Quiz: Structure of atom 1

Q1: The ratio of charge to mass (e/m) for an electron was determined by:

A) Rutherford
B) Bohr
C) J.J. Thomson
D) Millikan

Q2: The charge on an electron was determined by the oil drop experiment conducted by:

A) Rutherford
B) Millikan
C) Bohr
D) Goldstein

Q3: Which of the following particles has the highest specific charge?

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

Q4: The maximum number of electrons in a shell having principal quantum number n is:

A) 2n2
B) n2
C) 4n2
D) 2n

Q5: The number of subshells present in the nth shell is:

A) n
B) n2
C) 2n
D) 2n2

Q6: Which quantum number determines the shape of an orbital?

A) Principal
B) Azimuthal
C) Magnetic
D) Spin

Q7: The number of orbitals in a subshell is given by:

A) l
B) 2l+1
C) 2n+1
D) n2

Q8: The maximum number of electrons in a d-subshell is:

A) 6
B) 8
C) 10

D) 14

Q9: Which of the following sets of quantum numbers is not allowed?

A) n=3, l=2
B) n=2, l=1
C) n=1, l=1
D) n=4, l=3

Q10: The orbital angular momentum of an electron depends on:

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

Q11: The number of nodal planes in a p-orbital is:

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

Q12: The total number of orbitals in the nth shell is:

A) n
B) n2
C) 2n2
D) 2n+1

Q13: Which quantum number determines the orientation of an orbital?

A) n
B) l
C) m_l
D) m_s

Q14: The number of electrons present in the third shell of an atom can be maximum:

A) 8
B) 18
C) 32
D) 50

Q15: Which of the following orbitals has spherical shape?

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

Q16: The spin quantum number of an electron can have values:

A) 0 and 1
B) +1 and -1
C) +1/2 and -1/2
D) +1/2 only

Q17: The Pauli exclusion principle states that:

A) Electrons revolve in fixed orbits
B) No two electrons have same spin
C) No two electrons have identical set of quantum numbers
D) Orbitals are filled in order

Q18: The energy of an electron in a hydrogen atom depends on:

A) n only
B) n and l
C) n, l, m
D) All quantum numbers

Q19: Which of the following has the highest energy?

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

Q20: The number of radial nodes in a 3p orbital is:

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

Q21: The wavelength of radiation associated with a moving electron is given by:

A) Planck equation
B) Bohr equation
C) de Broglie equation
D) Rydberg equation

Q22: The Heisenberg uncertainty principle is significant for:

A) Macroscopic objects
B) Moving cars
C) Electrons
D) Planets

Q23: The minimum uncertainty in position and momentum is given by:

A) h
B) h/2
C) h/4pi
D) 2h

Q24: Which model could not explain the stability of atom?

A) Bohr model
B) Rutherford model
C) Quantum mechanical model
D) Atomic orbital model

Q25: The spectrum obtained from hydrogen atom is:

A) Continuous
B) Absorption
C) Emission line spectrum
D) Band spectrum

Q26: Which transition in hydrogen atom emits maximum energy?

A) n=2 \to 1
B) n=3 \to 2
C) n=4 \to 3
D) n=5 \to 4

Q27: The Balmer series corresponds to transitions ending at:

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

Q28: Which of the following series lies in the ultraviolet region?

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

Q29: The Rydberg constant is maximum for:

A) Hydrogen
B) He+
C) Li2+
D) Be3+

Q30: The angular momentum of electron in Bohr orbit is:

A) nh
B) nh/2pi
C) h/2pi
D) n2h/2pi

Q31: The probability of finding electron at nucleus for 2p orbital is:

A) Maximum
B) Minimum
C) Zero
D) Finite

Q32: The shape of d_{z2} orbital is:

A) Dumbbell
B) Double dumbbell
C) Clover leaf
D) Dumbbell with ring

Q33: Which orbital has maximum penetration power?

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

Q34: The energy of orbit in hydrogen atom is given by:

A) -13.6/n
B) -13.6/n2
C) -13.6n2
D) -13.6n

Q35: Which of the following statements is correct?

A) Electron behaves only as particle
B) Electron behaves only as wave
C) Electron shows dual nature
D) Electron has no mass

Q36: The number of nodal planes in a d-orbital is:

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

Q37: Which quantum number has only two possible values?

A) n
B) l
C) m_l
D) m_s

Q38: Which transition corresponds to Paschen series?

