COMMON PRE-BOARD EXAMINATION – 2023

CHEMISTRY THEORY (043)

MAX. MARKS:70 **CLASS: XII** **TIME: 3 HOURS**

ANSWERKEY

SECTION A

The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1) Ans: B) Osmotic pressure 1

2) Ans: D) the overall reaction is $2\ Fe + O_2 + 4\ H^+ \rightarrow 2\ Fe^{2+} + 2\ H_2O$ 1

3) Ans: C) $[Fe(CO)_5]$ 1

4) Ans: C) $3^0 > 2^0 > 1^0$ 1

5) Ans: A) diamminedichloridoplatinum(II) 1

6) Ans: A) Copper liberates hydrogen from acids. 1

7) Ans: A) A = C_2H_4, B = C_2H_5OH, C = C_2H_5NC, D = C_2H_5CN 1

8) Ans: D) denaturation of protein 1

9) Ans: A) linkage isomers 1

10) Ans: A) CH_3CHO 1

11) Ans: C) Sucrose 1

12) Ans: B) $[Co(CN)_6]^{3-}$ 1

13) Ans: C) Aldohexose 1

14) Ans: D) Glycogen 1

15) Ans: D 1

16) Ans: A 1

17) Ans: B 1

18) Ans: D 1

SECTION B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

19) Ans: a) The pressure which must be applied to the solution side to prevent 1

the passage of solvent into it through a semipermeable membrane.

b) van't Hoff factor gives the extent of association or dissociation of the solute particles in solution. 1

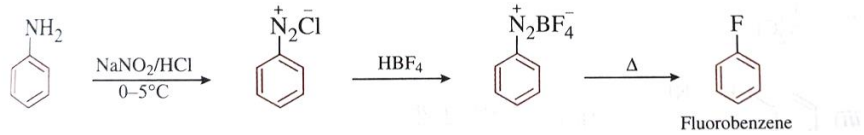
20) Ans: i) $CH_3CH_2CH_3$, CH_3OCH_3, CH_3CHO, CH_3CH_2OH 1

ii) $(CH_3)_2CHCOOH$, $CH_3CH(Br)CH_2COOH$, $CH_3CH_2CH(Br)COOH$ 1

OR

Ans: a. Propanal contain H atom on the carbonyl group but propanone does not. Cleavage of C – H bond in propanal is easier than cleavage of C – C bond in propanone. 1

b. Fehling's test. Benzaldehyde does not react with Fehling's reagent while propanal gives reddish brown precipitate. Chemical eqn 1

21) Ans: i. 

1

ii. The conversion of primary aromatic amines into diazonium salts

OR

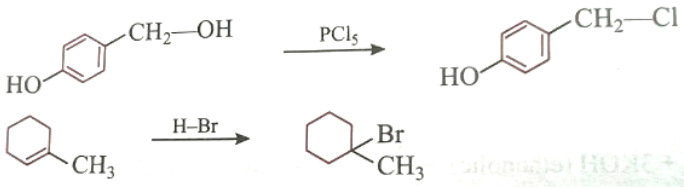
Ans: a) Butamine is a primary amine, which forms strong intermolecular hydrogen bonding than N-ethylethanamine, which is a secondary amine. 1

b) Pyridine is used to remove the side product, HCl from the reaction mixture and to shift the equilibrium to the right hand side. 1

22) Ans: i. 3 – Bromo – 2 – methyl but – 1 – ene 1

ii. Any two uses 1

23) Ans:



1

1

24) Ans: a) Rate = k $[R]^2$ = k a^2

[R] = ½ a 1

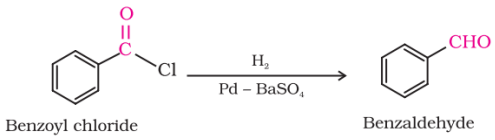
Rate = k $(½ a)^2$ = ¼ ka^2

Rate of reaction becomes ¼ th of the initial rate.

b) A reaction which is not truly of first order but under certain conditions becomes a reaction of first order is called pseudo first order reaction. 1

25) 1

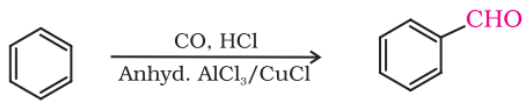
Ans: i)



Benzoyl chloride Benzaldehyde

1

ii)



