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CHEMISTRY TEST - CHAPTER 2: ATOMIC STRUCTURE

Name:		Roll No.		Section:

Total Time: 2:30 Hour
Time Allowed: 150 Minutes

Total Marks: 150

PAPER OBJECTIVE
SECTION-A (MARKS 150)

NOTE: Section-A is compulsory. All parts of this section are to be answered on these pages and handed over to the center superintendent. Deleting / overwriting is not allowed. Do not use lead pencil.

Q.1 Fill the relevant bubble for each part. All parts carry one mark.

Questions	A	B	C	D	A B C D
1. The subatomic particle discovered by J.J. Thomson is the:	positron	proton	electron	neutron	○○●○
2. In an electric field, a beam of electrons is deflected towards the:	negative pole	positive pole	neither pole	both poles equally	○●○○
3. In an electric field, a beam of protons is deflected towards the:	positive pole	negative pole	both poles equally	neither pole	○●○○
4. Which particle passes through electric and magnetic fields undeflected?	Neutron	Proton	Cation	Electron	●○○○
5. A proton is approximately how many times heavier than an electron?	18.36 times	183 times	18360 times	1836 times	○○○●
6. The magnitude of the charge on one electron is:	1.6022×10^{-10} C	1.6750×10^{-27} C	1.6022×10^{-19} C	9.1095×10^{-31} C	○○●○
7. The relative charge of an electron is:	0	+1	−2	−1	○○○●
8. Which subatomic particle carries no electric charge?	Electron	Neutron	Proton	Positron	○●○○
9. Atomic number is equal to the number of:	nucleons in the atom	neutrons in the nucleus	protons in the nucleus	electrons in the valence shell	○○●○
10. Mass number represents the total number of:	protons and neutrons	electrons only	protons and electrons	neutrons and electrons	●○○○
11. An atom has 17 protons and 18 neutrons. Its mass number is:	35	18	17	36	●○○○
12. A chlorine atom has atomic number 17 and mass number 37. The number of neutrons in it is:	37	54	17	20	○○○●
13. The number of electrons in Mg^{2+} (Z = 12) is:	2	10	14	12	○●○○
14. The number of electrons in Al^{3+} (Z = 13) is:	16	13	3	10	○○○●

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Questions	A	B	C	D	A B C D
15. The number of electrons in S^{2-} (Z = 16) is:	18	14	16	2	●○○○
16. In a cation, the number of electrons equals the atomic number minus the:	number of neutrons	number of protons	mass number	magnitude of charge on the cation	○○○●
17. A copper atom has atomic number 29 and mass number 63. Its number of neutrons is:	63	34	92	29	○●○○
18. A species has 13 protons, 14 neutrons and 10 electrons. Its charge is:	+3	+1	+4	−3	●○○○
19. A species has 9 protons and 10 electrons. It carries a charge of:	+2	−1	+1	−2	○●○○
20. Which species has the same number of electrons as a neon atom?	Na^+	Li^+	Cl^-	K^+	●○○○
21. A student finds that species X has 20 protons and 18 electrons. X is:	a neutral atom	an anion with −2 charge	a cation with +1 charge	a cation with +2 charge	○○○●
22. Across a period (left to right), atomic radius generally:	first increases then becomes zero	remains constant	decreases	increases	○○●○
23. Down a group, atomic radius:	becomes zero	decreases	increases	remains constant	○○●○
24. The atomic radius decreases across a period mainly because of the increase in:	nuclear charge	number of shells	shielding effect	number of neutrons	●○○○
25. The atomic radius increases down a group because:	nuclear charge decreases	the number of shells increases	electrons are removed	shielding decreases	○●○○
26. A cation is always ___ than its parent atom.	smaller	the same size	larger	unpredictable in size	●○○○
27. An anion is ___ than its parent atom.	smaller	the same size	half the size	larger	○○○●
28. Cations are smaller than their parent atoms because of:	addition of a new shell	decreased nuclear charge	increased electron–electron repulsion	increased effective nuclear charge and reduced electron repulsion	○○○●
29. Which atom has the largest radius?	Na	Si	Mg	Al	●○○○
30. Which atom has the smallest radius among Na, Mg, S and Cl?	S	Cl	Na	Mg	○●○○
31. Which atom has the largest atomic radius among Li, Na, K and Mg?	K	Na	Mg	Li	●○○○