A) n>3 \to 3
B) n>2 \to 2
C) n>1 \to 1
D) n>4 \to 4

Q39: The magnetic quantum number m_l for p-subshell can have values:

A) 0
B) +/-1
C) 0, +/-1
D) +/-2

Q40: The correct order of increasing energy of orbitals is:

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

Q41: The number of radial nodes in a 4s orbital is:

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

Q42: The number of angular (planar) nodes in a 3d orbital is:

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

Q43: Which orbital has zero angular nodes?

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

Q44: The total number of nodes in a 4p orbital is:

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

Q45: Which orbital has the maximum number of angular nodes?

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

Q46: The probability of finding an electron at the nucleus is maximum for:

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

Q47: Which of the following orbitals does not exist?

A) 1p
B) 2p
C) 3d
D) 4f

Q48: The maximum number of electrons with $m_s = +1/2$ in a p-subshell is:

A) 2
B) 3
C) 6
D) 1

Q49: Which of the following sets of quantum numbers is allowed?

A) n=3,l=3
B) n=3,l=2
C) n=2,l=2
D) n=1,l=1

Q50: The energy difference between two successive Bohr orbits:

A) Increases with n
B) Decreases with n
C) Remains constant
D) Becomes zero

Q51: Which spectral series corresponds to transitions ending at n=4?

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

Q52: The de Broglie wavelength of an electron increases when:

A) Velocity increases
B) Mass increases
C) Velocity decreases
D) Charge increases

Q53: Which of the following has zero magnetic quantum number?

A) s-orbital only
B) p-orbital only
C) d-orbital only
D) All orbitals

Q54: The shape of p-orbitals is best described as:

A) Spherical
B) Dumbbell
C) Cloverleaf
D) Double dumbbell

Q55: Which of the following statements about orbitals is correct?

A) Orbitals are fixed circular paths
B) Orbitals represent probability regions
C) Orbitals contain exactly two electrons always
D) Orbitals are same as orbits

Q56: The minimum energy transition in hydrogen atom among the following is:

A) n=2 \to 1
B) n=3 \to 2
C) n=4 \to 3
D) n=5 \to 4

Q57: Which orbital has the highest energy in a multi-electron atom?

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

Q58: The azimuthal quantum number l can have maximum value:

A) n
B) n-1
C) n+1
D) 2n

Q59: The number of nodal planes in a p_x orbital is:

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

Q60: Which of the following transitions corresponds to absorption of maximum energy?

A) n=1 \to 2
B) n=2 \to 3
C) n=3 \to 4
D) n=4 \to 5

Q61: The uncertainty principle is most significant for:

A) Cricket ball
B) Car
C) Electron
D) Bullet

Q62: Which of the following quantum numbers can be zero?

A) n
B) l
C) m_l
D) m_s

Q63: The maximum number of electrons in a shell with n=5 is:

A) 18
B) 32
C) 50
D) 72

Q64: Which orbital has zero radial nodes?

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

Q65: The orientation of d_{xy} orbital lies:

A) Along x-axis
B) Along y-axis
C) Between x and y axes
D) Along z-axis

Q66: Which of the following is NOT a fundamental particle in atomic structure?

A) Electron
B) Proton
C) Neutron
D) Photon

Q67: The angular momentum of an electron in quantum mechanics is quantized as:

A) l(l+1)h/2pi
B) \sqrt{l(l+1)}h/2pi
C) nh/2pi
D) h/2pi

Q68: The orbital with minimum penetration power is:

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

Q69: Which statement is true for hydrogen-like species?

A) Energy depends on n only
B) Energy depends on n and l
C) Energy depends on all quantum numbers
D) Energy is same for all orbitals

Q70: The line spectrum of hydrogen atom arises due to:

A) Electron spin transitions
B) Nuclear transitions
C) Electronic transitions between energy levels
D) Vibrational transitions

Q71: The value of Rydberg constant for hydrogen is approximately:

A) 1.097x107 m-1
B) 1.097x106 m-1
C) 1.097x105 m-1
D) 1.097x108 m-1

Q72: Which of the following orbitals has highest shielding effect?

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

Q73: The number of electrons that can have same set of n,l,m_l values is:

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

Q74: Which orbital is directionless?

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

Q75: The shortest wavelength in hydrogen spectrum belongs to:

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

Q76: Which orbital has maximum number of total nodes?

