SEAT No._____ No. of printed pages : 03

[57/A-34]

SARDAR PATEL UNIVERSITY

B. Sc. [SEMESTER - V] EXAMINATION

Monday, 16-04-2018

02:00 P.M. TO 05:00 P.M.

PHYSICAL CHEMISTRY : US05CCHE06

Total marks : 70.

NB. Figures to the right indicates full marks.

Q.-1. Choose and rewrite the correct options for the following MCQs. [10]

1. The polymorphic forms which can undergo reversible transformations into one another at the transition temperature are said to be,_____
   (a) Monotropic (b) Isotropic
   (c) Enantiotropic (d) Allotropic
2. The incongruent melting point is also known as,_____
   (a) Transition temperature (b) Meritectic temperature
   (c) Peritectic temperature (d) All of these
3. The curve representing the equilibrium between liquid water and solid ice at different temperature is called,_____
   (a) Vapour pressure curve (b) Fusion curve
   (c) Sublimation curve (d) None of these
4. The mathematical expression, which represents relation between amount of gas adsorbed by the adsorbent at equilibrium pressure and temperature is called,_____
   (a) Adsorption curve (b) Absorption curve
   (c) Absorption isobar (d) Adsorption isobar
5. An example of sorption is,_____
   (a) Water and Sponge (b) Ammonia and Charcoal
   (c) Water and Silica gel (d) Hydrogen gas and Charcoal
6. Chromatography is a technique, which is based on,_____
   (a) Separation (b) Absorption
   (c) Adsorption (d) Purification
7. The quality and quantity of heavy metals present in organometallic compounds can be identified by,_____
   (a) ECD (b) FPD (c) TCD (d) FID
8. In GLC, the quantitative determination can be done by measuring,_____
   (a) Area of peak (b) Number of peak
   (c) Position of peak (d) All of these
9. Which one of the following is used to remove the dissolved oxygen in a polarographic cell solution?_____
   (a) Nitrogen gas (b) Oxygen gas
   (c) Ammonia gas (d) Gelatin
10. In polarography, quantitative determination can be done by measuring,_____
    (a) Half wave potential (b) Applied voltage
    (c) Residual current (d) Limiting diffusion current

(P.T.O.)

Q.-2. Give the answer of ANY TEN questions. [20]

1. For the system : $CaCl_2\ 6H_2O_{(s)}$, $Ca^{+2}{}_{(aq)}$, $Cl^-{}_{(aq)}$, $H_2O_{(l)}$, $H_2O_{(g)}$, determine the number of components.
2. Define the terms : (i) Polymorphism (ii) Monotropy
3. Is it possible to have a quadruple point in a phase diagram of a one component system ? Why ?
4. Explain the terms : (i) Adsorption isobar (ii) Absorption
5. What are gas masks and its function in application of adsorption?
6. State Freundlich equation and give its limitations.
7. Explain the term : Retardation factor (R_f)
8. The width of chromatographic peak is 33 seconds and retention time is 7.52 minutes. Calculate the HETP for 1.50 meter column.
9. What is meant by conditioning of column in gas chromatography ?
10. What precautions are necessary to be used while using a capillary in DME ?
11. Explain with example, the role of supporting electrolyte in a polarographic cell.
12. Define half wave potential and give its significance.

Q.-3. Answer the following :

(A) Define phase and degree of freedom. Derive the Gibbs phase rule. [06]

(B) The specific volume of ice and water at 0 ^{0}C are 1.0907 cm^3 and 1.0001 cm^3, respectively. What would be the change in melting point of ice per atm. increase of pressure ? [Given : Heat of fusion of ice = 79.8 $cal.gm^{-1}$, Molar mass of water : 18 gm mol^{-1} , 1 atm. = 101325 Nm^{-2} , 1 cal. = 4.184 J]. [04]

OR

Q.-3. Answer the following :

(A) Explain the term congruent melting point. Draw and discuss the phase diagram in which two components form a stable compound with congruent melting point. [06]

(B) State and explain important conditions for equilibrium between various phases in a heterogeneous system. [04]

Q.-4. Answer the following :

(A) Derive Langmuir's equation of adsorption isotherm. Discuss its various forms under different conditions of pressure. [06]

(B) Write a note on : Adsorption indicators. [04]

OR

Q.-4. Answer the following :

(A) Write the differences between physical and chemical adsorption. [06]

(B) Discuss the factors affecting the adsorption. [04]

Q.-5. Explain Gradient Elution Chromatography. Discuss the factors affecting chromatographic separation efficiency. [10]

OR

Q.-5. Sketch the block diagram of gas chromatography. Explain the principle and working of it in detail. [10]

Q.-6. Answer the following :

(A) Discuss the DME. Give the merits and demerits of DME. [06]

(B) The mass of 20 drops of mercury was found to be 0.1320 gm and the drop time was 4.94 seconds. Calculate the : (i) Flow rate of mercury (ii) Capillary constant. [04]

OR

Q.-6. Answer the following :

(A) Write notes on : (i) The kinetic current (ii) The standard addition method [06]

(B) The instantaneous diffusion current at DME of 2.1 mM solution of Lead ion (Pb^{+2}) was 15.2 μA. If $m^{⅔}t^{⅙}$ for capillary use in the study was 1.60. Calculate the : (i) Diffusion coefficient of lead ion [04]

(ii) Diffusion current constant

(iii) K of ilkovic equation.