ANNEXURE -A

DAV PUBLIC SCHOOLS, ODISHA ZONE

SUBJECT: - CHEMISTRY, CLASS: XI (Half Yearly) 2023-24

BLUEPRINT OF QUESTION PAPER

Sl No.	Chapters / units	Marks Allotted in Syllabus	Sec-A VSA (MCQs) (16No.sx1)	Sec-B SA-I (5No.s.x2)	Sec-C SA-II (7No.s.x3)	Sec-D CBQ (2Nos.x4)	Sec-E LA (3Nos.x5)	TOTAL (33No.s)
1	SOME BASIC CONCEPTS OF CHEMISTRY	14	4	1	1		1	7
2	STRUCTURE OF ATOM	16	4		1	1	1	7
3	CLASSIFICATION OF ELEMENTS	12	2	2	2			6
4	CHEMICAL BONDING	16	4	2	1		1	8
5	THERMODYNAMICS	12	2		2	1		5
	MARKS	70	16x1=16	5x2=10	7x3=21	2x4=8	3x5=15	33

Subject: Chemistry **Class: XI** **Full Mark: 70** **Nos. of Questions: 33**

As per the syllabus the typology of question as follows:

R & U → Remembering & Understanding 30% **21 MARKS**

APP → Application 30% **21 MARKS**

AN, E & C →Analyzing**,** Evaluating & Creating 40% **28 MARKS**

TOTAL = 70 MARKS

ANNEXURE-B

DAV PUBLIC SCHOOLS, ODISHA

Half-Yearly Exam. **SUBJECT: CHEMISTRY** **CLASS : XI**

QUESTIONWISE ANALYSIS

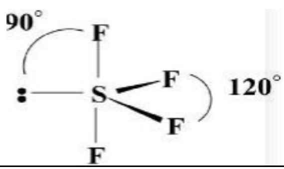
Sl. No.	Chapters / units	Forms of Question - (LA, CBQ, SA-II, SA-I, VSA(MCQs)	Marks Allotted	(R&U),(A), (AN,E&C)
1	Some basic concepts of chemistry	(MCQs)	1	AN, E&C
2	Structure of atom	(MCQs)	1	A
3	Some basic concepts of chemistry	(MCQs)	1	AN, E&C
4	Structure of atom	(MCQs)	1	A
5	Some basic concepts of chemistry	(MCQs)	1	AN, E&C
6	Structure of atom	(MCQs)	1	A
7	Thermodynamics	(MCQs)	1	R & U
8	Chemical Bonding	(MCQs)	1	R & U
9	Chemical Bonding	(MCQs)	1	AN, E&C
10	Classification of elements	(MCQs)	1	R & U
11	Thermodynamics	(MCQs)	1	AN, E&C
12	Chemical Bonding	(MCQs)	1	A
13	Some basic concepts of chemistry	(MCQs)	1	AN, E&C
14	Structure of atom	(MCQs)	1	AN, E&C
15	Chemical Bonding	(MCQs)	1	AN, E&C
16	Classification of elements	(MCQs)	1	AN, E&C
17	Classification of elements	SA-I	2	R & U
18	Chemical Bonding	SA-I	2	R &U
19	Classification of elements	SA-I	2	R &U
20	Some basic concepts of chemistry	SA-I	2	AN, E&C
21	Chemical Bonding	SA-I	2	A
22	Thermodynamics	SA-II	3	AN, E&C
23	Chemical Bonding	SA-II	3	A
24	Structure of atom	SA-II	3	AN, E&C
25	Some basic concepts of chemistry	SA-II	3	AN, E&C
26	Classification of elements	SA-II	3	A
27	Thermodynamics	SA-II	3	R & U
28	Classification of elements	SA-II	3	AN, E&C
29	Thermodynamics	CBQ	4	A
30	Structure of atom	CBQ	4	R & U
31	Some basic concepts of chemistry	LA	5	A
32	Chemical Bonding	LA	5	R & U
33	Structure of atom	LA	5	AN, E&C

