P. P. SAVANI UNIVERSITY

SecondSemester of B.Sc. Examination

December-2021

SSCH1070–Physical Chemistry-II

29.12.2021, Wednesday **Time: 10:30 a.m. to 12:30 a.m. Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

Section-I (Total Marks - 30)

Q.1 Short Questions **[10]**

1.1 Objectives **[05]**

1.1a The law of the relative lowering of vapor pressure was given by

- **A** Van't Hoff
- **B** Raoult
- **C** Ostwald
- **D** Henry

1.1b In an isothermal process _____ remains constant.

- **A** temperature
- **B** matter
- **C** heat
- **D** None of the above

1.1c The adsorption of hydrogen on charcoal is

- **A** physical adsorption
- **B** chemical adsorption
- **C** sorption
- **D** none of these

1.1d How temperature does affects rate of chemical reaction?

- **A** Increases
- **B** Does not affect
- **C** Decreases
- **D** Affects but only under specific conditions

1.1e A thermos flask is an example of

- **A** isolated system
- **B** open system
- **C** closed system
- **D** heterogeneous system

1.1f A system in which no thermal energy passes into or out of the system is called

- **A** adiabatic system
- **B** an open system
- **C** a reversible system
- **D** a closed system

1.1g Which out of the following is not an intensive property?

- **A** pressure

B concentration
C density
D volume

1.1h Rate laws for chemical reactions are determined
A by examining the coefficients in the balanced chemical equation
B from the equilibrium constant
C from the rates of the forward and reverse reactions of the system at equilibrium
D by experiment

1.1i A reaction in which all reactants are in the same phase is called
A elementary
B bimolecular
C homogeneous
D heterogeneous

1.1j Molal elevation constant is the boiling point elevation when _____ of the solute is dissolved in one kg of the solvent.
A One gram
B One mole
C One Kg
D None of these

1.2 Answer the Following: (MCQ/Short Question/Fill in the Blanks) **[05]**

1.2a In a series of reactions, slow reaction is the rate-determining step. (True/False)

1.2b Give the unit(s) for first-order reactions rate constant, k?

1.2c State the first law of thermodynamics

1.2d A reaction in which all reactants are in the same phase is called_____. (homogeneous/heterogeneous)

1.2e How can the presence of a catalyst affect the rate of a reaction?

Q.2 Short Notes (Attempt any two) **[06]**

A Write a note on third law of thermodynamics.

B State and explain Raoult's law.

C State the difference between molecularity and order of reaction.

Q.3 Explain in detail (Attempt any two) **[14]**

A Define the following terms: system, boundary, surroundings, intensive properties, extensive properties, cyclic process and isochoric process

B Write a detailed note on applications of Adsorption.

C Derive the expression of rate constants for the first order reactions. Write a short note Molecularity

Section-II (Total Marks - 30)

Q.1 Short Questions [10]

1.1 Objectives [05]

1.1a The tendency of a process to occur naturally is called

A momentum of the reaction
B spontaneity of the reaction
C equilibrium of the reaction
D none of these

1.1b Which of the following is intensive property?

A mass
B density
C volume
D internal energy

1.1c Which of the following includes all the aims of kinetics?

I. to measure the rate of a reaction
II. to be able to predict the rate of a reaction
III. to be able to establish the mechanism by which a reaction occurs to be able to control a reaction

A (i), (ii) and (iii)
B (i) and (ii)
C (i) and (iii)
D (i), (ii), (iii) and (iv)

1.1d Freundlich isotherms is not applicable at

A high pressure
B low pressure
C 273 K
D room temperature

1.1e A real solution is that which

A obeys Raoult's law
B does not obey Raoult's law
C obeys Henry's law
D does not obey Henry's law

1.1f When a non-volatile solute is added to a solvent, the freezing point of the solvent _____.

A increases
B decreases
C remains the same
D none of these

1.1g Adsorbate is that substance

A which concentrates on the surface
B where adsorption takes place
C which evaporates from the surface of metals
D none of these

1.1h Why is a minimum energy needed for an effective collision?

A energy is needed to break bonds

B energy is needed to orient the particles correctly

C a minimum energy is needed, so that the particles will collide many times per second

D enough energy is needed to give off heat in a reaction

1.1i According to chemical kinetic theory, a reaction can occur

A if the reactants collide with the proper orientation

B if the reactants possess sufficient energy of collision

C if the reactants are able to form a correct transition state

D all of the above

1.1j In an adsorption process unimolecular layer is formed. It is

A physical adsorption

B chemical adsorption

C ion-exchange

D chromatographic analysis

1.2 Answer the Following: (MCQ/Short Question/Fill in the Blanks) [05]

1.2a Define: Physical adsorption.

1.2b The change in free energy is a measure of.....?

1.2c Rate laws for chemical reactions are determined by theoretically. (True/False)

1.2d When a non-volatile solute is added to a solvent, the freezing point of the solvent _____. (increases/decreases)

1.2e Define the term homogeneous.

Q.2 Short Notes (Attempt any two) [06]

A Write a note on Molar heat capacity.

B Write the assumptions of Langmuir adsorption isotherm and derive the equation pertaining to it.

C Derive an expression for isothermal reversible expansion work of an ideal gas.

Q.3 Explain in detail (Attempt any two) [14]

A Write a note on collision theory of reaction rates.

B What are spontaneous reactions? Explain in detail giving examples.

C Write a detailed note on Raoult's law and Henry's law. Show that in any solution if the solvent obeys Raoult's law, the solute obeys Henry's law.