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CHEMISTRY TEST - CHAPTER 3: CHEMICAL BONDING

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. Electronegativity is the power of a covalently bonded atom to attract:	all electrons of another atom	protons from another atom	the shared pair of electrons towards itself	neutrons from the nucleus	○○●○
2. The most commonly used electronegativity scale was designed by:	Heitler	Linus Pauling	Mulliken	London	○●○○
3. Down a group, electronegativity:	increases	decreases	first increases then decreases	remains constant	○●○○
4. Across a period from left to right, electronegativity:	increases	remains constant	becomes zero	decreases	●○○○
5. Electronegativity decreases down a group because the effect of nuclear charge is overcome by:	a decrease in atomic number	loss of neutrons	decrease in atomic mass	the addition of an extra shell (shielding)	○○○●
6. In the third period, the element with the highest electronegativity is:	Sodium	Sulphur	Chlorine	Magnesium	○○●○
7. Electronegativity across a period increases because the effective nuclear charge increases while shielding:	decreases	increases	becomes double	remains constant	○○○●
8. In general, nonmetals have ___ electronegativity values than metals.	equal	higher	lower	zero	○●○○
9. According to Pauling values, a bond is ionic when the electronegativity difference is:	0.4 or lower	between 0.4 and 1.8	greater than 1.8	exactly zero	○○●○
10. A bond is polar covalent when the electronegativity difference is:	between 0.4 and 1.8	exactly zero	greater than 1.8	0.4 or lower	●○○○
11. A bond is non-polar covalent when the electronegativity difference is:	0.4 or lower	greater than 1.8	between 0.4 and 1.8	greater than 3.0	●○○○
12. Potassium (0.82) and chlorine (3.16) form KCl. The electronegativity difference and bond type are:	0.96, ionic	3.98, non-polar	2.34, polar covalent	2.34, ionic	○○○●
13. For HCl (H = 2.20, Cl = 3.16), the electronegativity difference is 0.96, so the bond is:	metallic	polar covalent	non-polar covalent	ionic	○●○○
14. For an O–O bond in the O_2 molecule, the electronegativity difference is:	1.8	3.44	0.4	zero	○○○●

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Questions	A	B	C	D	A B C D
15. Aluminium chloride is more covalent than magnesium chloride because the Al^{3+} ion has:	higher polarising power	larger size	lower charge	no empty orbitals	●○○○
16. Covalent character in a compound increases with ___ polarising power of the cation.	lower	constant	zero	higher	○○○●
17. Across a period from left to right, the covalent character of chlorides generally:	remains constant	increases	becomes ionic	decreases	○●○○
18. Dipole moment is the product of the magnitude of charge and the:	distance between the charges	number of electrons	bond energy	mass of the atoms	●○○○
19. The SI unit of dipole moment named in the book is the:	newton	debye	joule	pascal	○●○○
20. One debye is equal to:	3.335×10^{-30} C m	9.1×10^{-31} C m	1.602×10^{-19} C m	3.335×10^{-10} C m	●○○○
21. The greater the electronegativity difference between two atoms, the bond is:	non-polar	less polar	metallic	more polar	○○○●
22. Which molecule is non-polar although it contains polar bonds?	NH_3	H_2O	CO_2	HCl	○○●○
23. Why is CO_2 non-polar although the C=O bonds are polar?	It is an ionic compound	It contains no bonds	The bond dipoles cancel each other	The C=O bonds are non-polar	○○●○
24. Which of the following is a non-polar molecule?	CCl_4	HF	H_2O	NH_3	●○○○
25. Which of the following is a polar molecule?	Cl_2	HF	CCl_4	CBr_4	○●○○
26. In a polar covalent bond, the more electronegative atom bears a:	partial negative charge	full positive charge	partial positive charge	no charge	●○○○
27. Bond energy is the energy required to:	form one mole of ions	melt one mole of solid	ionise one mole of atoms	break the bond of the same type in one mole of a substance	○○○●
28. Bond length is the distance between the:	nucleus and the valence shell	two electrons in a bond	two molecules	nuclei of two covalently bonded atoms	○○○●
29. The bond energy of H–H (436 kJ/mol) is greater than that of H–Br (366 kJ/mol) because:	the H–H bond length is shorter	Br has no electrons	Br is smaller than H	H–H is polar	●○○○
30. Among hydrogen halides, which has the greatest bond energy?	HI	HF	HCl	HBr	○●○○
31. The bond energy of F_2 is lower than that of Cl_2 because:	lone pairs on the small F atoms repel each other	F is larger than Cl	F is less electronegative	F_2 has a double bond	●○○○

