

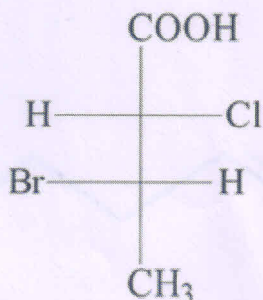
- c) $\Delta H = 0$ d) $\Delta H = 1$
- (vii) Predict the number of nodal planes present in the highest energy π -molecular orbital of benzene.
 a) 0 b) 1
 c) 2 d) 3
- (viii) In an isochoric process, 500 Cal heat is absorbed. Calculate the internal energy change (ΔU) for the process.
 a) 1000 Cal b) 250-Cal
 c) 700 Cal d) 500 Cal
- (ix) Determine the number of unpaired electrons present in $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$.
 a) 0 b) 1
 c) 2 d) 3
- (x) Identify the compound that is most effective in nucleophilic addition reactions.
 a) CH_3CHO b) CH_3COCH_3
 c) PhCHO d) HCHO
- (xi) Identify the correct value of compressibility factor for an ideal gas.
 a) 0 b) ∞
 c) 1 d) -1
- (xii) The color observed at the end point of complexometric titration of water by EDTA is
 a) white b) blue
 c) red d) yellow
- (xiii) What is the solution to the Schrodinger equation for a particle lying outside the boundaries of a confined one – dimensional box?
 a) $\psi = 0$ b) $\Psi = \infty$
 c) $\Psi = -\infty$ d) $\Psi = 1$
- (xiv) Predict the condition at which a real gas behave as an ideal gas.
 a) high pressure b) low pressure
 c) medium pressure d) all pressure range
- (xv) Predict the number of unpaired electrons present in the HOMO of an oxygen molecule.
 a) 0 b) 1
 c) 2 d) 3

Group-B

(Short Answer Type Questions)

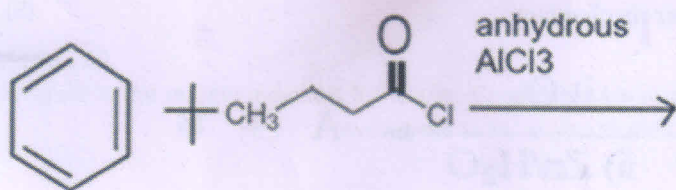
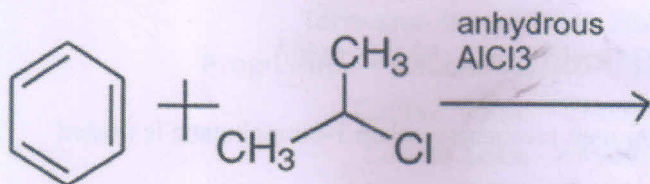
3 x 5=15

2. Represent the following molecule in eclipsed and staggered form in the Newmann (3) projection formulae.



3. Define the hardness of water and state its unit. Name two salts that cause hardness in water. (3)

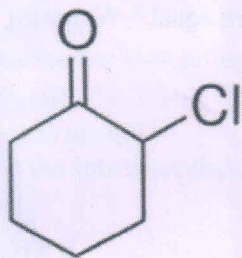
4. A system of an ideal gas absorbs 12.5 kJ of heat (Q). Calculate the workdone (W) and (3) internal energy change (ΔU) in the following processes using the first law of thermodynamics: (i) isothermal process and (ii) isochoric process.
5. When silicon is doped with gallium, which type of semiconductor do you expect? (3) Explain your answer.
6. Analyze the products of the following reactions: (3)



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OR

Analyze the product when the below compound is treated with OH^- . (3)

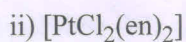


Group-C

(Long Answer Type Questions)

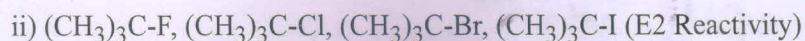
5 x 6=30

7. Describe the reasons behind the following facts. (5)
- (i) Water expands on freezing.
- (ii) Ethanol has a higher boiling point than dimethyl ether.
8. Represent the structure of all the possible optical isomers of each of the following (5) complexes:
- i) $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$



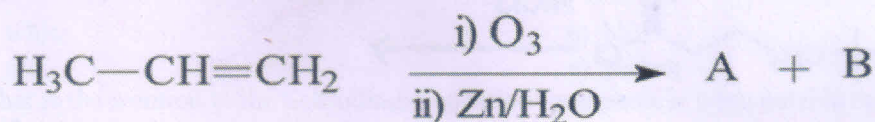
9. Illustrate the two enantiomers of 2-phenyl-2-chloropropanoic acid through Fisher (5) projection formulae and convert them in the Flying wedge projection formula.

10. a. Explain the order of reactivity of the following sets of compounds as indicated: (5)



b. Show the major product formation with mechanism when 1-bromobutane is treated with sodium iodide.

11. Predict the products with a proper mechanism. (5)



12. "The adiabatic curve is steeper than the isothermal curve." – Justify. (5)

OR

Justify that, " ΔA and ΔG for an ideal gas in an isothermal process are equal." Where (5) 'G' is Gibb's free energy and 'A' is Helmholtz free energy.

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