ANNEXURE -C

Half-Yearly Exam., SUBJECT CHEMISTRY CLASS :XI

MARKING SCHEME

Qn. No.	Value Points	Marks Allotted	PAGE NO.OF NCERT /TEXT BOOK
	SECTION-A		
1.	(d) 12 g He	1	Pg-18
2.	(b) 2.5h/π	1	Pg- 56
3.	(c) 46	1	Pg-23
4.	(b) Heisenberg's uncertainty principle	1	Pg-51
5.	(c) 34.52	1	Pg-19
6.	(a) 6.63×10^{-24} Kg m sec^{-1}	1	Pg-73
7.	(d) Heat capacity	1	Pg-180
8.	(b) $H_2O>HF>NH_3$	1	Pg- 121
9.	(a) 2 unpaired electrons in π_b MO	1	Pg-127
10.	(b) S	1	Pg-105
11.	(b) -46.2kJ	1	Pg-160
12.	(b) sp, sp^2 and sp^3	1	Exmp-39
13.	(c) Assertion is correct, reason is incorrect	1	Pg-17
14.	(a) Both (A) and (R) are true and (R) is correct explanation of A.	1	Pg-25
15.	(c) Assertion is correct, reason is incorrect	1	Pg-108
16.	(b) Both A and R are true but R is not the correct explanation of A.	1	Pg-88
	SECTION-B		
17.	118- Ununoctium Position in the modern periodic table: 7^{th} period and 18^{th} group.	1 ½ + ½	Pg-80
18.	(a) BF_3 is symmetrical molecule. Hence individual dipolemoments cancel out and net dipolemoment become zero. (b) Due to presence of one lone pair of electrons on nitrogen and three bond pairs, the geometry of NH_3 is tetrahedral and shape is trigonal pyramidal. OR (a) It is due to resonance. (b) It is due to lp-lp repulsion in H_2O molecule which overcomes lp-bp repulsion in case of NH_3.	1 1 1 1	Pg-112
19.	$Na_2O + H_2O \rightarrow 2NaOH\,(Basic)$ $Cl_2O_7 + H_2O \rightarrow 2HClO_4\,(Acidic)$	1 1	Pg-91
20.	$2H_2 + O_2 \rightarrow 2H_2O$ 4g 32g 36g According to the equation, 4g H_2 requires 32g O_2 So, 3g H_2 requires $O_2 = \frac{32\times3}{4} = 24g\ O_2$ Here 3g H_2 is mixed with 29g of O_2. (i) All H_2 will react. Hence, H_2 is the limiting reagent. (ii)According to the equation, 4g H_2 gives 36g H_2O. Hence,3g H_2 will give=$\frac{36\times3}{4}$=27g H_2O	1 1	Pg-20

21.	No. of sigma bond=9, No of Pie bond=3	1 1	Pg-120
	SECTION-C		
22.	$\mathbf{CH_3OH(l) + 3/2O_2 (g) \longrightarrow CO_2 (g) + 2H_2O}$ $\mathbf{\Delta_rH^{\Theta} = -726 kJmol^{-1}}$ **--(i)** $\mathbf{C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}}$ **,** $\mathbf{\Delta_cH^{\Theta} = -393\ kJ\ mol^{-1}}$ **– (ii)** $\mathbf{H_{2(g)} + 1/2O_{2(g)} \longrightarrow H_2O_{(l)}}$**,** $\mathbf{\Delta_fH^{\Theta} = -286\ kJmol^{-1}}$ **–(iii)** The desired equation is $C_{(s)}+2H_{2(g)}+l/2O_{2(g)} \longrightarrow CH_3OH_{(l)};\Delta_fH^{\Theta} = \pm?$-- (iv) Multiply eqn. (iii) by 2 and add to eqn. (ii) $C_{(s)}+2H_{2(g)}+ 2O_{2(g)} \longrightarrow CO_{2(g)}+2H_2O_{(l)}$ $\Delta H = -(393 + 522) = -965$ $\mathbf{kJmol^{-1}}$ **-----------(v)** Subtract eqn. (v) from eqn. (i) $CH_3OH_{(l)}+3/2O_{2(g)} \longrightarrow CO_{2(g)}+2H_2O_{(l)}$: $\Delta H = -726$ **kJ** mol^{-1} ----------------------(vi) Subtract eqn. (vi) from eqn. (v) : $C(s) + 2H_{2(l)} + l/2O_{2(g)} \longrightarrow CH_3OH_{(l)}$; $\Delta_fH^{\Theta} = -239$ **kJ** mol^{-1}	 ½ 1 ½ 1	Pg-180
23.	(a) The bond dipoles of two C=O. bonds cancel the moment of each other. Whereas, H_2O molecule has a net dipole moment (1.84 D). H_2O molecule has a bent structure because here the O—H bonds are oriented at an angle of 104.5° and do not cancel the bond moments of each other. (b) The hybridization of B changes from sp^2 to sp^3 whereas the hybridization of N remains same i.e sp^3. (c) The geometry of SF_4 molecule is a "see-saw."`  	1 1 1	Pg- 137
24.	(a) Power of bulb, P = 25 Watt = 25 Js^{-1} Energy of one photon, $E = h\nu = hc/\lambda$ Substituting the values in the given expression of E: $E = \frac{(6.626\times10^{-34})(3\times10^{8})}{(0.57\times10^{-6})} = 34.87\times10^{-20}$ J $E = 34.87 \times 10^{-20}$ J Rate of emission of quanta per second $= \frac{25}{34.87\times10^{-20}} = 7.169\times10^{19}\ s^{-1}$ (b) Correct statement .	 ½ ½ 1 1	Pg- 53,47,59

<table>
<tr>
<td>25.</td>
<td>Molecular mass = 98.96

<table>
<tr><th>Element</th><th>%</th><th>Atomic mass</th><th>Relative no. of moles</th><th>Simplest molar ratio</th><th>Simplest whole no.ratio</th></tr>
<tr><td>C</td><td>24.27</td><td>12</td><td>$\frac{24.27}{12}$ = 2.02</td><td>$\frac{2.02}{2.02}$ = 1</td><td>1</td></tr>
<tr><td>H</td><td>4.07</td><td>1</td><td>$\frac{4.07}{1}$ = 4.07</td><td>$\frac{4.07}{2.02}$ = 2</td><td>2</td></tr>
<tr><td>Cl</td><td>71.65</td><td>35.5</td><td>$\frac{71.65}{35.5}$ = 2.02</td><td>$\frac{2.02}{2.02}$ = 1</td><td>1</td></tr>
</table>

Simple molar ratio=1:2:1 for C: H: Cl

Empirical Formula= CH_2Cl
Empirical mass= 49.5
n=molecular mass/empirical mass=98.96/49.5= 2
Molecular formula = n × (Empirical formula)
= 2 × (CH_2Cl) = $C_2H_4Cl_2$</td>
<td>1

1

1</td>
<td>Pg-51</td>
</tr>
<tr>
<td>26.</td>
<td>(i) Stable full filled electronic configuration
(ii) N has a stable configuration since it has half-filled 2p-orbitals so it is reluctant to gain an electron. So, nitrogen has slightly positive electron gain enthalpy.
(iii) Hydrogen has properties similar to the group 1 elements (alkali metals) and it also shows the properties of group 17 elements (Halogens). Hydrogen's similarity with two completely different groups of elements in the modern periodic table has made it difficult for scientists to place it in particular group and hence the position of hydrogen in the modern periodic table is not fixed.
(iv) This is due to the increase in nuclear charge and decrease in atomic size, as a result of which shared electron pair can be attracted more towards itself.</td>
<td>1x3</td>
<td>Pg-85, 87</td>
</tr>
<tr>
<td>27.</td>
<td>(a)
For the given reaction,
2A + B→C

As per the Gibbs Helmholtz equation:
$\Delta G = \Delta H - T\Delta S$
Assuming the reaction at equilibrium, $\Delta G=0$;
So, $\Delta H=T\Delta S$
$T=\Delta H/\Delta S$
T = (400 kJ mol^{-1})/ (0.2 kJ K^{-1} mol^{-1}) = 2000 K
Thus, reaction will be in a state of equilibrium at 2000 K.
For the reaction to be spontaneous, ΔG must be negative. Hence, for the given reaction to be spontaneous, T should be greater than 2000 K.

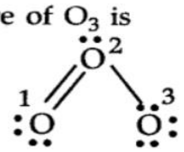
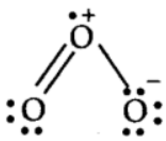
(b)
ΔH : negative (- ve) because energy is released in bond formation
ΔS : negative (- ve) because entropy decreases when atoms combine to form molecules.</td>
<td>½

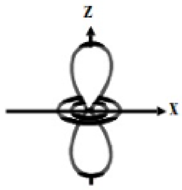
½

1

1</td>
<td>Pg-184</td>
</tr>
</table>

28.	(a) (i) All the given species contain same number of electrons (10). Hence, they are isoelectronic species. (ii) The increasing order of ionic radii is $Al^{3+} < Mg^{2+} < Na^{+} < F^{-} < O^{2-} < N^{3-}$ (b) Because the number of protons are more than number of electrons and hence effective nuclear charge increases.	1 1 1	Pg-96
SECTION-D			
29	(a) C_P-C_V= R (b) The amount of heat required to raise the temperature of 1 mole of a substance by 1 degree celcius. (c) q = McΔT = 1000× 4.18×20 =83600 J $=\frac{83600}{1000}$ = 83.6 KJ OR $2SO_{2(g)} + O_{2(g)} \rightarrow 2SO_{3(g)}$ For the above reaction $\Delta n^{(g)}$ =2-(2+1)= -1 $\Delta U = \Delta H - \Delta n^{(g)}RT$ =−92.38-(-1)×(8.314×298) =−92.38+(8.314×298) =−92.38+4.95=−87.43kJ	1 1 ½ ½ 1 ½ ½ 1	Pg-161,163
30	(a) λ = h/mv (b) No, Because of large masses, the wavelength associated with macroscopic object becomes so short that it can not be detected. (c) $\lambda = h / (2mKE)^{1/2}$ $=\frac{6.626\times10^{-34}}{\sqrt{2\times9.1\times10^{-31}\times3\times10^{-25}}}$ $=1.2\times10^{-7}$m OR $P = \frac{h}{\lambda}$ so, here we have to use formula $\frac{P_A}{P_B} = \frac{\lambda_B}{\lambda_A}$ Given, $P_B = \frac{P_A}{2}$ and $\lambda_A = 5 \times 10^{-8} m$ so, $\frac{P_A}{P_A/2} = \frac{\lambda_B}{5\times10^{-8}}$ $\lambda=10^{-7}$m hence, wavelength of B is 10^{-7}m	1 ½ ½ ½ ½ 1 ½ ½ ½ ½	Pg-27
SECTION-E			
31	(a) Molar mass of glucose ($C_6H_{12}O_6$) $= 12 \times 6 + 1 \times 12 + 16 \times 6 = 180$ $\text{Molarity} = \frac{\text{conc. in gL}^{-1}}{\text{Molar mass}} = \frac{0.90\ \text{gL}^{-1}}{180\ \text{g mol}^{-1}} = 0.005\ \text{M}$ (b) $CaCO_3 \rightarrow CaO + CO_2$ 10.0 g 5.6 g 2.24L=4.4 g Since, mass of reactant = Mass of product	1x5	Pg-17,19,15

	So, the law of conservation of mass is obeyed. (c) 0.5 mol Na_2CO_3 means the quantity of weight of Na_2CO_3 present whereas 0.5M Na_2CO_3 means 0.5 moles of Na_2CO_3 present in 1 L solution. it is a measure of quantity of Na_2CO_3 in the solution (d) Number of moles of solvent=1000/18=55.56 mol Mole fraction of the solute $=\frac{2.5}{2.5+55.56}$ =0.043 (e) $CaCO_3+2HCl \rightarrow CaCl_2+H_2O+CO_2$ According to the balanced reaction 100 g of $CaCO_3$ requires 2×36.5=73 g of HCl 50 g $CaCO_3$ requires:= 73/100×50=36.5 g HCl (f) 14 gm of Nitrogen has higher volume		
32.	(a)The octet rule states that atoms tend to form compounds in ways that give them eight valence electrons and thus the electronic configuration of a noble gas. Limitations:(any two) (i) Incomplete octet: In certain molecules such as BeH_2, $BeCl_2$, BH_3, BF_3, the central atom has less than 8 electrons in its valence shell, yet the molecule is stable. (ii) Expanded octet: In certain molecules such as PF_5, SF_6, IF_7, H_2SO_4, the central atom has more than 8 valence electrons, yet the molecule is stable. (iii) Odd electron species: In certain molecules such as NO_2 , the central atom has one odd electron. (iv) Xe being a noble gas also forms compounds like XeF_4, XeF_6 (v) It failed to explain the relative stability of molecules. (vi) The shape of the molecule is not predicted by the octet rule. (b) Lewis structure of O_3 is  Formal charge on O(1) = $6 - 4 - \frac{1}{2}(4) = 0$ Formal charge on O(2) = $6 - 2 - \frac{1}{2}(6) = +1$ Formal charge on O(3) = $6 - 6 - \frac{1}{2}(2) = -1$.  **OR** (a) N_2: $\sigma1s^2, \sigma*1s^2, \sigma2s^2, \sigma*2s^2, \pi2p_x^2=\pi2p_y^2, \sigma*2p_z^2$ Bond Order = $\frac{N_b-N_a}{2}=\frac{10-4}{2}=3$ O_2: $\sigma1s^2, \sigma*1s^2, \sigma2s^2, \sigma*2s^2, \sigma*2p_z^2, \pi2p_x^2=\pi2p_y^2, \pi*2p_x^1=\pi*2p_y^1$ Bond Order = $\frac{N_b-N_a}{2}=\frac{10-6}{2}=2$ O_2^+: $\sigma1s^2, \sigma*1s^2, \sigma2s^2, \sigma*2s^2, \sigma*2p_z^2, \pi2p_x^2=\pi2p_y^2, \pi*2p_x^1$ Bond Order = $\frac{N_b-N_a}{2}=\frac{10-5}{2}=2.5$ O_2^-: $\sigma1s^2, \sigma*1s^2, \sigma2s^2, \sigma*2s^2, \sigma*2p_z^2, \pi2p_x^2=\pi2p_y^2, \pi*2p_x^2=\pi*2p_y^1$ Bond Order = $\frac{N_b-N_a}{2}=\frac{10-7}{2}=1.5$ Increasing order of stability $O_2^- < O_2 < O_2^+ < N_2$ (b) Any two difference.	1 1+1 ½ ½ ½ ½ ½ ½ ½ ½ 1 2	Pg-135,105,129

33.	(a) (i)n=5	1	Pg-70,41,70,61,59
	(ii)  d_{z^2}	1	
	(b) (i) $1s^2 2s^2 2p^6 3s^2 3p^6$ Number of unpaired electrons=0 (ii) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$ Number of unpaired electrons=3	1+1	
	(c) $\frac{(n_2-n_1)(n_2-n_1+1)}{2}$	½	
	$=\frac{(7-2)(7-2+1)}{2} = \frac{5\times6}{2} = 15\ lines$	½	
	OR		
	(a) Energy for hydrogen electron present in a particular energy shell,	1	
	$E_n = -\frac{-2.18\times10^{-18}}{n^2} J\ atom^{-1}$	1	
	Ionisation energy for hydrogen electron present in orbit n = 5 is $IE_5 = E_\infty - E_5 = 0 - \left(\frac{-2.18\times10^{-18}}{25}\right) J\ atom^{-1} = 8.72\times10^{-20} J\ atom^{-1}$		
	(b) (i) n-l-1 = 3-1-1 =1 (ii) l = 2	1+1	
	(c) Electron bearing quantum numbers:n=4, l=3 will have the lower energy because of lower n value making it closer to nucleus	1	