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

Q77: Which quantum number decides the size of orbital?

A) n
B) l
C) m_l
D) m_s

Q78: Which transition corresponds to emission of visible light?

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

Q79: The probability density is maximum where the wave function psi is:

A) Zero
B) Maximum
C) Negative
D) Imaginary

Q80: Which of the following rules explains the filling order of orbitals?

A) Pauli principle
B) Hund’s rule
C) Aufbau principle
D) Heisenberg principle

Q81: The number of radial nodes present in a 5p orbital is:

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

Q82: The total number of nodes (radial + angular) in a 6d orbital is:

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

Q83: Which of the following orbitals has the highest penetration power?

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

Q84: The number of orbitals in the f-subshell is:

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

Q85: The maximum number of electrons that can have n=4 and l=2 is:

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

Q86: Which of the following quantum numbers determines the energy of orbitals in multi-electron atoms?

A) n only
B) l only
C) n and l
D) m_l

Q87: The degeneracy of hydrogen atom orbitals arises because energy depends only on:

A) n
B) l
C) m_l
D) m_s

Q88: Which orbital has the maximum number of nodal planes?

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

Q89: The number of electrons with same spin that can be accommodated in a d-subshell is:

A) 2
B) 5
C) 10
D) 3

Q90: Which of the following orbitals has one radial node?

A) 2s
B) 3p
C) 4d
D) 3s

Q91: The de Broglie wavelength of a particle is independent of its:

A) Mass
B) Velocity
C) Charge
D) Momentum

Q92: Which series of hydrogen spectrum corresponds to infrared region?

A) Lyman
B) Balmer
C) Paschen
D) All except Lyman

Q93: The velocity of electron in the first Bohr orbit of hydrogen atom is proportional to:

A) n
B) 1/n
C) n2
D) 1/n2

Q94: Which of the following transitions produces radiation of shortest wavelength?

A) n=2 \to 1
B) n=3 \to 1
C) n=4 \to 1
D) n=\infty \to 1

Q95: The angular momentum of an electron in a p-orbital is:

A) 0
B) \sqrt{2}h/2pi
C) h/2pi
D) \sqrt{6}h/2pi

Q96: Which orbital is least affected by shielding effect?

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

Q97: The number of possible values of magnetic quantum number for l=3 is:

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

Q98: Which of the following orbitals has the highest energy in the same shell?

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

Q99: The line spectrum of hydrogen is explained by:

A) Rutherford model
B) Bohr model
C) Thomson model
D) Quantum uncertainty

Q100: Which of the following orbitals is most stable in a multi-electron atom?

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

Q101: The principal quantum number represents:

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

Q102: Which of the following has zero probability density at the nucleus?

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

Q103: The number of electrons in a completely filled n=4 shell is:

A) 18
B) 32
C) 36
D) 50

Q104: Which orbital has two angular nodes?

A) 3p
B) 3d
C) 4s
D) 2p

Q105: The value of m_l for an s-orbital is:

A) -1, 0, +1
B) 0 only
C) +/-1
D) +/-2

Q106: Which orbital experiences the maximum effective nuclear charge?

A) ns
B) np
C) nd
D) nf

Q107: The maximum number of electrons that can have n=3 is:

A) 8
B) 18
C) 32
D) 14

Q108: Which of the following is an impossible set of quantum numbers?

A) n=4,l=3
B) n=3,l=2
C) n=2,l=1
D) n=2,l=2

Q109: The number of electrons that can be accommodated in a subshell with l=3 is:

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

Q110: Which physical quantity is represented by psi2?

A) Wave function
B) Probability density
C) Energy
D) Momentum

Q111: The uncertainty principle arises due to:

A) Instrumental error
B) Wave nature of matter
C) Electron charge
D) Nuclear forces

Q112: Which series in hydrogen spectrum corresponds to transitions ending at n=5?

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

Q113: The Bohr radius is directly proportional to:

A) n
B) n2
C) 1/n
D) 1/n2

Q114: Which orbital has zero angular momentum?

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

Q115: Which of the following transitions corresponds to emission of infrared radiation?

A) 3 \to 2
B) 4 \to 3
C) 2 \to 1
D) 3 \to 1

Q116: The number of orbitals in the n=5 shell is:

A) 5
B) 25
C) 50
D) 10

Q117: Which of the following orbitals has the greatest radial extension?

