

2017

( 5th Semester )

CHEMISTRY

FIFTH PAPER (CHEM-351)

( Organic Chemistry—II )

Full Marks : 55

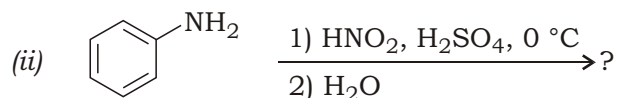
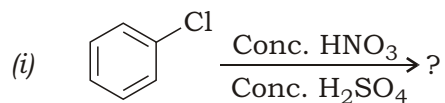
Time : 2½ hours

( PART : B—DESCRIPTIVE )

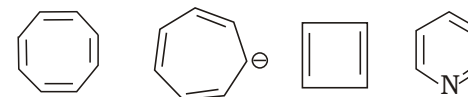
( Marks : 35 )

The figures in the margin indicate full marks  
for the questions

1. (a) Draw the resonance molecular orbital picture of benzene. 2
- (b) Complete the following transformations with suitable mechanism : 2+2=4

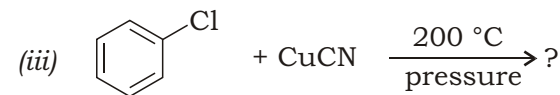
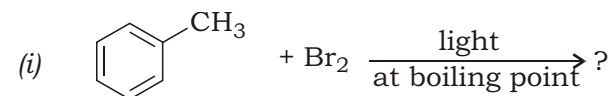


- (c) Which of the following species satisfy Hückel's rule? Explain. 1

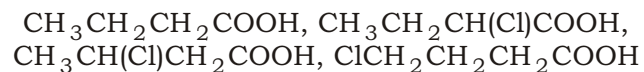


OR

2. (a) Explain why the acidity of *m*-nitrophenol is much lower than its *o*- and *p*-isomers. 2
- (b) Complete the following reaction (mechanism not required) : 1×3=3

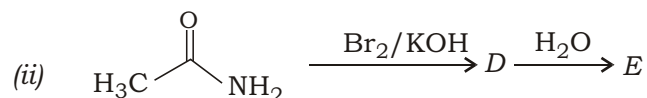
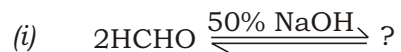


- (c) What do you mean by nuclear and side chain halogenations? Give examples. 2
3. (a) Arrange the following in their increasing order of acidity. Explain. 2



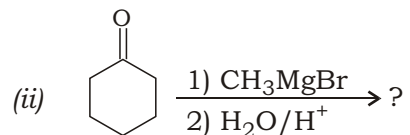
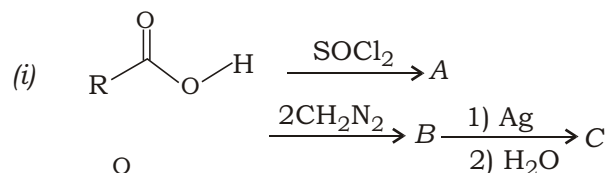
( 3 )

- (b) Write one chemical test to confirm the presence of carbonyl group. 1
- (c) Write the product(s) of the following reactions with suitable mechanism :  $2 \times 2 = 4$



OR

4. (a) Compound (A)  $\text{C}_4\text{H}_8\text{O}$  forms phenylhydrazine. It fails to react with Tollen's reagent but gives iodoform test. On reduction with  $\text{Zn-Hg/HCl}$ , (A) yields *n*-butane. Assign structure (A). 2
- (b) Complete the following reactions :  $3+2=5$



5. (a) Write the Hinsberg's test to distinguish between  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  amines. 2

8G/217a

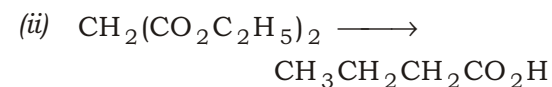
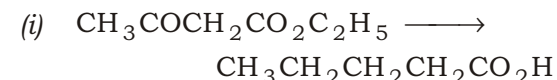
( Turn Over )

( 4 )

