

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION)

CLASS: IMSC  
BRANCH: CHEMISTRY

SEMESTER: I  
SESSION: MO/2022

SUBJECT: CH113 PHYSICAL CHEMISTRY-I

TIME: 2 HOURS

FULL MARKS: 25

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates.
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- Q.1(a) Write down the final expression for Maxwell's distribution of velocity in terms of  $m$  and  $M$  (molar mass). Explain the effect of temperature by plot of fraction of molecules vs velocity. [3]
- Q.1(b) Write down the main postulates of Kinetic theory of gases and also Kinetic gas equation. [2]
- Q.2(a) What are the different types of molecular velocities. Explain Average velocity, RMS velocity, most probable velocity. [3]
- Q.2(b) What is mean free path? Explain  $E = \frac{3}{2} RT$  [2]
- Q.3(a) Define degree of freedom of a molecule. Calculate various degree of freedom of the following molecule- (i) He (ii)  $H_2$  (iii)  $H_2O$  (iv)  $CO_2$  [3]
- Q.3(b) Explain - Equipartition of Energy. [2]
- Q.4(a) What are the conditions of deviation of gases from Ideal behavior. Explain the graph between  $Z$  (compressibility factor) vs pressure for different gases. [3]
- Q.4(b) Explain excluded volume per molecule is four times the actual volume of gas molecule. [2]
- Q.5(a) What do you understand by group postulates? What conditions must be specified in order that the symmetry elements ABC form a mathematical group. [3]
- Q.5(b) Discuss the symmetry elements and symmetry operations. [2]

:::::: 17/01/2023 :::::M