2017

(5th Semester)

CHEMISTRY

EIGHTH (A) PAPER [CHEM–354 (A)]

(Analytical Chemistry)

Full Marks : 75

Time : 3 hours

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

1. *(a)* What is meant by 'salting out'? Why is it used in liquid extraction? 4

(b) What are the principle and applications of molecular distillation? 3

(c) Describe the applications of Craig method. 3

OR

2. *(a)* What is the principle of zone refining? Briefly discuss the zone refining method. 3

(b) Write short notes on the uses of the following compounds in extraction processes : 4

(i) Oxine

(ii) Crown ethers

(c) Distinguish between distribution coefficient and distribution ratio. 3

3. *(a)* Diffusion current constant for Zn^{2+} is 8·25, when $m = 32{\cdot}5$ mg/sec and $t = 3{\cdot}4$ sec, if the diffusion current for the unknown solution of Zn^{2+} is $4{\cdot}3\ \mu A$. What is the concentration of Zn^{2+} in the unknown solution? 3

(b) Provide the basic principle of coulometry and illustrate the applications of coulometric titrations using a suitable example. 3

(c) Discuss the conductometric titration for the solution of barium hydroxide and sulphuric acid with the stoichiometric equation and plot (graph). 4

OR

4. *(a)* Define the following : 3

Half-wave potential, back potential and diffusion current

(b) What are meant by working electrode and supporting electrode? Provide an example for each one. 4

(c) What are the advantages of dropping mercury electrode (DME) over a solid microelectrode? 3

5. *(a)* Which method (TGA or DTA) is more suitable to study adsorption and desorption phenomena? Why? 1+1=2

(b) TGA does not require a reference material, whereas DTA requires a reference material for the thermal analysis. Explain. 4

(c) Discuss how endothermic and exothermic processes can be studied using DTA methods using suitable example and plot (graph). 4

OR

6. *(a)* What is meant by glass transition? Which method can be used to study the glass transitions? 1+2=3

(b) How can thermal stability of a material be studied using DTA methods? 4

(c) How do we study dehydration using DSC method? 3

7. *(a)* Describe isosbestic point in UV-visible absorption spectroscopy. 3

(b) A sample is excited by 4047 Å. The following Raman lines are observed :

4226·5 Å (Stokes line) and
3882 Å (anti-Stokes line)

Calculate the Raman shifts in Å and cm^{-1}. 4

(c) Write Beer-Lambert equation and explain its applications in internal calibration method. 3

OR

8. *(a)* The force constant for the vibrational frequency band of HCl is 516 $N\text{-}m^{-1}$. Calculate the vibrational frequency of HCl. [Hint : 1 amu = $1{\cdot}660565\times10^{-27}$ kg] 4

(b) Write the Boltzmann distribution equation and the importance of Boltzmann distribution law in Flame emission spectrometry. 3

(c) Describe briefly about releasing agents and ionization suppressors employed in atomic absorption spectrometry. 3

9. *(a)* Differentiate between butter and cooking oils (sunflower/soyabean/mustard oils). 3

(b) What is meant by RM value? What is its importance in the characterization of fats and oils? 4

(c) Discuss briefly about iodine-bromine value. 3

OR

10. *(a)* Define saponification value. How can saponification value be determined experimentally? 4

(b) What are the basic constituents of milk? 2

(c) How does iodine value signify the degree of unsaturation in oils and fats? Define rancidity. 4

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Subject Code : CHEM/V/08 (a)

Booklet No. A

Date Stamp .....

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To be filled in by the Candidate

DEGREE 5th Semester
(Arts / Science / Commerce / .....) Exam., **2017**

Subject .....
Paper .....