- (b) Explain active methylene compounds with suitable examples.  $1\frac{1}{2}$
- (c) What will happen when methyl amine reacts with acetyl chloride? Write the mechanism of the reaction.  $1\frac{1}{2}$
- (d) Differentiate between tautomerism and resonance. 2

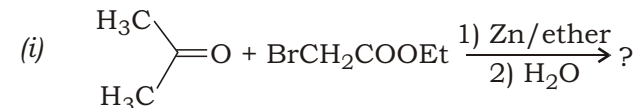
OR

6. (a) Complete the following chemical transformations :  $2\frac{1}{2} \times 2 = 5$



- (b) "Aryl amines are weaker bases than alkyl amines." Explain. 2
7. (a) Explain  $\text{B}_{\text{AC}}2$  mechanism for the hydrolysis of ester. 2

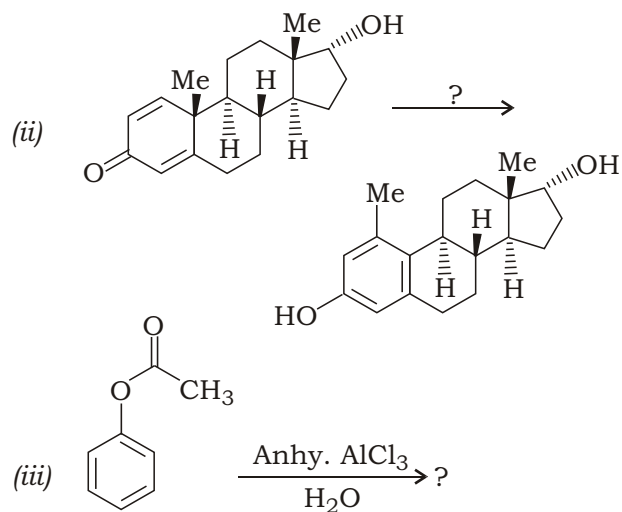
- (b) Complete the following reactions with suitable mechanism (any two) :  $2\frac{1}{2} \times 2 = 5$



8G/217a

( Continued )

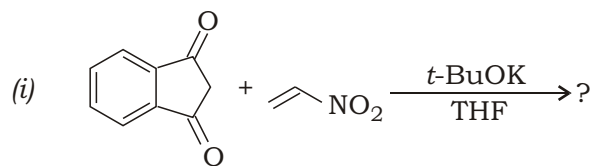
( 5 )



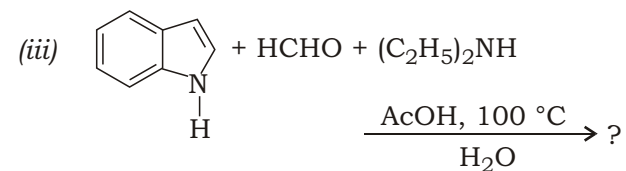
OR

8. (a) Write a brief note on the formation of carbon-carbon double bond. 2

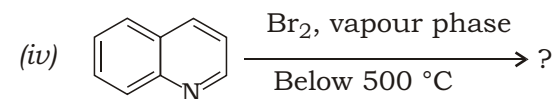
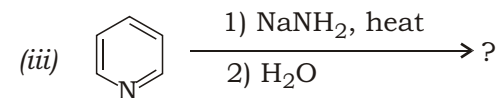
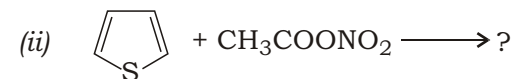
(b) Complete the following transformations with suitable mechanism (any two) :  $2\frac{1}{2} \times 2 = 5$



( 6 )



9. (a) Complete the following transformations (any three, mechanism not required) :  $1 \times 3 = 3$



