

P-930

Total Pages : 3

Roll No.

MCH-503

Physical Chemistry-I

M.Sc. Chemistry (MSCCH)

1st Semester Examination, 2023 (June)

Time : 2 Hours]

[Max. Marks : 35

Note : This paper is of Thirty Five (35) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein. Candidates should limit their answer to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

SECTION-A

(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Nine and Half ($9\frac{1}{2}$) marks each. Learners are required to answer any Two (02) questions only.

($2 \times 9\frac{1}{2} = 19$)

1. Explain the following :

- (a) First law of thermodynamics.
- (b) Postulates of quantum mechanics.

2. Define entropy along with its physical significance. Describe entropy change for a reversible and irreversible process.
3. Discuss Schrodinger's wave equation. Derive an expression for an energy of a particle in one dimensional box.
4. Write explanatory notes on the following :
 - (a) Approximation methods of quantum chemistry.
 - (b) Third law of thermodynamics.
5.
 - (a) Explain Le Chatelier's principle along with examples,
 - (b) What do you mean by activity and activity coefficient.

SECTION-B

(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Four (04) marks each. Learners are required to answer any Four (04) questions only. (4×4=16)

1. Discuss Clausius inequality. Calculate an entropy change that takes place during an expansion of 3 moles of an ideal gas from a volume of 2 litres to a volume of 20 litres at 300K.

2. Write short notes on the following :
 - (a) Born-Oppenheimer approximation.
 - (b) Nernst heat theorem.

 3. (a) Discuss the criteria of spontaneity and equilibrium in terms of free energy.
 - (b) What are ideal solutions? State Raoult's law.

 4. Discuss molecular orbital theory of hydrogen molecule.

 5. Write short notes on the following :
 - (a) Eigen value and Eigen function.
 - (b) Operators used in quantum chemistry.

 6. Explain Joule-Thomson effect and define Joule-Thomson coefficient.

 7. Define rigid rotator. Derive an expression for energy of a rigid rotator.

 8. Define electron spin and describe the wave equation for hydrogen like atoms.
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