UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Sixth Semester – 2020

Paper: Physical Chemistry

Course Code: CHEM-313 Part – I (Compulsory) **Time: 15 Min. Marks: 10**

Roll No. in Fig. ……

Roll No. in Words. ……

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Signature of Supdt.:

ATTEMPT THIS PAPER ON THIS QUESTION SHEET ONLY.

Division of marks is given in front of each question.

This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the correct choice. (10x1=10)

1 Two moles of a monoatomic gas is mixed with three moles of a diatomic gas. The molar specific heat of the mixture at constant volume is:

A 1.625R B 2.1R

C 1.25R D 2.5R

2 The density of molecules is maximum at which speed?

A V_{rms} B V_p

C V_{mean} D V_{inst}

3 The average kinetic energy associated with each degree of freedom is

A kT B 2kT

C kT/2 D kT/4

4 Arrhenius equation $k = Ae^{-\frac{E_a}{RT}}$ in differential form can be written as

A $E_a = -R\left(\frac{d\ln k}{d(\frac{1}{T})}\right)$ B $E_a = -R\left(\frac{d\ln k}{dT}\right)$

C $E_a = -\frac{1}{R}\left(\frac{d\ln k}{dT}\right)$ D None of these

5 The SI units of pre-exponential factor A in equation $k = Ae^{-\frac{E_a}{RT}}$ for 2nd order reaction are

A $M^{-1}S^{-1}$ B $M^{-2}S^{-1}$

C MS^{-1} D None of these

6 According to equation $\ln k = \ln k_o + 1.018 Z_A Z_B \sqrt{I}$, rate of the following reaction

$CH_3COOC_2H_5 + OH^- \xrightarrow{k} products$

A Increases with increase in ionic strength B Decreases with increase in ionic strength

C Remains Constant D None of these

7 Law of Consecration is also known as _____ law of thermodynamics.

A zeroth B 1st

C 2nd D 3rd

8 Energy and mass can't be transferred between surroundings and system in ..... process.

A Isolated B Closed

C Open D None of these

9 According to third law of thermodynamics, entropy of the system reaches to minimum value at:

A 0 K B 0°C

C 273K D 298K

10 Pick the correct expression for total partition function

A $Q=Q_t+Q_v+Q_r+Q_e$ B $Q=Q_t.Q_v.Q_r.Q_e$

C Both A and B D None of these

UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Sixth Semester – 2020

Roll No. ……

Paper: Physical Chemistry
Course Code: CHEM-313 Part – II

Time: 2 Hrs. 45 Min. Marks: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q. 2 Answer Short Questions. (10x2=20)

a) What is closed process?

b) What is partition function?

c) Define second law of thermodynamics.

d) What is meant by degree of freedom?

e) Describe most probable velocity.

f) What is cage effect?

g) Reactions in solution phase are faster than in gas phase. Why?

h) What is law of conservation energy?

i) What is difference between spontaneous and non-spontaneous processes?

j) Explain Nernst heat theorem.

Section III (Questions with Brief Answers) **(3 x 10 = 30)**

1. Define third law of thermodynamics and give its experimental verification. (10)
2. Derive and explain Maxwell's Distribution Law for distribution of molecular velocities among gas molecules. (10)
3. (a) Discuss the effect of temperature on the rate of reaction on the bases of Arrhenius equation. (5)

   (b) Derive Eyring equation using postulates of transition state theory. (5)