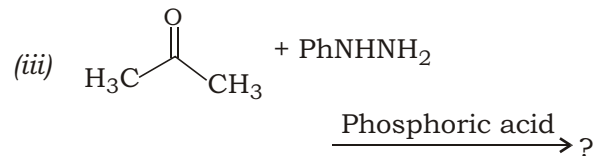
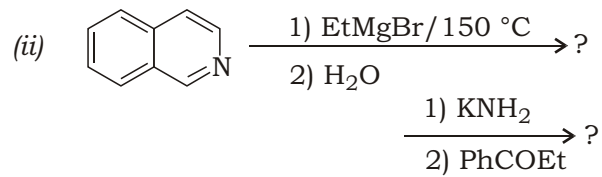
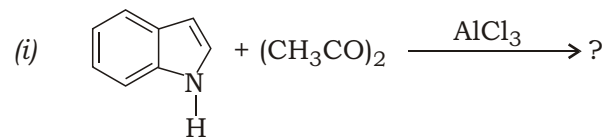
(b) How will you synthesise isoquinoline by Bischler-Napieralski method? Give chemical equations. 4

OR

10. (a) Mention one method of preparation for pyridine. Give the chemical equation. 2

( 7 )

(b) Complete the following reactions with suitable mechanism (any two) :  $2\frac{1}{2}\times 2=5$



\*\*\*

**2 0 1 7**

( 5th Semester )

**CHEMISTRY**

FIFTH PAPER (Chem-351)

**( Organic Chemistry—II )**

( PART : A—OBJECTIVE )

( Marks : 20 )

*The figures in the margin indicate full marks for the questions*

SECTION—I

( Marks : 5 )

Put a Tick (✓) mark against the correct answer in the brackets provided : 1×5=5

**1.** Which of the following statements with respect to phenol is true?

- (a) Phenol reacts with ammonia in the presence of  $\text{ZnCl}_2$  to give 2-hydroxy aniline ( )
- (b) Phenol undergoes nitration with dilute nitric acid to form *m*-nitrophenol ( )
- (c) Phenol can be prepared by hydrolysis of aryl halides with aqueous NaOH ( )
- (d) The boiling point of *o*-nitrophenol is higher than its *meta*- and *para*-isomers ( )

( 2 )

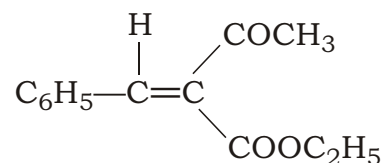
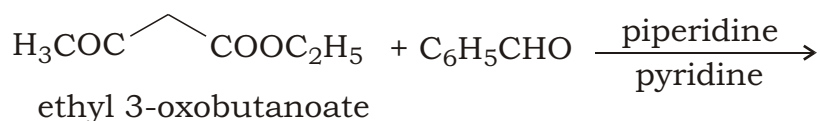
2. Ketones are the first oxidation product of

- (a) 1°-alcohols ( )
- (b) 2°-alcohols ( )
- (c) 1°-amines ( )
- (d) carboxylic acids ( )

3. Aniline on treatment with bromine water gives

- (a) 2-bromoaniline ( )
- (b) 3-bromoaniline ( )
- (c) 4-bromoaniline ( )
- (d) 2,4,6-tribromoaniline ( )

4. In the following transformation, ethyl 3-oxobutanoate reacts with benzaldehyde in the presence of piperidine-pyridine mixture as a catalyst to give ethyl 2-benzylidene-3-oxobutanoate.



ethyl 2-benzylidene-3-oxobutanoate

This type of reaction is known as

- (a) Claisen-Schmidt reaction ( )
- (b) Mannich reaction ( )
- (c) Knoevenagel reaction ( )
- (d) Michael addition reaction ( )

( 3 )

5. The order of aromaticity in pyrrole, furan and thiophene is

(a) thiophene > pyrrole > furan ( )

(b) thiophene > furan > pyrrole ( )

(c) furan > pyrrole > thiophene ( )

(d) furan > thiophene > pyrrole ( )

( 4 )

SECTION—II

( Marks : 15 )

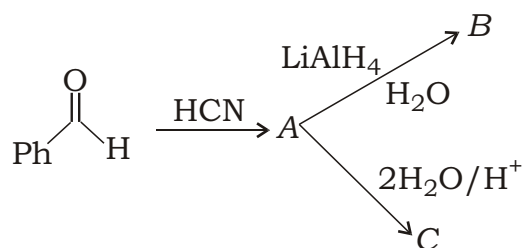
Answer the following questions in not more than  
6 sentences each : 3×5=15

