SET	A

INDIAN SCHOOL MUSCAT
HALF YEARLY EXAMINATION 2022
CHEMISTRY (043)

CLASS: XI Max. Marks: 70

MARKING SCHEME			
SET	QN.NO	VALUE POINTS	MARKS
		SECTION A	
A	1	(d) Unbinilium	1
A	2	(d) Intermolecular hydrogen bonding	1
A	3	(c) 1 m	1
A	4	(c) node	1
A	5	(b) $3s^2\ 3p^5$	1
A	6	(c) 4.8176×10^{23} atoms	1
A	7	(b) 0	1
A	8	(b) Trigonal pyramidal	1
A	9	(a) F	1
A	10	(a) 200 L	1
A	11	(a) [Ar] $3d^5\ 4s^1$	1
A	12	(c) 0.12 M	1
A	13	(b) 2py and 2py	1
A	14	(c) d_z^2, d_x^2- $_y^2$	1
A	15	(D)	1
A	16	(A)	1
A	17	(C)	1
A	18	(D)	1
		SECTION B	
A	19	Moles of HCl = 10^{-4} mol - 1 Molecules = $10^{-4} \times 6.022 \times 10^{23} = 6.022 \times 10^{19}$ - 1	2
A	20	(i) 3d orbitals have higher energy. Based on n+ l rule: for 3d , n+l value =5 and for 4s n+l value = 4. The orbital with lower n+l value have lower enegy	1+1

		(ii) It is impossible to determine the exact position and exact momentum of an electron simultaneously and accurately. **OR** (a) Bohr radius = $(52.9 \times 2^2) \div Z$ pm $= (52.9 \times 4) \div 2 = 105.8$ pm (b) Pauli's Exclusion rule statement	
A	21	MO configuration – 1 BO – 2- ½ Paramagnetic – ½	2
A	22	(i) HF is more polar as compared to HCl because F is more electronegative than Cl. Greater the difference in electronegativity, more will be polarity, higher will be dipole moment. (ii) Resonance structures of CO_3^{2-}	1+1
	23	(a) Cs, large size – ½ + ½ (b) Period = 4 Group = 9 - ½ + ½ **OR** (i) It is due to stable electronic configuration of noble gases and because of inter electronic repulsion, addition of electrons require energy (ii)In case of N electron has to be removed from half filled orbitals hence more energy is required leading to the higher value of ionization enthalpy of nitrogen	1+1
A	24	Molality = 0.32 x 1000/0.68 x 18 = 26.14 m - 2	2
A	25	(i) Small size, high charge /radius ratio (or) polarizing power, high electronegativity, absence of d-orbitals – any two - 1 (ii) any two correct properties	1+1
		SECTION C	
	26	(i) KE = 0 $h\upsilon - h\upsilon_0 = 0$ $\upsilon = \upsilon_0$ $\upsilon = c/\lambda = 4.41 \times 10^{14}\ s^{-1}$ $h\upsilon_0 = 6.626 \times 10^{-34} \times 4.41 \times 10^{14} = 2.92 \times 10^{-19}$ J	3
	27	(a) Lewis structure (b) $MgCl_2$ – ½ Smaller size and greater charge – ½ (c) Bond length is defined as the equilibrium distance between the nuclei of two bonded atoms in a molecule. **OR** (i) σ bond is stronger. This is because σ bond is formed by head on overlapping of atomic orbitals and therefore overlapping is large. Whereas π bond is formed by sideways overlapping. (ii) $GaCl_3$ – ½ Greater charge – ½ (iii) Bond angle is defined as the angle between the orbitals containing bonding electron pairs around the central atom in a molecule.	1+1+1

