[121]
E+G

SARDAR PATEL UNIVERSITY, VALLABH VIDYANAGAR
B.Sc. (SEMESTER–V) EXAMINATION
Thursday, 25th November 2021
3.00 pm – 5.00 pm
PHYSICAL CHEMISTRY: US05CCHE23

Marks-70

Q-1   Select the most appropriate option for the following questions. (MCQ's)   (10)

1   The change in internal energy ΔU in a cyclic process is _____
    (a) Zero   (b) Positive (c) negative (d) Can't be decided

2   If vapor condenses in to liquid, entropy _____
    (a) Decrease   (b) Remains constant (c) is zero (d) Increases

3   At given temperature, if activation energy is very low then rate of reaction will be _____
    (a) Very high   (b) very low   (c) medium   (d) none of these

4   Which of the following are called Arrhenius parameters?
    (a) K and A   (b) Ea and A   (c) K and T   (d) Ea and T

5   _____ is a factor affecting on quantum yield.
    (a) Pressure   (b) Temperature   (c) Catalyst   (d) Concentration of reactants

6   Lembert's law explain the relation between intensity of light and _____
    (a) Opacity (b) concentration of solution (c) thickness of medium (d) all of above

7   _____ is not a type of luminescence.
    (a) Photoluminescence   (b) Cathode luminescence
    (c) Chemi luminescence   (d) Floroluminescence

8   _____ is the critical temperature of a gas, the more readily will it be adsorbed on solid surface.
    (a) lower   (b) higher   (c) moderate   (d) all of these

9   Adsorption takes place with _____ in the enthalpy of the system.
    (a) increase (b) decrease (c) no change (d) none of these

10 Rate of Physisorption increases with _____
    (a) decrease in temperature   (b) increase in temperature
    (c) decrease in pressure   (d) decrease in surface area
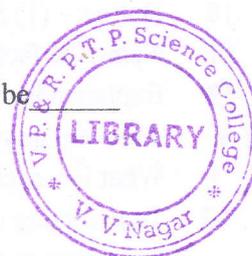
Q-2   Fill the blanks with correct option.   08

1   Efficiency of Carnot cycle is always _____. (less than one, greater than one)

2   Unit of entropy is _____. (Liter. Atm, Joule/Kelvin)

3   _____ is the factor which does not effect on rate of chemical reaction.
    (molecularity, temperature)

4   For a complex reaction, rate determining step is always _____. (slow, fast)

5   The best source of ultra violate light is _____. (Tungsten lamp, Mercury lamp)

6   For a photochemical reaction $H_2 + Cl_2 \rightarrow 2HCl$, quantum yield ($\phi$) is _____.
    ($\phi > 1$, $\phi < 1$)

7   Adsorption of H_2 gas on surface of Ni is an example of _____. (Physisorption, Chemisorption)

8   For adsorption, the plot of log x/m $\rightarrow$ logP is linear with slope equal to _____ (1/n , logK)

Q-3   Answer briefly the following questions. (Any ten)   20

1   Give two examples of spontaneous process.

2 Give the equation for the entropy change accompanying conversion of one crystalline phase to another crystalline phase.

3 Write a brief note on physical significance of entropy.

4 What is meant by mechanism of reaction? Explain equilibrium approximation.

5 Discuss the effect of catalyst on reaction rate.

6 Define:- (1) Threshold energy (2) Activated complex.

7 Differentiate between dark (thermal) reaction and photochemical reaction.

8 Calculate the energy of one Einstein in erg/mole for radiation having wave length 3000 A^0.

9 Discuss the factors affecting on quantum yield (ϕ).

10 Define:- (1) Sorption (b) Desorption.

11 Name the factors affecting on adsorption and discuss any one.

12 Explain adsorption isotherm.

Q-4 **Answers any _four_ questions from the followings.** 32

1 What is a cyclic process? Discuss Carnot cycle in details.

2 Temperature of 1 mol of an ideal gas is increased from 100 K to 300 K. Calculate the change in entropy at constant volume and constant pressure.
(R = 1.987 cal/(deg.mol) and C_V = 1.5R)

3 Derive the well known Eyring question for the rate constant for simple bimolecular gaseous reaction using activated complex theory.

4 The decomposition of ozone gas $2O_3 \rightarrow 3O_2$ obeys the following rate law.

$Rate = \frac{-d[O_3]}{dt} = \frac{[O_3]^2}{[O_2]}$. Show that the following mechanism is consistent with the rate law mentioned above.

Step : 1 $O_3 < ------ > O_2 + O$ (fast equilibrium)
Step : 2 $O + O_3 ------ > 2O_2$ (slow)

5 Write a note on fluorescence and explain its characteristics with examples.

6 For a photochemical reaction A -----> B, by absorption of 6.62×10^7 erg energy of radiation having wave length $3600 A^0$, 1.0×10^5 mole B is formed. Find out quantum yield (ϕ) for reaction.

7 Differenciate between Physisorption and Chemisorption.

8 Discuss Freundlich adsorption isotherm. Give its limitations.