1. Unlike alkyl halides, aryl halides do not react with nucleophiles under normal laboratory conditions. Explain.



( 5 )

2. Complete the following reactions :



( 6 )

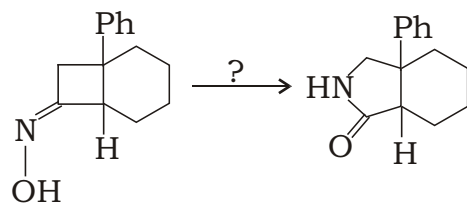
3. Write the chemical reaction of ethyl amine with—

(a)  $\text{NaNO}_2/\text{HCl}$

(b)  $\text{CHCl}_3/\text{KOH}$

( 7 )

4. Which reagent is used for the following alteration?  
Complete the reaction using proper reaction mechanism.



( 8 )

5. Explain why nitration of pyrrole predominantly take place at C-2- position.

\*\*\*

Subject Code : CHEM/V/05

Booklet No. **A**

.....

Date Stamp .....

.....

**To be filled in by the Candidate**

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

Subject .....

Paper .....

.....

**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 .....

**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 45 minutes of the commencement of the Examination.
3. While answering the questions of this booklet, any cutting, erasing, overwriting 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.

Signature of  
Scrutiniser(s)

Signature of  
Examiner(s)

Signature of  
Invigilator(s)

2 0 1 7

( 5th Semester )

CHEMISTRY

SIXTH PAPER (CHEM-352)

( Inorganic Chemistry—II )

Full Marks : 55

Time : 2½ hours

( PART : B—DESCRIPTIVE )

( Marks : 35 )

*The figures in the margin indicate full marks  
for the questions*

1. (a) Define radius ratio rule. 1  
 (b) Explain Born-Haber cycle. 3  
 (c) Discuss briefly the factors affecting the magnitude of lattice energy. 3

**OR**

2. (a) Define solvation energy. 1

(b) Discuss Frenkel defects giving suitable example. 3

(c) Define *p*-type and *n*-type semiconductors giving suitable examples. 3

3. (a) What is the bond order for H<sub>2</sub> molecule? 1

(b) What are the necessary conditions for the combination of atomic orbitals to form molecular orbitals? 3

(c) Draw the MO diagram of CO and calculate the bond order. 3

**OR**

4. (a) Define van der Waals' forces. 1

(b) Explain with suitable example dipole-induced dipole interaction. 3

(c) Draw the MO diagram of N<sub>2</sub>. 3

5. (a) Define catenation. 1

(b) Discuss the different types of interhalogen compounds. 3

(c) Describe briefly the separation of noble gases by fractionalization of liquid air. 3

( 3 )

OR

6. (a) What do you understand by inert pair effect? 1
- (b) Discuss the formation of clathrates with suitable example. 3
- (c) Explain the structure of XeF<sub>6</sub>. 3
7. (a) Define Bronsted-Lowry concept of acid. 1
- (b) Illustrate the solvolysis reaction in liquid ammonia. 3
- (c) Define acids and bases on the basis of solvent system concept giving suitable examples. 3

OR

8. (a) Give one example of complex formation reaction shown by ammono base in liquid ammonia. 1
- (b) Evaluate the symmetry elements and symmetry point group of NH<sub>3</sub>. 3
- (c) Discuss in brief the classification of cations and anions based on HSAB principle. 3

( 4 )

9. (a) What is inner sphere complex? 1
- (b) Discuss the characteristics of first row transition elements for the ability to form complexes and the magnetic properties. 4
- (c) Why is [Cr(NH<sub>3</sub>)<sub>6</sub>]<sup>3+</sup> paramagnetic? Explain in brief. 2

OR

10. (a) Explain why *d*-block elements are called transition elements. 1
- (b) Discuss the factors affecting the magnitude of CFSE. 3
- (c) Draw and explain the crystal field splitting pattern in octahedral geometry. 3

\*\*\*

Subject Code : CHEM/V/06

Booklet No. **A**

.....

