:

- A) 1s
- B) 2s
- C) 3s
- D) All s-orbitals

Q138: The de Broglie wavelength associated with a particle decreases when:

- A) Mass increases
- B) Velocity decreases
- C) Momentum decreases
- D) Kinetic energy decreases

Q139: Which of the following transitions corresponds to Pfund series?

- A) $n \rightarrow 1$
- B) $n \rightarrow 2$
- C) $n \rightarrow 3$
- D) $n \rightarrow 5$

Q140: The shortest wavelength photon is emitted when an electron falls from:

- A) $n = 4 \rightarrow 1$
- B) $n = 3 \rightarrow 1$
- C) $n = 2 \rightarrow 1$
- D) $n = \text{infinity} \rightarrow 1$

Q141: The total number of electrons that can have $n = 6$ is:

- A) 36
- B) 32
- C) 18
- D) 12

Q142: Which of the following orbitals has the highest penetration power?

- A) 3s
- B) 3p
- C) 3d
- D) 4s

Q143: The uncertainty principle becomes significant when dealing with:

- A) Macroscopic bodies
- B) Microscopic particles
- C) Large masses
- D) Stationary objects

Q144: The number of electrons that can have $l = 2$ and $m = 0$ is:

- A) 1
- B) 2
- C) 5
- D) 10

Q145: The radius of the n th Bohr orbit is proportional to:

- A) n
- B) n^2
- C) $1/n$
- D) $1/n^2$

Q146: The emission of radiation in hydrogen atom occurs due to:

- A) Acceleration of electron
- B) Transition between energy levels
- C) Circular motion of electron
- D) Collision of atoms

Q147: Which of the following has the maximum number of radial nodes?

- A) 5s
- B) 5p
- C) 5d
- D) 5f

Q148: The total number of nodal surfaces in 5p orbital is:

- A) 2
- B) 3
- C) 4
- D) 5

Q149: The maximum kinetic energy of photoelectrons depends on:

- A) Intensity of radiation
- B) Frequency of radiation
- C) Nature of metal
- D) Surface area of metal

Q150: Which orbital has no nodal plane?

- A) s
- B) p
- C) d
- D) f

Q151: The Balmer limit corresponds to wavelength approximately:

- A) 656 nm
- B) 486 nm
- C) 364.6 nm
- D) 121.6 nm

Q152: Which statement is correct for de Broglie waves?

- A) Applicable only to photons
- B) Applicable only to electrons
- C) Applicable to all moving particles
- D) Applicable only to charged particles

Q153: The number of orbitals having $l = 3$ is:

- A) 5
- B) 7
- C) 9
- D) 14

Q154: The shortest wavelength line in hydrogen spectrum corresponds to:

- A) Paschen limit
- B) Balmer limit
- C) Lyman limit
- D) Brackett limit

Q155: The energy of an electron in hydrogen atom becomes zero when:

- A) $n = 1$
- B) $n = 2$
- C) $n = \text{infinity}$
- D) $n = 0$

Q156: Which orbital has two angular nodes?

- A) p
- B) d
- C) f
- D) s

Q157: The hydrogen spectrum supports the concept of:

- A) Continuous energy levels
- B) Quantized energy levels
- C) Random electron motion
- D) Nuclear instability

Q158: The de Broglie wavelength of a moving body becomes negligible when:

- A) Mass is very small
- B) Velocity is very small
- C) Momentum is very large
- D) Energy is low

Q159: The number of electrons that can have $n = 5$ and $l = 1$ is:

- A) 2
- B) 6
- C) 10
- D) 14

Q160: The correct order of increasing energy of orbitals is:

- A) $3s < 3p < 3d$
- B) $3p < 3s < 3d$
- C) $3d < 3p < 3s$
- D) $3s < 3d < 3p$

Q161: The de Broglie wavelength of an electron accelerated through 2500 V is approximately:

- A) 0.245 Å
- B) 0.122 Å
- C) 0.388 Å
- D) 0.061 Å

Q162: If the uncertainty in position of an electron is reduced to half, the uncertainty in its momentum will:

- A) Remain same
- B) Become half
- C) Become double
- D) Become four times

Q163: The wavelength of radiation emitted in transition $n = 10 \rightarrow n = 2$ of hydrogen atom lies in:

- A) Ultraviolet
- B) Visible
- C) Infrared
- D) X-ray

Q164: The maximum number of electrons that can have $n = 5, l = 2$ is:

- A) 6
- B) 10
- C) 14
- D) 18

Q165: The ratio of de Broglie wavelengths of two electrons accelerated through 100 V and 400 V respectively is:

- A) 1:2
- B) 2:1
- C) 1:4
- D) 4:1

Q166: The number of angular nodes present in 7f orbital is:

- A) 2
- B) 3
- C) 4
- D) 5

Q167: The energy of photon emitted when electron falls from $n = 5$ to $n = 1$ in hydrogen atom is closest to:

- A) 12.1 eV
- B) 13.1 eV
- C) 13.6 eV
- D) 10.2 eV

Q168: Which of the following orbitals has the highest radial probability at the nucleus?

- A) 1s
- B) 2s
- C) 3s
- D) All s-orbitals

Q169: The number of orbitals having $n = 6$ and $l = 4$ is:

- A) 7
- B) 9
- C) 11
- D) 13

Q170: The shortest wavelength among the following transitions is produced by:

- A) $n = 3 \rightarrow 1$
- B) $n = 4 \rightarrow 1$
- C) $n = 5 \rightarrow 1$
- D) $n = \text{infinity} \rightarrow 1$

Q171: The uncertainty principle is most significant for which particle?

- A) Electron
- B) Proton
- C) Alpha particle
- D) Dust particle

Q172: The number of radial nodes in 7p orbital is:

- A) 3
- B) 4
- C) 5
- D) 6

Q173: Which orbital has maximum number of nodal surfaces?

- A) 4s
- B) 4p
- C) 4d
- D) 4f

Q174: The speed of an electron associated with de Broglie wavelength 0.5 Å is approximately:

- A) $1.5 \times 10^6 \text{ m s}^{-1}$
- B) $3.6 \times 10^6 \text{ m s}^{-1}$
- C) $7.3 \times 10^6 \text{ m s}^{-1}$
- D) $1.1 \times 10^7 \text{ m s}^{-1}$

Q175: Which of the following transitions corresponds to infrared radiation?

- A) $n = 4 \rightarrow 3$
- B) $n = 3 \rightarrow 2$
- C) $n = 2 \rightarrow 1$
- D) $n = 5 \rightarrow 2$

Q176: The maximum number of electrons having $m = -2$ is:

- A) 2
- B) 4
- C) 6
- D) 10

Q177: The principal quantum number for an orbital having 3 radial nodes and 2 angular nodes is:

- A) 5
- B) 6
- C) 7
- D) 8

Q178: The Balmer series limit corresponds to transition:

- A) $n = 3 \rightarrow 2$
- B) $n = 4 \rightarrow 2$
- C) $n = \infty \rightarrow 2$
- D) $n = 2 \rightarrow 1$

Q179: Which particle has the longest de Broglie wavelength at same kinetic energy?

- A) Electron
- B) Proton
- C) Neutron
- D) Alpha particle

Q180: The number of orbitals having energy same as 4p orbital in hydrogen atom is:

- A) 1
- B) 4
- C) 9
- D) 16

Q181: The wavelength of photon emitted in transition $n = 4 \rightarrow n = 1$ of hydrogen atom is closest to:

- A) 121.6 nm
- B) 97 nm
- C) 102.6 nm
- D) 656 nm

Q182: Which orbital has zero probability of finding electron at nucleus?

- A) 1s
- B) 2s
- C) 2p
- D) 3s

Q183: The energy spacing between successive higher energy levels in hydrogen atom:

- A) Increases
- B) Decreases
- C) Remains constant
- D) Becomes zero

Q184: The number of electrons that can have $n = 7$ is:

- A) 98
- B) 72
- C) 50
- D) 32

Q185: The wavelength of photon having energy 6.8 eV is approximately:

- A) 182 nm
- B) 364 nm
- C) 121.6 nm
- D) 656 nm

Q186: Which orbital has one radial node and two angular nodes?