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Questions	A	B	C	D	A B C D
32. Which of the following has the smallest radius?	K^+	Na	Na^+	K	○○●○
33. Atomic radius influences which of the following properties?	Ionization energy	Electronegativity	Bond length	All of these	○○○●
34. Atomic radius is the average distance between the nucleus and the:	outermost electrons	two electrons in an orbital	innermost electron	nuclei of two different atoms	●○○○
35. The principal quantum number is represented by the symbol:	s	l	m	n	○○○●
36. The azimuthal quantum number is represented by the symbol:	s	l	m	n	○●○○
37. The magnetic quantum number is represented by the symbol:	m	n	s	l	●○○○
38. The possible values of the principal quantum number are:	0, 1, 2, …	−1, 0, +1	+½ and −½	1, 2, 3, …	○○○●
39. The azimuthal quantum number describes the:	number of neutrons	shape of the orbital (subshell)	spin of the electron	size of the shell only	○●○○
40. For a given value of n, the azimuthal quantum number l has values from:	−n to +n	0 to n	0 to n − 1	1 to n	○○●○
41. When n = 3, the possible values of l are:	0, 1, 2 and 3	0, 1 and 2	0 and 1	1, 2 and 3	○●○○
42. The number of subshells in the shell with n = 4 is:	3	16	4	5	○○●○
43. The magnetic quantum number has values ranging from:	−l to +l	−n to +n	0 to n − 1	0 to l	●○○○
44. For l = 1, the values of the magnetic quantum number are:	−1, 0 and +1	0 only	−2 to +2	0 and 1	●○○○
45. The number of orbitals in a d subshell is:	3	7	5	1	○○●○
46. The number of orbitals in an f subshell is:	5	7	9	3	○●○○
47. The number of orbitals in a p subshell is:	7	5	3	1	○○●○
48. The spin quantum number can have the values:	+½ only	+½ and −½	+1 and −1	0 and 1	○●○○

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Questions	A	B	C	D	A B C D
49. In 1925, who showed that an electron also spins about its own axis?	Bohr	Goudsmit	Dalton	Planck	○●○○
50. The maximum number of electrons that can occupy one orbital is:	10	6	2	1	○○●○
51. The maximum number of electrons in a p subshell is:	6	2	10	14	●○○○
52. The maximum number of electrons in a d subshell is:	5	6	14	10	○○○●
53. The maximum number of electrons in an f subshell is:	10	14	18	6	○●○○
54. The maximum number of electrons in the shell with n = 3 is:	8	32	9	18	○○○●
55. The subshell with n = 3 and l = 2 is:	3s	3d	3p	4d	○●○○
56. The subshell with n = 4 and l = 0 is:	3s	4s	4d	4p	○●○○
57. Which set of quantum numbers is NOT allowed?	n = 3, l = 2	n = 1, l = 0	n = 2, l = 1	n = 2, l = 2	○○○●
58. The total number of orbitals in the shell with n = 3 is:	3	9	18	5	○●○○
59. Which quantum number explains the splitting of spectral lines in a magnetic field?	Magnetic quantum number	Azimuthal quantum number	Spin quantum number	Principal quantum number	●○○○
60. An s subshell has how many possible values of the magnetic quantum number?	Seven	One	Three	Five	○●○○
61. Which quantum number also indicates the period number in the periodic table?	Azimuthal quantum number	Spin quantum number	Principal quantum number	Magnetic quantum number	○○●○
62. An electron is present in the 4p subshell. Its n and l values are:	n = 1, l = 4	n = 4, l = 0	n = 4, l = 1	n = 3, l = 1	○○●○
63. Two electrons in the same $3p_x$ orbital have the same n, l and m but differ in:	spin quantum number	principal quantum number	azimuthal quantum number	magnetic quantum number	●○○○
64. The Aufbau principle states that electrons are filled in orbitals in order of:	decreasing energy	increasing size	increasing energy	random order	○○●○
65. Which orbital is filled first?	4s	4f	4p	3d	●○○○