Date Stamp .....

**To be filled in by the Candidate**

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

Subject .....

Paper .....

.....

**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 .....

**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 45 minutes of the commencement of the Examination.
3. While answering the questions of this booklet, any cutting, erasing, overwriting 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.

Signature of  
Scrutiniser(s)

Signature of  
Examiner(s)

Signature of  
Invigilator(s)



**2 0 1 7**

( 5th Semester )

**CHEMISTRY**

SIXTH PAPER (CHEM-352)

**( Inorganic Chemistry—II )**

( PART : A—OBJECTIVE )

( Marks : 20 )

*The figures in the margin indicate full marks for the questions*

SECTION—I

( Marks : 5 )

Put a Tick (✓) mark against the correct answer in the brackets provided : 1×5=5

**1.** The crystal structure of NaCl is

(a) simple cubic lattice ( )

(b) face-centred cubic lattice ( )

(c) body-centred cubic lattice ( )

(d) disordered cubic lattice ( )

( 2 )

2. The Bond order of  $\text{He}_2$  is

(a) 1 ( )

(b) 2 ( )

(c) 3 ( )

(d) 0 ( )

3. Caro's acid is

(a)  $\text{H}_2\text{SO}_4$  ( )

(b)  $\text{H}_2\text{SO}_5$  ( )

(c)  $\text{H}_2\text{S}_2\text{O}_8$  ( )

(d)  $\text{H}_2\text{S}_2\text{O}_7$  ( )

( 3 )

4. The symmetry point group of  $\text{BF}_3$  is

(a)  $D_{3h}$  ( )

(b)  $D_{3v}$  ( )

(c)  $C_{3v}$  ( )

(d)  $C_3$  ( )

5.  $\text{Fe}[(\text{H}_2\text{O})_6]^{2+}$  is

(a) outer orbital complex ( )

(b) inner orbital complex ( )

(c) neutral complex ( )

(d) None of the above ( )

( 4 )

SECTION—II

( Marks : 15 )

Answer the following questions :

3×5=15

1. Explain in brief the Schottky defect.

( 5 )

2. Discuss the band theory of conductors and insulators.

( 6 )

3. Discuss the ionic or covalent characters of alkaline earth metal hydrides.

( 7 )

4. Why tetrahalides of carbon do not behave as Lewis acids while tetrahalides of other elements of group 14 are Lewis acids?

( 8 )

5. Discuss the stability of transition metal complex.

\*\*\*



2017

( 5th Semester )

CHEMISTRY

SEVENTH PAPER (CHEM-353)

( Physical Chemistry—II )

Full Marks : 55

Time : 2½ hours

( PART : B—DESCRIPTIVE )

( Marks : 35 )

*The figures in the margin indicate full marks  
for the questions*

1. (a) What is meant by mean free path? 1  
 (b) Discuss the effect of temperature on the distribution of molecular velocities. 3  
 (c) Calculate the root mean square velocity, average velocity and most probable velocity of sulphur dioxide (SO<sub>2</sub>) at 427 °C.  
 ( $R = 8.314 \times 10^7$  ergs/degree/mole) 3

OR

2. (a) What is meant by equipartition of energy? 1  
 (b) What is meant by degree of freedom of a molecule? How is this classified into different types? 3  
 (c) Using the principle of equipartition of energy estimate the energy of H<sub>2</sub>, H<sub>2</sub>O and CO<sub>2</sub> at room temperature, assuming that all the degrees of freedom are excited and contribute towards the energy of the molecules. 3
3. (a) State the third law of thermodynamics. 1  
 (b) Discuss the term Gibbs' free energy. 3  
 (c) How does work function vary with temperature and volume? 3

OR

4. (a) What is meant by chemical potential? 1  
 (b) Derive an expression for the variation of chemical potential with temperature. 3  
 (c) Derive Gibbs-Duhem equation. 3
5. (a) Define liquid crystal. Write the difference between smectic and nematic liquid crystals. 1+2=3

