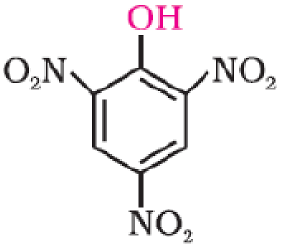
SECOND YEAR HIGHER SECONDARY SECOND TERMINAL EVALUATION 2019

PART III CHEMISTRY

KEY

<table>
<tr><th>SL.NO</th><th>SOLUTION</th><th>SCORE</th></tr>
<tr><td>1</td><td>c) Froth floatation</td><td>1</td></tr>
<tr><td>2</td><td>a) Liquid ammonia</td><td>1</td></tr>
<tr><td>3</td><td>+3</td><td>1</td></tr>
<tr><td>4</td><td>c) linkage isomerism</td><td>1</td></tr>
<tr><td>5</td><td>a) CCl_2F_2</td><td>1</td></tr>
<tr><td>6</td><td>b)
</td><td>1</td></tr>
<tr><td>7</td><td>b) Rosenmund Reduction</td><td>1</td></tr>
<tr><td>8</td><td>d) 68%</td><td>1</td></tr>
<tr><td>9</td><td>a) Milk</td><td>1</td></tr>
<tr><td>10.</td><td>Crystalline solids: quartz, NaCl
Amorphous solid: glass, rubber</td><td>2</td></tr>
<tr><td>11</td><td>Brownian movement
In colloids, the particles of dispersion medium are in a state of continuous zig-zag motion. This motion was first observed by Robert Brown and it is known as Brownian movement.
Peptization
The process of conversion of a freshly prepared precipitate into a colloidal sol by shaking it with suitable dispersion medium in the presence of small amount of electrolyte is called <i>peptization</i>.</td><td>2</td></tr>
<tr><td>12</td><td>Ideal solution
These are solutions which obey Raoult’s law over the entire range of concentration. For such solutions, the enthalpy of mixing (ΔH mix) of the pure components is zero and also volume of mixing (ΔV mix) is zero. i.e. for an ideal solution,
e.g solutions of n-hexane and n-heptane, bromoethane and chloroethane, benzene and toluene etc.</td><td>2</td></tr>
<tr><td>13</td><td>
<table>
<tr><th>A</th><th>B</th></tr>
<tr><td>Magnetic separation</td><td>Haematite</td></tr>
<tr><td>Zone refining</td><td>Germanium</td></tr>
<tr><td>Mond’s process</td><td>$Ni(CO)_4$</td></tr>
<tr><td>Leaching</td><td>Bauxite</td></tr>
</table>
</td><td>2</td></tr>
<tr><td>14</td><td>a) Any one preparation method
E.g: $S(s) + O_2(g) \rightarrow SO_2(g)$
$SO_3^{2-}(aq) + 2H^+(aq) \rightarrow H_2O(l) + SO_2(g)$
b) Moist sulphur dioxide behaves as a reducing agent. It converts Iron (III) ions to Iron (II) ions and decolourises acidified potassium permanganate (VII) solution (This used as a test for SO_2).
$2Fe^{3+} + SO_2 + 2H_2O \longrightarrow 2Fe^{2+} + SO_4^{2-} + 4H^+$
$5\,SO_2 + 2MnO_4^- + 2H_2O \longrightarrow 5\,SO_4^{2-} + 4H^+ + 2Mn^{2+}$</td><td>2</td></tr>
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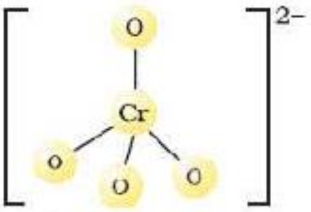
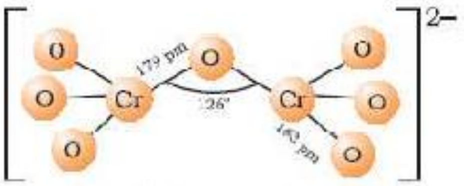
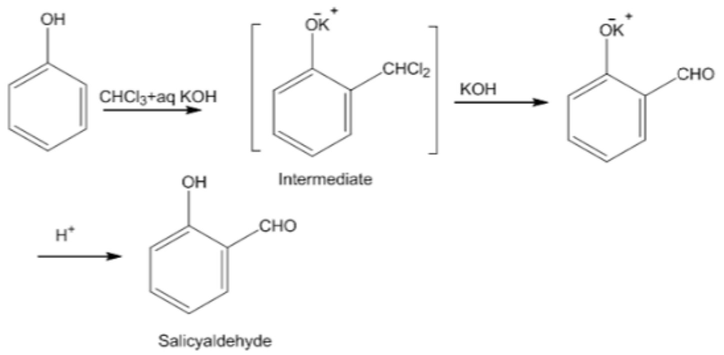
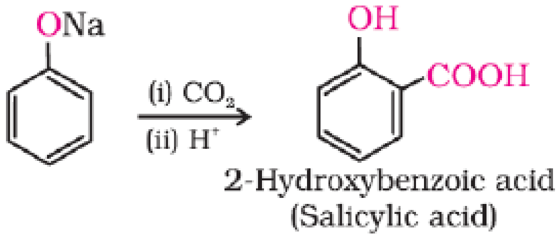
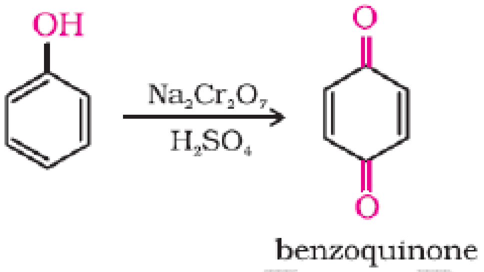
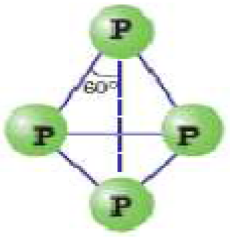
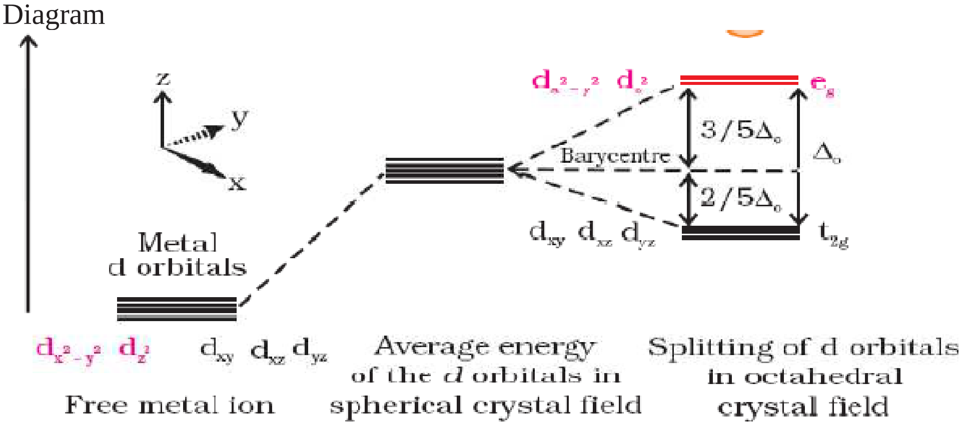
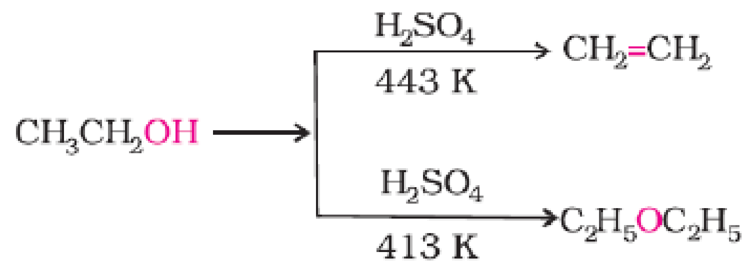
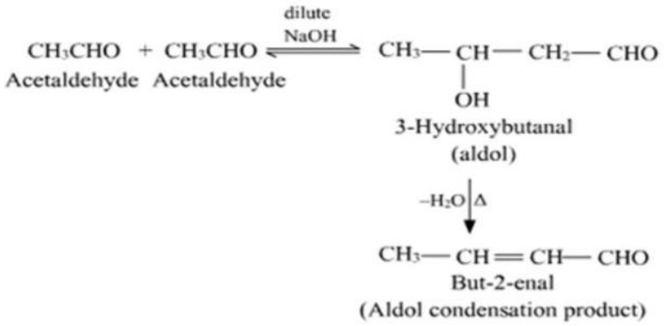
15	**a) Nitric acid** **b) By using Ostwald process**	**1** **1**
16	a) Paramagnetism arises from the presence of unpaired electrons. Each unpaired e- is associated with a spin magnetic moment and an orbital magnetic moment. For the compounds of 1st row transition elements, the contribution of orbital magnetic moment is effectively cancelled and so only spin magnetic moment is considered. It is determined by the no. of unpaired e-s and is calculated by the spin only formula: $\mu s = \sqrt{n(n+2)}$ where n is the no. of unpaired electrons b) $\mu s = \sqrt{(5)(5+2)} = 5.916$ BM (n = no.of unpaired electrons = 5)	**2**
17	**Wurtz- fittig reaction** $C_6H_5\text{-}Cl + 2Na + CH_3\text{-}Cl$ ether $C_6H_5\text{-}CH_3 + 2NaCl$	**2**
18	**C_2H_5Cl is more reactive** **Because haloarenes are less reactive towards nucleophilic substitution reaction:** **(1) Resonance effect** **(2) Difference in hybridisation of carbon atom in C—X bond** **(3) Instability of phenyl cation** **(4) Repulsion between nucleophile and electron rich benzene ring** **(any two reasons)**	**2**
19	**$HCHO + CH_3MgBr \longrightarrow CH_3\text{-}CH_2\text{-}OMgBr \longrightarrow CH_3\text{-}CH_2\text{-}OH + Mg(OH)X$** **(Any other method can be used)**	**2**
20	**Explanation with equation** **(dehydration of alcohol: symmetrical ether, williamson's ether synthesis: unsymmetrical ether)**	**2**
21	**a) $CH_3\text{-}COOH + PCl_3/PCl_5/SOCl_2 \longrightarrow CH_3\text{-}COCl + (H_3PO_3/POCl_3/SO_2\text{+}HCl)$** **b)**  $CH_3COOH + NH_3 \rightleftharpoons \underset{\text{Ammonium acetate}}{CH_3CO\overset{-\,+}{O}NH_4} \xrightarrow[-H_2O]{\Delta} \underset{\text{Acetamide}}{CH_3CONH_2}$	**2**
22	**Differences in structure/physical and chemical properties**	**2**
23	**(1&2) Primary cells:** These are cells which cannot be recharged or reused. Here the reaction occurs only once and after use over a period of time, they become dead E.g. Dry cell, mercury button cell etc. **A secondary cell** can be recharged and reused again and again. Here the cell reaction can be reversed by passing current through it in the opposite direction. The most important secondary cell is lead storage cell, which is used in automobiles and invertors. **(3) primary cell(mercuric cell)**	**3**
24	a) 1) **Activation energy:** According to Arrhenius, a chemical reaction occurs by the collision of reactant molecules. All the molecular collisions are not effective. For effective collision, the colliding molecules should have a minimum kinetic energy called **activation energy**. 2) The number of collisions per second per unit volume of the reaction mixture is known as collision frequency (Z). b) For a reaction A + B → Products Rate (r) = $Z_{AB}\, e^{-Ea/RT}$	**1** **1** **1**
25	a) ***Mond's process for Refining Nickel***: In this process, nickel is heated in a stream of carbon monoxide forming a volatile complex, nickel tetracarbonyl: $Ni + 4CO \xrightarrow{330\text{ - }350K} Ni(CO)_4$ It is then decomposed to Ni and CO by heating at very high temperature. $Ni(CO)_4 \xrightarrow{450 - 470\,K} Ni + 4CO$ ***van Arkel Method for Refining Zirconium or Titanium***: Here the crude metal is heated in an evacuated vessel with iodine. The metal forms it volatile iodide.	**2**