Benzene Benzaldehyde

SECTION C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

26) 1

Ans: The cell representation is $Mg(s)|Mg^{2+}(0.2M) \,||\, Ag^{+}(1 \times 10^{-3}M) \,|\, Ag(s)$

applying nernst equation

$E_{cell} = E^0_{cell} - \frac{0.0591}{2}\log\frac{[Mg^{2+}]}{[Ag^{2+}]}$ ½

$E^0(Ag^+/Ag) - E^0(Mg^{2+}/Mg) - \frac{0.0591}{2}\log\frac{0.2}{(10^{-3})^2}$ ½

$= +0.80V - (-2.37V) - \frac{0.0591}{2}\log(2 \times 10^5)$

$= +3.17V - \frac{0.0591}{2}[\log 2 + \log 10^5]$ ½

$= +3.17V - \frac{0.0591}{2} \times 5.3010$ ½

= +3.17V - 0.1566V

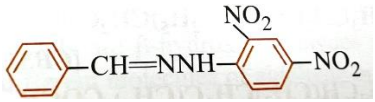
= 3.0134 V

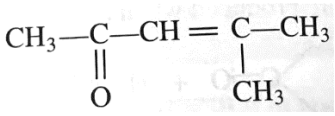
27) Ans: a) On heating, H_2O is lost. In the absence of ligand, crystal field splitting does not occur hence the substance becomes colourless. 1

b) CO has empty π – orbitals which overlap with filled d – orbitals of transition metals and form π – bonds by back bonding. NH_3 can not form such back bonding. 1

c) The difference of energy between two sets of degenerate orbitals after crystal field splitting 1

28) Ans: i. $KMnO_4$ – KOH 1

ii. a.  1

b.  1

29) Ans: a) The linkage between two monosaccharides through oxygen atom in an oligosaacharide or a polysaccharide 1

b) Sucrose is a dextro rotatory ($+66.5^0$) but after hydrolysis it gives an 1

equimolar mixture of D-(+)-glucose and D-(-)-fructose, which is laevorotatory. This change of specific rotation from dextro rotation to laevo rotation is called inversion of sugar and the mixture obtained is called invert sugar.

c) Carbohydrates which on hydrolysis give two to ten molecules of monosaccharides are called oligosaccharides. 1

d) These are the organic compounds required in small amounts in our diet but their deficiency causes specific diseases.

30) Ans: $\pi = i\,CRT = i\,\frac{W2\times R\times T}{M2\times V}$ ½

$= \frac{3\times 0.025\times 0.0821\times 298}{174\times 2}$ 1 ½

$= 5.27 \times 10^{-3}$ atm 1

OR

Ans: $\alpha = 92\% = 0.92$ ½

$\alpha = \frac{i-1}{n-1}$, $0.92 = \frac{i-1}{2-1}$

$i = 1.92$ ½

$\Delta Tf = i\,Kf\,\frac{w2\times 1000}{m2\times w1}$ ½

$T^0_f - T_f = \frac{1.92\times 1.86\times 0.5\times 1000}{74.5\times 100} = 0.24$ 1

$T_f = 0 - 0.24 = -0.24^0C$ ½

SECTION D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

31) Ans: a) It is defined as conductance of electrolyte when distance between electrodes is 1 cm and area of cross section is 1 cm^2. 1

b) The electrolytic conductance increases with increase in temperature because the degree of dissociation increases with increase in temperature. 1

c) $\Lambda_m = \frac{K\times 1000}{c}$ ½

$K = \frac{\Lambda_m \times c}{1000} = \frac{138.9\times 1.5}{1000} = 0.20842$ S cm^{-1}. 1 ½

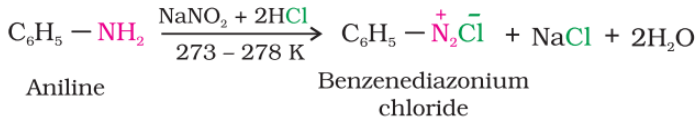
OR

$\Lambda^0_{(CH3COOH)} = \lambda^0_{(H^+)} + \lambda^0_{(CH3COO^-)} = 349.6 + 40.9 = 390.5$ S cm^2 mol^{-1} 1

$\alpha = \frac{\Lambda m}{\Lambda_m^0} = \frac{39.05}{390.5} = 0.1$ or 10% 1

32) Ans: a) NH_3, $(CH_3)_3N$, CH_3NH_2, $(CH_3)_2NH$ 1

b) It is because due to resonance in aromatic amines, the lone pair of electrons on the nitrogen atom gets delocalized over the benzene ring and thus is less easily available for protonation. 1

c)(i) 

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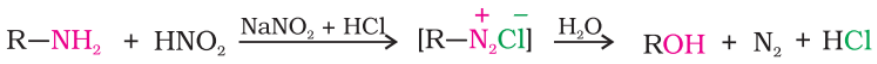
(ii) 

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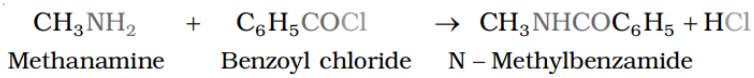
OR

