# COMMON PRE-BOARD EXAMINATION 2022-23

## Subject: CHEMISTRY (043)
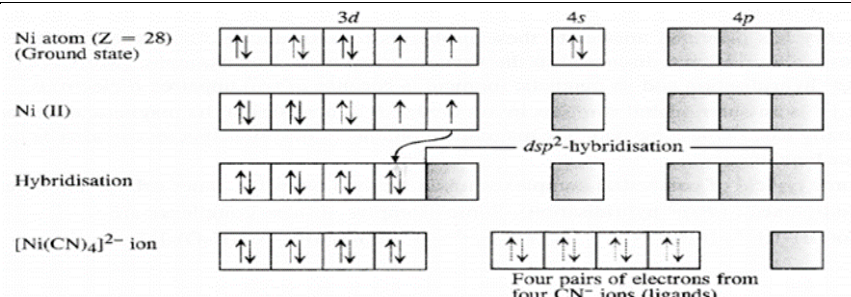
Date:

MARKING SCHEME

1. b
2. 
    (b)    $Rate = \dfrac{[R]_0 - [R]}{t}$

    $\Rightarrow \quad 0.6 \times 10^{-3} \times 20 \times 60 = [R]_0 - [R]$

    $\Rightarrow \quad 0.72\ M$

    Amount of [B] produced = $[R]_0 - [R]$
    $= 0.72\ M$

3. (a) In zero order of reaction $t_{1/2} \propto [R]_0$
4. (a) $E_a = E_1 + E_2$ and products are less stable due to higher energy.
5. (b) due to 5 unpaired electrons
6. (c)
7. (b)
8. (b)
9. (c)
10. (d)
11. (a)
12. (c)
13. (c)
14. (b)
15. (a)
16. (d)
17. (d)
18. (c)

| 19. | Conductivity: Conductivity of a solution is defined as the conductance of a solution of 1 cm length and having 1 sq. cm as the area of cross-section. It is represented by K.   Its unit is S cm-1<br>    Molar conductivity: Molar conductivity of a solution at a dilution V is the conductance of all the ions produced from one mole of the electrolyte dissolved in V cm3 of the solution when the electrodes are 1 cm apart and the area of the electrodes is so large that the whole of the solution is contained between them. It is represented by Λm. Its unit is S cm2 mol-1<br>Conductivity and molar conductivity of electrolytes increase with increasing temperature. | 1+1 =2 |
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| 20. | . a) The change in concentration of reactant or product per unit time is called rate of reaction<br>b) $\dfrac{-d[N_2]}{dt} = \dfrac{-1}{3}\dfrac{d[H_2]}{dt} = +\dfrac{1}{2}\dfrac{d[NH_3]}{dt}$ | 1+1 =2 |
| 21 | When reaction is completed 99.9%,    $[R]_n = [R]_0 - 0.999[R]_0$<br>k =2.303 /t . log[R0]/[R] | 1 ½ |

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| | $t = 6.909/k$    For half-life of the reaction    $t_{1/2} = 0.693/k$    $t / t_{1/2} = 10$ times | ½ |
| | **OR** | |
| | Since Rate = $K[A]^2$ <br> For second order reaction Let $[A] = a$,   then Rate = $Ka^2$ <br> (i) If $[A] = 2a$ then Rate = $K(2a)^2 = 4Ka^2$ <br> ∴Rate of reaction **becomes 4 times** | 1 |
| | (ii) If $[A] = a/2$ then Rate = $K(a/2)^2 = Ka^2/4$ <br> ∴ Rate of reaction will be **1/4 th** | 1 |
| 22 | a)       Dichloridobis (ethane-1,2-diamine)cobalt (III) chloride | 1 |
| | b)      cis - $[CrCl_2(ox)_2]^{3-}$ is chiral (optically active). | 1 |
| 23 | . a) $(CH_3)_2C.Br < (CH_3)_2.CHCH_2.Br < CH_3CH_2CH_2CH_2Br$ | 1 |
| | b) $CH_3-CH=CH_2 + HBr$ (Peroxide) -> <br> $CH_3CH_2CH_2 Br + AgNO_2 -> CH_3CH_2CH_2NO_2$ | 1 |
| | **OR** | 1 |
| | a) $CN^-$ is ambidentate nucleophile. <br> b) Chloroform get oxidized to phosgene in sunlight. So dark coloured bottles used to prevent reaction with sunlight. | 1 |
| 24 | a) Butanone < Propanone < Propanal < Ethanal | 1 |
| | b) Ethanal on heating with $I_2$ in NaOH gives a yellow ppt of iodoform but propanal does not respond to this test. | 1 |
| 25. | a) any one difference (The chemical composition of nucleotide consists of a phosphate group, a sugar and a nitrogenous base. A nucleoside has a chemical composition that consists of a sugar and a base without the phosphate group) | 1 |
| | b) due to solubility in water, it will intake regularly. <br> ( Water soluble vitamins must be supplied regularly in diet because they are readily excreted in urine and cannot be stored (except vitamin B12) in our body) | 1 |

