

Roll No. ....

## **CHE-503**

### **Physical Chemistry**

M. Sc. CHEMISTRY (MSCCH-12/13/16)

First Year, Examination, 2017

**Time : 3 Hours**

**Max. Marks : 70**

**Note :** This paper is of **seventy (70)** marks containing **three (03)** sections A, B and C. Attempt the questions contained in these sections according to the detailed instructions given therein.

#### **Section-A**

##### **(Long Answer Type Questions)**

**Note :** Section 'A' contains four (04) long answer type questions of fifteen (15) marks each. Learners are required to answer *two* (02) questions only.

1. (a) Describe Collision theory of reaction rates. What is steric factor ?  
(b) Derive Clausius-Clapeyron equation. What are its important uses ?
2. (a) Discuss first two postulates of quantum mechanics.  
(b) Derive Schrödinger wave equation.

3. (a) State and explain Nernst heat theorem. Discuss also the Third Law of Thermodynamics.  
(b) Write a note on chemical potential.
4. (a) State and explain Einstein's law of photochemical equivalence. What is quantum yield ?  
(b) Write a note on First Law of Thermodynamics.

### Section-B

#### (Short Answer Type Questions)

**Note :** Section 'B' contains eight (08) short answer type questions of five (05) marks each. Learners are required to answer *six* (06) questions only.

1. Explain the functioning of hydrogen electrode as cathode and as anode.
2. Describe the kinetics of unimolecular gaseous adsorption on solid surface.
3. Write a note on entropy and its physical significance.
4. Differentiate between the rate constant and rate of a reaction.
5. Write a note on Joule-Thomson effect.
6. Discuss the kinetics of decomposition of  $\text{CH}_3\text{CHO}$ .
7. Write a note on fluorescence and phosphorescence.
8. Explain the reasons of low and high quantum yield in photochemical reactions.

**Section-C****(Objective Type Questions)**

**Note :** Section 'C' contains ten (10) objective type questions of one (1) mark each. All the questions of this section are compulsory.

Indicate whether the following statements are True *or* False :

1. For an ideal gas Joule-Thomson coefficient is zero.  
(True/False)
2. The unit of rate constant of second order reactions is  $\text{mol}^{-1} \text{lit. time}^{-1}$ .  
(True/False)
3. The uncertainty principle was given by Planck.  
(True/False)
4. Free energy of a photochemical reaction increases.  
(True/False)
5. At absolute zero the temperature value of  $\Delta H$  and  $\Delta G$  are equal.
6. The specific conductivity increases with dilution.

Choose the correct alternative.

7. In ideal conditions of any reaction the quantum efficiency value is :
  - (a) more than one
  - (b) less than one
  - (c) equal to one
  - (d) zero

8. Units of force constant is :
- (a) dyne per centimeter
  - (b) joule  $\text{cm}^2$
  - (c) dyne  $\text{cm}^2$
  - (d) None of these
9. Which one has zero dipole moment ?
- (a) HCl
  - (b)  $\text{CO}_2$
  - (c)  $\text{CH}_3\text{Cl}$
  - (d) None of these
10. Electromagnetic radiation with minimum wavelength is :
- (a) Ultraviolet
  - (b) X-ray
  - (c) Infrared
  - (d) Radio waves