<table>
<tr><td>A</td><td>28</td><td>(i) Δv = 0.001% of velocity of electron = (0.001 x 300) ÷ 100
= 3 x 10^{-3} ms^{-1}
m_e= 9.1 x 10^{-31} kg
h = 6.626 x 10^{-34}
$\Delta x = h \div (4\pi m \Delta v)$ = 1.945 x 10^{-2} m</td><td>3</td></tr>
<tr><td>A</td><td>29</td><td>
<table>
<tr><th>Element</th><th>%</th><th>Atomic mass</th><th>Moles</th><th>Mole ratio</th><th>Simplest ratio</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>C</td><td>57.8</td><td>12</td><td>4.82</td><td>2</td><td>4</td></tr>
<tr><td>H</td><td>3.6</td><td>1</td><td>3.6</td><td>1.49</td><td>3</td></tr>
<tr><td>O</td><td>38.6</td><td>16</td><td>2.41</td><td>1</td><td>2</td></tr>
</table>
Empirical formula = $C_4H_3O_2$
Molecular formula = 2 ($C_4H_3O_2$) = $C_8H_6O_4$
OR
Mole of ,methanol = 60/32 =1.875
Molarity = 1.875/.5 = 3.75 M</td><td>3</td></tr>
<tr><td>A</td><td>30</td><td>(i) 7 – 1
(ii) 10 – 1
(iii) 8 - 1</td><td>3</td></tr>
<tr><td>A</td><td>31</td><td>(i) Lyman series definition - 1
(ii) Wavenumber = 8.227 x 10^4 cm^{-1} - 1
(iii) mvr = nh/2π
2πr = nh/mv
de-broglie wavelength ʎ= h/mv
from (1) and (2)
2πr = nʎ - 2
OR
Bohr’s equation for helium ion – ½
Substitution – ½
Enthalpy = 8.72 x 10^{-18} J - 2</td><td>1+1+2</td></tr>
<tr><td>A</td><td>32</td><td>(i) Hybridization definition - 1
(ii) sp^3d^2 and octahedral - ½ + ½
(iii) Orbital overlap diagram - 2
OR
Any 2 conditions</td><td>1+1+2</td></tr>
<tr><td>A</td><td>33</td><td>(a) Period trend and reason – 1
Group trend and reason – 1
(b) F – ½ small size and interelectronic repulsion - 1
(c) Definition of isoelectronic species – ½
Any two species which is isoelectronic with Ca^{2+} - ½ + ½</td><td>5</td></tr>
<tr><td>A</td><td>34</td><td>(a) Energy level diagram – 1
Orbital overlap diagram – 1</td><td>5</td></tr>
</table>

		Shape of the hybridised orbital – ½ Sp2 – ½ (b) XeF_4 – square planar – 1 BrF_3 - T shape OR (a) Graph – 1 BE – ½ BL – ½ Explanation - 1 (b) (b) XeO_4 – tetrahedral – 1 IF_4^- - square planar - 1	
A	35	(i) Black body- definition -1 (ii) $E= h\upsilon = hc/\lambda = 3.98 \times 10^{-15}$ J - 1 (iii) Correct shapes 1 + 1 (iv) n = 4, l = 0, ml = 0, s = anyone - 1 OR (a) Hund's rule - 1 (ii) Explains about orientation - 1 (iii) 4 - 1 (iv) 2.25×10^2 nm	5
B	1	(b) IR	1
B	2	(d) Aufbau principle	1
B	3	(b) o-nitrophenol	1
B	4	(c) 0.005 M	1
B	5	(b)12	1
B	6	(c) ClF_3	1
B	7	(d) 2	1
B	8	(c) Representative elements	1
B	9	(b) 0.875 M	1
B	10	(b) Molarity	1
B	11	(b)	1
B	12	(d)	1
B	13	(a)	1
B	14	(c) 1.806×10^{23}	1
B	15	(A)	1
B	16	(C)	1
B	17	(D)	1
B	18	(D)	1
B	19	(i) Limiting reactant definition – 1 (ii) Volume of ammonia produced = 200 L - 1	2
B	20	(i) $[Ar]3d^9$ - 1 (ii) Photo electric effect definition - 1 OR	2

		(a) Energy associated with first orbit of Li^{2+} = -1.962 x 10^{-17} J - 1 (b) Stark effect – splitting of spectral line in electric field - 1	
B	21	MO configuration – 1 BO – 2- ½ Paramagnetic – ½	2
B	22	(i) In NH_3 the bond dipoles and lone pair dipole act in same direction where as in NF_3 the bond dipoles and lone pair dipole act in opposite directions – 1 (ii) Resonance structures of NO_3^{--} - 1	2
B	25	(a) Van der waal's redius def – 1 (b) N, Cl, O, F - 1	2
B	26	ʎ = h/mv ʎ = 4.8 x 10^{-12}m v = 1.516 x 10^{8}m/s K.E = ½ mv^2 K.E = 1.046 x 10^{-14} J	3
B	30	(i) 5– 1 (ii) 14 – 1 (iii) 8 – 1	3
B	31	(i) Balmer series definition -1 (ii) Wavenumber = 1.523 x 10^4 cm^{-1} -1 (iii) mvr = nh/2π 2πr = nh/mv de-broglie wavelength ʎ= h/mv from (1) and (2) 2πr = nʎ - 2 OR Bohr's equation for helium ion – ½ Substitution – ½ Enthalpy = 8.72 x 10^{-18} J - 2	4
B	33	(a) Period trend and reason – 1 Group trend and reason – 1 (b) F – ½ small size and interelectronic repulsion - 1 (c) Definition of isoelectronic species – ½ Any two species which is isoelectronic with Mg^{2+} - ½ + ½	
B	35	(iv) n=3, l=0, ml=0 , s= anyone – 1 (b) Energy and size - 1	