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| 26 | a) henry law expression or statement- Henry's law is a gas law which states that at the amount of gas that is dissolved in a liquid is directly proportional to the partial pressure of that gas above the liquid when the temperature is kept constant | 1 |
| | b) $P_1^0 = 0.850$ bar; $p = 0.845$ bar; $M_1 = 78$ g mol$^{-1}$; $w_2 = 0.5$ g; $w_1 = 39$ g <br> $P_1^0 - P_1 / P_1^0 = W_2 X M_1 / M_2 X W_1$ | 1 |
| | 0.850 bar – 0.845 bar /0.850 bar <br> 0.5 g × 78 g mol /M $_2$× 39 g | ½ |
| | **M₂ = 170 g mol–1** | ½ |
| 27 . | a) due to (d-d transition) | 1 |
| | b) Proper VBT diagram and magnetism (refer ncert page no 255) <br>      6, +2 | 1 |
| | Outer electronic configuration of nickel (Z = 28) in ground state is $3d^84s^2$. Nickel in this complex is in + 2 oxidation state. It achieves + 2 oxidation state by the loss of the two 4s-electrons. The resulting Ni2+ ion has outer electronic configuration of $3d^8$. Since CN– ion is a strong field, under its attacking influence, two unpaired electrons in the 3d orbitals pair up. | 1 |

Outer electronic configuration of nickel (Z = 28) in ground state is 3d8 4s2 Nickel in this complex is in + 2 oxidation state. Nickel achieves + 2 oxidation state by the loss of two 4s-electrons. The resulting Ni2+ ion has outer electronic configuration of 3d8. Since CP ion is a weak field ligand, it is not in a position to cause electron pairing

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     b)  When FeSO4 and (NH4)2SO4 solutions are mixed in 1 : 1 molar ratio, a double salt known as Mohr's salt is formed. It has the formula FeSO4.(NH4)2SO4.6H2O. But in CuSO4, the Cu is part of coordination entity and cannot be ionized

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| 28. | a) C6H5 CH2Cl will undergo SN1 reaction faster. | 1 |
| | The carbocation formed by C6 H5 CH2Cl gets stabilized through resonance. | 1 |
| | Greater the stability of carbocation, greater will be its ease of formation from the respective halide | |
| | b) chloro benzene converts into phenol (with reaction | 1 |
| 29.. | a) Correct chemical reaction. | 1 |
| | b) Correct chemical reaction. | 1 |
| | c) Correct chemical reaction. | 1 |
| | d) Correct chemical reaction. | 1 |
| 30. | a) (C2H5 ) 2NH > C2H5NH2 > NH3 > C6H5NH2 | 1 |
| | b) Aniline does not undergo Friedel-Crafts reaction (alkylation and acetylation) due to salt formation with aluminium chloride, the Lewis acid, which is used as a catalyst. Due to this, nitrogen of aniline acquires positive charge and hence acts as a strong deactivating group for further reaction. | 1 |
| | c) No reaction occurs. | 1 |
| 31. | . a) solution that follow Raoult's law at all concentrations, is ideal solution. | 1 |
| | b) positive deviation | |
| | C)  The various quantities known to us are as follows: $\Pi$ = 2.57 × 10–3 bar, | 1 |
| | V = 200 cm3 = 0.200 litre | |
| | T = 300 K | 1 |
| | R = 0.083 L bar mol-1 K-1 | |
| | Substituting these values in equation we get | |
| | M2= w2RT/ $\Pi$ V | 1 |
| | M2 =1 .26 g × 0.083 L bar K-1 mol -1 × 300 K/    2.57×10 -3 bar × 0.200 L | |
| | = 61,022 g mol-1 | |
| |             OR | |
| | Correct Reasons | |