A) 2s
B) 3s
C) 4s
D) 3p

Q118: Which rule explains equal distribution of electrons in degenerate orbitals?

A) Pauli principle
B) Aufbau principle
C) Hund’s rule
D) Heisenberg principle

Q119: The wave mechanical model treats electrons as:

A) Particles only
B) Waves only
C) Both waves and particles
D) Stationary charges

Q120: Which of the following orbitals has the highest number of angular nodes?

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

Q121: The number of radial nodes present in a 6s orbital is:

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

Q122: The total number of nodes in a 5d orbital is:

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

Q123: Which of the following orbitals has zero radial nodes?

A) 2p
B) 3p
C) 3s
D) 4s

Q124: The number of angular nodes in a 4f orbital is:

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

Q125: Which orbital has maximum radial nodes among the following?

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

Q126: The energy of an electron in hydrogen atom depends on:

A) n only
B) n and l
C) n,l,m_l
D) All quantum numbers

Q127: Which orbital will have the lowest energy in a multi-electron atom?

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

Q128: The degeneracy of orbitals in a hydrogen atom is due to:

A) Same l value
B) Same m_l value
C) Same n value
D) Same spin

Q129: Which of the following orbitals has the highest angular momentum?

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

Q130: The number of orbitals present in the n=6 shell is:

A) 6
B) 18
C) 36
D) 12

Q131: Which orbital has one angular node and two radial nodes?

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

Q132: The maximum number of electrons that can have the same value of n and l is:

A) 2
B) 4
C) 2(2l+1)
D) 2l+1

Q133: Which quantum number decides the number of orbitals in a subshell?

A) n
B) l
C) m_l
D) m_s

Q134: Which orbital has zero probability of finding electron at the nucleus?

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

Q135: The shortest wavelength among the following transitions is:

A) 3 \to 2
B) 4 \to 2
C) 5 \to 2
D) \infty \to 2

Q136: Which series in hydrogen spectrum lies completely in infrared region?

A) Balmer
B) Lyman
C) Paschen
D) All except Balmer

Q137: The Bohr radius of the first orbit of hydrogen atom is approximately:

A) 0.529 A
B) 1 A
C) 0.0529 A
D) 5.29 A

Q138: The velocity of electron in Bohr orbit decreases with increase in:

A) Z
B) n
C) Nuclear charge
D) Mass of nucleus

Q139: Which orbital is least penetrating towards the nucleus?

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

Q140: The number of nodal planes in a d_{xy} orbital is:

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

Q141: The energy of photon emitted during electronic transition is proportional to:

A) Wavelength
B) Frequency
C) Square of wavelength
D) Amplitude

Q142: Which orbital has three angular nodes?

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

Q143: Which transition in hydrogen atom corresponds to Balmer series?

A) n>1 \to 1
B) n>2 \to 2
C) n>3 \to 3
D) n>4 \to 4

Q144: The principal quantum number n cannot have the value:

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

Q145: Which of the following quantum numbers determines the spin orientation of electron?

A) n
B) l
C) m_l
D) m_s

Q146: The maximum number of electrons that can occupy a single orbital is:

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

Q147: Which rule explains pairing of electrons with opposite spins?

A) Hund’s rule
B) Aufbau principle
C) Pauli exclusion principle
D) Heisenberg principle

Q148: Which of the following orbitals has the highest shielding effect?

A) 1s
B) 2p
C) 3d
D) 4f

Q149: The angular momentum of an electron in an s orbital is:

A) 0
B) h/2pi
C) \sqrt{2}h/2pi
D) nh/2pi

Q150: The spectral lines of hydrogen are due to:

A) Nuclear transitions
B) Spin transitions
C) Electronic transitions
D) Vibrational transitions

Q151: Which series corresponds to transitions ending at n=6?

A) Pfund
B) Humphreys
C) Brackett
D) Paschen

Q152: The radius of Bohr orbit increases with:

A) 1/n
B) n
C) n2
D) Z

Q153: Which orbital is spherically symmetric?

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

Q154: Which of the following does not explain the dual nature of electron?

A) Photoelectric effect
B) de Broglie hypothesis
C) Davisson-Germer experiment
D) Rutherford scattering

Q155: The Davisson-Germer experiment confirmed:

A) Particle nature of electron
B) Wave nature of electron
C) Charge of electron
D) Mass of electron

Q156: The wave function psi of an electron has physical meaning only when:

A) psi is real
B) psi is imaginary
C) psi2 is finite
D) psi2 is integrable

Q157: Which of the following orbitals has maximum energy for n=5?

