



# BRAINWARE UNIVERSITY

Term End Examination 2023-2024  
Programme – B.Sc.(BT)-Hons-2022

Course Name – Chemistry-II

Course Code - BBTC406

( Semester IV )

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

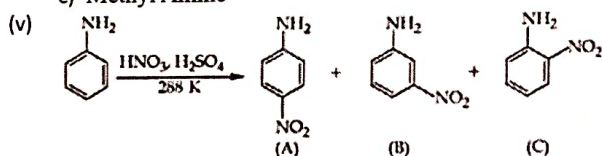
### Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Which of the following statements is correct with respect to electrolytic solutions?  
 a) Its conductance is independent of dilution  
 b) Its conductance decreases with dilution  
 c) Its conductance increases with dilution  
 d) Its equivalent conductance decreases with dilution
- (ii) Which of the given solutions have an equal value of molar conductivity and equivalent conductivity?  
 a) 1 M BaSO<sub>4</sub>  
 b) 1 M KCl  
 c) 1 M BCl<sub>3</sub>  
 d) 1 M CaSO<sub>4</sub>
- (iii) Which of the following compounds gives a primary alcohol upon reaction with phenyl magnesium bromide?  
 a) 2-Methyloxirane  
 b) Ethylene oxide  
 c) Ethyl formate  
 d) Oxirane
- (iv) An organic compound A on reduction gives compound B which on reaction with CHCl<sub>3</sub>/KOH forms C. The compound C on catalytic reduction gives N-methyl Aniline. The compound A is  
 a) Nitrobenzene  
 b) Nitromethane  
 c) Methyl Amine  
 d) Aniline



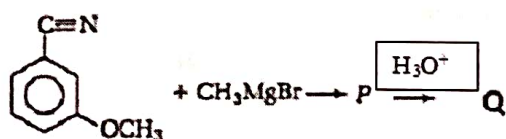
- Correct statement about the given chemical reaction is  
 a) -NH<sub>2</sub> group is ortho and para directing, So B product is not possible  
 b) Resonance is possible and B will be the major product  
 c) Resonance is possible and A will be the major product  
 d) The reaction will be sulphonated instead of nitration
- (vi) Given below are two statements:

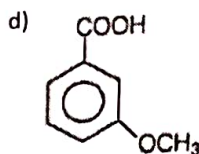
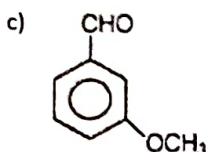
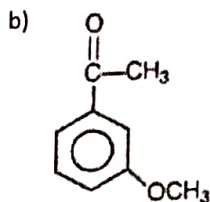
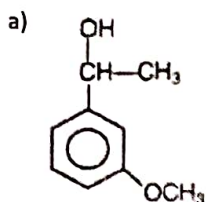
Statement I: In Hofmann degradation reaction, the migration of only an alkyl group takes place from carbonyl carbon of the amide to the nitrogen atom.

Statement II: The group is migrated in Hofmann degradation reaction to electron deficient atom.

In the light of the above statements, choose the most appropriate answer from the options given below:

- a) Both statement I & II are correct  
 b) Both statement I & II are incorrect  
 c) Statement I is correct but Statement II is incorrect  
 d) Statement II is correct but Statement I is incorrect
- (vii) The product Q in the given reaction is.....

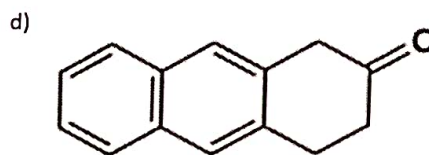
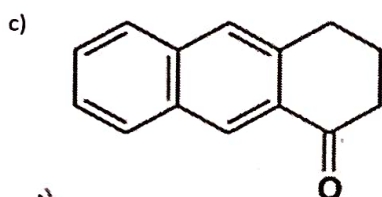
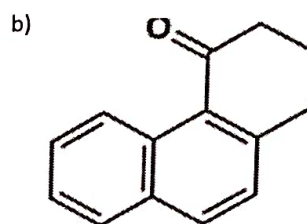
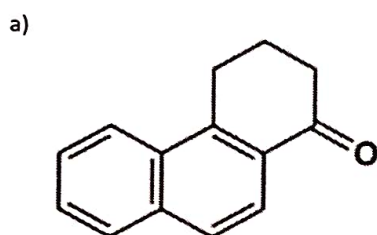
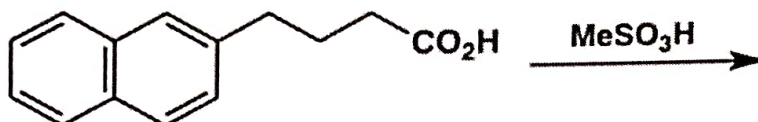




(viii) What happens when two molecules of benzyl chloride condensed in presence of  $\text{AlCl}_3$ ?

- a) Naphthalene is formed  
 b) Phenanthrene is formed  
 c) Anthracene is formed  
 d) All of these

(ix) Which one is the main product of the following reaction?



(x) Gibbs energy change ( $\Delta G$ ) is related to equilibrium constant ( $K$ ) as:

- a)  $\Delta G^\circ = -RT \ln K$   
 b)  $\Delta G^\circ = RT \ln K$   
 c)  $\ln K = -RT / \Delta G^\circ$   
 d)  $\ln K = \Delta G^\circ / RT$

(xi) The slope of the plot obtained for  $[A]$  vs  $t$  in a zero order reaction is.....

- a)  $-k$   
 b)  $k$   
 c)  $k / 2.303$   
 d)  $0.693 / k$

(xii) In a process 701 J heat is absorbed by a system and 394 J work is done by system. Calculate the change in internal energy of the system.

