DEPARTMENT OF GOVERNMENT EXAMINATIONS

HIGHER SECONDARY FIRST YEAR EXAMINATION MAY- 2022

KEY ANSWER FOR CHEMISTRY – ENGLISH MEDIUM

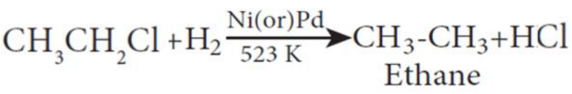
Maximum Marks - 70

Answer all the Questions **Part -I** **15 x 1 = 15**

Q.NO	Option	A Type	Q.NO	Option	B Type
1	c)	C_8H_{18}	1	a)	1p + 2n
2	b)	- 2ºC	2	c)	(1) – (iv), (2) – (iii), (3) – (i), (4) – (ii)
3	a)	$–C(CH_3)_3$ > $-CH(CH_3)_2$ >- $CH_2 – CH_3$ > $-CH_3$	3	b)	NO
4	b)	NO	4	c)	Mass / volume
5	d)	d) Both assertion and reason are true but reason is not the correct explanation of assertion	5	c)	C_8H_{18}
6	c)	Mass / volume	6	a)	Lithium
7	b)	for a system at equilibrium Q is always less than the equilibrium constant	7	a)	$–C(CH_3)_3$ > $-CH(CH_3)_2$ >- $CH_2 – CH_3$ > $-CH_3$
8	c)	(1) – (iv), (2) – (iii), (3) – (i), (4) – (ii)	8	c)	Stark effect
9	a)	Lithium	9	b)	for a system at equilibrium Q is always less than the equilibrium constant
10	b)	$MgCl_2$	10	d)	tautomers
11	a)	1p + 2n	11	b)	$MaCl_2$
12	a)	$O_2^{2–}$	12	b)	- 2ºC
13	c)	Stark effect	13	a)	O_2^{2-}
14	d)	near the hydrogen chloride bottle	14	d)	Both assertion and reason are true but reason is not the correct explanation of assertion
15	d)	tautomers	15	d)	near the hydrogen chloride bottle

Part – II

Answer any SIX Questions and Questions No.24 is Compulsory. **6 X 2 =12**

16	**Gram equivalent mass** is defined as the mass of an element (compound or ion) that combines or displaces 1.008 g hydrogen or 8 g oxygen or 35.5 g chlorine. **Correct definition** ………………………………………………		2
17	n = 2 represents L shell, $2n^2$ ……………………………………………... Maximum number of electron in L shell is $2 \times 2^2 = 8$ electrons ……..	1 1	2
18	**Types of Covalent (Molecular) hydrides** i) electron precise (CH_4, C_2H_6, SiH_4, GeH_4), ii) electron deficient (B_2H_6) iii) electron-rich hydrides (NH_3, H_2O).	1 ½ ½	2
19	**The spontaneity of any process depends on three different factors.** **i)** If the enthalpy change of a process is negative, then the process is exothermic (ΔH is negative) **ii)** If the entropy change of a process is positive, (ΔS is positive) **iii)** The Gibbs free energy which is the combination of the above two (ΔH -TΔS) should be negative for a reaction to occur spontaneously $\Delta H - T\Delta S < 0$ (OR) i) $\Delta H < 0$ ii) $\Delta S > 0$ iii) $\Delta G < 0$	½ ½ 1	2
20	**Sign convention of heat** i) If heat flows into the system from the surrounding, energy of a system increases. Hence it is taken to be positive (+q). ii) If heat flows out of the system into the surrounding, energy of the system decreases. Hence, it is taken to be negative (–q).	1 1	2
21	**$4NO + 6H_2O \rightleftharpoons 4NH_3 + 5O_2$** (Correct balanced equation)………………….. (unbalanced equation ……………………………………….. 1M)	2	2
22	**Isotonic solutions** Two solutions having same osmotic pressure at a given temperature are called isotonic solutions. **(Correct definition)**	2	2
23	Conversion of ethyl chloride into ethane:  $CH_3CH_2Cl + H_2 \xrightarrow[523\ K]{Ni(or)Pd} \underset{Ethane}{CH_3\text{-}CH_3} + HCl$ Explanation only ……………………………………………………… 1 M	2	2

24	**Compulsory questions:** i) $C_6H_5Cl + 2NH_3 \xrightarrow[50\ atm]{250^0C} C_6H_5NH_2 + NH_4Cl$ Chlorobenzene Aniline ii) $C_6H_5Cl + 2Na + Cl\text{-}C_6H_5 \xrightarrow[\Delta]{Ether} C_6H_5- C_6H_5 + 2NaCl$ Chlorobenzene Biphenyl	1 1	2

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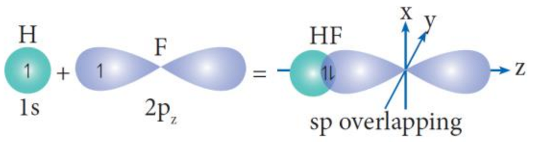
Part – III

Answer any SIX Questions and Questions No.33 is Compulsory. 6 X 3 =18

25	i) $\underline{C}O_2$ $x + 2 (- 2) = 0$ $x = 4$ ii) $H_2\underline{S}O_4$ $2 (+ 1) + x + 4 (- 2) = 0$ $2 + x - 8 = 0$ $x = + 6$	1½ 1½	3
26	i) It is defined as the amount of energy released (required in the case noble gases) when an electron is added to the valence shell of an isolated neutral gaseous atom in its ground state to form its anion. ii) It is expressed in kJ mol^{-1} **$A + e^- \rightarrow A^- + EA$ ....**	2 1	3
27	John Dalton stated that " **the total pressure of a mixture of non-reacting gases is the sum of partial pressures of the gases present in the mixture**". Correct statement...................................	3	3
28	$\frac{\Delta P}{P^{\circ}_{A}} = \frac{w_B \times M_A}{w_A \times M_B}$ The molar mass of the solute (M_B) can be calculated using the known values of w_A, w_B, M_A and the measured relative lowering of vapour pressure.	2 1	3
29	Electronic configuration of hydrogen atom is $1s^1$ Valence shell electronic configuration of fluorine atom : $2s^2\ 2px^2, 2py^2, 2pz^1$ When half filled 1s orbital of hydrogen linearly overlaps with a half filled 2pz orbital of fluorine, a σ-covalent bond is formed between hydrogen and fluorine. (OR)  	½ ½ 2	3
30	**Optical Isomerism** Compounds having same physical and chemical property but differ only in the rotation of plane of the polarized light are known as optical isomers and the phenomenon is known as optical isomerism Correct statement...................................		3

<table>
<tr>
<td>31</td>
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<table>
<tr><th>S.NO</th><th>Nucleophiles</th><th>Electrophiles</th></tr>
<tr><td>1</td><td>Nucleophiles are reagents that has high affinity for electro positive centre.</td><td>Electrophiles are reagents that are attracted towards negative charge or electron rich centre.</td></tr>
<tr><td>2</td><td>All Lewis bases act as nucleophiles.</td><td>All Lewis acids act as electrophiles</td></tr>
<tr><td>3</td><td>Ex: Neutral Nucleophiles:
NH_3, H_2O, R-OH, R-O-R'
-Ve charged nucleophiles
X- (Cl^-, Br^-, I^-)
$RCOO^-$, RO^-, OH^-, CN^-
(any one example)</td><td>Ex: Neutral electrophiles :
CO_2, $AlCl_3$, BF_3, $FeCl_3$:CCl_2
+Ve charged Electrophiles:
H^+, X^+, O^+, N^+
(any one example)</td></tr>
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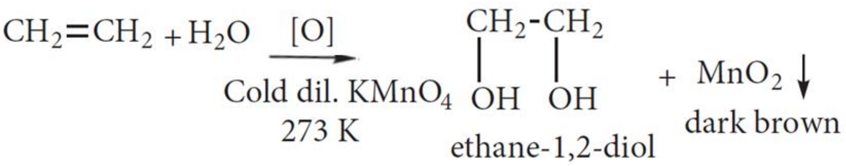
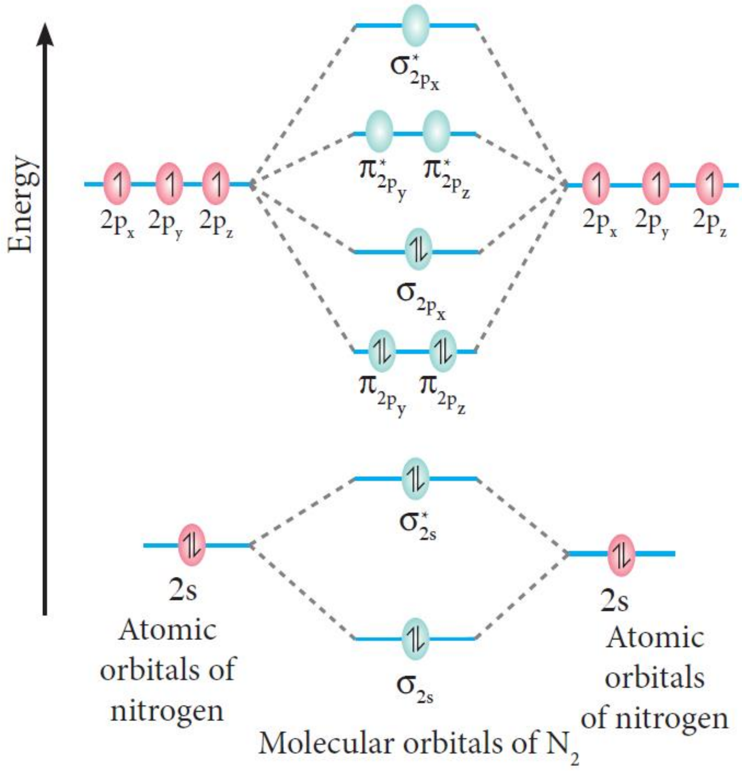
<td>3</td>
</tr>
<tr>
<td>32</td>
<td>Alkenes react with Baeyer's reagent to form vicinal diols. The purple solution (Mn^{7+}) becomes dark green (Mn^{6+}), and then produces a dark brown precipitate (Mn^{4+}) (OR)

$CH_2{=}CH_2 + H_2O \xrightarrow[\text{Cold dil. } KMnO_4 \text{ 273 K}]{[O]} \underset{\text{ethane-1,2-diol}}{CH_2(OH)-CH_2(OH)} + \underset{\text{dark brown}}{MnO_2 \downarrow}$</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>33</td>
<td>Compulsory questions:
$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$
$K_C = \frac{[NH_3]^2}{[N_2][H_2]^3}$
$= \frac{1.8\times10^{-2}\times1.8\times10^{-2}}{1.2\times10^{-2}\times3\times10^{-2}\times3\times10^{-2}\times3\times10^{-2}} = 1\times10^3\, L^2\, mol^{-2}$</td>
<td>1
1
1</td>
<td>3</td>
</tr>
</table>

Part – IV

Answer all the Questions **5 x 5 = 25**

<table>
<tr>
<td>34</td>
<td>a) i) n = 4 l = 0, 1, 2, 3 four sub-shells ⇒ s, p, d, f
l = 0 m_l = 0 ; one 4s orbital.
l = 1 m_l = –1, 0, +1 ; three 4p orbitals.
l = 2 m_l = –2, –1, 0, +1, +2 ; five 4d orbitals.
l = 3 m_l = -3, –2, –1, 0, +1, +2 , +3; seven 4f orbitals
Over all (16)Sixteen orbital</td>
<td>½
½
½
½</td>
<td>2</td>
</tr>
</table>

	ii) Electronic configuration of N atom is **$1s^2\ 2s^2\ 2p^3$** Electronic configuration of N_2 molecule **$\sigma1s^2 < \sigma^*1s^2 < \sigma2s^2 < \sigma^*2s^2 < \pi2py^2 = \pi2pz^2 < \sigma2px^2$**  Molecular orbitals of N_2 $\text{Bond order} = \frac{N_b - N_a}{2} = \frac{10-4}{2} = 3$ Molecule has *no unpaired electrons.* Hence, it is **diamagnetic**	1 1 1	3
	(OR)		
	b) Pauling Method : $d = r_{C+} + r_{A-}$ ------------------ (1) r_{C+}, r_{A-} are the radius of the cation and anion respectively. i.e. $r_{C^+} \propto \frac{1}{(Z_{eff})_{C^+}}$ ———————— (2) and $r_{A^-} \propto \frac{1}{(Z_{eff})_{A^-}}$ ———————— (3) Where Z_{eff} is the effective nuclear charge and $Z_{eff} = Z - S$ Dividing the equation 2 by 3 $\frac{r_{C^+}}{r_{A^-}} = \frac{(Z_{eff})_{A^-}}{(Z_{eff})_{C^+}}$ – – – –(4) On solving equation(1) and (4) the values of r_{C+} and r_{A-} can be calculated	1 1 1 1 1	5

<table>
<tr><td>35</td><td>a) i) Reason for the anomalous behaviour of beryllium
1) Its small size and high polarising power
2) Relatively high electronegativity and ionisation enthalpy as compared to other members
3) Absence of vacant d-orbitals in its valence shell
ii) Comparison of Properties of Beryllium with other elements of the group
<table>
<tr><th>Beryllium</th><th>Other elements of the family</th></tr>
<tr><td>Forms covalent compounds</td><td>form ionic compounds</td></tr>
<tr><td>High melting and boiling point</td><td>Low melting and boiling point</td></tr>
<tr><td>Does not react with water even at elevated temperature</td><td>React with water</td></tr>
<tr><td>Does not combine directly with hydrogen</td><td>Combine directly with hydrogen</td></tr>
<tr><td>Does not combine directly with halogens.
Halides are covalent</td><td>Combine directly with halogens
Halides are electrovalent.</td></tr>
</table>
(Correct two points)</td><td>1
1
1
2</td><td>5</td></tr>
<tr><td></td><td>(OR)</td><td></td><td></td></tr>
<tr><td></td><td>b) Characteristics of internal energy (U):
i) The internal energy of a system is an extensive property. It depends on the amount of the substances present in the system. If the amount is doubled, the internal energy is also doubled.
ii) The internal energy of a system is a state function. It depends only upon the state variables (T, P, V, n) of the system. The change in internal energy does not depend on the path by which the final state is reached.
iii) The change in internal energy of a system is expressed as $\Delta U= U_f - U_i$
iv) In a cyclic process, there is no internal energy change. $\Delta U_{(cyclic)} = 0$
v) $\Delta U= U_f - U_i = -\text{ ve } (U_f < U_i)$
vi) $\Delta U=Uf - Ui = +\text{ ve } (U_f > U_i)$</td><td>1
1
½
½
1
1</td><td>5</td></tr>
<tr><td>36</td><td>a) Determination of molar mass of solute from elevation of boiling point
If the solution is prepared by dissolving w_B g of solute in w_A g of solvent, then the molality is,
$$m = \frac{\text{Number of moles of solute} \times 1000}{\text{weight of solvent in grams}} \quad \text{............}(1)$$
$$\text{Number of moles of solute} = \frac{w_B}{M_B} \quad \text{............}(2)$$
Where, M_B = molar mass of the solute Therefore,</td><td>1
1</td><td></td></tr>
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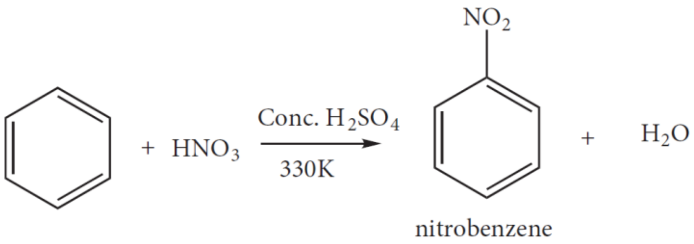
	$m = \frac{w_B \times 1000}{M_B \times w_A}$ ....(3) $\Delta T_b = \frac{K_b \times w_B \times 1000}{M_R \times w_A}$ ....(4) Molar mass can be calculated by using (4) $M_B = \frac{K_b \times w_B \times 1000}{\Delta T_b \times w_A}$ ....(5)	1 1 1	
	(OR)		
	b) i) Bond length The distance between the nuclei of the two covalently bonded atoms is called bond length. **ii) Bond angle** Covalent bonds are directional in nature and are oriented in specific directions in space. This directional nature creates a fixed angle between two covalent bonds in a molecule and this angle is termed as bond angle. **iii) Bond enthalpy** The bond enthalpy is defined as the minimum amount of energy required to break one mole of a particular bond in molecules in their gaseous state. The unit of bond enthalpy is kJ mol^{-1}.	1 2 2	5
37	a) The extent of ionic character in a covalent bond can be related to the electro negativity difference to the bonded atoms. In a typical polar molecule, $A^{\delta-}$— $B^{\delta+}$, the electronegativity difference (χ_A - χ_B) can be used to predict the percentage of ionic character as follows. **If the electronegativity difference (χ_A - χ_B), is** i) equal to 1.7, then the bond A-B has 50% ionic character ii) if it is greater than 1.7, then the bond A-B has more than 50% ionic character, iii) if it is lesser than 1.7, then the bond A-B has less than 50% ionic character.	2 1 1 1	5
	(OR)		
	b) i) 2-bromo-3-methylbutane ii) methoxymethane iii) 2-hydroxybutanal iv) buta-1,3-diene v) 4-chloropent-2-yne	1 1 1 1 1	5

38 a) **i) nitrobenzene**

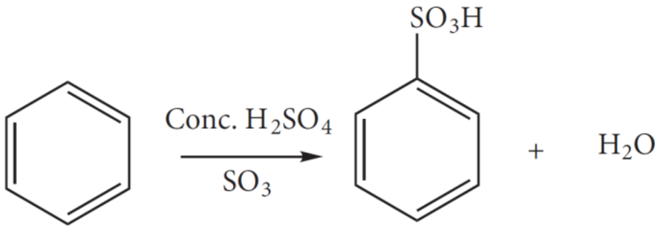
Nitration:

When benzene is heated at 330K with a nitrating mixture (Con. HNO_3 + Con. H_2SO_4), nitro benzene is formed by replacing one hydrogen atom by nitronium 2
ion(electrophile) Concentrated H_2SO_4 is added to produce nitronium ion NO_2^+



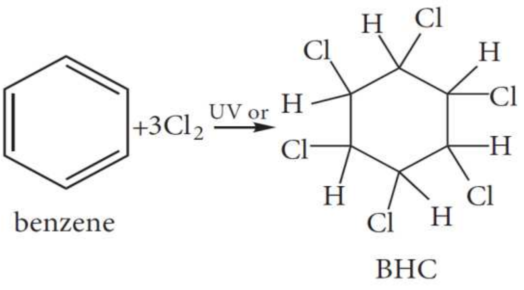
ii) benzene sulphonic acid

Sulphonation: Benzene reacts with fuming sulphuric acid (Con H_2SO_4 + SO_3) 2
and gives benzene sulphonic acid. The electrophile SO_3 is a molecule. Although
it does not have positive charge, it is a strong electrophile. This is because the 5
octet of electron around the sulphur atom is not reached. The reaction is reversible and desulphonation occurs readily in aqueous medium.



iii) BHC : Benzene reacts with three molecules of Cl_2 in the presence of sun light or UV light to yield Benzene Hexachloride (BHC) $C_6H_6Cl_6$. This is known as gammaxane or Lindane which is a powerful insecticide.

(or)

 1

(OR)

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<td>b) 1. Ethene reacts with HCl to give Chloroethane $CH_3 - CH_2Cl$ as (B) by addition reaction.

$CH_2 = CH_2 + HCl \rightarrow CH_3 - CH_2Cl$

2. Chloroethane reacts with ammonia to give Ethylamine $CH_3 - CH_2NH_2$ as (C). It is a primary amine and Carbylamine test is the characteristic test for 1° amine.

$CH_3 - CH_2Cl + NH_3 \rightarrow CH_3 - CH_2NH_2 + HCl$

<table>
<tr><td>A</td><td>$CH_2 = CH_2$</td><td>Ethene (or) Ethylene</td></tr>
<tr><td>B</td><td>$CH_3 - CH_2Cl$</td><td>Chloroethane (or) Ethyl chloride</td></tr>
<tr><td>C</td><td>$CH_3 - CH_2NH_2$</td><td>Ethylamine(or) Ethanamine</td></tr>
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<td>5</td>
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