

Fifth Semester B.Sc. Degree Examination, October/November 2019

(CBCS Scheme)

Chemistry

Paper V (5.1) — ORGANIC CHEMISTRY

Time : 3 Hours]

[Max. Marks : 90

Instructions to Candidates :

- 1) The question paper has Two Parts, Part A and Part B
- 2) Both the Parts should be answered
- 3) Equations and structures are to be given wherever necessary.

PART – A

Answer any **TEN** of the following questions. Each question carries **2** marks : **(10 × 2 = 20)**

1. What are enantiomers? Illustrate with an example.
2. Write the E and Z configurations of 2-bromo-2-butene.
3. What are reducing and non-reducing sugars?
4. What is isoprene rule? Explain with an example.
5. Give a chemical evidence to show the presence of pyridine ring in nicotine.
6. What are vat dyes? Give an example.
7. What are antipyretics? Give two examples.
8. Give the reaction of benzene sulphonic acid with
 - (a) PCl_5
 - (b) NaOH .
9. What are pesticides? Give two examples.
10. Mention the ingredients and uses of Lipstic.

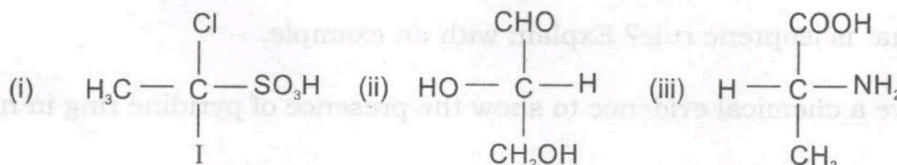
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11. What is finger print region of IR spectrum?
12. How many PMR signals are expected from
- (a) toluene
 - (b) ethylalcohol.

PART - B

Answer any **SEVEN** of the following questions. Each question carries **10** marks :
(7 × 10 = 70)

13. (a) What is resolution? Describe the chemical - method of resolution of the racemic mixture.
- (b) State the necessary conditions for Biphenyl derivatives to show optical activity. Write the structure of one optically active Biphenyl derivative.
- (c) Write the structures of erythro and threo isomeric pairs of tartaric acid. Which pair represents mesomers and which pair represents enantiomers? **(4 + 3 + 3)**
14. (a) Write the structures of geometric isomers of a compound with molecular formula $C_4H_4O_4$. Describe the action of heat on this compound.
- (b) Assign the (R) or (S) configuration for the following compounds :



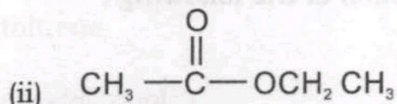
- (c) Explain geometrical isomerism of allene derivatives. **(4 + 3 + 3)**
15. (a) What is racemisation? Give the mechanism of racemisation of lactic acid.
- (b) Write a short note on Killiani-Fischer synthesis.
- (c) Write the Haworth structure of
- (i) Sucrose and
 - (ii) Lactose. **(4 + 3 + 3)**

16. (a) Discuss the structural elucidation of citral.
(b) What are the general characteristics of alkaloids?
(c) Give two medicinal uses of each of the following :
(i) quinine
(ii) piperine
(iii) nicotine. **(4 + 3 + 3)**
17. (a) How is nicotine synthesised?
(b) Write the structure of Camphor and give any two uses.
(c) Give the synthesis of Zingiberene from methylheptenone. **(4 + 3 + 3)**
18. (a) Outline the synthesis of Congored.
(b) What is Saccharin? How is it synthesised? Mention its uses.
(c) Write the structure and uses of Bombykol. **(4 + 3 + 3)**
19. (a) Give the synthesis of Sulphanilamide and mention its uses.
(b) What are cosmetics? Mention their harmful effects.
(c) Explain the terms with an example
(i) pheromones
(ii) antioxidants. **(4 + 3 + 3)**
20. (a) Explain the terms :
(i) Auxochrome and
(ii) Mutarotation with suitable example.
(b) Name an antibiotic drug you have studied and write its structure and mention its uses.
(c) Describe the classification of dyes based on the method of application to fabric. **(4 + 3 + 3)**
21. (a) Explain the terms :
(i) Chemical shift
(ii) Spin-Spin splitting.
(b) Give any three applications of NMR spectroscopy.