1



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SECTION E

The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

33) Ans: a) $k = \frac{2.303}{t} \log\frac{[R]0}{[R]} = \frac{2.303}{20} \log\frac{0.400}{0.289} = 1.62 \times 10^{-2}$ min^{-1} 2

b) $1.62 \times 10^{-2} = \frac{2.303}{100} \log\frac{0.400}{[R]}$

$5.052 = \frac{0.400}{[R]}$ 2

[R] = 0.0791 M

c) Initial rate of reaction = k [R] 1

$= 1.62 \times 10^{-2} \times 0.400 = 6.48 \times 10^{-3}$ mol L^{-1} min^{-1}

OR

Ans: i) $\log\frac{k2}{k1} = \frac{Ea}{2.303 \times R} \frac{T2-T1}{T1T2}$ ½

$\log\frac{4 \times 10^{-2}}{2 \times 10^{-2}} = \frac{Ea}{2.303 \times 8.314} \frac{310-300}{300 \times 310}$ = 53598 J/mol = 53.598 kJ/mol 1½

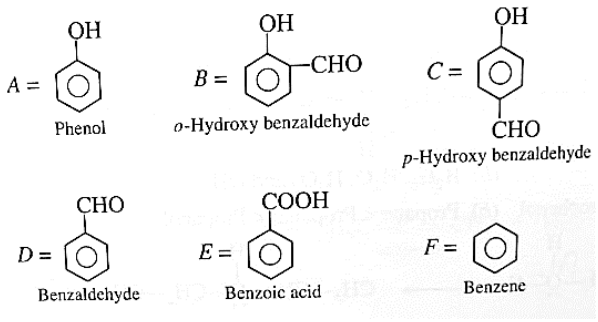
ii) a) slope = $\frac{-k}{2.303}$ 1

$k = -2.303 \times -2.0 \times 10^{-6} = 4.606 \times 10^{-6}$ s^{-1} ½

b) $t_{1/2} = \frac{[R]0}{2k}$ ½

1

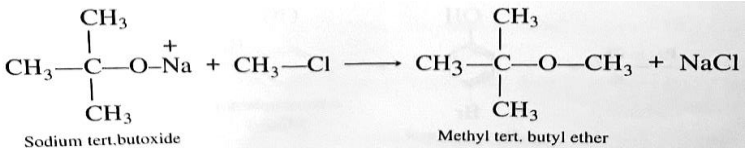
34) Ans:



1
1
1
1
1

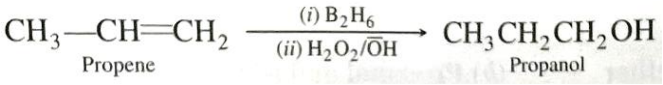
OR

Ans: i. a.

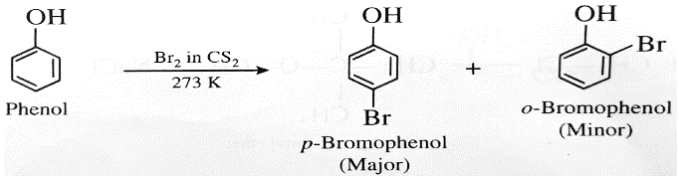


1

b.



c.



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ii. ethanol gives yellow ppt with iodoform test while diethyl ether does not. $CH_3CH_2OH + 4\ I_2 + 6NaOH \rightarrow CHI_3 + HCOONa + 5\ NaI + 5\ H_2O$

1
1

iii. Ethanol, Water, Phenol

35) Ans: a) i) $8\ MnO_4^- + 3\ S_2O_3^{2-} + H_2O \rightarrow 8\ MnO_2 + 6\ SO_4^{2-} + 2\ OH^-$

1

ii) $Cr_2O_7^{2-} + 3\ Sn^{2+} + 14\ H^+ \rightarrow 2\ Cr^{3+} + 3\ Sn^{4+} + 7\ H_2O$

1

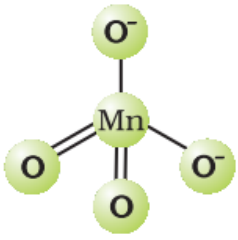
b) 1) $4\ FeCr_2O_4 + 8\ Na_2CO_3 + 7\ O_2 \rightarrow 8\ Na_2CrO_4 + 2\ Fe_2O_3 + 8\ CO_2$

½

2) $2\ Na_2CrO_4 + 2\ H^+ \rightarrow Na_2Cr_2O_7 + 2\ Na^+ + H_2O$

½

c)



Tetrahedral manganate ion (green)

1

d) Transition metals form large number of complex compounds is due to: 1) comparatively smaller sizes of the metal ions and high ionic charges

½
½

2) the availability of d – orbitals for bond formation.