

MARKING SCHEME

CHEMISTRY

PREBOARD EXAMINATION 2022

1. Any two (1x 2)

- a) Benzaldehyde < Acetaldehyde < Formaldehyde.
- b) 4-methoxybenzoic acid < 4-nitrobenzoic acid < 2,4 dinitrobenzoic acid.
- c) Ethanal < Ethanol < Ethanoic acid.

2. (2)

Specific Conductance $k = 0.035 \times 1/100 = 3.5 \times 10^{-4} \text{ohm}^{-1}\text{cm}^{-1}$

Molar Conductance = $k \times 1000/M = 3.5 \times 10^{-4} \times 1000/0.5 = 0.7 \text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$

3.a) because carbanion formed is stabilized by resonance i.e stabilization of conjugate base or enolate anion. (1)

b) because -COOH grp is electron withdrawing and deactivating. Carboxylic group get bonded to catalyst AlCl_3 . { -COOH (Lewis base) Lp on oxygen to AlCl_3 (Lewis acid)}. (1)

Section B

4. a) Due to electron attracting phenyl grp and resonance effect of Pi orbitals of benzene ring with lp of electrons on the nitrogen atom compared with that of ammonia. (1)

b) haloarenes have to react with potassium phthalimide and they are least reactive and hence bond cleavage does not take place. (1)

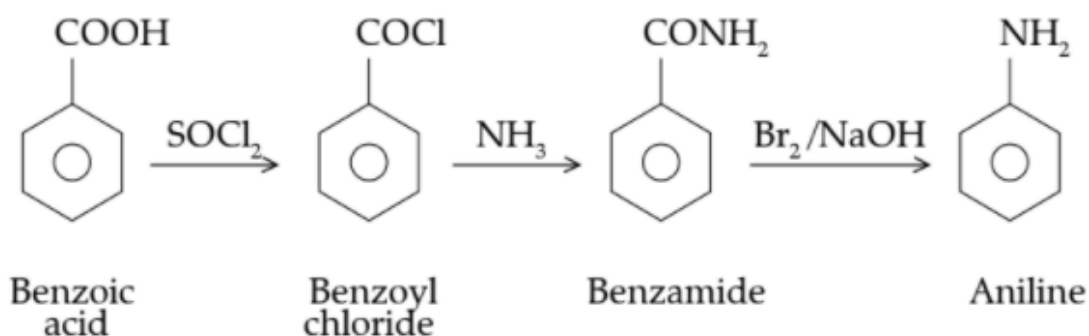
c) Methanoic Acid is associated with intermolecular hydrogen bonding to more extent than methylamine. (1)

OR

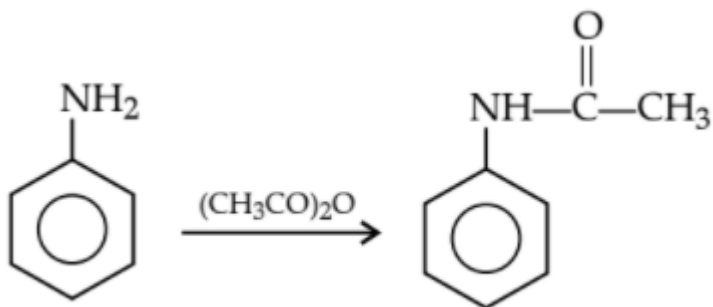
4.

(1 x3)

a) Benzoic acid to Aniline :



B) Aniline to N- Phenylethanamide



C) Ethanoic acid to Methanamine



5. a) In $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ - Ni^{2+} has d^8 which has 2 unpaired electron . In presence of weak ligand H_2O electron pairing doesnot occur, thus undergo d-d transition. Red colour absorbed and complementary colour green is emitted. 1

b) Hybridization = SP^3 (1)

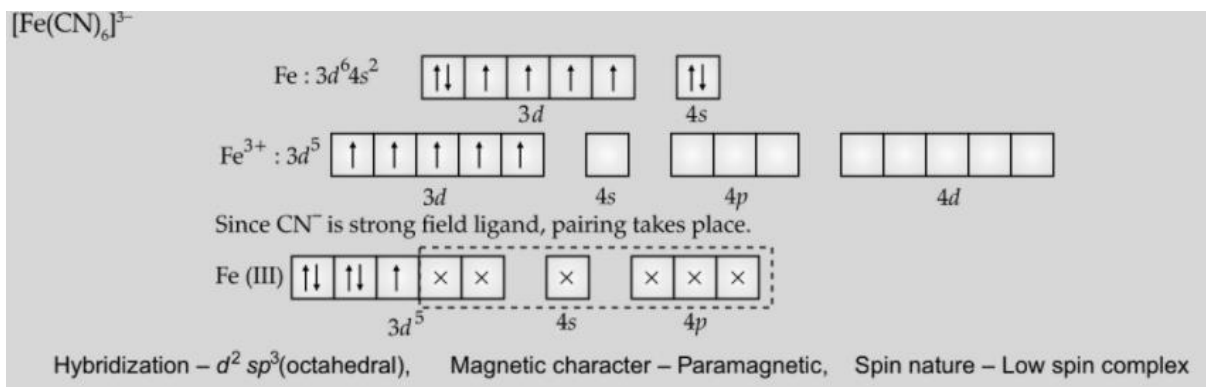
IUPAC name – Tetracarbonylnickel(0) (1)

OR

a) t_2g^4 (1)

b)

(2)



6. a) Because of half filled orbital in Mn²⁺ and fully filled orbital in Zn²⁺.