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Questions	A	B	C	D	A B C D
66. Which of the following shows the correct order of increasing orbital energy?	1s < 2s < 2p < 3s < 3p < 4s < 3d	1s < 2p < 2s < 3s < 3p < 3d < 4s	2s < 1s < 2p < 3s < 3p < 4s < 3d	1s < 2s < 3s < 2p < 3p < 3d < 4s	●○○○
67. The (n + l) value of a 4s orbital is:	6	5	3	4	○○○●
68. According to the (n + l) rule, which orbital has higher energy?	1s	4s	Both are equal	3d	○○○●
69. Which orbital has greater energy: 5f or 6p?	Both have equal energy	6p	Cannot be predicted	5f	○○○●
70. Which orbital has greater energy: 5s or 4d?	3p	5s	4d	Both have equal energy	○○●○
71. The correct increasing energy order of 5s, 4p, 4s and 3d is:	4s < 3d < 4p < 5s	4s < 4p < 3d < 5s	3d < 4s < 4p < 5s	5s < 4p < 3d < 4s	●○○○
72. The 11th electron of an atom enters which orbital?	4s	3s	3p	2p	○●○○
73. Pauli's exclusion principle states that no two electrons in an atom can have the same:	energy	spin quantum number	set of all four quantum numbers	principal quantum number	○○●○
74. If two electrons occupy the same orbital, they must have:	different l values	opposite spins	different n values	the same spin	○●○○
75. Hund's rule states that degenerate orbitals are:	filled in pairs before any single occupancy	first occupied singly with parallel spins	filled in order of decreasing energy	occupied only by paired electrons	○●○○
76. Degenerate orbitals are orbitals which have:	no electrons	different energies	the same energy	different shapes only	○○●○
77. The number of unpaired electrons in a nitrogen atom (Z = 7) is:	2	0	1	3	○○○●
78. The number of unpaired electrons in an oxygen atom (Z = 8) is:	3	2	0	1	○●○○
79. The number of unpaired electrons in a carbon atom (Z = 6) is:	4	2	1	3	○●○○
80. How many unpaired electrons are present in the configuration $3d^5$?	4	0	3	5	○○○●
81. The number of unpaired electrons in chromium (Z = 24) is:	6	4	2	5	●○○○
82. Chromium has the configuration $4s^1$ $3d^5$ because:	half-filled subshells have extra stability	an s orbital cannot hold two electrons	4s is higher in energy than 3d always	chromium has 25 electrons	●○○○

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Questions	A	B	C	D	A B C D
83. The ground-state configuration of copper (Z = 29) ends with:	$3d^9\ 4s^2$	$3d^{10}\ 4s^2$	$3d^{10}\ 4s^1$	$3d^8\ 4s^2$	○○●○
84. The electronic configuration of the fluoride ion (F^-) is:	$1s^2\ 2s^2\ 2p^6$	$1s^2\ 2s^2\ 2p^4$	$1s^2\ 2s^2\ 2p^5$	$1s^2\ 2s^2\ 2p^6\ 3s^1$	●○○○
85. The electronic configuration of the sodium ion (Na^+) is:	$1s^2\ 2s^2\ 2p^6\ 3s^1$	$1s^2\ 2s^2\ 2p^6\ 3s^2$	$1s^2\ 2s^2\ 2p^6$	$1s^2\ 2s^2\ 2p^5$	○○●○
86. Which subshell can hold a maximum of 10 electrons?	f	p	s	d	○○○●
87. The element with the configuration $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^6$ is:	Nickel	Iron	Copper	Zinc	○●○○
88. The electronic configuration of the chloride ion (Cl^-) is:	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$	○○●○
89. The Mg^{2+} ion is isoelectronic with:	neon	argon	helium	krypton	●○○○
90. The chemical properties of an atom are governed mainly by its:	nuclear mass	valence electrons	inner-shell electrons	neutrons	○●○○
91. Electrons minimise their mutual repulsion by occupying:	the highest shell	separate orbitals of the same subshell	only the s orbital	the same orbital	○●○○
92. An orbital is best described as:	a fixed circular path of an electron	a region where the electron is never found	the centre of the nucleus	a region of space where the probability of finding an electron is maximum	○○○●
93. The shape of an s orbital is:	dumbbell	cloverleaf	linear	spherical	○○○●
94. The shape of a p orbital is:	spherical	cloverleaf	dumbbell	circular	○○●○
95. Most d orbitals have a shape described as:	dumbbell	spherical	cloverleaf (four lobes)	linear	○○●○
96. The number of lobes in a p orbital is:	6	4	2	1	○○●○
97. The three p orbitals are oriented along:	the xy plane only	the x, y and z axes	a single sphere	the x-axis only	○●○○
98. A free radical is a species that has:	one or more unpaired electrons	all electrons paired	a complete octet	a positive charge only	●○○○
99. Which of the following is a free radical?	Na^+	Ne	Cl•	Cl^-	○○●○

