

SEAT NO: \_\_\_\_\_

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[92]

Eng.

SARDAR PATEL UNIVERSITY  
BSc (Semester- 5) Examination  
Physical Chemistry  
US05CCHE23

Date: 28/12/2020

Day: Monday

Time: 2:00 to 4:00 pm

Total Marks: 70

Q:1 Answer the following questions:

[10]

- (1) In a spontaneous change of volume expansion, entropy change is  
(a) Negative (b) zero (c) Positive (d) can't be decided
- (2) Entropy is a measure of \_\_\_\_\_  
(a) Arrangement (b) Disorder (c) Order (d) Energy
- (3) The rate law for a reaction  $2A+B \rightarrow A_2B$  which occurring in a single step is .....  
(a) Rate =  $K[A]^2[B]$  (b) Rate =  $K[A]^2[B]/[A_2B]$  (c) Rate =  $K_2[A][B]$  (d) Rate =  $K[A][B]$
- (4) Which of the following factors does not influence the rate of chemical reaction?  
(a) Nature of reactants (b) concentration of reactants (c) Molecularity (d) Temperature
- (5) The activation energy is equal to \_\_\_\_\_ minus energy actually possessed by molecules.  
(a) Chemical energy (b) Threshold energy (c) Mechanical energy (d) Thermal energy
- (6) Beer's law explains the relation between intensity of light and \_\_\_\_\_  
(a) concentration of solution (b) Thickness of medium (c) opacity (d) all of above
- (7) For primary photochemical reactions quantum yield ( $\Phi$ ) = \_\_\_\_\_  
(a)  $\Phi > 1$  (b)  $\Phi < 1$  (c)  $\Phi = 1$  (d)  $\Phi = 0$
- (8) For adsorption the plot of  $\log x/m \rightarrow \log p$  is linear with slope is equal to  
(a) K (b)  $1/n$  (c)  $\log K$  (d) n
- (9) The rate of physical adsorption increase with \_\_\_\_\_  
(a) decrease in temperature (b) increase in temperature  
(c) decrease in pressure (d) decrease in surface area
- (10) How many layers are adsorbed in chemisorption  
(a) two (b) three (c) one (d) Many



Q-2 Fill in the blank for the following .

[8]

- (1) concept of \_\_\_\_\_ is the result of study of second law of thermodynamics (Entropy/Heat capacity)

[1]

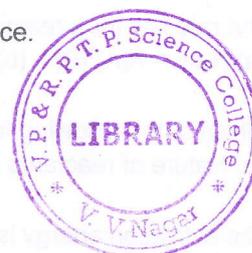
[P.T.O.]

- (2) Efficiency of Carnot cycle is always \_\_\_\_\_ (more than one / less than one)
- (3) For a complex reaction, rate determining step is always \_\_\_\_\_ (slow / fast)
- (4) If at given temperature activation energy for a reaction is high, the rate of chemical reaction is \_\_\_\_\_ (high/ low)
- (5) Radio Micrometer is the type of \_\_\_\_\_ ( filter/Detector)
- (6) Factor affecting on quantum yield is \_\_\_\_\_ (Inert gases/ Catalyst)
- (7) \_\_\_\_\_ the critical temperature of the gas, the more readily will be adsorbed ( lower / higher)
- (8) Freundlich isotherm is not applicable at \_\_\_\_\_ (high pressure/ lower pressure).

**Q-3 Answer the following questions in short. (any 10)**

[20]

- (1) Describe limitations of the first law of thermodynamics.
- (2) Describe the cyclic process briefly
- (3) Write a short note on the Carnot theorem.
- (4) Can the activation energy of the reaction be zero or negative ? Explain
- (5) Define the term (a) Activated complex (b) Temperature coefficient
- (6) What is the catalyst? How does catalyst increase the rate of chemical reaction?
- (7) Calculate energy in erg/mole for one Einstein for radiation having wave-length( $\lambda$ )= 3000Å
- (8) Define: Fluorescence and Phosphorescence
- (9) What is meant by Luminescence? Write types of Luminescence.
- (10) Differentiate between adsorption and absorption.
- (11) Discuss any two factors affecting adsorption.
- (12) Define: (a) Adsorption isotherm (b) Adsorption isobar.



**Q-4 Answer the following questions (Any four)**

[32]

- (1) Write a note on change in entropy during phase transformation.
- (2) Calculate the change in entropy for fusion of 1kg ice at 0°C, Heat of fusion for ice is 334.72 J.gm<sup>-1</sup>
- (3) Derive an equation for rate constant for unimolecular reaction by Lindemann theory.
- (4) The activation energy of a non-catalysed reaction at 310K is 83.68 KJ mol<sup>-1</sup> and the activation energy of the same reaction catalysed by an enzyme is 25.10 KJ mol<sup>-1</sup>. Calculate the ratio of the rate constants of the enzyme catalysed and non-catalysed reaction ( $R=8.314 \text{ JK}^{-1} \text{ mole}^{-1}$ )
- (5) Define: Quantum yield ( $\Phi$ ). Give reasons for low and high Quantum yield.
- (6) The path length of solution of substance in water having concentration is 10<sup>-3</sup> M is 1cm, which absorbs 10% of incident radiation. what should be the concentration of the solution in order to absorb 90% of the same incident radiation.
- (7) Write down assumptions and derive Langmuir adsorption isotherm giving proper mathematical equation.
- (8) Discuss BET theory giving mathematical equations and its limitations.

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[22]