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(c) Write the number of signals possible in the proton NMR spectra of the following and give their multiplicity :

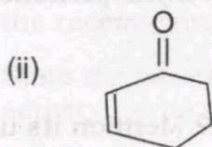
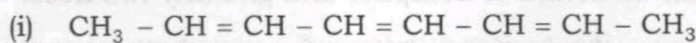
(i) Phenol



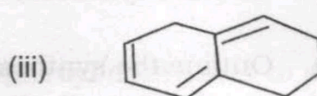
(4 + 3 + 3)

22. (a) What are the different types of modes of vibrations associated with bonds in a molecule? Write the classification in each type of vibration.

(b) Calculate the λ_{max} of



and



(c) Explain the terms :

(i) Nuclear shielding and

(ii) Bathochromic shift.

(4 + 3 + 3)

Fifth Semester B.Sc. Degree Examination, October/November 2019

(CBCS Scheme)

Chemistry

Paper VI (5.2) — PHYSICAL CHEMISTRY

Time : 3 Hours]

[Max. Marks : 90

Instructions to the Candidates :

- 1) The question paper has Two Parts, Part A and Part B
- 2) Answer Both the Parts.

PART – A

Answer any **TEN** of the following questions. Each question carries **2** marks : **(10 × 2 = 20)**

$$(h = 6.626 \times 10^{-34} \text{ JS}, c = 3 \times 10^8 \text{ ms}^{-1}, m_e = 9.11 \times 10^{-31} \text{ kg})$$

1. How can you justify the quantisation of energy for a particle in one dimensional box? **(2)**
2. What is the commutator of the two operators \hat{A} and \hat{B} ? What is its value when the operators commute? **(2)**
3. An electron is confined to an infinite one dimensional box of length 4×10^{-10} m. Calculate its energy in the fourth energy level. **(2)**
4. Write the expression for the angular and radial wave functions for hydrogen like particles. **(2)**
5. Write expression for ψ_{MO} and ψ_{+MO} for H_2^+ ion according to LCAO method. **(2)**
6. Write any two postulates of Molecular orbital theory. **(2)**
7. How many signals are observed in the PMR spectrum of ethyl alcohol? Indicate their multiplicity. **(2)**
8. Calculate the ESR frequency in a magnetic field of 3.5 T. Given $g = 2$ and $\mu_B = 9.273 \times 10^{-24} \text{ JT}^{-1}$. **(2)**

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9. Why N_2 molecule does not exhibit rotational spectrum but NO exhibit? (2)
10. What are
- (a) fundamental bands and
 - (b) hot bands. (2)
11. What happens to the quantum yield of photosynthesis of HCl, if the vessel contains traces of oxygen. Explain with reason. (2)
12. Calculate the value of Einstein corresponding to a radiation of wavelength 300 nm. (2)

PART - B

Answer any **SEVEN** of the following questions. Each question carries **10** marks ;
(7 × 10 = 70)

13. (a) Derive Schrodinger wave equation based on the postulates of quantum mechanics.
- (b) Let $\hat{A} = 4x^2$ and $\hat{B} = \frac{d}{dx}$ and $f(x) = ax^3$. Find $\hat{A}\hat{B}f(x)$ and $\hat{B}\hat{A}f(x)$.
- (c) Give the expression for a wave function of a particle in one dimensional box. Convert it into a normalized wave function. (4 + 3 + 3)
14. (a) Derive Heisenberg's uncertainty principle from the expectation values of x , x^2 , p_x and p_x^2 .
- (b) If \hat{A} and \hat{B} are two operators such that $[\hat{A}, \hat{B}] = 1$, show that $[\hat{A}, \hat{B}^2] = 2\hat{B}$.
- (c) Show that the square of the angular momentum (L^2) and its z-component (L_z) commute with each other. (Given -
- $[\hat{L}_x, \hat{L}_z] = i\hbar(L_y)$ and
- $[\hat{L}_y, \hat{L}_z] = i\hbar(L_x)$ and
- $[\hat{L}_z, \hat{L}_z] = 0$) (4 + 3 + 3)