	$Zr + 2I_2 \rightarrow ZrI_4$ The metal iodide is decomposed electrically by using a tungsten filament, electrically heated to about 1800K. The pure metal is thus deposited on the filament. $ZrI_4 \rightarrow Zr + 2I_2$ **b)** In order to use this method, there are two requirements: **i.** The metal should form a volatile compound with an available reagent, **ii.** The volatile compound should be easily decomposable, so that the recovery is easy.	**1**
26	**a)** When two different halogens react with each other, interhalogen compounds are formed. They can be assigned general compositions as AX, AX_3, AX_5 and AX_7 **b)** **Any one example** $Cl_2 + F_2 \xrightarrow{437K} 2ClF$ (equal volume) $Cl_2 + 3F_2 \xrightarrow{573K} 2ClF_3$ (excess) $I_2 + Cl_2 \rightarrow 2ICl$ (equimolar) $I_2 + 3Cl_2 \rightarrow 2ICl_3$ (excess) $Br_2 + 3F_2 \rightarrow 2BrF_3$ (diluted with water) $Br_2 + 5F_2 \rightarrow 2BrF_5$ (excess) c) The reactivity of inter halogen compound is higher when compared to halogen compounds since X-X^1 bond is highly reactive than X-X bond	**1** **1** **1**
27	a) From chromite ore ($FeCr_2O_4$). b) Structures  Chromate ion  Dichromate ion c) Any one example with equation Iodides to iodine $6I^- \rightarrow 3I_2 + 6e^-$ $Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$ $6I^- + Cr_2O_7^{2-} + 14H^+ \rightarrow 3I_2 + 2Cr^{3+} + 7H_2O$	**1** **1** **1**
28	a) Potassium hexacyanido ferrate (II) b) Inner orbital complex c) In $K_4[Fe(CN)_6]$ oxidation state of iron is +2 and in $K_3[Fe(CN)_6]$ oxidation state is +3. Since both have strong field ligands pairing occur. In case of +2 oxidation state all electrons is paired such that configuration is t_2g^6. But in case of +3 oxidation state configuration is t_2g^5. Hence $K_3[Fe(CN)_6]$ more stable because Fe^{3+} is smaller size and higher charge than that of Fe^{2+}	**1** **1** **1**
29	a) Any two differences between SN^1 and SN^2 mechanism b) CH_3-Cl c) (primary haloalkanes are more reactive in SN^2 mechanism, due to steric hindrance of alkyl group)	**1** **1** **1**