- A) 3d
- B) 4d
- C) 4f
- D) 5p

Q187: The emission of line spectrum is possible because:

- A) Electrons lose energy continuously
- B) Electrons exist only in fixed energy states
- C) Atoms emit all wavelengths
- D) Electrons revolve in elliptical orbits

Q188: The de Broglie wavelength associated with a moving car is negligible because:

- A) Velocity is small
- B) Mass is large
- C) Momentum is zero
- D) Energy is low

Q189: The maximum number of electrons that can have $l = 4$ is:

- A) 10
- B) 14
- C) 18
- D) 22

Q190: The wavelength of photon emitted when electron falls from $n = 8$ to $n = 4$ lies in:

- A) Ultraviolet
- B) Visible
- C) Infrared
- D) X-ray

Q191: The shape of electron cloud in p-orbital is due to:

- A) Magnetic quantum number
- B) Azimuthal quantum number
- C) Principal quantum number
- D) Spin quantum number

Q192: The total number of nodal surfaces in 6d orbital is:

- A) 3
- B) 4
- C) 5
- D) 6

Q193: The hydrogen atom emits radiation in ultraviolet region during:

- A) Balmer series
- B) Lyman series
- C) Paschen series
- D) Brackett series

Q194: Which orbital has highest energy among the following in hydrogen atom?

- A) 3s
- B) 3p
- C) 3d
- D) All have same energy

Q195: The de Broglie wavelength of a particle is inversely proportional to:

- A) Velocity
- B) Mass
- C) Momentum
- D) Energy

Q196: Which quantum number explains splitting of spectral lines in magnetic field?

- A) n
- B) l
- C) m
- D) s

Q197: The number of orbitals in a shell having principal quantum number n is:

- A) n
- B) $2n$
- C) n^2
- D) $2n^2$

Q198: The probability of finding electron between nucleus and first radial node is maximum for:

- A) 1s
- B) 2s
- C) 3s
- D) 2p

Q199: The shortest wavelength photon is emitted when electron transition occurs from:

- A) $n = 3 \rightarrow 2$
- B) $n = 4 \rightarrow 2$
- C) $n = 5 \rightarrow 2$
- D) $n = \text{infinity} \rightarrow 1$

Q200: The hydrogen emission spectrum provides direct evidence of:

- A) Wave nature of light
- B) Particle nature of electron
- C) Quantized energy levels
- D) Existence of nucleus

Q201: The de Broglie wavelength of an electron accelerated through a potential difference of 3600 V is approximately:

- A) 0.204 Å
- B) 0.122 Å
- C) 0.408 Å
- D) 0.061 Å

Q202: If the uncertainty in momentum of an electron is doubled, the uncertainty in its position will:

- A) Become half
- B) Become double
- C) Remain same
- D) Become four times

Q203: The wavelength of radiation corresponding to transition $n = 9 \rightarrow n = 3$ in hydrogen atom lies in:

- A) Ultraviolet
- B) Visible
- C) Infrared
- D) X-ray

Q204: The maximum number of electrons that can have $n = 6$ and $l = 1$ is:

- A) 2
- B) 6
- C) 10
- D) 14

Q205: The ratio of frequencies of photons emitted in transitions $n = 4 \rightarrow 2$ and $n = 3 \rightarrow 2$ is approximately:

- A) 1.25
- B) 1.67

- C) 2.25
- D) 3.00

Q206: The number of angular nodes present in 8g orbital is:

- A) 3
- B) 4
- C) 5
- D) 6

Q207: The energy of photon emitted when an electron falls from $n = 6$ to $n = 1$ in hydrogen atom is closest to:

- A) 12.8 eV
- B) 13.2 eV
- C) 13.6 eV
- D) 10.2 eV

Q208: Which orbital has the maximum value of probability density at the nucleus?