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Questions	A	B	C	D	A B C D
100. The electronic configuration of a free radical is the same as that of its:	cation	parent neutral atom	nearest noble gas	anion	○●○○
101. Ionization energy is the minimum energy required to remove the:	outermost electron from a gaseous isolated atom	innermost electron from a solid atom	a proton from the nucleus	all electrons from a molecule	●○○○
102. Ionization energy is usually expressed in the units:	J/s	kJ	mol/kJ	kJ/mol	○○○●
103. The atom must be in the gaseous state for ionization energy measurement to avoid:	loss of neutrons	formation of anions	influence of heat of fusion and vaporization	increase in nuclear charge	○○●○
104. Across a period, ionization energy generally:	decreases	remains constant	increases	becomes zero	○○●○
105. Down a group, ionization energy generally:	increases	decreases	remains constant	doubles	○●○○
106. The first ionization energy decreases in going from:	B to C	Li to Be	Be to B	C to N	○○●○
107. The first ionization energy of aluminium is lower than that of magnesium because the outer electron of Al is in a:	4s subshell	2p subshell	completely filled orbital	3p subshell, higher in energy than 3s	○○○●
108. The slight drop in ionization energy from nitrogen to oxygen is due to:	increase in shielding	increase in atomic radius	spin pair repulsion in the 2p subshell	decrease in nuclear charge	○○●○
109. Group VA elements show relatively higher ionization energies because of:	empty d orbitals	half-filled p orbitals	increased shielding	completely filled s orbitals	○●○○
110. Which element has the highest first ionization energy in Period 3?	Chlorine	Argon	Magnesium	Sodium	○●○○
111. Which element has the lowest first ionization energy in Period 3?	Sodium	Argon	Aluminium	Magnesium	●○○○
112. Which has the highest first ionization energy among Na, Mg, Al and Si?	Si	Na	Al	Mg	●○○○
113. Which of the following does NOT affect ionization energy?	Number of neutrons	Nuclear charge	Atomic radius	Shielding effect	●○○○
114. Across a period the shielding effect:	decreases	becomes zero	increases	remains approximately constant	○○○●
115. An increase in shielding by inner shells ___ the ionization energy.	does not change	increases	doubles	decreases	○○○●
116. Sodium shows a very large gap between its first and second ionization energies. This indicates that it belongs to group:	1	17	2	13	●○○○

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Questions	A	B	C	D	A B C D
117. For magnesium, a very large jump in successive ionization energies occurs between the:	fourth and fifth	second and third	third and fourth	first and second	○●○○
118. An element has successive ionization energies (kJ/mol) of 580, 1815, 2740 and 11 600. It belongs to group:	1	12	13	14	○○●○
119. The successive ionization energies of an element always:	decrease	alternate	remain constant	increase	○○○●
120. A big gap between successive ionization energies shows that the next electron is removed from the:	outermost subshell	inner (lower) shell	same shell	valence orbital	○●○○
121. Successive ionization energy values are an index of the ___ of an atom.	mass number	isotope count	neutron number	valence	○○○●
122. Noble gases have the highest ionization energies in their periods because of their:	low nuclear charge	large atomic radii	stable, completely filled valence shells	half-filled shells	○○●○
123. Mass spectrometry separates ions on the basis of their:	density	colour	mass-to-charge ratio (m/z)	boiling point	○○●○
124. The three fundamental steps of mass spectrometry are:	absorption, emission and detection	ionization, filtration and distillation	vaporization, condensation and detection	ionization, mass analysis and detection	○○○●
125. In a mass spectrum, the x-axis represents the:	m/z ratio	temperature	relative abundance	time	●○○○
126. In a mass spectrum, the y-axis represents the:	m/z ratio	abundance of ions	ionization energy	atomic number	○●○○
127. Chlorine has two isotopes, ^{35}Cl (75.76%) and ^{37}Cl (24.24%). Its relative atomic mass is about:	35.00	36.00	37.24	35.48	○○○●
128. Non-integer relative atomic masses of elements are due to:	errors in measurement	presence of neutrons only	the relative abundance of different isotopes	presence of electrons	○○●○
129. Boron has ^{10}B (20%) and ^{11}B (80%). Its average atomic mass is:	10.5	10.2	11.0	10.8	○○○●
130. Neon has ^{20}Ne (90%) and ^{22}Ne (10%). Its average atomic mass is:	20.2	21.0	21.8	20.8	●○○○
131. Copper has ^{63}Cu (69%) and ^{65}Cu (31%). Its average atomic mass is about:	63.62	64.38	63.00	64.00	●○○○
132. Magnesium has ^{24}Mg (79%), ^{25}Mg (10%) and ^{26}Mg (11%). Its average atomic mass is:	24.00	25.00	25.32	24.32	○○○●
133. Bromine has two isotopes ^{79}Br and ^{81}Br in equal abundance. Its average atomic mass is:	160	81	80	79	○○●○

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Questions	A	B	C	D	A B C D
134. Isotopes of an element have the same atomic number but different:	mass numbers	numbers of electrons	numbers of protons	chemical symbols	●○○○
135. Which technique is used to determine the relative abundance of isotopes?	Chromatography	Titration	Filtration	Mass spectrometry	○○○●
136. When electrons in an atom return from higher to lower energy levels, they release energy in the form of:	neutrons	protons	alpha particles	light	○○○●
137. The line spectrum of each element is:	continuous	the same as that of hydrogen	identical for all elements	characteristic of that element	○○○●
138. Distinct lines in an emission spectrum support the idea that electrons occupy:	nuclear orbitals	random positions	continuous energy levels	quantized energy levels	○○○●
139. Sodium shows a characteristic emission line of which colour?	Red	Yellow	Green	Violet	○●○○
140. Splitting of spectral lines in an electric field is called the:	Photoelectric effect	Compton effect	Zeeman effect	Stark effect	○○○●
141. Splitting of spectral lines in a magnetic field is called the:	Raman effect	Stark effect	Compton effect	Zeeman effect	○○○●
142. Which scientist's model first introduced quantized energy levels (shells) with fixed energy?	Niels Bohr	Rutherford	Dalton	Thomson	●○○○
143. Which pair are both series of the hydrogen emission spectrum?	Paschen and Pauli	Lyman and Hund	Lyman and Paschen	Balmer and Aufbau	○○●○
144. Silicon (Z = 14) has how many valence electrons?	2	8	4	3	○○●○
145. Semiconductors have electrical conductivity:	equal to zero always	between that of conductors and insulators	equal to insulators	higher than metals	○●○○
146. Pure silicon or germanium is called an ___ semiconductor.	intrinsic	n-type	p-type	extrinsic	●○○○
147. Adding controlled impurities to a semiconductor is called:	ionization	distillation	doping	sublimation	○○●○
148. Doping silicon with phosphorus produces an:	p-type semiconductor	insulator	n-type semiconductor	conductor only	○○●○
149. Doping silicon with boron produces a:	noble gas	n-type semiconductor	metal	p-type semiconductor	○○○●
150. In p-type semiconductors the charge carriers are:	holes	ions only	neutrons	protons	●○○○

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