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

Q158: The number of electrons that can be accommodated in 5f subshell is:

A) 10
B) 14
C) 18
D) 7

Q159: Which of the following is an invalid set of quantum numbers?

A) n=3,l=1,m_l=0
B) n=2,l=1,m_l=1
C) n=2,l=2,m_l=0
D) n=4,l=3,m_l=-2

Q160: The most probable distance of electron from nucleus in ground state hydrogen atom is:

A) 0
B) a0
C) 2a0
D) 3a0

Q161: The number of radial nodes present in a 7s orbital is:

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

Q162: The total number of nodes in a 6p orbital is:

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

Q163: Which orbital has two radial nodes and one angular node?

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

Q164: The number of angular nodes in a 5f orbital is:

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

Q165: Which of the following orbitals has the maximum total number of nodes?

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

Q166: In hydrogen-like species, the energy of electron depends on:

A) n only
B) l only
C) n and l
D) All quantum numbers

Q167: Which orbital has the lowest energy according to (n+l) rule?

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

Q168: The degeneracy of orbitals in hydrogen atom arises because:

A) Same l values
B) Same m_l values
C) Energy depends only on n
D) Spin is ignored

Q169: Which orbital has the highest angular momentum?

A) 3p
B) 4d
C) 5f
D) 6s

Q170: The number of orbitals in the n=7 shell is:

A) 7
B) 49
C) 14
D) 28

Q171: Which orbital has one radial node and zero angular nodes?

A) 2s
B) 3s
C) 3p
D) 4s

Q172: The maximum number of electrons with l=2 is:

A) 6
B) 8
C) 10
D) 14

Q173: Which quantum number determines the number of nodal planes?

A) n
B) l
C) m_l
D) m_s

Q174: Which orbital has zero probability density at the nucleus?

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

Q175: The shortest wavelength among the following transitions is:

A) 4 \to 3
B) 3 \to 2
C) 2 \to 1
D) \infty \to 1

Q176: Which hydrogen spectral series lies in the ultraviolet region?

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

Q177: The Bohr radius of hydrogen atom is approximately:

A) 0.529 A
B) 1 A
C) 0.0529 A
D) 5.29 A

Q178: The velocity of electron in a Bohr orbit is inversely proportional to:

A) n
B) n2
C) Z
D) m

Q179: Which orbital has minimum penetration towards the nucleus?

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

Q180: The number of nodal planes in a p_y orbital is:

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

Q181: The energy of a photon is directly proportional to its:

A) Wavelength
B) Frequency
C) Amplitude
D) Speed

Q182: Which orbital has three angular nodes?

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

Q183: Which transition corresponds to Balmer series?

A) n>1 \to 1
B) n>2 \to 2
C) n>3 \to 3
D) n>4 \to 4

Q184: Which quantum number can never be zero?

A) n
B) l
C) m_l
D) m_s

Q185: The spin quantum number of an electron can be:

A) 0 and 1
B) -1 and +1
C) +/-1/2
D) +/-1

Q186: The maximum number of electrons in a single orbital is:

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

Q187: Which principle explains that no two electrons in an atom have same set of quantum numbers?

A) Hund’s rule
B) Aufbau principle
C) Pauli exclusion principle
D) Heisenberg principle

Q188: Which orbital has the highest shielding effect?

A) 1s
B) 2p
C) 3d
D) 4f

Q189: The angular momentum of an electron in an s orbital is:

A) 0
B) h/2pi
C) \sqrt{2}h/2pi
D) nh/2pi

Q190: The hydrogen line spectrum arises due to:

A) Nuclear transitions
B) Spin transitions
C) Electronic transitions
D) Vibrational transitions

Q191: Which hydrogen spectral series ends at n=6?

A) Pfund
B) Humphreys
C) Brackett
D) Paschen

Q192: The radius of the nth Bohr orbit is proportional to:

A) n
B) n2
C) 1/n
D) 1/n2

Q193: Which orbital is directionless?

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

Q194: Which experiment confirmed the wave nature of electron?

A) Photoelectric effect
B) Davisson-Germer experiment
C) Millikan oil drop experiment
D) Rutherford scattering

Q195: The most probable distance of electron from nucleus in ground state hydrogen atom is:

A) 0
B) a0
C) 2a0
D) 3a0