Questions	A	B	C	D	A B C D
32. Greater bond energy means the bond is:	ionic in nature	weaker and the molecule more reactive	stronger and the molecule is less reactive	longer and weaker	○○●○
33. Alkyl fluorides are less reactive than alkyl chlorides because the:	C–F bond energy is greater than C–Cl	C–F bond is non-polar	C–F bond is longer	F atom is larger	●○○○
34. The VSEPR theory is used to determine the:	atomic number	melting point of solids	ionisation energy	shape and bond angle of molecules	○○○●
35. The correct order of repulsion between electron pairs is:	bp–bp > lp–lp > lp–bp	lp–lp > lp–bp > bp–bp	lp–bp > lp–lp > bp–bp	bp–bp > lp–bp > lp–lp	○●○○
36. A molecule with two electron pairs and no lone pairs around the central atom has the shape:	linear	trigonal planar	tetrahedral	bent	●○○○
37. The bond angle in $BeCl_2$ is:	120°	109.5°	90°	180°	○○○●
38. BCl_3 has a shape that is:	linear	trigonal planar	tetrahedral	trigonal pyramidal	○●○○
39. The bond angle in BCl_3 is:	180°	90°	120°	109.5°	○○●○
40. The shape of the carbonate ion (CO_3^{2-}) is:	trigonal pyramidal	trigonal planar	linear	tetrahedral	○●○○
41. SO_2 has two bonding pairs and one lone pair, so its shape is:	linear	tetrahedral	bent (V-shaped)	trigonal planar	○○●○
42. The bond angle in SO_2 is:	less than 120°	180°	109.5°	exactly 120°	●○○○
43. The shape of CH_4 is:	tetrahedral	linear	trigonal pyramidal	square planar	●○○○
44. The H–C–H bond angle in methane is:	120°	107°	109.5°	104.5°	○○●○
45. NH_3 has three bond pairs and one lone pair, so its shape is:	tetrahedral	trigonal pyramidal	bent	trigonal planar	○●○○
46. The H–N–H bond angle in ammonia is less than 109.5° because of:	its ionic nature	absence of lone pairs	lone pair–bond pair repulsion	bond pair–bond pair repulsion	○○●○
47. The shape of the H_2O molecule is:	trigonal planar	bent (V-shaped)	linear	tetrahedral	○●○○
48. The H–O–H bond angle in water is:	109.5°	104.5°	107°	120°	○●○○

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Questions	A	B	C	D	A B C D
49. The H-O-H angle in water is smaller than the H-N-H angle in ammonia because water has:	three bond pairs	no lone pair	two lone pairs on the central atom	one lone pair	○○●○
50. PCl_5 has five bonding pairs and no lone pairs, so its shape is:	trigonal bipyramidal	octahedral	square planar	tetrahedral	●○○○
51. In PCl_5, the Cl–P–Cl angles in the equatorial plane are:	180°	90°	109.5°	120°	○○○●
52. SF_6 has six bonding pairs and no lone pairs, so its shape is:	trigonal bipyramidal	octahedral	square planar	tetrahedral	○●○○
53. All bond angles in an octahedral molecule such as SF_6 are:	120°	109.5°	180°	90°	○○○●
54. The ammonium ion (NH_4^+) has how many bonding pairs and lone pairs on nitrogen?	2 and 2	4 and 0	3 and 1	5 and 0	○●○○
55. The shape of the NH_4^+ ion is:	bent	tetrahedral	linear	trigonal pyramidal	○●○○
56. The molecule of NCl_3 is expected to be:	tetrahedral	linear	trigonal planar	trigonal pyramidal	○○○●
57. When atoms contain more than eight electrons in the valence shell, this is called:	duplet rule	expanded octet (hypervalency)	incomplete octet	octet rule	○●○○
58. An example of a species with expanded octet is:	SF_6	H_2O	NH_3	CH_4	●○○○
59. Atoms of the third and later periods can expand their octet because they have:	smaller size	additional d subshells in the valence shell	fewer protons	no electrons in s orbitals	○●○○
60. Which pair of molecules has an incomplete octet around the central atom?	NH_3 and H_2O	SF_6 and PCl_5	$BeCl_2$ and BCl_3	CH_4 and CCl_4	○○●○
61. VSEPR theory helps medicinal chemists to:	find the mass number of drugs	measure the boiling point of drugs	understand how drug molecules interact in the body	count the neutrons in drugs	○○●○
62. Enzymes recognise and bind to drug molecules on the basis of their:	molecular shape	colour	mass number	number of neutrons	●○○○
63. Cisplatin, $Pt(NH_3)_2Cl_2$, used against cancer, has a ___ structure.	tetrahedral	linear	square planar	trigonal planar	○○●○
64. Cisplatin kills cancer cells by:	damaging DNA and inhibiting DNA synthesis	breaking enzymes into atoms	increasing blood flow	dissolving proteins	●○○○
65. Liposomes are used as drug carriers because they are:	biocompatible, spherical lipid vesicles	gaseous particles	inorganic salts	metallic crystals	●○○○

