

PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2022  
(Sixth Semester)

Branch – CHEMISTRY

PHYSICAL CHEMISTRY -II

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 x 1 = 10)

- The rate constant of a zero order reactions has the unit  
(i)  $s^{-1}$       (ii)  $dm^{-3} mol s^{-1}$       (iii)  $dm^6 mol^{-2} s^{-1}$       (iv)  $dm^3 mol^{-1} s^{-1}$
- A plot of  $\log(a-x)$  against time  $t$  is a straight line. This indicates that the reaction is of  
(i) Zero order      (ii) second order      (iii) first order      (iv) third order
- In a chemical reaction if the reactant requires high amount of activation energy, then the reaction is  
(i) fast      (ii) slow      (iii) instantaneous      (iv) none of these
- A photochemical reaction takes place by the absorption of  
(i) Heat energy      (ii) infra red radiations  
(iii) microwave radiations      (iv) UV and Visible radiation
- Among the following which molecule has zero dipole moment  
(i)  $CO_2$       (ii)  $H_2O$       (iii)  $NH_3$       (iv)  $HBr$
- For a paramagnetic material, which of the following statement is correct?  
(i) magnetic susceptibility  $< 0$       (ii) magnetic susceptibility  $> 0$   
(iii) magnetic susceptibility = 0      (iv) none of these
- What is Gibb's phase rule for a general system?  
(i)  $F = C - P + 1$       (ii)  $F + P = C - 1$       (iii)  $F = C - P + 2$       (iv)  $F = C - P$
- What is the degree of freedom when three phases co-exist?  
(i) 2      (ii) 3      (iii) 1      (iv) 0
- What is the point group of a linear molecule with a center of symmetry?  
(i)  $D_{\infty h}$       (ii)  $C_{\infty h}$       (iii)  $T_d$       (iv)  $O_h$
- When two operators  $A$  and  $B$  commute with each other, then  $[\hat{A}, \hat{B}]$  is equal to  
(i) 1      (ii) 2      (iii) 0      (iv)  $\neq 0$

Cont...

**SECTION - B (25 Marks)**

Answer ALL questions

ALL questions carry EQUAL Marks (5 x 5 = 25)

- 11.a. Discuss any one method of determining the order of a reaction.  
OR
- b. Compare order and molecularity.
- 12.a. Write and discuss Arrhenius equation.  
OR
- b. State the laws of photochemistry.
- 13.a. Define induced dipole moment, permanent dipole moment and polarisability  
OR
- b. Write a note on the applications of magnetic susceptibility.
- 14.a. Draw and explain the phase diagram of carbon dioxide system.  
OR
- b. Discuss the changes observed in a cooling curve of a two component system forming a eutectic.
- 15.a. Explain rotational axis of symmetry with an example.  
OR
- b. What do you understand by normalization of wave function? Explain.

**SECTION -C (40 Marks)**

Answer ALL questions

ALL questions carry EQUAL Marks (5 x 8 = 40)

- 16.a. Write the steps involved in  $H_2-Br_2$  chain reaction and discuss its kinetics  
OR
- b. Derive expressions for half- life period and order for a second order reaction when both the reactants are same.
- 17.a. Explain collision theory of bimolecular reactions. Discuss its failure.  
OR
- b. Define quantum yield. How is it determined experimentally.
- 18.a. Derive Clausius-Mosotti equation for molar polarization.  
OR
- b. Illustrate the measurement of magnetic susceptibility by Gouy's method.
- 19.a. Draw a neat phase diagram of one component water system and explain .  
OR
- b. Explain the terms congruent melting point, incongruent melting point and eutectic.
- 20.a. Construct the group multiplication table for  $C_{2v}$  point group.  
OR
- b. Derive the time independent Schrödinger wave equation. Discuss the importance of  $\psi$  and  $\psi^2$ .