| RAMAKRISHNA MISSION VIDYAMANDIRA | | | | | | |
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| (Residential Autonomous College affiliated to University of Calcutta) | | | | | | |
| FIRST YEAR [2018-21] B.A. /B.Sc. SECOND SEMESTER (January – June) 2019 | | | | | | |
| Mid-Semester Examination, March 2019 | | | | | | |
| Date | Date : 25/03/2019 INDUSTRIAL CHEMISTRY (Honours) | | | | | |
| Time | e : 1 | 11am – 1pm Paper: II I | Full Marks: 50 | | | |
| (Use a separate Answer Book for each group) | | | | | | |
| | | <u>Group A</u> | (20 marks) | | | |
| | | (Answer <u>any four</u> questions) | [4 × 5] | | | |
| 1. | a) | Rearrange the following nucleophiles in increasing order of nucleophilicity with pre- explanation. | oper [2+3] | | | |
| | NH ₃ , NH ₂ NH ₂ , NH ₂ OH | | | | | |
| | b) | Reaction rate of MeI with azide ion (N_3^-) at 0°C increased 4.5×10^4 fold on transfer methat to dimethylformadie (DMF) as solvent. Explain. | anol [2+3] | | | |
| 2. | a) | The products of the reaction of a primary alkyl halide with NaCN and AgCN are differ What are the products? Explain with mechanism. | rent. [2+3] | | | |
| | b) | Explain what will happen when (R)-2-iodooctane is kept with KI^{128} is dry acetone for line. | long [2+3] | | | |
| 3. | a) | Why is neopentyl bromide inert to S_N^2 displacement reaction? | | | | |
| | b) | Vinyl halides are unreactive towards S_N^{-1} and S_N^{-2} reactions but alkyl halides are not Explained | n. [2+3] | | | |
| 4. | a) | Explain why compounds like tropone and fulvene possess significant dipole moments. | [1] | | | |
| | | $ \begin{array}{c} \hline \\ \\ \\ $ | | | | |
| | b) | Give an example of bimolecular aromatic $S_N (S_N^2 \text{ aromatic})$ reaction and draw the addition elimination mechanism for such reaction. | n [2] | | | |

c) Sulfonation of naphthalene at 80 °C gives 1-napthalene sulphonic acid as the main product, while at 160 °C 2-napthalene sulphonic acid is formed as main product. Provide detailed explanation with reasons for the above observations.

[2]

5. a) Give the major product of the reaction, paying particular attention to REGIOCHEMICAL outcomes.



b) The following molecules is combined with hydrogen gas in the presence of Lindlar palladium.
 What is product of the reaction? [3+2]



6. Mercury is toxic and used only when necessary for synthesis. In class we learned that the oxymercuration/demarcuration scheme could be used to give products of alkene hydration without rearrangements. For each of the following reactions, give the product of each and indicate the product you would obtain by simple hydration in aqueous acid.



Group B (15 marks)

(Answer <u>any three</u> questions) [3×5]

7. Among Me₃N, C₅H₅N and MeCN which is less basic and why? [2] a) b) Show the Lewis acidity order of the compounds BX_3 (X= F, Cl, Br). Give reasons. [3] From Nernst equations derive the expression for equivalence point potential during the titration 8. a) of Fe²⁺ with standard KMnO₄ solution at 1 (N) acidity. Hence calculate the potential at equivalence point. Given: $E^0 F_e^{3+} F_e^{2+} = 0.77 V$ and $E^0 M_{nO4} F_{Mn}^{2+} = 1.51 V$. b) What is redox indicator? Give two example of redox indicator. [3+2]Distinguish between double salts and complex salts. 9. a) [2] Give an analytical application of imperfect and perfect complexes, mentioning the reaction. [3] b) $Pt(NH_3)_2 Cl_2$ has two isomeric forms. Suggest a Chemical pathway to elucidate structure of 10. a) the isomers. [3] [2] Explain with an example the ambidentate ligating behaviour of NO_2^{-1} (nitrite ion). b) Write down the possible isomeric forms of (i) $\left[\operatorname{Ru}(\operatorname{Py})_{3}\operatorname{Cl}_{3} \right]$ and (ii) $\left[\operatorname{Co}(\operatorname{en})_{2}(\operatorname{NO}_{2})\operatorname{Cl} \right]$. 11. a) [3] Give an analytical application of chelate complexes in gravimetric analysis. b) [2]

| | | | <u>Group C</u> | (15 marks) | |
|-------|--|---|---|------------|--|
| | | (Ar | nswer <u>any three</u> questions) | [3×5] | |
| 12. (| Cho | [3 × 5] | | | |
| i | i) The number of photons that pass through a unit area in a unit time is called | | | | |
| | | (a) amplitude of light(c) intensity of light | (b) frequency of light(d) wavelength of light | | |
| i | ii) The number of molecules reacted or formed per photon of light absorbed is called | | | | |
| | | (a) yield of the reaction(c) quantum yield | (b) quantum efficiency(d) quantum productivity | | |
| i | iii) Photochemistry deals with the study of | | | | |

- (a) photons
- (b) photos
- (c) reactions which proceed with absorptions of UV light
- (d) reactions which proceed with absorption of IR light
- iv) "In a photochemical reaction each molecule of the reacting substance absorbs a single photon of radiation causing the reaction and is activated to form the products." This is the statement of

| (a) Lambert-Beer's law | (b) Grothus-Draper law |
|------------------------|------------------------|
| (c) Stark-Einstein law | (d) Lambert's law |

v) The equation for the Lambert's law is

(a)
$$ln\left(\frac{I_o}{I}\right) = -bx$$

(b) $ln\left(\frac{I}{I_o}\right) = -bx$
(c) $ln\left(\frac{I}{I_o}\right) = -\in Cx$
(d) $ln\left(\frac{I}{I_o}\right) = \in Cx$

- 13. a) A 2 mm thick plate of a material transmits 70% of the incident light. Calculate the percentage of light transmitted if the thickness of the plate is 0.5 mm.
 - b) Calculate the energy of a photon corresponding to wave length 360 nm. Given :

Velocity of light = $3 \times 108 \text{ m sec}^{-1}$; h = $6.62 \times 10^{-34} \text{ J sec}^{-1}$.

- c) State Lambert Law.
- 14. a) A system is irradiated for 20 minutes and is found to absorb 4×10^{18} quantum per second. If the amount decomposed is 3×10^{-3} mole and N = 6.023 ×10²³, calculate the quantum efficiency of the reaction.
 - b) Elaborate the study of photochemical reaction stated below

 $_{H_2+I_2 \bigstar 2HI}$

[2+2+1]

15. a) Predict whether the following reactions will go to completion:

 $Zn_{(s)} + Cu_{(aq)}^{2+} = Zn_{(aq)}^{+2} + Cu_{(s)}$ Given: $E^{0}cu^{2+} / cu = 0.337V$ and $E^{0}zn^{2+} / zn = -0.763V$ [2]

- b) The resistance of 0.5 M solution of an electrolyte in a cell was found to be 45 ohm. Calculate the molar conductance of the solution if the electrodes in the cell are 2.2 cm apart and have an area of 3.8 cm².
- 16. a) Derive the cell in which the reaction is $AgBr_{(S)} = Ag^+ + Br^-$.

b) the equivalent conductance at infinite dilution of AgNO₃, KNO₃, and KCl solutions are 133.36, 144.96 and 149.86 at S.cm². (gm-equiv)⁻¹ at 25°C. Calculate [3]
i) Conductance at infinite dilution for AgCl.
ii) The quantity of ∧₀ (NaCl) - ∧₀ (NaNO₃)

[2]