( 3 )

- (b) What is the effect of temperature on surface tension? 2
- (c) What is meant by optical exaltation? 2

**OR**

6. (a) What is acid-base catalysis? 2
- (b) Discuss in detail the collision theory of bimolecular reaction. 3
- (c) What is meant by viscosity of liquid? 2
7. (a) What are the different kinds of Bravais lattices in a cubic unit cell? 2
- (b) How many atoms are present within—  
(i) simple cubic unit cell;  
(ii) face-centred cubic unit cell;  
(iii) body-centred cubic unit cell? 3
- (c) What is meant by crystal habit and interfacial angle? 2

**OR**

8. (a) What is meant by law of rational indices? 2
- (b) The radius of the cation in a solid measures 33 pm and the anion measures 70 pm. Predict the coordination number of cation and structure of the solid. 3
- (c) Define centre of symmetry and plane of symmetry. 1+1=2

( 4 )

9. (a) What is meant by equivalent conductance and molar conductance? 2
- (b) How will you test the validity of Ostwald dilution law? 2
- (c) At 291 K, the molar conductivities at infinite dilution of  $\text{NH}_4\text{Cl}$ ,  $\text{NaOH}$  and  $\text{NaCl}$  are 12.8, 217.4 and 108.9  $\text{ohm}^{-1} \text{cm}^2$  respectively. If the molar conductivity of a centinormal solution of  $\text{NH}_4\text{OH}$  is 9.33  $\text{ohm}^{-1} \text{cm}^2$ , what is the percentage dissociation of  $\text{NH}_4\text{OH}$  at this dilution? 3

**OR**

10. (a) Derive the relationship between the ionic conductance and transport number. 2
- (b) Describe moving boundary method for the determination of transport number. 2
- (c) Calculate the transport number of  $\text{H}^+$  ions and  $\text{Cl}^-$  ions from the following data obtained by the moving boundary method using cadmium chloride as the indicator electrolyte. 3

Concentration of  $\text{HCl} = 0.1 \text{ N}$   
Mass of silver deposited in the  
coulometer = 0.1209 gm  
Movement of boundary = 7.5 cm  
Cross-section of the tube = 1.24  $\text{cm}^2$

\*\*\*

Subject Code : CHEM/V/07

Booklet No. **A**

.....

Date Stamp .....

**To be filled in by the Candidate**

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

Subject .....

Paper .....

.....

**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 .....

**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 45 minutes of the commencement of the Examination.
3. While answering the questions of this booklet, any cutting, erasing, overwriting 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.

Signature of  
Scrutiniser(s)

Signature of  
Examiner(s)

Signature of  
Invigilator(s)

**CHEM/V/07**

**2 0 1 7**

( 5th Semester )

**CHEMISTRY**

SEVENTH PAPER (CHEM-353)

( **Physical Chemistry—II** )

( PART : A—OBJECTIVE )

( Marks : 20 )

*The figures in the margin indicate full marks for the questions*

SECTION—A

( Marks : 5 )

Put a Tick (✓) mark against the correct answer in the brackets provided : 1×5=5

**1.** For a non-linear polyatomic molecule HCHO the vibrational degree of freedom is

(a) 5 ( )

(b) 4 ( )

(c) 1 ( )

(d) 6 ( )

( 2 )

2. According to the third law of thermodynamics at absolute zero, for a perfect crystal entropy, change is

(a) positive ( )

(b) negative ( )

(c) zero ( )

(d) None of the above ( )

3. Bragg's equation is

(a)  $n \lambda = 2d \sin \theta$  ( )

(b)  $n \lambda = d \sin \theta$  ( )

(c)  $\sin \theta = n \lambda$  ( )

(d)  $\sin \theta = n \lambda$  ( )

( 3 )

4. The reciprocal of electrical resistance is called

(a) conductance ( )

(b) resistivity ( )

(c) molar conductance ( )

(d) specific conductance ( )

5. The Miller indices of a crystal plane which cuts through the crystal axes  $a$ ,  $b$ ,  $c$  is

(a) 0, 1, 0 ( )