- A) 1s
- B) 2s
- C) 3s
- D) 4s

Q209: The number of orbitals possible for $l = 5$ is:

- A) 9
- B) 11
- C) 13
- D) 15

Q210: The shortest wavelength radiation among the following is produced by transition:

- A) $n = 4 \rightarrow 2$
- B) $n = 5 \rightarrow 2$
- C) $n = 6 \rightarrow 2$
- D) $n = \text{infinity} \rightarrow 2$

Q211: The uncertainty principle is negligible for:

- A) Electron
- B) Proton
- C) Neutron
- D) Baseball

Q212: The number of radial nodes in 8s orbital is:

- A) 5
- B) 6
- C) 7
- D) 8

Q213: Which of the following orbitals has the highest total number of nodes?

- A) 5s
- B) 5p
- C) 5d
- D) 5f

Q214: The speed of an electron having de Broglie wavelength 0.25 Å is approximately:

- A) $1.5 \times 10^6 \text{ m s}^{-1}$
- B) $3.6 \times 10^6 \text{ m s}^{-1}$
- C) $7.3 \times 10^6 \text{ m s}^{-1}$
- D) $1.46 \times 10^7 \text{ m s}^{-1}$

Q215: Which of the following transitions in hydrogen atom gives infrared radiation?

- A) $n = 3 \rightarrow 1$
- B) $n = 4 \rightarrow 2$
- C) $n = 5 \rightarrow 3$
- D) $n = 2 \rightarrow 1$

Q216: The maximum number of electrons that can have $m = +3$ is:

- A) 1
- B) 2
- C) 6
- D) 14

Q217: The principal quantum number for an orbital having 2 angular nodes and 1 radial node is:

- A) 4
- B) 5
- C) 6
- D) 7

Q218: The series limit of Paschen series corresponds to transition:

- A) $n = 4 \rightarrow 3$
- B) $n = 5 \rightarrow 3$
- C) $n = \infty \rightarrow 3$
- D) $n = 3 \rightarrow 2$

Q219: At the same kinetic energy, which particle has the shortest de Broglie wavelength?

- A) Electron
- B) Proton
- C) Neutron
- D) Alpha particle

Q220: The number of orbitals degenerate with 5d orbital in hydrogen atom is:

- A) 5
- B) 9
- C) 16
- D) 25

Q221: The wavelength of photon emitted in transition $n = 5 \rightarrow n = 2$ of hydrogen atom is closest to:

- A) 434 nm
- B) 486 nm
- C) 656 nm
- D) 410 nm

Q222: Which orbital has zero electron density at the nucleus?

- A) 1s
- B) 2s
- C) 3p
- D) 3s

Q223: The separation between successive energy levels in hydrogen atom:

- A) Increases with n
- B) Decreases with n
- C) Is constant
- D) First increases then decreases

Q224: The maximum number of electrons that can have $n = 8$ is:

- A) 64
- B) 72
- C) 98
- D) 128

Q225: The wavelength corresponding to a photon of energy 10.2 eV is approximately:

- A) 121.6 nm
- B) 364.6 nm
- C) 656 nm
- D) 97 nm

Q226: Which orbital has one radial node and three angular nodes?

- A) 4f
- B) 5f
- C) 5g
- D) 6f

Q227: The emission of line spectrum from excited hydrogen atom is due to:

- A) Continuous loss of energy
- B) Discrete energy transitions
- C) Electron spin
- D) Nuclear reactions

Q228: The de Broglie wavelength of a truck moving at high speed is negligible because:

- A) Velocity is small
- B) Mass is very large
- C) Momentum is zero
- D) Energy is low

Q229: The maximum number of electrons that can have $l = 5$ is:

- A) 18
- B) 22
- C) 26
- D) 30

Q230: The radiation emitted in transition $n = 7 \rightarrow n = 4$ belongs to:

- A) Ultraviolet
- B) Visible
- C) Infrared
- D) X-ray

Q231: The shape of an orbital is determined by:

- A) n
- B) l
- C) m
- D) s

Q232: The total number of nodal surfaces in 7d orbital is:

- A) 4
- B) 5
- C) 6
- D) 7

Q233: The hydrogen atom emits ultraviolet radiation during:

- A) Balmer series
- B) Lyman series
- C) Paschen series
- D) Brackett series

Q234: Which orbital has highest energy among the following in hydrogen atom?

