

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, MARCH 2021

FIRST YEAR [BATCH 2020-23]

INDUSTRIAL CHEMISTRY [HONOURS]

Date : 24/03/2021

Time : 11 am - 1 pm

Paper : I [CC1]

Full Marks : 50

Unit - I

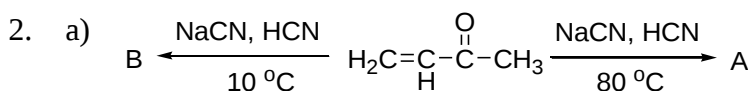
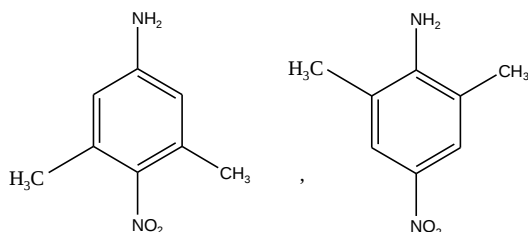
Answer **any five** questions from question nos. **1 to 8**:

[5 × 5]

1. a) How to prepare ${}^+\text{CH}_5$? Which one is more acidic among ${}^+\text{CH}_3$ and ${}^+\text{CH}_5$? Justify your answer.

b) Which one is more basic among the following compounds? Explain with proper reasons.

[3+2]



i) Identify A and B with proper structure.

ii) Indicate thermodynamic and kinetic Controlled product

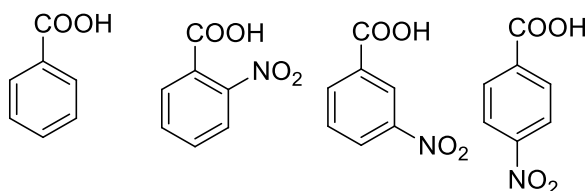
iii) Draw the energy profile diagram.

iv) Which step is reversible and which step is irreversible.

b) What is proton sponge? Give one example.

[4+1]

3. a) Arrange the following molecules with increasing acidity order and explain with proper justification:

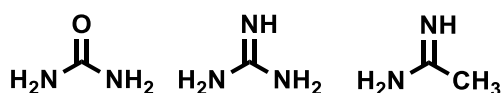


b) Draw the orbital picture diagram of Singlet and triplet carbene. Give two difference between singlet and triplet carbene. Among these two carbene which one is more stable?

[2.5+2.5]

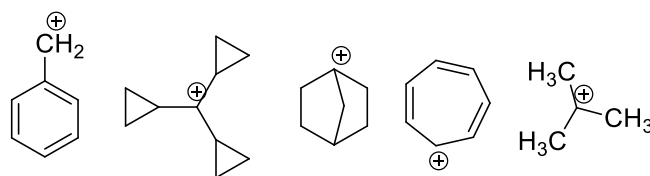
4. a) Define Electrophile and Nucleophile with proper example.

b) Compare the base strength of

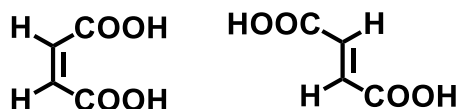


[2+3]

5. a) Arrange the following molecules with increasing order of their stability:

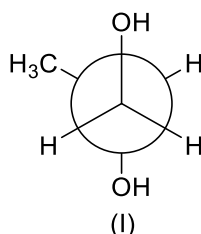


- b) Compare the ΔpK_a value of the following two compound:

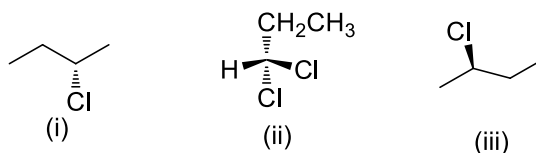


[2+3]

6. a) Give the Fischer projection of the following structure (I):



- b) Determine whether the following are chiral or achiral or prochiral, if chiral mention R and S.



[2+3]

7. a) Write the cyclohexane chair and boat form in Newman projection formula.
b) Give one examples each of keto-enol, nitro-acenitro and nitroso-oxime tautomerism.
8. a) Explain how hyper conjugation, inductive effect and steric effect stabilize the carbocation?
b) Compare the dipole moments of CHCl_3 , CH_2Cl_2 , CH_3Cl .

[2+3]

[3+2]

Unit - II

Answer **any five** questions from question nos. 9 to 16:

[5 × 5]

9. a) Calculate the radius of the first allowed Bohr orbit for Hydrogen atom.
b) What does azimuthal quantum number and magnetic quantum number indicate?
10. a) Mention the merits and demerits of Bohr's theory.
b) Calculate the first Bohr radius of He^+ ion. Given the first radius of H atom = $0.529\text{\AA}$.
11. a) State Pauli's exclusion principle and Hund's maximum spin multiplicity rule.
b) What is the maximum number of electrons that can be accommodated in the subshell represented by the following set of quantum numbers (i) $n=2, l=1$, (ii) $n=5, l=3$ (iii) $n=3, l=2$ and (iv) $n=6, l=0$

[3+2]

[2+3]

[3+2]

12. a) Explain with examples the bond moment and dipole moment.
b) Between MgO and NaCl whose lattice is greater? [3+2]
13. a) Covalent bond(s) is (are) directional. Comment.
b) Write the geometry and hybridization of the two molecules by VSE PR concept. (i) BH_3 (ii) PF_5 [2.5+2.5]
14. a) Hydrogen bonding plays a very important role in sustaining our life. Comment on.
b) What do you mean by lattice energy and hydration energy? [2+3]
15. a) Justify :- i) Fluorine is sometimes referred to as super halogen.
ii) the position of noble gases in the Periodic table.
b) PbI_4 is nonexistent whereas PbCl_2 is a stable compound. [3+2]
16. What is lanthanide contraction? Write down the causes of Lanthanide contraction. Write down the consequences of Lanthanide contraction. [1+2+2]

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