RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

FIRST YEAR B.A./B.SC. SECOND SEMESTER (January – June) 2014 Mid-Semester Examination, March 2014

Date : 25/03/2014

CHEMISTRY (General) Paper : II

Time : 11 am – 12 noon

Full Marks : 25

[1]

[1]

[2]

[2]

[Use a separate Answer Book for each group]

<u>Group – A</u>

(Answer <u>any one</u> of the following)

- 1. a) Indicate which of the following properties are extensive or intensive :
 [2]

 i) Molar Volume
 ii) Angular momentum

 iii) Internal energy
 iv) Surface area
 - b) From Gay-Lussac's Experiment, prove that for an ideal gas $\left(\frac{\partial U}{\partial V}\right)_{T} = 0$. [1]
 - c) What do you mean by Joule-Thomson coefficient (μ) of a gas? How a gas would behave, if its $\mu = a$ negative quantity? [1]
 - d) Write the expression for the Maxwell's one-dimensional velocity distribution curve for gas molecules and explain all the terms involved. [2]
 - e) What are the important assumptions for the kinetic theory of gas (any two)? From the PV = $\frac{1}{2}$ mNC²_{rms},

show that
$$C_{\rm rms} = \left(\frac{3RT}{M}\right)^{0.5}$$
. [2]

- 2. a) What do you mean by an adiabatic process. Draw P-V curves for the adiabatic and the isothermal processes (both reversible). [1]
 - b) Calculate the work involved when 25 gm of $CaCO_3$ decomposes into CaO and CO₂. [2]
 - c) What do you mean by the work "standard enthalpy of a compound"?
 - d) Calculate molar specific heat for CO₂ molecule. Do you think theoretical molar specific heat varies with temperature? Explain. [3]
 - e) Arrive the Avogadro's law from the kinetic theory of gas model.

<u>Group – B</u>

(Answer <u>any one</u> of the following)

3. a) Draw contributing resonance structures for each of the following species. [2]

i)
$$H_3C - \overset{+}{C} - CH = CHCH_3$$
 ii) $\swarrow O$

- b) Use 1-bromo-2-methyl butane and any other one or two carbon compounds, if needed, to synthesize 3-methylhexane with good yields. [2]
- c) Define with an example (<u>**any one**</u>) :
 - i) Plane of Symmetry
 - ii) Diastereomers
- d) Write the structure of the following compounds in Fischer projection formula :
 - i) Meso tartaric acid
 - ii) Active Butane-2, 3-diol

4.	a)	 Which statement is true? i) Resonance hybrid is inherently unstable. ii) Resonance hybrid is more stable than any individual resonance form. iii) Resonance hybrid is average of all resonance forms resembling the less stable forms. iv) Resonance hybrid is average of all resonance forms resembling the more stable forms. 	[1]	
	b)	Which one is more acidic— acetic acid or chloroacetic acid? —Explain.	[2]	
	() d)	Write the structure of the following compounds in Fischer projection formula:	[2]	
	u)	i) L-Alanine ii) D-2-butyl methyl ether iii) D-Lactic acid	[3]	
<u>Group – C</u>				
5.	a)	Draw the qualitative MO diagram of CO and comment on its polarity.	[3]	
	b)	$CaO + SiO_2 \rightarrow CaSiO_3$, Explain the reaction interms of acid-base concept.	[2]	
Or,				
	a)	What are the basic differences between standard electrode potential and formal potential?	[2]	
	b)	Discuss bonding in B ₂ molecule in the light of MO theory and explain its magnetic behaviour.	[3]	
6.	a) b)	What do you mean by specific conductance? Deduce the unit of specific conductance. Explain the variation of specific conductance and equivalent conductance of a strong and w electrolyte with dilution.	[1+1] veak [2]	
	Or,			
	a)	Arrange and explain the equivalent conductance of the following ions. OH^-, Cl^-, H^+, K^+	[11/2]	
	b)	The equivalent conductivity at infinite dilution (λ_0) for CH ₃ COONa, HCl and NaCl is 78, 384	and	
		109 respectively. Calculate λ_0 for CH ₃ COOH.	[1]	
	c)	Define order and molecularity by a comparative study.	[11/2]	

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