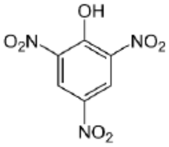
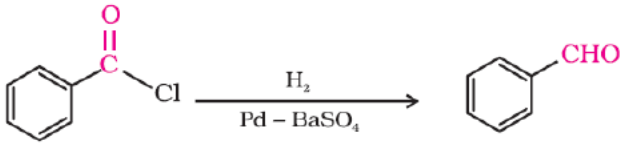
SECOND YEAR HIGHER SECONDARY MODEL EXAMINATION 2025 – ANSWER KEY

SUBJECT: **CHEMISTRY** **Qn. Code:** **625**

Qn. No.	Sub Qns.	Answer Key/Value Points	Score	Total
		Answer any 4 questions from 1 to 5. Each carries 1 score		
1.		b) Low atmospheric pressure	1	1
2.		$^{3}/_{2}$ OR, 1.5	1	1
3.		b) $3d^5$	1	1
4.		a) Both statement I and statement II are true and statement II is the correct explanation of statement I	1	1
5.		2	1	1
		Answer any 8 questions from 6 to 15. Each carries 2 scores		
6.		Osmosis Water treatment/Water movement from soil into plant roots/preservation of fish or meat by salting/preservation of fruits by adding sugar (Candid fruits)/Pickled mango/Any other correct application.	1 1	2
7.		The cell reaction stops completely and no current will flow through the cell.	1 + 1	2
8.	(i) (ii)	1 OR, First order s^{-1}	1 1	2
9.		Pseudo first order reactions are reactions which appear to follow higher order but actually follow first order kinetics. E.g.: Hydrolysis of ester **OR,** Inversion of cane sugar **OR,** Any hydrolysis reaction	1 1	2
10.		Aryl halides are less reactive towards nucleophilic substitution reactions: (i) due to Resonance effect, the C – X bond gets a partial double bond character. (ii) due to the repulsion between nucleophile and electron rich benzene ring. (iii) due to the sp^2 hybridisation of the carbon atom to which halogen atom is bonded in aryl halides. (iv) due to the instability of phenyl cation. ***[Any 2 reasons are required]***	2 x 1	2
11.		*Fermentation of Molasses*: The sugar in molasses is converted to glucose and fructose, in the presence of an enzyme, invertase. Glucose and fructose undergo fermentation in the presence of another enzyme, zymase to give ethanol and carbon dioxide. **OR**, the equations: $C_{12}H_{22}O_{11} + H_2O \xrightarrow{invertase} C_6H_{12}O_6 + C_6H_{12}O_6$ Sucrose Glucose Fructose $C_6H_{12}O_6 \xrightarrow{zymase} 2\ C_2H_5OH + 2\ CO_2$ Ethanol	2 x 1 = 2	2

<table>
<tr><td>12.</td><td></td><td><table><tr><th>Column - I</th><th>Column – II</th></tr><tr><td>i) Conversion of phenol to salicylic acid</td><td>b) Kolbe's reaction</td></tr><tr><td>ii) Reaction of alkyl halide with sodium alkoxide</td><td>c) Williamson's synthesis</td></tr><tr><td>iii) Manufacture of phenol</td><td>d) Cumene</td></tr><tr><td>iv) Conversion of ketone to 2^0 alcohol</td><td>a) Grignard reagent</td></tr></table></td><td>4 x ½</td><td>2</td></tr>
<tr><td>13.</td><td></td><td>2,4,6-Trinitrophenol OR, Picric acid OR, </td><td>2</td><td>2</td></tr>
<tr><td>14.</td><td></td><td><i>Rosenmund reduction</i>: Acid chlorides react with hydrogen in presence of palladium (Pd) supported on barium sulphate ($BaSO_4$), we get aldehydes. This reaction is called Rosenmund reduction.
OR, $R\text{-}COCl + H_2 \xrightarrow{Pd/BaSO_4} R\text{-}CHO + HCl$
OR, 
(Benzoyl chloride) (Benzaldehyde)
OR, Any other example.</td><td>2</td><td>2</td></tr>
<tr><td>15.</td><td></td><td>$CH_3CH_2NH_2$ is more basic than $C_6H_5NH_2$.
This is due to the electron releasing inductive effect (+I effect) of CH_3CH_2- group.
OR, In $C_6H_5NH_2$, the lone pair of electrons is in conjugation with the benzene ring. So it is less available for protonation.
OR, due to the electron withdrawing inductive effect of $-C_6H_5$ (phenyl) group.</td><td>1
1</td><td>2</td></tr>
<tr><td colspan="5">Answer any 8 questions from 16 to 26. Each carries 3 scores</td></tr>
<tr><td>16.</td><td>(i)</td><td>Since the solute is non-volatile, the vapour pressure of the solution is less than that of the pure solvent. So the freezing point is also lower than that of the pure solvent.
OR, due to depression of freezing point.</td><td>1</td><td>3</td></tr>
<tr><td></td><td>(ii)</td><td>Here $w_2 = 1.00$ g, $w_1 = 50$ g, $\Delta T_f = 0.40$ K, $K_f = 5.12$ K kg mol^{-1}, $M_2 = ?$
We know that $\Delta T_f = \frac{1000\,K_f\,w_2}{w_1 M_2}$ OR, $M_2 = \frac{1000\,K_f\,w_2}{w_1.\Delta T_f}$
On substituting in the above equation, we get
$M_2 = \frac{1000 \times 5.12 \times 1}{50 \times 0.40} = \underline{\underline{256\ g\ mol^{-1}}}$</td><td>1
1</td><td></td></tr>
<tr><td>17.</td><td>(i)</td><td>Lead storage battery – Secondary battery
Mercury cell - Primary battery
Nickel-Cadmium cell – Secondary battery
Dry cell – Primary battery</td><td>4 x ½
= 2</td><td>3</td></tr>
<tr><td></td><td>(ii)</td><td>The advantages of fuel cell over primary and secondary batteries are:
1. They work continuously as long as the reactants (fuels) are supplied.
2. They are highly efficient.</td><td>1</td><td></td></tr>
</table>

<table>
<tr><td></td><td></td><td>3. They are eco-friendly
4. Water obtained from $H_2 - O_2$ fuel cell can be used for drinking. <i>[Any 1 required]</i></td><td></td><td></td></tr>
<tr><td>18.</td><td>(i)

(ii)</td><td>Catalyst lowers the activation energy of a reaction. OR, A catalyst provides a new path for the reaction by lowering the activation energy.
We know that, $\log \frac{k_2}{k_1} = \frac{E_a}{2.303\,R}\,\frac{T_2 - T_1}{T_1\,T_2}$
Here $T_1 = 500$ K, $k_1 = 0.02\ s^{-1}$, $T_2 = 700$ K, $k_2 = 0.07\ s^{-1}$ and $R = 8.314\ J\ K^{-1}\ mol^{-1}$
$\log \frac{0.07}{0.02} = \frac{E_a}{2.303 \times 8.314}\,\frac{700-500}{500 \times 700}$
$E_a = \frac{0.5440 \times 2.303 \times 8.314 \times 500 \times 700}{200}$ = 18228 J mol^{-1} = 18.228 kJ mol^{-1}</td><td>1
1

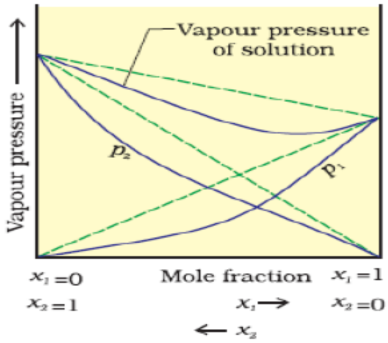
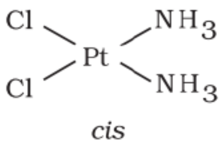
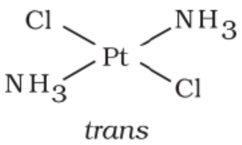
1</td><td>3</td></tr>
<tr><td>19.</td><td></td><td>A is Sodium chromate (Na_2CrO_4)
B is Sodium dichromate ($Na_2Cr_2O_7$)
C is Potassium dichromate ($K_2Cr_2O_7$)</td><td>1
1
1</td><td>3</td></tr>
<tr><td>20.</td><td>(i)

(ii)

(iii)</td><td>Due to the presence of large number of unpaired electrons/strong metallic bonding/high effective nuclear charge/partially filled d-orbitals/ability to show variable oxidation state. <i>[Any one reason required]</i>
Due to the presence of partially filled d-orbitals/d-d transition/electronic excitation from lower d-orbital to higher d-orbital.
Due to Lanthanoid contraction/similar atomic radii/similar properties.</td><td>1
1
1</td><td>3</td></tr>
<tr><td>21.</td><td>(i)

(ii)</td><td>$[Co(NH_3)_5SO_4]Cl$
IUPAC name – Pentaamminesulphatocobalt(III)chloride
Co-ordination number = 6</td><td>1
1
1</td><td>3</td></tr>
<tr><td>22.</td><td>(i)
(ii)
(iii)</td><td>d^2sp^3 hybridisation
Inner orbital complex
Diamagnetic</td><td>1
1
1</td><td>3</td></tr>
<tr><td>23.</td><td>(i)
(ii)
(iii)</td><td>$CH_3CH_2CH_2I$ (1-Iodopropane)
$CH_3CH_2CH_2Cl$ (1-Chloropropane)
$CH_3CH_2CH_2CH_2Br$ (1-Bromobutane)</td><td>1
1
1</td><td>3</td></tr>
<tr><td>24.</td><td>(i)
(ii)
(iii)</td><td>Br_2/red P
DIBAL-H/H_2O
Zn-Hg/HCl</td><td>1
1
1</td><td>3</td></tr>
<tr><td>25.</td><td>(i)

(ii)</td><td>p-Hydroxyazobenzene
It is used as a dye.
Coupling reaction</td><td>1
1
1</td><td>3</td></tr>
<tr><td>26.</td><td></td><td><table>
<tr><th>DNA</th><th>RNA</th></tr>
<tr><td>DNA is double stranded</td><td>RNA is single stranded</td></tr>
<tr><td>The pentose sugar is deoxy ribose</td><td>The pentose sugar is ribose</td></tr>
<tr><td>The nitrogen bases are Adenine, Guanine, Cytosine and Thymine.</td><td>The nitrogen bases are Adenine, Guanine, Cytosine and Uracil.</td></tr>
</table></td><td>3 x 1</td><td>3</td></tr>
<tr><td colspan="5">Answer any 4 questions from 27 to 31. Each carries 4 scores</td></tr>
<tr><td>27.</td><td>(i)</td><td>Non-ideal solutions.
There are two types of non-ideal solutions.</td><td>½
½</td><td>4</td></tr>
</table>

<table>
<tr><td></td><td>(ii)</td><td>Negative deviation.
Here the solute-solvent interactions (A-B interactions) are stronger than solute-solute interaction (A-A interaction) and solvent-solvent interaction (B-B interaction).</td><td>1
1</td><td></td></tr>
<tr><td></td><td>(iii)</td><td>The vapour pressure – composition graph for such a solution is:
 </td><td>1</td><td></td></tr>
<tr><td>28.</td><td>(i)</td><td>It is the molar conductivity of an electrolyte at zero concentration or infinite dilution.</td><td>1</td><td>4</td></tr>
<tr><td></td><td>(ii)</td><td>Kohlrausch's law.
It states that the limiting molar conductivity of an electrolyte is the sum of the individual contributions of the anion and the cation of the electrolyte.
OR, For an electrolyte like A_xB_y which dissociates as: $A_xB_y \rightarrow xA^{y+} + yB^{x-}$
$\Lambda^0_{m(A_xB_y)} = x.\ \lambda^0_{(A^{y+})} + y.\ \lambda^0_{(B^{x-})}$</td><td>1
1</td><td></td></tr>
<tr><td></td><td>(iii)</td><td>$\Lambda^0_{m(CaCl_2)} = \lambda^0_{(Ca^{2+})} + 2 \times \lambda^0_{(Cl^-)}$
$= 119.0 + 2 \times 76.3 =$ 271.6 S cm^2 mol^{-1}</td><td>½
½</td><td></td></tr>
<tr><td>29.</td><td>(i)</td><td>Linkage isomerism arises in a complex due to the presence of ambidentate ligand, which can bind to the central atom through more than one donor atoms.
E.g.: $[Co(NH_3)_5(NO_2)]Cl_2$ & $[Co(NH_3)_5(ONO)]Cl_2$ OR, any other correct example.</td><td>1
1</td><td>4</td></tr>
<tr><td></td><td>(ii)</td><td>Geometrical isomers of $[Pt(NH_3)_2Cl_2]$ are:

<i>cis</i>

<i>trans</i></td><td>2</td><td></td></tr>
<tr><td>30.</td><td>(i)</td><td><table>
<tr><th>S_N1 Reaction</th><th>S_N2 Reaction</th></tr>
<tr><td>Proceeds in two steps</td><td>Proceeds in a single step</td></tr>
<tr><td>An intermediate (carbocation) is formed</td><td>No intermediate is formed</td></tr>
<tr><td>Order of the reaction is 1</td><td>Order of the reaction is 2</td></tr>
<tr><td>For optically active compounds, the reaction proceeds through racemisation.</td><td>For optically active compounds, the reaction proceeds through inversion of configuration.</td></tr>
<tr><td>The order of reactivity of alkyl halide is $3^0 > 2^0 > 1^0$</td><td>The order of reactivity of alkyl halide is $1^0 > 2^0 > 3^0$</td></tr>
</table>
<i>[Any 2 required]</i></td><td>2
1</td><td>4</td></tr>
</table>

	(ii)	$CH_3\text{-}CH_2\text{-}CHBr\text{-}CH_3 + KOH_{(alc)} \longrightarrow CH_3\text{-}CH_2\text{-}CH{=}CH_2 + CH_3\text{-}CH{=}CH\text{-}CH_3$ (2-Bromobutane) (But-1-ene) (But-2-ene) Major product is $CH_3\text{-}CH{=}CH\text{-}CH_3$ (But-2-ene)	1	
31.	(i)	***Aldol Condensation Reaction:*** Aldehydes and ketones having at least one α-hydrogen atom when heated with dilute alkali, we get α,β-unsaturated aldehyde or ketone. $2\ CH_3\text{-}CHO \xrightarrow[\Delta]{\text{dil. NaOH}} CH_3\text{-}CH{=}CH\text{-}CHO$ Ethanal But-2-enal Or, any other correct example.	2	4
	(ii)	***Cannizzaro Reaction:*** Aldehydes having no α-hydrogen atom, when treated with conc. alkali, undergo disproportionation to form one molecule of the alcohol and one molecule of carboxylic acid salt. $2\ HCHO \xrightarrow{\text{conc. KOH}} CH_3\text{-}OH + H\text{-}COOK$ Formaldehyde methanol potassium formate Or, any other correct example.	2	

???