

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

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

SECOND YEAR (BATCH 2020-23)

CHEMISTRY (GENERAL)

Date : 27/06/2022

Time : 11.00 am – 1.00 pm

Paper : IV

Full Marks : 50

[Use a separate Answer Book for each group]

Group :A

Attempt **any three** questions :

[3×5]

1. a) Write shorts on the following :-

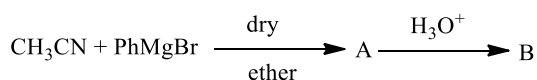
[2×2]

i) Cross aldol reactions

ii) Perkin reaction

b) Identify the following molecules A and B.

[1]

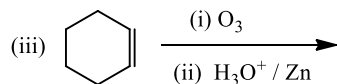
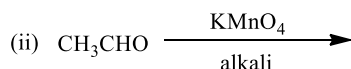
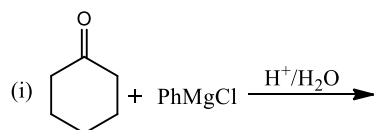


2. a) "D-glucose and D-fructose should give same osazone" — explain with proper reaction & structure.

[2]

b) Draw the structure of the products for the following reactions : (no mechanism needed).

[3]



3. a) Write short notes on :

[2×2]

i) Zwitter ions.

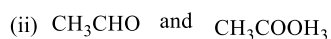
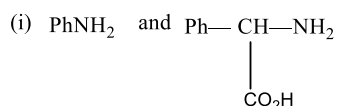
ii) Nucleoside and Nucleotide

b) Draw the general structure of lipid and indicate it's biological applications.

[1]

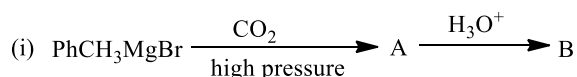
4. a) Give a suitable reaction to distinguish the following pair of molecules (write equation for each reaction).

[1.5×2]



b) Complete the following reactions and write down the structure for A,B and C.

[2]



5. a) Give reactions for preparation of 1°, 2° and 3° alcohol from Grignard reagents.

[3]

b) Give Kiliani-Fisher synthesis for step up reactions of D-glucose.

[2]

Group :B

Attempt **any seven** questions :

[7×5]

6. a) Write down the Maxwell's speed distribution equation for gas molecules and explain the terms.
b) Give equations for most probable speed, rms speed and average speed. And mark them in the Maxwell's graphical plot of fraction of molecules vs speed, C. [2+3]
7. a) Arrive the ideal gas equation from van-der-Waals equation for gas. Mention the conditions.
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 first order reaction arrive at the integrated form for the same.
b) The rate of an elementary reaction increases with temperature. Explain. [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? Comment on the order of the reaction.
b) Draw the energy profile diagram for a reaction, when catalysed and uncatalysed, in the same. Also, label the activation energy, the transition state. [3+2]
10. a) Write down the expression for Langmuir's adsorption isotherm. Give the significance of all terms.
b) Show graphically how the surface tension of a solution changes with concentration as surface active agents are added from very low value to a value, Micelle Concentration. [2+3]
11. a) Define capillary action. Draw picture of capillary rise for water.
b) Surface tension of a liquid at critical temperature is zero. Explain. [3+2]
12. a) Which P-V curve is steeper for ideal gas - reversible isothermal one or reversible adiabatic one?
b) Write down the 1st law of thermodynamics for no work. What is its significance. [3+2]
13. a) Deduce thermodynamically $w_{rev} = -nRT \ln(V_2/V_1)$ for an ideal gas, undergoing isothermal reversible expansion.
b) Find out from followings, intensive and extensive property - density, work, internal energy, molar enthalpy. [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 amorphous carbon is 96,960 cal and that of CO to CO₂ is 67,970 cal. Calculate the heat of formation of CO. [2+3]
15. a) Explain the terms: heat of neutralization, enthalpy of formation.
b) The volume of 2 moles of an ideal gas, at 300 K is increased from 1.12 lit to 4.48 lit by a irreversible, isothermal process. Calculate w, ΔE and ΔH. [2+3]
16. a) Calculate q, w, ΔU for the Carnot cycle stating the different steps.
b) A Carnot engine operates between 25°C and 100°C and accepts 300 kcal of heat. What will be the work done by the engine? [3+2]
17. a) Write down the Clausius statement and find the expression for ΔG in terms of entropy and enthalpy.
b) Vaporization is a spontaneous process. Explain the spontaneity with the nature of ΔH and ΔS, using 2nd law of thermodynamics. [3+2]

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