- a) 307 J  
 b) 1059 J  
 c) 1095 J  
 d) -394 J

(xiii) For the reaction  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$ , what will happen if we insert 2 moles of Argon at constant pressure?

- a) More backward reaction  
 b) More forward reaction  
 c) No effect  
 d) None of these

(xiv) According to the Warner's theory of coordination compound, 'secondary valency' refers to:

- a) Number of electrons lost or gained by a metal atom  
 b) Number of ligands directly bind to the metal ion  
 c) Maximum valency of the metal atom  
 d) Bond strength between central metal and ligands

(xv) More than one sort of hybridization can occur in a complex with geometry:

- a) Square pyramidal  
 b) Trigonal  
 c) Square planar  
 d) Octahedral

**Group-B**  
 (Short Answer Type Questions)

3 x 5=15

2. Synthesise Phenanthrene by Bogert Cook Synthesis.

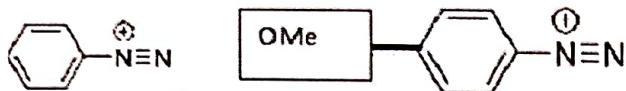
(3)

3. A reaction is first order with respect to A and second order with respect to B. (3)

- (i) What is the differential rate equation?
- (ii) Predict how the rate is affected by increasing the concentration of A three times.
- (iii) Predict how the rate is affected when the concentrations of both A and B are doubled.

4. (3)

Which one will decompose more easily.... Explain.



5. a. Define denticity of a ligand with example. (3)

b. Give examples for each of the following:

- i. Monodentate ligands (one cationic and one neutral)
- ii. Bidentate ligands (one anionic and one neutral)

6. Distinguish between Aniline and Ethyl amine by suitable tests. (3)

OR

Aromatic diazonium salts are more stable than aliphatic diazonium salts..... Justify or criticize the statement. (3)

**Group-C**

(Long Answer Type Questions)

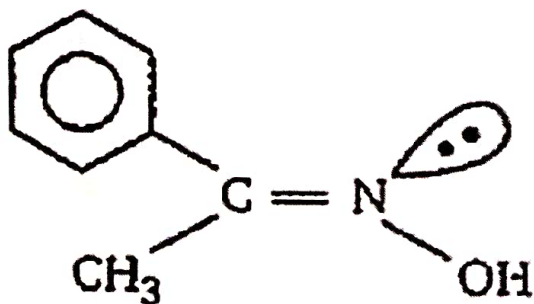
5 x 6=30

7. a. How many chelate rings are present in  $[M^{II}(EDTA)]^{2-}$  complex? (5)

b. Explain how the hardness of water is removed by EDTA?

8. (5)

How can Aniline be produced from the supplied reactant? (with mechanism)



Reactant

9. How can  $\alpha$ -Naphthol be synthesized from O-Bromo fluorobenzene? (5)

10. The enthalpy of formations of  $\text{CO}_2$  (g) from C (s) and CO (g) are  $-393.5 \text{ kJ mol}^{-1}$  and  $-283 \text{ kJ mol}^{-1}$ , respectively. Estimate the enthalpy of formation of CO (g) from C (s). (5)

11. a. Analyze the variation of molar or equivalent conductance with increasing dilution. (5)

b. Evaluate  $\Lambda_m^0$  of  $\text{CH}_3\text{COOH}$  with the help of Kohlrausch law. Given that  $\Lambda_m^0(\text{CH}_3\text{COONa}) = 209 \text{ S cm}^2 \text{ mol}^{-1}$ ,  $\Lambda_m^0(\text{HCl}) = 425 \text{ S cm}^2 \text{ mol}^{-1}$ ,  $\Lambda_m^0(\text{NaCl}) = 250 \text{ S cm}^2 \text{ mol}^{-1}$ .

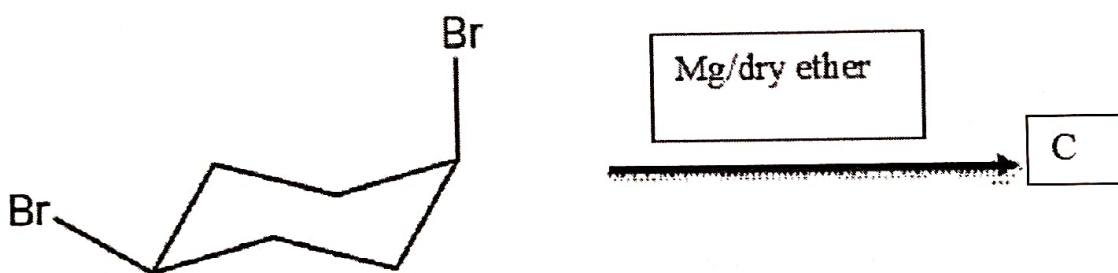
12. O-Phenylenediamine undergoes internal coupling reaction... Justify the statement with explanation. (5)

OR

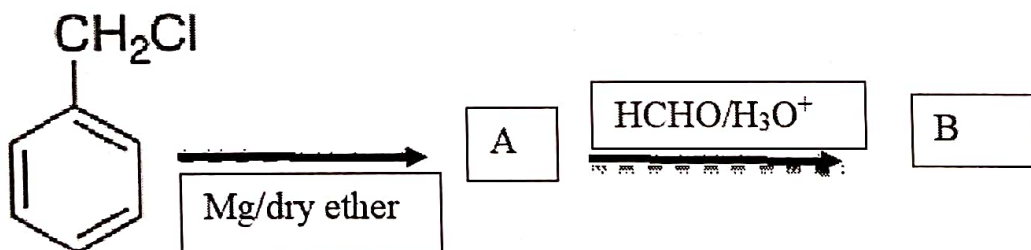
(5)

Predict A, B & C with suitable mechanism.

a)



b)



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