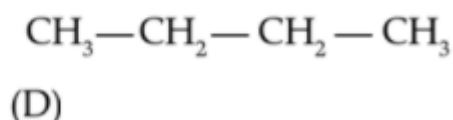
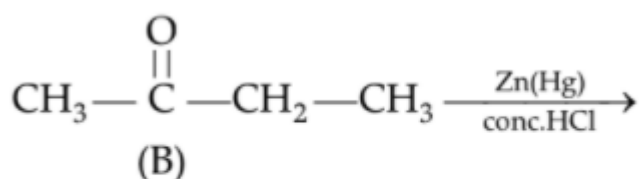
For Ni, E⁰ value is related to the highest negative enthalpy of hydration. 1

b) Ti²⁺ ion loses 2 electron readily to form more stable Ti⁴⁺ ion ($3d^0 4s^0$) (1)

c) smaller ionic size, high charge density and presence of empty d orbitals. (1)

7.

(a) A = CH ₃ CH ₂ CH ₂ CHO	[½]
B = CH ₃ COCH ₂ CH ₃	[½]
C = (CH ₃) ₂ CHCHO	[½]
D = CH ₃ CH ₂ CH ₂ CH ₃	[½]



(b) (B) as ketones are less reactive towards addition of HCN than aldehydes and alkane due to higher hindrance caused by steric effect and inductive effect.

(1)

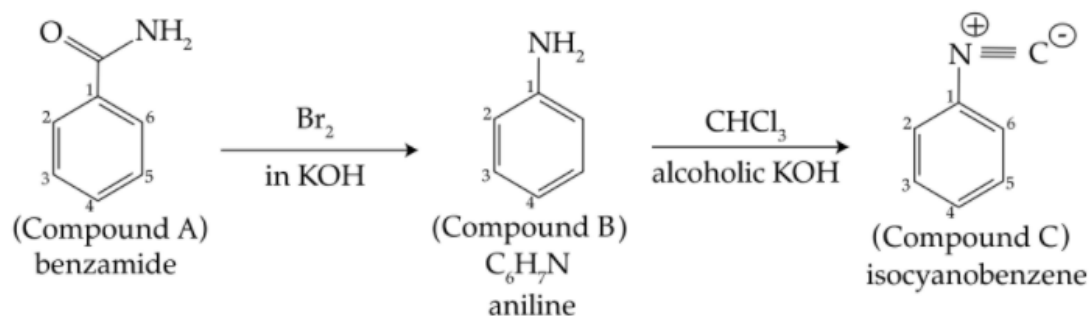
8.a) NH_3 has more vanderwaal's force of attraction than N_2 as NH_3 is polar and can form H bonds. Therefore, it can be adsorbed to more extent than nitrogen. (1)

b) Temperature above which micelle formation occurs. (1)

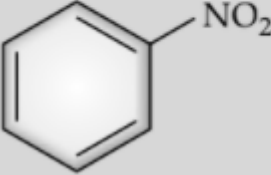
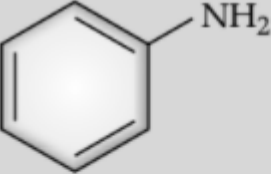
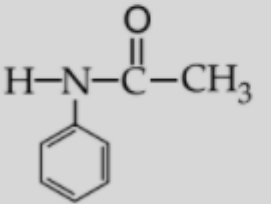
c) 4% solution of nitrocellulose in mixture of alcohol and ether. (1)

9.

(1 x 3)



OR

(a)	(A) CH_3CONH_2	[1/2]
	(B) CH_3NH_2	[1/2]
	(C) CH_3NC	[1/2]
(b)	(A) 	[1/2]
	(B) 	[1/2]
	(C) 	[1/2]

10 . $E^0_{\text{cell}} = +0.36\text{V}$

(1+1+1)

$$E_{\text{cell}} = 0.44\text{V}$$

$$\Delta G^{\circ} = -84.920\text{kJ}$$

11. a) Oxide in lower o.s are ionic , react with water to form hydroxide which is basic whereas oxide in highest O.S is covalent, dissolve in water forming acid. Acidic character increases with increase in O.S. (1)

b) CuCl_2 , Cu is in +2 o.s than Cu^+ in Cu_2Cl_2 due to high hydration enthalpy.(1)

c) Lanthanoid contraction .(1)

OR

a) Cu^{2+} salts are coloured because of unpaired electron undergo d-d transition.(1)

b) O and F are strong oxidizing agents, highly electronegative, small size and can provide energy for formation of transition metal ion in higher oxidation state. (1)

c) Zn, Cd and Hg have all the d- orbital fully filled. Therefore intermetallic bonding is weak in them and so they are soft metals.(1)

Section C :

a) Zero order. (1)

b) $k/2.303$ where 'k' is rate constant.. (1)

c) $t_{1/2}$ is directly proportional to initial concentration. (1)

d) $t_{99.9\%} = 10 t_{1/2} = 10 \times 40 = 400$ minutes (2)

OR

d) $t_{1/2} = [R_0] / 2k$ for zero order reaction. (2)