30	a)  b)  2-Hydroxybenzoic acid (Salicylic acid) c)  benzoquinone	**1** **1** **1**
31	1) Methyl benzenes when oxidised by using mild oxidising agents like chromyl chloride (CrO_2Cl_2) or chromic oxide (CrO_3) in acetic anhydride, we get benzaldehyde 2) Nitriles when reduced with stannous chloride in the presence of hydrochloric acid, we get imines, which on hydrolysis give corresponding aldehyde. 3) Esters are also reduced to aldehydes with DIBAL-H.	**1** **1** **1**
32	a) White phosphorous b) It is unstable due to the angular strain on P_4 molecule with the bond angle 60^0  c) It dissolves in boiling NaOH solution in an inert atmosphere giving PH_3 (phosphine). $P_4 + 3NaOH + 3H_2O \rightarrow PH_3 + 3NaH_2PO_2$ + sodium hypophosphite It readily catches fire in air to give dense white fumes of P4O10. $P_4 + 5O_2 \rightarrow P_4O_{10}$ d) **Red phosphorus:** It is obtained by heating white phosphorus at 573K in an inert atmosphere for several days. **Black phosphorus**: It has two forms- α-black phosphorus and β-black phosphorus. α-black phosphorus is formed when red phosphorus is heated in a sealed tube at 803K. It does not oxidise in air. β-Black phosphorus is prepared by heating white phosphorus at 473K under high pressure. It does not burn in air up to 673K. it is a conductor of electricity and is insoluble in CS_2	**1** **1** **1** **1**

33	a) when negative field is due to ligands in a complex, the degeneracy of the *d* orbitals is lost. It results in splitting of the *d* orbitals. This splitting of d-orbitals is termed as Crystal field splitting and it depends on the nature of the field. b) Diagram  c) In tetrahedral complex the splitting of energy is less compared to octahedral. Here Δo < P, the fourth electron enters one of the *eg* orbitals giving the configuration $t_2g^3eg^1$. Ligands for which Δo < P are known as *weak field ligands* and form high spin complexes	**1** **2** **1**
34	a) Ethanol is commonly known as *spirit* or *grain alcohol.* It is obtained commercially by the fermentation of sugar. The sugar in molasses, sugarcane or fruits like grapes 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. $C_{12}H_{22}O_{11} + H_2O \xrightarrow{\text{Invertase}} C_6H_{12}O_6 + C_6H_{12}O_6$ Sucrose Glucose Fructose $C_6H_{12}O_6 \xrightarrow{\text{Zymase}} 2C_2H_5OH + 2\ CO_2$ Ethanol b) Phenol is more acidic than ethanol. This is due to the following reasons: In alcohol, the O-H group is directly bonded to a sp^3 hybridized carbon atom, but in phenol, it is bonded to a sp^2 hybridized carbon. Due to the greater s-character and electronegativity of sp^2 hybridized carbon, the ease of O-H bond cleavage is greater on phenol and hence it is more acidic than alcohol. c)  	**1** **1** **2**
35	A) But-2-enal  B) Ethanoic acid CH_3-CHO + Ammoniacal $AgNO_3$ ⟶ CH_3-COOH	**1** **1**

	C) Ethanol $CH_3\text{-}CHO + LiAlH_4 \xrightarrow{\quad\quad} CH_3\text{-}CH_2\text{-}OH$	**1**
	D) Acetaldoxime $\underset{\text{acetaldehyde}}{CH_3CHO} + \underset{\text{Hydroxylamine}}{NH_2OH} \rightarrow \underset{\text{acetaldoxime}}{CH_3-CH=NOH} + H_2O$	**1**