		RAMAKRISHNA MISSION VIDYAMANDIRA (Residential Autonomous College affiliated to University of Calcutta)	
		FIRST YEAR [2019-22] B.A./B.Sc. FIRST SEMESTER (July – December) 2019 Mid-Semester Examination, September 2019	
Date	: 16/09/2019	CHEMISTRY (Honours)	
Time	: 11 am -12 noon	Paper : I [CC 1]	Full Marks : 25
		Use a Separate Answer Book for each group	
		Answer one question from each group	
		<u>Group – A</u>	
			[1×8]
1. a	a) Write the IUI	PAC name or draw the structure for the following compounds.	[1+1]

a) Write the IUPAC name or draw the structure for the following compounds.
 i)

ii) 4-Bromo-2-Chloro-5-Nitro toluene

b) Between the two carboanions which one is more stable and why?



c) Lable the following species as aromatic, non-aromatic or anti aromatic by drawing Frost's diagram for each.



d) Compare the C = O bond length for the following compounds. [1] CH_3 C=0 and CH_3-CO_2

[2]

[3]

[2]

[2]

2. a) Write the IUPAC name or draw the structure for the following molecules. [1+1]i)



- ii) 2-(Hydroxymethyl)-3-hydroxy propionic acid.
- b) Between the two acids which one is stronger acid and why?



c) Draw the orbital picture for the following molecules and also indicate the state of hybridization for each carbon atom.

 $CH_3 - CH = CH - CN$

d) Draw HOMO and LUMO molecular orbitals for

<u>Group – B</u>

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- 3. a) Derive an expression for the radius of any orbit in H atom following Bohr model.
 - b) What are the significance of ψ and ψ^2 ?
 - c) In hydrogen atomic spectra, the longest wavelength in Balmer series comes at 656 nm. Calculate the value of Rydberg constant. In Balmer series what will be shortest wavelength line?
- 4. a) Plot the probability vs r for the following radial wave function for H atom. show how many nodes are there. Identify the actual orbital this radial wave function represents.

$$R(r) = \frac{1}{2\sqrt{6}} \left(\frac{1}{a_0}\right)^{\frac{3}{2}} \left(\frac{r}{a_0}\right) e^{-\frac{r}{2a_0}}$$

b) Establish Bohr's assumption of quantized angular momentum from de Broglie's hypothesis. [2]

c) What are the orbital angular momentum of an electron in the orbitals (i) 2p and (ii) 3s? Give the number of radial and angular nodes in each case. [3]

[1×9]

[2]

[1×8]

[3]

[2]

[3]

[3]

5. a) Define with example, standard electrode potential and formal potential. What are the basic difference between standard electrode potential and formal potential? [1.5+1.5+2]
b) Chose and explain [2]

i) Stronger Protonic Acid : (HO)ClO or (HO)ClO₂

ii) Stronger lewis acid : BF₃ or Bcl₃.

- c) Explain the terms 'leveling effect and differentiating effect' using suitable example of your choice. [2]
- 6. a) Standard electrode potential of $Cu^{2+}/Cu^{+} = .16V$ and $l_2/2l^{-} = .54V$, yet Cu can be estimated iodometrically, explain. [2.5]
 - b) Explain the function of NH_4HF_2 , during quantitative estimation of Cu from a mixture of Fe^{3+} and Cu^{2+} .

Given :Standard electrode potential of $Fe^{3+}/Fe^{2+} = 0.77V$, $Cu^{2+}/Cu^{+} = .16V$ and $l_2/2l^- = 0.54v$. [2.5]

- c) In the light of solvent system theory, justify the nature of BiN in liquid NH₃. [2]
- d) Write the conjugate acids and bases from the following ions or molecules.

HS⁻, H₂PO⁻₄, CH₃COOH, HF

(2)

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[2]