

Total Pages : 4

B.Sc./6th Sem (H)/CHEM/23(CBCS)

2023

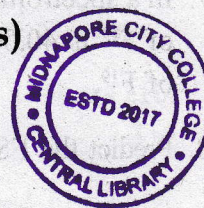
6th Semester Examination

CHEMISTRY (Honours)

Paper : C 14-T

[Physical Chemistry-V]

[CBCS]



Full Marks : 40

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

Group - A

Answer any *five* questions : $2 \times 5 = 10$

1. Define quantum yield.
2. Out of the two solutions, $K_2Cr_2O_7$ and KH_2PO_4 which one can be quantitatively estimated by spectroscopic method using Lambert-Beer's law in the visible range of radiation? Give appropriate explanation for your answer.
3. Write differences between adsorption and absorption.
4. Calculate the work done to broken a water drop of 1 mm radius into a million droplets [Given, $\gamma(\text{water}) = 72.75 \text{ erg cm}^{-2}$].
5. What is Zeta potential?

P.T.O.

(2)

The $C = O$ bond length in CO_2 is 120 pm. Calculate the moment of inertia of CO_2 (Given masses of C and O are $1.9 \times 10^{-27} \text{kg}$ and $2.5 \times 10^{-27} \text{kg}$ respectively).

7. In a spectrometer operating at 1 T, the NMR frequency of F^{19} is 40.06 MHz. Calculate the magnetogyric ratio of F^{19} .

8. Predict the ESR spectrum of the NH_2 radical.

Group - B

Answer any *four* questions : $5 \times 4 = 20$

9. (a) Derive an expression for the vapour pressure over curved liquid surface.

(b) State Jurin's law.

(c) Define work of adhesion.

3+1+1

10. (a) Photobromination of cinnamic acid to dibromocinnamic acid was carried out in blue light of wave length 440 nm at 35°C using light intensity of $1.5 \times 10^{-3} \text{J/s}$. An exposure of 20 minutes produces a decrease of 0.075 milli mole of bromine. The solution absorbs 80% of the light passing through it. Calculate the quantum yield of the reaction.

(b) What is photosensitized reaction?

3+2

11. (a) Suggest a mechanism for the photochemical

(3)

decomposition of HI by which you can show that quantum yield for the reaction is 2.

(b) Write differences between IC and ISC. 3+2

12. (a) Write short note on Gibb's adsorption isotherm.

(b) Plot and explain adsorption isobars for Chemisorption and Physisorption. 3+2

13. (a) Compare between Lyophilic sols and Lyophobic sols.

(b) Write short note on origin of charge and stability of lyophobic colloids. 2+3

14. (a) What is Tyndal effect?

(b) In the surface tension measurement of an aqueous solution of surfactant, change of surface tension with the concentration of the surfactant attains a plateau after micelle formation. — Explain.

(c) State Franck Condon principle. 2+2+1

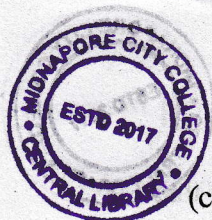
Group - C

Answer any *one* question : $10 \times 1 = 10$

15. (a) Explain the principle of NMR spectroscopy.

(b) Draw and explain energy level diagram and allowed transition an Unpaired electron coupling with two equivalent nuclei of spin $I = 1/2$.

P.T.O.



(4)

- (c) If there is +1.0% errors in the determination of the rotational constant (\bar{B}) B, of a diatomic molecule, calculate the percentage error in its bond length measurement.
- (d) State and explain mutual exclusion principle. 3+2+3+2
16. (a) What is Morse potential?
- (b) How classical mechanics explain the origin of Raman spectrum?
- (c) CO_2 is green house gas but O_2 is not. — Explain.
- (d) The vibrational energy levels of CO molecules is given by the expression —

$$E_v \text{ (in J)} = 4.3 \times 10^{-20} \left(v + \frac{1}{2} \right) - (2.5 \times 10^{-22}) \left(v + \frac{1}{2} \right)^2$$

Calculate the force constant. 2+3+2+3