(b) 0, 0, 1 ( )

(c) 1, 1, 0 ( )

(d) 1, 0, 0 ( )

( 4 )

SECTION—B

( Marks : 15 )

Answer the following questions :

3×5=15

1. What is meant by most probable velocity, collision diameter and root mean square velocity?

( 5 )

2. What is meant by additive and constitutive property?



( 6 )

3. X-rays of wavelength equal to 0.314 nm gives a first-order diffraction from the surface of a crystal when the value of  $\theta$  is  $10.5^\circ$ . Calculate the distance between the planes in the crystal parallel to the surface ( $\sin 10.5^\circ = 0.1822$ ).

( 7 )

4. What is meant by transport number of an ion? Show that the sum of transport numbers of cation and anion is unity.

( 8 )

5. Calculate the various degrees of freedom for He, HCl and C<sub>6</sub>H<sub>6</sub>.

\*\*\*

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  $m = 32.5$  mg/sec and  $t = 3.4$  sec, if the diffusion current for the unknown solution of  $Zn^{2+}$  is  $4.3 \mu A$ . 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

( 3 )

**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

8G/220a

( Turn Over )

( 4 )

- (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  $\text{cm}^{-1}$ . 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  $516 \text{ N}\cdot\text{m}^{-1}$ .  
Calculate the vibrational frequency of  
HCl. [Hint :  $1 \text{ amu} = 1.660565 \times 10^{-27} \text{ kg}$ ] 4
- (b) Write the Boltzmann distribution  
equation and the importance of  
Boltzmann distribution law in Flame  
emission spectrometry. 3

8G/220a

( Continued )

( 5 )

(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

\*\*\*

Subject Code : CHEM/V/08 (a)

Booklet No. **A**

[Empty dashed box]

Date Stamp .....

**To be filled in by the Candidate**

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

.....

[Empty dashed box]

**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 .....

**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, overwriting 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.**

*Signature of  
Scrutiniser(s)*

*Signature of  
Examiner(s)*

*Signature of  
Invigilator(s)*

**CHEM/V/08 (a)**

**2 0 1 7**

( 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,  $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ , the final product at the end of analysis that remains is

(a)  $\text{CaC}_2\text{O}_4$  (anhydrous) ( )

(b)  $\text{Ca(OH)}_2$  ( )

(c)  $\text{CaCO}_3$  ( )

(d)  $\text{CaO}$  ( )



( 2 )

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

(a)  $T$  ( $T$ —temperature) ( )

(b)  $V$  ( $V$ —volume) ( )

(c)  $m$  ( $m$ —molarity) ( )

(d)  $H$  ( $H$ —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 ( )

( 3 )

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 ( )

( 4 )

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 ( )

( 5 )

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?

( 6 )

2. Write short notes on the following :

(a) Molar conductance and specific conductance

(b) Principle of stripping voltammetry

( 7 )

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

( 8 )

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

( 9 )

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?

\*\*\*



2 0 1 7

( 5th Semester )

## CHEMISTRY

EIGHTH (B) PAPER [CHEM-354 (B)]

## ( Industrial 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) Distinguish soaps and detergents. 3
- (b) Define refractories. How are they manufactured? 4
- (c) What is the role of micronutrients on plants life? 3

**OR**

2. (a) Differentiate between china clay and porcelain. 3

- (b) What are bio-fertilizers? What is the advantage of using bio-fertilizers? 3
- (c) Write the methods of preparation and uses of the following : 2×2=4
- (i) LPG
- (ii) Water gas

3. (a) Explain the modes of operation of fermentation process. 4
- (b) Write a short note on food safety and assurance. 3
- (c) Write a short note on microbial biomass. 3

**OR**

4. (a) What is mutation? Discuss its function in genetic improvement of product formation. 4
- (b) What do you understand by heat transfer in food technology? What are the factors that affect heat transfer? 1+2=3
- (c) Discuss briefly the importance of minor components in food. 3
5. (a) Describe the process of 'tanning of skins' used in leather industry. 3

( 3 )

