RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, JUNE 2022

FIRST YEAR (BATCH 2021-24)

Date : 24/06/2022 **CHEMISTRY (GENERAL)**

Time : 11.00 am – 1.00 pm **Paper : II** Full Marks : 50

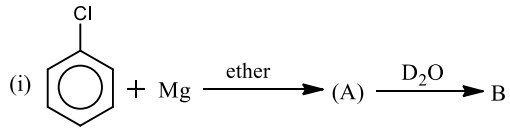
[Use a separate Answer book for **each group**]

Group :A

Attempt **any three** questions : [3×5]

1. a) Write down the synthesis of 1^o, 2^o, 3^o alcohols by using Grigand reagents. [3]

   b) Complete the following reactions [2×1]



2. a) Write short notes on the following :- [2×2]

   i) Cross Cannizzaro Reaction.

   ii) Benzoin condensation reaction.

   b) Write down the use of PCC. [1]

3. a) Write short notes on :- [2×2]

   (i) Kiliani-Fischer reaction.

   (ii) Osazone formation reaction

   b) Give an example of non-reducing sugar. Why it is called so? [1]

4. a) Write short notes on :- [2×2]

   (i) Isoelectric pH.

   (ii) Gabriel's Phthalimide Synthesis.

   b) Write down the Zwitter in structure for Alanine. [1]

5. a) What are Nucleosides and Nucleotides? Give example of each. [2×2]

   b) Write down nucleobases that are present in RNA. [1]

Group :B

Attempt **any seven** questions : [7×5]

6. a) Write down the expression for Maxwell's distribution of speed for gas molecules.

   b) Show graphically how the fraction of molecules with speed in the range C to C+dC changes with C at a given temperature T_l. In the same diagram plot the same at a higher temperature T_h. [2+3]

7. a) Write down the van-der-Waals equation for gas.

   b) In a graphical plot show how P changes with V for an ideal gas, a real gas and a van-der-Waals gas at a temperature lower than the critical temperature. [2+3]

8. a) Starting from the differential form of the rate equation for a second order reaction arrive at the integrated form for the same.

   b) How does the rate constant of an elementary reaction changes with temperature. [3+2]

9. a) 10 g of a reactant takes 2 hours to reduce to 5 g, and further 2 hours to reduce to 2.5 g. What is the rate of the reaction. Also find out the rate constant of the reaction.

   b) Draw the energy profile diagram for an elementary exothermic reaction. Label the average energy of reactant, product, the transition state and the activation energy barrier in the diagram. [2+3]

10. a) Write down the expression for Langmuir's adsorption isotherm. Plot the amount of gas adsorbed per gram of adsorbent agaisnt pressure of the gas.

    b) Show graphicallly how the surface tension of a solution changes with concentration as surface active agents are added from very low value to a valueicelle Concentration. [3+2]

11. a) Define surface tension of a liquid. How does it change with temperature.

    b) The stability of a colloid is kinetic, not thermodynamic in nature. [3+2]

12. a) Differentiate the work in reversible and irreversible isothermal expansion for an ideal gas, by a P-V graph plot.

    b) Write down the 1st law of thermodynamics for a isothermal process. What is it's significance. [3+2]

13. a) Deduce thermodynamically C_P - C_V = R for one mole of an ideal gas.

    b) Find out from followings, intensive and extensive property - pressure, temperature, density, molar specific heat. [3+2]

14. a) If a reaction takes place in presence of a catalyst, will the heat of reaction be the same as the uncatalysed reaction? Explain.

    b) The heat of combustion of methane is 210,800 cal. The heat of formation of CO_2 and H_2O(l) are 91,300 cals and 68,300 cals, respectively. Calculate the heat of formation of methane. [2+3]

15. a) State Hess's law of with one example.

    b) The volume of 1 mole of an ideal gas, initially at 27°C is increased from 2.28 lit to 4.46 lit by a reversible, isothermal process. Calculate w, ΔE and ΔH. [2+3]

16. a) Draw the Carnot cycle stating the different steps.

    b) A Carnot engine operates between 0°C and 100°C and accepts 450 kcal of heat. What will be the work done by the engine? [3+2]

17. a) Use Clausius statement to Deduce the thermodynamic condition for a spontaneous process at constant P and T.

    b) Crystallization is a process where entropy decreases, but it is a spontaneous process. Explain. [3+2]

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