- A) 4s
- B) 4p
- C) 4d
- D) All have same energy

Q235: The de Broglie wavelength is inversely proportional to:

- A) Velocity
- B) Mass
- C) Momentum
- D) Kinetic energy

Q236: Which quantum number explains splitting of spectral lines without magnetic field?

- A) n
- B) l
- C) m
- D) s

Q237: The number of orbitals in a shell with principal quantum number $n = 9$ is:

- A) 9
- B) 18
- C) 81
- D) 162

Q238: The probability of finding electron near the nucleus is maximum for:

- A) 2s
- B) 2p
- C) 3p
- D) 1s

Q239: The highest energy photon is emitted in transition:

- A) $n = 3 \rightarrow 2$
- B) $n = 4 \rightarrow 2$
- C) $n = 5 \rightarrow 2$
- D) $n = \text{infinity} \rightarrow 1$

Q240: The hydrogen emission spectrum conclusively proves the concept of:

- A) Continuous energy levels
- B) Quantized energy levels
- C) Wave nature of light
- D) Existence of neutrons

Q241: The de Broglie wavelength of an electron accelerated through a potential difference of 4900 V is approximately:

- A) 0.175 Å
- B) 0.247 Å
- C) 0.122 Å
- D) 0.388 Å

Q242: If the uncertainty in position of a particle is increased four times, the uncertainty in momentum will become:

- A) Four times
- B) Half
- C) One-fourth
- D) Unchanged

Q243: The wavelength of radiation emitted in the transition $n = 11 \rightarrow n = 2$ of hydrogen atom belongs to:

- A) Ultraviolet
- B) Visible
- C) Infrared
- D) Microwave

Q244: The maximum number of electrons that can have $n = 7$ and $l = 2$ is:

- A) 6
- B) 10
- C) 14

D) 18

Q245: The ratio of de Broglie wavelengths of two electrons having kinetic energies in the ratio 1:9 is:

- A) 1:3
- B) 3:1
- C) 1:9
- D) 9:1

Q246: The number of angular nodes present in 9h orbital is:

- A) 4
- B) 5
- C) 6
- D) 7

Q247: The energy of photon emitted when an electron falls from $n = 8$ to $n = 1$ in hydrogen atom is closest to:

- A) 12.9 eV
- B) 13.4 eV
- C) 13.6 eV
- D) 10.2 eV

Q248: Which orbital has the highest electron density exactly at the nucleus?

- A) 1s
- B) 2s
- C) 3s
- D) 4s

Q249: The number of orbitals corresponding to $l = 6$ is:

- A) 11
- B) 13
- C) 15
- D) 17

Q250: The shortest wavelength radiation is produced in hydrogen atom by transition:

- A) $n = 5 \rightarrow 2$
- B) $n = 4 \rightarrow 1$
- C) $n = 3 \rightarrow 1$
- D) $n = \text{infinity} \rightarrow 1$

Q251: The uncertainty principle is most applicable when dealing with:

- A) Baseball
- B) Bullet
- C) Electron
- D) Car

Q252: The number of radial nodes in 9s orbital is:

- A) 6
- B) 7
- C) 8
- D) 9

Q253: Which of the following orbitals has the maximum total number of nodes?

- A) 6s
- B) 6p
- C) 6d
- D) 6f

Q254: The speed of an electron having de Broglie wavelength 0.20 Å is approximately:

- A) $1.8 \times 10^6 \text{ m s}^{-1}$
- B) $3.6 \times 10^6 \text{ m s}^{-1}$
- C) $7.3 \times 10^6 \text{ m s}^{-1}$
- D) $1.8 \times 10^7 \text{ m s}^{-1}$

Q255: Which of the following transitions in hydrogen atom emits infrared radiation?