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|---|---|---|
| 32 | a) sucrose do not have free aldehyde group. <br> b) Sucrose is dextrorotatory but after hydrolysis gives dextrorotatory glucose and laevorotatory fructose. Since the laevorotation of fructose (–92.4°) is more than dextrorotation of glucose (+ 52.5°), the mixture is laevorotatory. Thus, hydrolysis of sucrose brings about a change in the sign of rotation, from dextro (+) to laevo (–) and the product is named as invert sugar <br> c) When a protein in its native form, is subjected to physical change like change in temperature or chemical change like change in pH, the hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein loses its biological activity. This is called denaturation of protein. <br> <div align="center">OR</div> <br> The D-L system corresponds to the configuration of the molecule: spatial arrangement of its atoms around the chirality center. Plus, minus indicate dextro and laevo. | |
| 33. | a) $E_{cell}$ decreases. b) Anode: <br> $Cl_2 \uparrow$ Cathode:$H_2$ <br> c) $E^0cell = 0.59V$ <br> <br> *NERNST EQUATION FOR CELL* <br> *Ecell = 0.6195V* <br> <br> **OR** <br> *a) Complex formation.* <br> b) $(425.9 + 91.0 – 126.4) S\ cm2\ mol\ –1 = 390.5\ S\ cm2\ mol–1$. <br> c) Anode: $Pb(s) + SO4\ 2–(aq) \rightarrow PbSO4\ (s) + 2e–$ <br> Cathode: $PbO2\ (s) + SO4\ 2–(aq) + 4H+ (aq) + 2e– \rightarrow PbSO4\ (s) + 2H2O\ (l)$ <br> Overall reaction <br> $Pb(s) + PbO2\ (s) + 2H2\ SO4\ (aq) \rightarrow 2PbSO4\ (s) + 2H2O(l)$ | 1 <br><br> ½ <br> ½ <br> ½ <br> ½ <br><br> 1 <br> 1 <br><br> 1 <br><br> 2 <br><br> 2 |
| 34 | . (i) $Cu2+(aq)$ is much more stable than $Cu+(aq)$. This is because although second ionization enthalpy of copper is large but $\Delta_{hyd}$ (hydration enthalpy) for $Cu^{2+}(aq)$ is much more negative than that for $Cu^+(aq)$ and hence it more than compensates for the second ionization enthalpy of copper. Therefore, many copper (I) compounds are unstable in aqueous solution and undergo disproportionation as follows: $2Cu+ \rightarrow Cu^{2+} + Cu$ <br> (ii) Because of very small energy gap between 5f, 6d and 7s subshells all their electrons can take part in bonding and shows variable oxidation states. <br> (iii) $Cr^{2+}$ has the configuration $3d^4$ which easily changes to $d^3$ due to stable half-filled $t_2g$ orbitals. Therefore $Cr^{2+}$ is reducing agent. While $Mn^{2+}$ has stable half-filled $d^5$ configuration. Hence $Mn^{3+}$ easily changes to $Mn^{2+}$ and acts as oxidising agent. <br><br> $(i)\ 8MnO_4^- \ (aq) + 3S_2O_3^{2-}\ (aq) + H_2O\ (l) \rightarrow$ <br> $\qquad 8MnO_2\ (s) + 6SO_4^{2-}\ (aq) + 2OH^-\ (aq)$ <br><br> $(ii)\ Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \rightarrow$ <br> $\qquad\qquad 2Cr^{3+} + 6Fe^{3+} + 7H_2O$ | |
| 35. | a) $CH_3CH_2CH_3 < CH_3CHO < CH_3OCH_3 < CH_3CH_2OH$, <br> b) The carbon atom of the carbonyl group of benzaldehyde is less electrophilic than carbon atom of the carbonyl group present in propanal. The polarity of the carbonyl group is reduced in benzaldehyde due to resonance and hence it is less reactive than propanal. | 1 <br><br> 1 <br><br> 1 |

c) electron withdrawing group NO2 attached
d) correct chemical reactions

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OR

a) methyl benzoic acid< benzoic acid <nitro benzoic acid
b) correct equation.
c)

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1
3

$$(i) \ R-CH_2COOH \xrightarrow[\text{(ii) } H_2O]{\text{(i) } X_2/\text{Red phosphorus}} R-\underset{\underset{X = Cl, Br}{\overset{|}{X}}}{CH}-COOH$$

α-halo alkanoic acid

$$(ii) \ R-COONa \xrightarrow[\text{Heat}]{\text{NaOH \& CaO}} R-H \ + \ Na_2CO_3$$

Alkane

(iii) correct equation.

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