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Questions	A	B	C	D	A B C D
66. A scientist designs a drug for an enzyme with a tetrahedral pocket of binding sites. According to VSEPR ideas, which drug geometry would fit better?	Bent	Linear	Trigonal planar	Tetrahedral	○○○●
67. Valence bond theory was proposed by:	Dalton and Bohr	Hund and Mulliken	Pauling and Hund	Heitler and London	○○○●
68. According to valence bond theory, a covalent bond is formed by the overlap of:	empty orbitals only	completely filled orbitals only	nuclei of atoms	half-filled atomic orbitals	○○○●
69. The number of covalent bonds an atom can form is equal to its number of:	filled orbitals	neutrons	unpaired electrons in the outermost shell	inner electrons	○○●○
70. The greater the overlap of orbitals, the ___ the bond formed.	stronger	longer	weaker	more ionic	●○○○
71. A sigma bond is formed by:	sharing of neutrons	head-on overlap of orbitals	attraction between ions	parallel overlap of p orbitals	○●○○
72. A pi bond is formed by:	ionic attraction	overlap of s–s orbitals only	parallel (sideways) overlap of p orbitals	head-on overlap of s orbitals	○○●○
73. A double bond consists of:	one sigma and two pi bonds	one sigma and one pi bond	two pi bonds	two sigma bonds	○●○○
74. A triple bond consists of:	three sigma bonds	one sigma and two pi bonds	three pi bonds	two sigma and one pi bond	○●○○
75. A sigma bond is stronger than a pi bond because in a sigma bond the electron density is:	zero	above and below the plane	between the two nuclei	far from the nuclei	○○●○
76. The H–H bond in the hydrogen molecule is formed by overlap of:	p–p orbitals	sp–s orbitals	s–p orbitals	s–s orbitals	○○○●
77. The F–F bond in the fluorine molecule is a:	sigma bond formed by s–s overlap	sigma bond formed by p–p head-on overlap	double bond	pi bond formed by p–p overlap	○●○○
78. The H–F bond is formed by overlap of:	2s with 2s	1s of hydrogen with 2p of fluorine	1s of hydrogen with 2s of fluorine	2p of hydrogen with 2p of fluorine	○●○○
79. The oxygen molecule O_2 contains:	one sigma and two pi bonds	two pi bonds only	two sigma bonds	one sigma and one pi bond	○○○●
80. The nitrogen molecule N_2 contains:	one sigma and two pi bonds	three sigma bonds	three pi bonds	two sigma and one pi bond	●○○○
81. Hybridization is the mixing of atomic orbitals of:	different energies and shapes to give equivalent hybrid orbitals	only s orbitals	same energy and same shape	only p orbitals	●○○○
82. Before hybridization, electrons in the ground state are often:	removed from the atom	paired in the same orbital	promoted to the excited state	converted to neutrons	○○●○

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83. An sp hybrid orbital has:	50% s-character and 50% p-character	33% s-character	25% s-character	75% s-character	●○○○
84. Hybrid orbitals formed by sp hybridization can form only:	pi bonds	metallic bonds	sigma bonds	ionic bonds	○○●○
85. In $BeCl_2$, the beryllium atom undergoes:	no hybridization	sp^3 hybridization	sp^2 hybridization	sp hybridization	○○○●
86. The electronic configuration of Be in the excited state is:	$1s^2\ 2p^2$	$1s^2\ 2s^1\ 2p^1$	$1s^2\ 2s^1$	$1s^2\ 2s^2$	○●○○
87. Each carbon atom in acetylene (C_2H_2) is:	sp^3 hybridized	not hybridized	sp hybridized	sp^2 hybridized	○○●○
88. The carbon–carbon triple bond in acetylene consists of:	one sigma sp–sp bond and two pi bonds	three sigma bonds	two sigma and one pi bond	three pi bonds	●○○○
89. The shape of the acetylene molecule is:	bent	linear with 180° bond angle	tetrahedral	trigonal planar	○●○○
90. sp^2 hybridization involves the mixing of:	two s and two p orbitals	one s and two p orbitals	one s and three p orbitals	one s and one p orbital	○●○○
91. In BCl_3, boron undergoes:	sp hybridization	sp^3 hybridization	dsp^2 hybridization	sp^2 hybridization	○○○●
92. Each carbon atom in ethene (C_2H_4) is:	sp hybridized	sp^3 hybridized	unhybridized	sp^2 hybridized	○○○●
93. The double bond between the carbon atoms in ethene consists of:	two sigma bonds	two pi bonds	one sigma and one pi bond	one sigma and two pi bonds	○○●○
94. The H-C-H and H-C-C bond angles in ethene are:	180°	109.5°	120°	90°	○○●○
95. The pi bond in ethene is formed by the parallel overlap of:	sp orbitals	1s orbitals of hydrogen	unhybridized 2p orbitals	sp^2 orbitals	○○●○
96. sp^3 hybridization involves the mixing of:	one s and one p orbital	one s and three p orbitals	three s and one p orbital	one s and two p orbitals	○●○○
97. In methane, the carbon atom forms four sigma bonds by overlap of sp^3 and:	1s orbitals of hydrogen	2p orbitals of hydrogen	sp orbitals of hydrogen	2s orbitals of hydrogen	●○○○
98. Each carbon in ethane (C_2H_6) is:	sp hybridized	unhybridized	sp^3 hybridized	sp^2 hybridized	○○●○
99. How many sigma bonds are present in an ethane molecule?	8	7	5	6	○●○○

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Questions	A	B	C	D	A B C D
100. The nitrogen atom in ammonia is:	sp^3 hybridized with one lone pair	sp^2 hybridized	sp hybridized	sp^3 hybridized with no lone pair	●○○○
101. The oxygen atom in a water molecule is:	sp^3 hybridized with no lone pair	sp^2 hybridized	sp hybridized	sp^3 hybridized with two lone pairs	○○○●
102. The bond angle in ammonia is reported as:	104.5°	120°	107°	109.5°	○○●○
103. In the hybridization of water, how many of the four sp^3 orbitals of oxygen are half-filled?	1	3	2	4	○○●○
104. sp^3 hybridization gives a bond angle of 109.5° in:	BCl_3	CH_4	$BeCl_2$	C_2H_2	○●○○
105. A coordinate (dative) covalent bond is formed when:	electrons are transferred completely	each atom donates one electron	both shared electrons are donated by one atom	electrons are shared equally by three atoms	○○●○
106. For a coordinate covalent bond, one atom must have a lone pair and the other:	a full orbital	no nucleus	a negative charge only	an empty orbital	○○○●
107. In the hydronium ion (H_3O^+), the dative bond is formed between:	hydrogen and chlorine	oxygen and two protons	a water molecule and a proton	two water molecules	○○●○
108. A coordinate covalent bond is present in:	hydrogen molecule	carbon monoxide	sodium chloride	methane	○●○○
109. Which of the following molecules contains a coordinate covalent bond?	H_2	Ozone (O_3)	CH_4	N_2	○●○○
110. In the ammonium ion formed from NH_3 and H^+, the nitrogen atom acts as the:	electron pair donor	neutron donor	proton donor	electron pair acceptor	●○○○
111. Intermolecular forces are the forces present between:	covalent molecules	ions in a crystal	metal atoms in a lattice	atoms inside a molecule	●○○○
112. Permanent dipole–dipole forces are present between:	polar molecules	non-polar molecules	noble gas atoms	ions in a solid	●○○○
113. Instantaneous dipole–induced dipole forces are present between:	only ions	only metals	only polar molecules	non-polar molecules	○○○●
114. Stronger dipole–dipole forces lead to ___ boiling points.	unchanged	lower	zero	higher	○○○●
115. The strength of van der Waals forces increases with the:	number of electrons or relative molecular mass	electronegativity of the solvent	number of neutrons only	ionisation energy	●○○○
116. The boiling point of propane (C_3H_8) is higher than that of ethane (C_2H_6) because propane has:	ionic character	a larger molecular mass and stronger van der Waals forces	hydrogen bonding	a double bond	○●○○

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117. The boiling points of the halogens increase from F_2 to I_2 because:	they form hydrogen bonds	covalent bonds become stronger	van der Waals forces increase with the number of electrons	electronegativity increases	○○●○
118. Hydrogen bonding occurs when hydrogen is covalently bonded to:	C, S or P	Cl, Br or I	Na, K or Li	F, N or O	○○○●
119. A hydrogen bond is best described as:	an ionic bond	a strong intermolecular force and not a true bond	a covalent bond	a metallic bond	○●○○
120. Ammonia is soluble in water because it:	is a non-polar molecule	has no lone pair	forms ionic bonds with water	forms hydrogen bonds with water molecules	○○○●
121. Ice floats on liquid water because:	water molecules are closer in ice	ice has no hydrogen bonds	ice has an open hydrogen-bonded structure and lower density	ice is heavier than water	○○●○
122. In ice, each oxygen atom is surrounded tetrahedrally by:	sodium ions	chlorine atoms	hydrogen atoms	neon atoms	○○●○
123. The correct order of strength of intermolecular forces is:	H-bonding > instantaneous dipole–induced dipole > permanent dipole–dipole	instantaneous dipole–induced dipole > H-bonding > permanent dipole–dipole	permanent dipole–dipole > H-bonding > instantaneous dipole–induced dipole	H-bonding > permanent dipole–dipole > instantaneous dipole–induced dipole	○○○●
124. The melting and boiling points of simple covalent molecules depend upon:	intermolecular forces	ionic character	strength of covalent bonds inside the molecule	number of neutrons	●○○○
125. Hydrogen fluoride has a higher boiling point than other hydrogen halides due to:	a larger molecular mass	hydrogen bonding between HF molecules	absence of polarity	a weaker H–F bond	○●○○
126. Among the hydrides H_2O, H_2S, H_2Se, H_2Te, which has the highest boiling point?	H_2Se	H_2S	H_2Te	H_2O	○○○●
127. Which of the following has the highest melting point in the book's table?	Iron	Methane	Diamond	Sodium chloride	○○●○
128. Methane has a low melting and boiling point because it has:	strong covalent network	ionic bonds	metallic bonding	weak intermolecular forces	○○○●
129. Which of the following is held together by a giant covalent structure?	Diamond	Sodium chloride	Methane	Iron	●○○○
130. In general, ionic, covalent and metallic bonds are ___ than intermolecular forces.	stronger	unrelated	equal	weaker	●○○○
131. Molecular orbital theory was proposed by:	Bohr and Planck	Heitler and London	Dalton and Pauling	Hund and Mulliken	○○○●
132. In molecular orbital theory, atomic orbitals combine linearly to form:	hybrid orbitals only	ions	molecular orbitals	new atoms	○○●○
133. The number of molecular orbitals formed is always ___ the number of atomic orbitals combined.	equal to	half of	double	three times	●○○○

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134. A bonding molecular orbital is formed by the:	loss of electrons	subtractive overlap of atomic orbitals	splitting of the nucleus	additive overlap of atomic orbitals	○○○●
135. An antibonding molecular orbital has ___ electron density between the two nuclei.	equal	maximum	very high	zero	○○○●
136. Bond order is equal to:	electrons in ABMO − electrons in BMO	2 × electrons in BMO	electrons in BMO + electrons in ABMO	½ (electrons in BMO − electrons in ABMO)	○○○●
137. If the bond order of a molecule is zero, the molecule is:	paramagnetic	diamagnetic	very stable	unstable and does not exist	○○○●
138. The bond order of H_2 is:	0	1	2	3	○●○○
139. The helium molecule He_2 does not exist because its bond order is:	three	two	one	zero	○○○●
140. A molecule with unpaired electrons in its molecular orbitals is:	ionic	diamagnetic	non-polar always	paramagnetic	○○○●
141. The total number of electrons in the N_2 molecule is:	14	16	10	18	●○○○
142. The bond order of the nitrogen molecule is:	1	2	3	0	○○●○
143. The nitrogen molecule is:	paramagnetic with low bond energy	ionic	diamagnetic with very high bond energy	paramagnetic with a double bond	○○●○
144. The bond energy of N_2 given in the book is about:	436 kJ/mol	946 kJ/mol	159 kJ/mol	498 kJ/mol	○●○○
145. The total number of electrons in the O_2 molecule is:	16	18	12	14	●○○○
146. The bond order of the oxygen molecule is:	1	3	2	0	○○●○
147. The paramagnetic nature of oxygen is explained by the presence of two unpaired electrons in the:	σ bonding orbital	π bonding orbitals	π* antibonding orbitals	σ* antibonding orbital	○○●○
148. Which theory fails to explain the paramagnetism of oxygen?	Valence bond theory	Molecular orbital theory	Both of these	Neither of these	●○○○
149. The bond order of the fluorine molecule is:	0	2	3	1	○○○●
150. Arrange the bond lengths of N_2, O_2 and F_2 in increasing order:	$N_2 < O_2 < F_2$	$N_2 < F_2 < O_2$	$F_2 < O_2 < N_2$	$O_2 < N_2 < F_2$	●○○○

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