15. (a) Solve the Schrodinger wave equation of a simple harmonic oscillator for θ (Theta) equation.
- (b) What is degeneracy? Calculate the degeneracy of the energy level with energy equal to $14h^2/8ma^2$.
- (c) Show that the function $\cos ax$ is an eigen function of $\frac{d^2}{dx^2}$. Find the corresponding eigen value. **(4 + 3 + 3)**
16. (a) Sketch the molecular orbital diagram of LiH molecule. Calculate its bond order.
- (b) Using LCA₀ approximation, write down the complete wave function for a heteronuclear diatomic molecule AB assuming that it has 85% covalent character and 15% ionic character.
- (c) Compare the main features of the valence bond theory with that of the molecular orbital theory. **(4 + 3 + 3)**
17. (a) Explain the mechanism of photochemical dissociation of HI.
- (b) Derive the expression for the operator $\left(\frac{d}{dx}x\right)^2$.
- (c) What is Zero point energy? What does it signify? **(4 + 3 + 3)**
18. (a) State the following with reference to rotational spectra
- energy expression
 - region of appearance
 - criterion
 - selection rule.
- (b) The separation of rotational spectral lines occurred at 332 m^{-1} for NO molecule. Calculate internuclear distance. (Given, $\mu_{\text{NO}} = 1.24 \times 10^{-26} \text{ kg}$; $h = 6.626 \times 10^{-34} \text{ JS}$).
- (c) Mention any three applications of rotational spectra. **(4 + 3 + 3)**
19. (a) Show that pure vibrational spectra consists of a single line of same frequency.
- (b) Vibrational rotational spectrum of HBr shows an absorption band centred at $2.652 \times 10^5 \text{ m}^{-1}$. Calculate the force constant and Zero point energy. (Given – $\mu = 1.653 \times 10^{-27} \text{ kg}$, $h = 6.627 \times 10^{-34} \text{ JS}$, $c = 3 \times 10^8 \text{ ms}^{-1}$).

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- (c) Calculate the total number of modes of vibrations for
- CO₂ and
 - H₂O molecules.
- Indicate how many of them are IR active. **(4 + 3 + 3)**
20. (a) Discuss the origin of Raman spectra. Explain the terms
- Rayleigh lines
 - Stokes lines.
- (b) State mutual exclusion rule. What are antistokes lines?
- (c) State Franck-condon principle. What are singlet and triplet states? **(4 + 3 + 3)**
21. (a) Explain fine splitting of proton NMR spectra in
- ClCH₂CH₂I and
 - CH₃CHO.
- (b) Give the hyperfine splitting of ESR spectrum of methyl radical ($\bullet\text{CH}_3$).
- (c) What is chemical shift? What are the scales used to measure it? How are they related? **(4 + 3 + 3)**
22. (a) Derive Beer-Lambert's law. What are its limitations?
- (b) A substance absorbs 2.6×10^6 quanta of radiation per second. 0.002 mol of substance undergoes chemical reaction in 1200 S. Calculate quantum efficiency.
- (c) What is photosensitization? Explain with an example. **(4 + 3 + 3)**



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V Semester B.Sc. Examination, Nov./Dec. 2013
(Semester Scheme)
CHEMISTRY
Paper – VI : Physical Chemistry

Time : 3 Hours

Max. Marks : 60

Instruction : The question paper has **two** Parts. **Both** the Parts should be answered.

PART – A

Answer **any six** of the following questions. **Each** question carries **two** marks. (6×2=12)

1. State Kohlrausch's law and give its mathematical equation.
2. Why CdCl_2 is chosen as an indicator electrolyte in the determination of transport number of H^+ ion in HCl.
3. Explain the effect of dilution on molar conductance.
4. What is buffer action ? Give an example for basic buffer.
5. State common ion effect. Give an example.
6. State law of photochemical equivalence.
7. What is zero point energy ? Give its significance.
8. Define the term magnetic susceptibility.
9. What are paramagnetic substances ? Give an example.
10. Calculate the force constant for stretching in HCl molecule, given the fundamental vibrational wave number is 288600 m^{-1} . The reduced mass of HCl is $1.62 \times 10^{-27} \text{ Kg}$.

P.T.O.



PART – B

Answer **any eight** of the following questions. **Each** question carries **six** marks. **(8×6=48)**

11. a) