

Roll No.

MSCCH-13 (M.Sc. Chemistry)
First Year, Examination-2015
CHE-503
Physical Chemistry

Time : 3 Hours

Maximum Marks : 60

Note : This paper is of sixty (60) marks divided into 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 any two (02) questions only. (2×15=30)

1.
 - (a) Describe the collision theory of reaction rates.
 - (b) Describe the methods of determining the order of a reaction.
2.
 - (a) Explain the reasons of high and low quantum yields with suitable examples.
 - (b) Describe the Einstein's law of photochemical equivalence.

3. (a) Describe the Nernst Heat theorem and its importance.
 (b) Discuss the various statements of second law of thermodynamics.
4. (a) Derive the Schrodinger's wave equation.
 (b) Derive the Gibb's Helmholtz equation and write its importance.

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 any four (04) questions only. (4×5=20)

1. Differentiate between the rate constant and the rate of a reaction.
2. Write the first law of thermodynamics and its significance.
3. Derive the rate expression of a second order reaction when the initial concentration of the reactions is same.
4. Describe the Joule Thomson effect.
5. Write a note on well behaved wave function.
6. Describe Entropy in detail.
7. Describe the effect of temperature on reaction rates.
8. Write a note on corrosion.

Section - C

(Objective Type Questions)

Note : Section 'C' contains ten (10) objective-type questions of one (01) mark each. All the questions of this section are compulsory. (10×1=10)

Indicate whether the following True or False :

1. The quantum yield of the photochemical combination of H_2 and Cl_2 is very low.
2. The efficiency of a Carnot's engine is always less than 100%.
3. For a first order reaction the half life period of the reaction is independent of the initial concentration of the reactant.
4. The equivalent conductance of an electrolytic solution decreases with the increase in dilution.
5. There are 58.5 g of NaCl in one g mol of sodium chloride.

Choose the right alternative :

6. If $\frac{de^x}{dx} = e^x$; (where e^x is a function and $\frac{d}{dx}$ is an operator) the eigen value is :
(a) e^x (b) x
(c) 1 (d) Zero
7. How many gm of NaOH are present in 1000 mL of 0.1M solution in NaOH
(a) 40 g (b) 4.0 g
(c) 0.1 g (d) 0.4 g

8. The efficiency of a heat engine operating between 400 K and 300 K is
- (a) 0.5 (b) 0.75
(c) 1.0 (d) 0.25
9. The unit of the rate constant of second order reaction is :
- (a) $\text{mol}^{-1} \text{L S}^{-1}$ (b) S^{-1}
(c) $\text{mol L}^{-1} \text{S}^{-1}$ (d) mol L S^{-1}
10. The free energy change ΔG for a spontaneous reaction in the forward direction is.
- (a) $\Delta G = (+) \text{Ve}$ (b) $\Delta G = (-) \text{Ve}$
(c) $\Delta G = \text{Zero}$ (d) $\Delta G = \text{H}$