- (b) How will you prepare nitroglycerine? 3
- (c) Explain the following briefly : 2×2=4
- (i) BOD
- (ii) COD

**OR**

6. (a) Write a short note on water pollution by agriculture runoff. 3
- (b) Give an account of treatment of tannery effluents. 3
- (c) What is an explosive? Give one method of preparation of dynamite. 1+3=4
7. (a) Discuss briefly the 'gasification' of coal. 3
- (b) Write the economic importance of coal. 3
- (c) Write short notes on the following : 2×2=4
- (i) Knocking
- (ii) Synthetic petrol

**OR**

8. (a) What is producer gas? Mention its properties and uses. 3
- (b) Explain 'cracking of petroleum'. 3

( 4 )

- (c) What are different chemicals manufactured from coal tar? 2
- (d) What are the environmental impacts of coal mining? 2

9. (a) What is textile design? Write in short about designer's projection. 1+2=3
- (b) How will you prepare polyaniline? Write its application. 3
- (c) What are polyurethanes? Write the two methods of formation of polyurethanes. 1+3=4

**OR**

10. (a) Discuss the importance of timing in the textile industry. 4
- (b) How do we facilitate colour combinations during textile designing? 3
- (c) How will you prepare polyester? Write its applications. 3

\*\*\*

**Subject Code : CHEM/V/08 (b)**

.....

**Booklet No. A**

Date Stamp .....

.....

**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, overwriting 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)*

**CHEM/V/08 (b)**

**2 0 1 7**

( 5th Semester )

**CHEMISTRY**

EIGHTH (B) PAPER [CHEM-354 (B)]

**( Industrial 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. The gas which is present in LPG is

(a) propane and butane ( )

(b) methane and butane ( )

(c) methane and propane ( )

(d) methane and benzene ( )

**/221**

( 2 )

2. The formula of china clay is

(a)  $\text{Al}_3\text{Si}_2\text{O}_5(\text{OH})_4$  ( )

(b)  $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$  ( )

(c)  $\text{Al}_2\text{SiO}_5(\text{OH})_4$  ( )

(d)  $\text{Al}_2\text{Si}_2\text{O}_4(\text{OH})_4$  ( )

3. The process of removing heat from low-temperature reservoir and transferring it to high-temperature reservoir is

(a) fermentation ( )

(b) pasteurization ( )

(c) refrigeration ( )

(d) None of the above ( )

4. Most industrial enzymes are obtained from

(a) plants ( )

(b) microbes ( )

(c) insects ( )

(d) animal tissues ( )

( 3 )

5. Both temporary and permanent hardness of water can be removed by

- (a) boiling ( )
- (b) distillation ( )
- (c) filtration ( )
- (d) All of the above ( )

6. Bitumen is used as

- (a) road surfacing ( )
- (b) lubricant ( )
- (c) motor fuel ( )
- (d) None of the above ( )

7. The solid fuels can be used in internal combustion engine only after their

- (a) solidification ( )
- (b) liquefaction ( )
- (c) gasification ( )
- (d) None of the above ( )

( 4 )

8. The monomer of polyvinyl chloride (PVC) is

- (a) chloroethene ( )
- (b) chloroethane ( )
- (c) ethylene trichloride ( )
- (d) chloroform ( )

9. Which of the following is not a polyamide?

- (a) Kevlar ( )
- (b) Glycogen ( )
- (c) Protein ( )
- (d) Nylon-66 ( )

10. The quality of the yarn mainly depends on which parameter of the fibre in textile industry?

- (a) Fineness ( )
- (b) Maturity ( )
- (c) Length ( )
- (d) Cross linking ( )

( 5 )

SECTION—B

( Marks : 15 )

Answer the following questions :

3×5=15

1. What is ceramic? What are the main raw materials of ceramic?



( 6 )

2. Discuss briefly about food preservation.

( 7 )

3. Describe the process of curing of leather.

( 8 )

4. What is octane number? How can we increase the octane number in fuel?

( 9 )

5. Describe how texture of the paper could affect designing in textile industry.

\*\*\*