BK BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
SENIOR SECONDARY CO-ED DAY CUM BOYS' RESIDENTIAL SCHOOL

MID-TERM EXAMINATION 2023-24

CHEMISTRY (043)

Class :XII
Date
Admission No.:

Duration : 3 Hrs
Max. Marks : 70
Roll No.:

SECTION A

1. (b) 0.1 M Na_3PO_4 2. (a) Cellulose acetate 3. (b) 3F 4. (a) 38%

5. (b) zero 6. (a) sec^{-1} 7. (a) +3 8. (c) Zr^{4+}, Hf^{4+}

9. (a) 3 10. (b) Potassium hexacyanidoferrate (III) 11. (ii) SN2 mechanism

12. (ii) Fitting Reaction 13. a 14. a 15.a 16.d

SECTION B

This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

17. (a) $3d^54s^1$ which is unstable in compare to $3d^54s^2$ 1

(b) Packing efficiency is higher due to unpaired electron 1

18. (a) 3x96500C **1** (b) 2x96500C 1

19. (a) Solution: K kg mol-1 1

(b) Answer:The volume of the resulting solution decreases on mixing liquids X and Y. It shows negative deviation . 1

20. Ans.Rate=k[A][B] 1

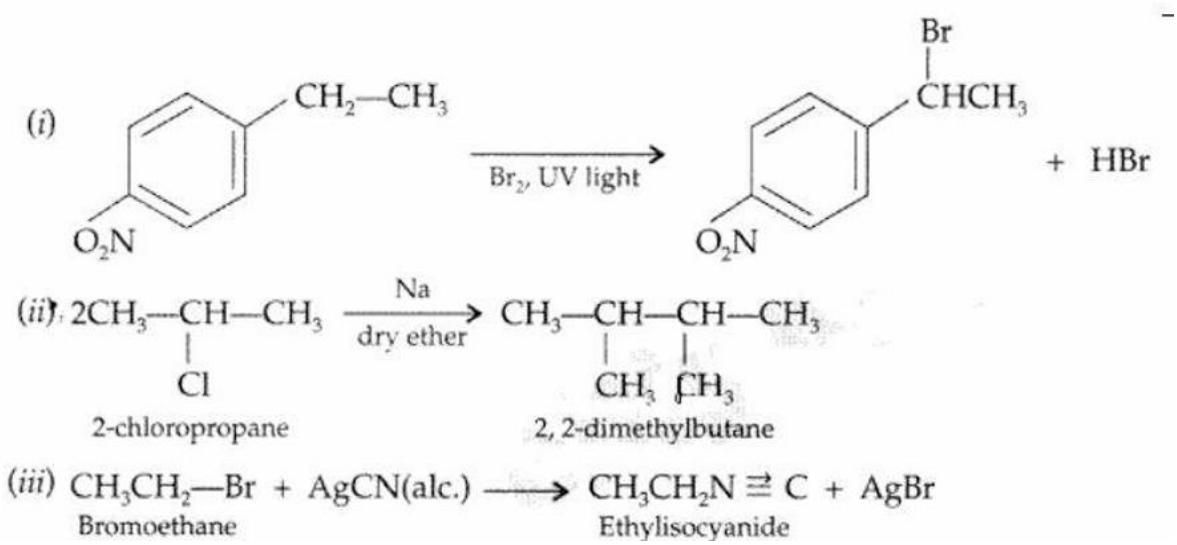
Average rate- Rate of a reaction for a particular period or interval of time. Instantaneous rate–Rate of a reaction at a particular instant of time OR

Ans: Chemical reactions which are not first order but behave as first order reaction under suitable conditions are called pseudo first order Reactions. Ex: Inversion of cane sugar. C12H22O11+H2O >C6H12O6+C6H12O6

21. Answer: It is octahedral, 1 d2sp3 hybridised, diamagnetic in nature. 1

SECTION C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.



23. (a) 2-Bromo 3-mehyl pentene

(b) C6H5C(CH3) (C6H5)Br > C6H5CH(C6H5)Br > C6H5CH(CH3)Br > C6H5CH2Br

(c)

24. using nernst equation 2 2.96v 1

25.(a) 1. Tetraammineaquachlorido cobalt(III) chloride. 2. Dichlorido bis(ethane 1, 2-diamine) chromium (III) chloride.

(b) The difference between energies of two sets of d-orbitals t2g and e is called crystal field splitting energy (Δ0). If Δ0 > P, the configuration will be t2g4, eg0. Ligands will produce strong field and pairing takes place.

26. (i) Zero (ii) –k (iii) mol L–1 s –1

27. (a) due to unpaired electron 1

(b) due to inter atomic interaction is higher, due to unpaired electron. 1

(c)due to Similar size 1

28 . Henry's law : Henry's law states that "The partial pressure of the gas in vapour phase is proportional to the mole fraction of the gas in the solution ". 1

Applications of Henry's law : i)To increase the solubility of CO2 in soft drinks and soda water, the bottle is sealed under high pressure. ii)To avoid a dangerous medical condition called bends, scuba divers use oxygen diluted with less soluble helium gas. **2**

Or

(*b*) **Given :** $K_H = 1.67 \times 10^8$ Pa

$pCO_2 = 2.53 \times 10^5$ Pa

Using Henry's law

$pCO_2 = K_H \times xCO_2$

$\therefore \quad xCO_2 = \frac{pCO_2}{K_H} = \frac{2.53 \times 10^5 \text{Pa}}{1.67 \times 10^8 \text{Pa}}$

$\therefore \quad xCO_2 = 1.515 \times 10^{-3}$

$$\frac{nCO_2}{nH_2O + nCO_2} = \frac{nCO_2}{nH_2O} = 1.515 \times 10^{-3}$$

No. of moles of water present in 500 ml

soda water $= \frac{500}{18} = 27.78$ mol

i.e. $nH_2O = 27.78$ mol

$nCO_2/27.78 = 1.515 \times 10^{-3}$

i.e. $nCO_2 = 42.08 \times 10^{-3}$ moles $= 0.042$ mol

SECTION D

The following questions are case -based questions. Each question carries 4 marks. Read the passage carefully and answer the questions that follow

29. (a) $k = Ae^{-Ea/RT}$

(b) The extra energy which must be supplied to reactants in order to undergo effective collision to form products. It represents fraction of molecules possessing activation energy (Ea) or more than Ea.