INSTRUCTIONS TO CANDIDATES

1. **The Booklet No. of this script should be quoted in the answer script meant for descriptive type questions and vice versa.**
2. **This paper should be ANSWERED FIRST and submitted within 1 (one) Hour of the commencement of the Examination.**
3. **While answering the questions of this booklet, any cutting, erasing, over-writing or furnishing more than one answer is prohibited. Any rough work, if required, should be done only on the main Answer Book. Instructions given in each question should be followed for answering that question only.**

To be filled in by the Candidate

DEGREE 5th Semester
(Arts / Science / Commerce / .....) Exam., **2017**

Roll No. .....
Regn. No. .....

Subject .....
Paper .....

Descriptive Type
Booklet No. B .....

Signature of Scrutiniser(s) *Signature of Examiner(s)* *Signature of Invigilator(s)*

/220

2017

(5th Semester)

CHEMISTRY

EIGHTH (A) PAPER [CHEM–354 (A)]

(Analytical Chemistry)

(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 10)

Put a Tick (✓) mark against the correct answer in the brackets provided : 1×10=10

1. During thermogravimetric analysis of calcium oxalate monohydrate, $CaC_2O_4 \cdot H_2O$, the final product at the end of analysis that remains is

(a) CaC_2O_4 (anhydrous) ( )

(b) $Ca(OH)_2$ ( )

(c) $CaCO_3$ ( )

(d) CaO ( )

2. Differential scanning calorimetry (DSC) directly measures _____ of transitions.

(a) ΔT (T—temperature) ( )

(b) ΔV (V—volume) ( )

(c) Δm (m—molarity) ( )

(d) ΔH (H—heat) ( )

3. The _____ ion can be effectively extracted in presence of other alkali metal ions using 12-crown-4.

(a) Li ( )

(b) K ( )

(c) Rb ( )

(d) Cs ( )

4. In a simple liquid-liquid extraction, the relationship between distribution ratio and partition coefficient is

(a) distribution ratio and partition coefficient are divergent ( )

(b) distribution ratio and partition coefficient are identical ( )

(c) high distribution ratio and low partition coefficient ( )

(d) low distribution ratio and high partition coefficient ( )

5. Flame emission spectroscopy employs only _____ samples.

(a) gaseous ( )

(b) liquid ( )

(c) crystalline solid ( )

(d) amorphous solid ( )

6. Extraction of a solute using solvent extraction is essentially an _____ process.

(a) endothermic ( )

(b) exothermic ( )

(c) equilibrium ( )

(d) electronic ( )

7. Bathochromism corresponds to

(a) increase in absorbance value ( )

(b) decrease in absorbance value ( )

(c) shift towards longer wavelength ( )

(d) shift towards shorter wavelength ( )

8. Coulometric titrations are best suited for

(a) redox titrations ( )

(b) precipitation titrations ( )

(c) complexometric titrations ( )

(d) colorimetric titrations ( )

9. Iodine value indicates the

(a) number of amine groups ( )

(b) number of unsaturated bonds ( )

(c) number of amide bonds ( )

(d) number of carboxylic acid groups ( )

10. Margarine (dalda) is rich in

(a) saturated fatty acids ( )

(b) unsaturated fatty acids ( )

(c) cholesterol ( )

(d) acetic acid ( )

SECTION—B

(*Marks* : 15)

Answer the following questions : 3×5=15

1. A solute *S*, has a K_D between water and chloroform of 5·00. A 50·00 mL sample of a 0·050 *M* aqueous solution of the solute is extracted with 15·00 mL of chloroform. *(a)* What is the extraction efficiency for this separation? *(b)* What volume of chloroform is needed to extract 99·9% of the solute?

2. Write short notes on the following :

(a) Molar conductance and specific conductance

(b) Principle of stripping voltammetry

3. How do we experimentally determine the protein and fat content in milk?

4. Describe the applications of differential scanning calorimetry (DSC) for the analysis of gypsum and calcium carbonate (the raw materials for cement).

5. Illustrate the block diagram of atomic absorption spectrometer. What is the importance of hollow cathode lamps as the source of light in atomic absorption spectrometer?

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