- A) $n = 4 \rightarrow 1$
- B) $n = 3 \rightarrow 1$
- C) $n = 4 \rightarrow 3$
- D) $n = 2 \rightarrow 1$

Q256: The maximum number of electrons that can have $m = -4$ is:

- A) 1
- B) 2
- C) 4
- D) 8

Q257: The principal quantum number of an orbital having 3 radial nodes and 3 angular nodes is:

- A) 6
- B) 7
- C) 8
- D) 9

Q258: The series limit of Brackett series corresponds to transition:

- A) $n = 5 \rightarrow 4$
- B) $n = 6 \rightarrow 4$
- C) $n = \text{infinity} \rightarrow 4$
- D) $n = 4 \rightarrow 3$

Q259: At the same kinetic energy, which particle has the longest de Broglie wavelength?

- A) Electron
- B) Proton
- C) Neutron
- D) Alpha particle

Q260: The number of orbitals degenerate with 6p orbital in hydrogen atom is:

- A) 9
- B) 16
- C) 25
- D) 36

Q261: The wavelength of photon emitted in transition $n = 6 \rightarrow n = 2$ of hydrogen atom is closest to:

- A) 410 nm
- B) 434 nm
- C) 486 nm
- D) 656 nm

Q262: Which orbital has zero probability of finding electron at the nucleus?

- A) 1s
- B) 2s
- C) 3p
- D) 3s

Q263: The separation between successive energy levels in hydrogen atom becomes:

- A) Larger at higher n
- B) Smaller at higher n
- C) Constant
- D) Zero at $n = 2$

Q264: The maximum number of electrons that can have $n = 9$ is:

- A) 162
- B) 128
- C) 98
- D) 81

Q265: The wavelength corresponding to a photon of energy 3.4 eV is approximately:

- A) 364.6 nm
- B) 486 nm
- C) 656 nm
- D) 121.6 nm

Q266: Which orbital has two radial nodes and one angular node?

- A) 4p
- B) 5p
- C) 5d
- D) 6s

Q267: The emission of line spectrum is possible because electrons:

- A) Lose energy continuously
- B) Exist only in fixed energy states
- C) Move in elliptical orbits
- D) Collide with nucleus

Q268: The de Broglie wavelength of a macroscopic object is negligible due to:

- A) Low velocity
- B) High energy
- C) Large mass
- D) Zero momentum

Q269: The maximum number of electrons that can have $l = 6$ is:

- A) 22
- B) 26
- C) 30
- D) 34

Q270: The radiation emitted in transition $n = 9 \rightarrow n = 5$ belongs to:

- A) Ultraviolet
- B) Visible
- C) Infrared
- D) X-ray

Q271: The orientation of an orbital in space is determined by:

- A) n
- B) l
- C) m
- D) s

Q272: The total number of nodal surfaces in 8d orbital is:

- A) 6
- B) 7
- C) 8
- D) 9

Q273: The hydrogen atom emits radiation in ultraviolet region during:

- A) Balmer series
- B) Lyman series
- C) Paschen series
- D) Brackett series

Q274: Which orbital has highest energy among the following in hydrogen atom?

- A) 5s
- B) 5p
- C) 5d
- D) All have same energy

Q275: The de Broglie wavelength is inversely proportional to:

- A) Velocity
- B) Mass
- C) Momentum
- D) Kinetic energy

Q276: Which quantum number explains splitting of spectral lines in presence of magnetic field?

- A) n
- B) l
- C) m
- D) s

Q277: The number of orbitals in a shell with principal quantum number $n = 10$ is:

- A) 10
- B) 20
- C) 100
- D) 200

Q278: The probability of finding electron very close to the nucleus is maximum for:

- A) 2s
- B) 2p
- C) 3s
- D) 1s

Q279: The highest energy photon is emitted in transition:

- A) $n = 4 \rightarrow 3$
- B) $n = 5 \rightarrow 3$
- C) $n = 6 \rightarrow 2$
- D) $n = \text{infinity} \rightarrow 1$

Q280: The hydrogen emission spectrum is experimental proof of:

- A) Wave nature of light
- B) Particle nature of electron
- C) Quantized energy levels
- D) Existence of nucleus