OR

Rate = -(0.4-0.5/2*10) mole per litre per second

30. (a) 0 1

(b) Cis 1

(c) One mole of $[Cr(H_2O)_6]Cl_2$ 2 mole of AgCl is formed 2

OR

(c) loan pair containing and negative charge carrying groups or compounds called ligands. 1

The metal which binds all the ligands called ligands 1

SECTION E

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

31

(A) When n- butyl chloride reacts with alcoholic KOH, the product formed is butene. This reaction is known as hydrohalogenation.

$$CH_3 - CH_2 - CH_2 - CH_2 - Cl \xrightarrow[Dehydrogenation]{KOH(alc)} CH_3 - CH_2 - CH_2 = CH_2 + H_2O$$

(B) The reaction of bromobenzene with Mg in the presence of dry ether, the product of this reaction is Phenylmagnesium bromide

$$Ph - Br + Mg \xrightarrow{dry\ ether} Ph - MgBr$$

(C) The hydrolysis of chlorobenzene is not possible under normal conditions. In order to subject chlorobenzene for hydrolysis, we need to heat chlorobenzene in an aqueous medium with sodium hydroxide solution at temperature 623K and a pressure of 300 atm to form phenol.

$$Ph - Cl \xrightarrow[H^+]{NaOH,623K,300atm} Ph - OH$$

(D) The reaction of ethyl chloride with aqueous KOH, the product formed is ethanol

$$CH_3 - CH_2 - Cl \xrightarrow{KOH(aq)} CH_3 - CH_2 - OH + KCl$$

(F) The reaction of methyl chloride with KCN, the product formed is methyl cyanide. This reaction is a substitution reaction.

$$CH_3 - Cl + KCN \xrightarrow[Nucleophilic\ substitution]{} CH_3 - CN + KCl$$

OR

(a). KCN is predominantly ionic and provides cyanide ions in solution. Although both carbon and nitrogen atoms are in a position to donate electron pairs, the attack takes place mainly through carbon atom and not through nitrogen atom since C—C bond is more stable than C—N bond. However, AgCN is mainly covalent in nature and nitrogen is free to donate electron pair forming isocyanide as the main product

B

(iii) Propene to 1 - nitropropane

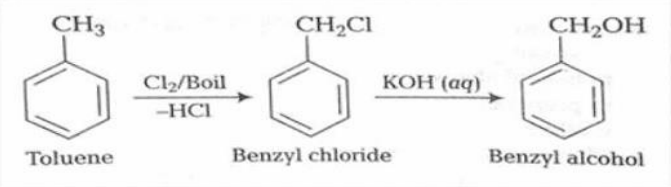
$CH_3CH = CH_2 + HBr \xrightarrow{peroxide} CH_3CH_2CH_2Br \xrightarrow{AgNO_2} CH_3CH_2CH_2NO_2 + AgBr$

1-nitro propane

(iv) Toluene to benzyl alcohol

$C_6H_5 - CH_3 + Cl_2 \xrightarrow{UV\ light} C_6H_5 - CH_2Cl \xrightarrow{NaOH} C_6H_5 - CH_2OH + NaCl$ toluene

benzyl alcohol



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32. (a) Answer: At Anode: Pb + SO4-2 → PbSO4 + 2e-

At Cathode : $PbO2 + SO_4^{-2} + 4H^+ + 2e- \rightarrow PbSO4 + 2H2O$

On charging the battery, the reaction is reversed and $PbSO_4$ on anode and cathode is converted into Pb and PbO2 respectively.

(b) Answer: Given : E° = 1.1V, F = 96,500 C mol-5, n = 2 Zn + Cu2+ ⇌ Cu + Zn 2+ Using ΔG° = -nFE° = -2 × 96500 × 1.1 = 212,300 CV mol -1

Or

(a) Statements two laws 2

(b) (i) Mercury cell is used in hearing aids.

(ii) Fuel cell was used in the Apollo Space Programme.

(iii) Lead storage cell is used in automobiles and inverters.

33. A= Fe_2CrO_4, B= Na_2CrO_4, C= $Na_2Cr_2O_7$, D= $K_2Cr_2O_7$

a) $4Fe_2CrO_4 + 8Na_2CO_3 + 7O_2 \rightarrow 8\ Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$

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

c) $Na_2Cr_2O_7 + 2KCl \rightarrow K_2Cr_2O_7 + 2NaCl$

Ans: A= MnO_2, B= K_2MnO_4, C= $KMnO_4$ and D = KIO_3

a) $2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2\ H_2O$

b) $3MnO_4^- + 4H^+ \rightarrow 2\ MnO_4^- + MnO_2 + 2H_2O$

c) $2MnO_4^- + H_2O + KI \rightarrow 2MnO_2 + 2OH^- + KIO_3$

**********end of paper**********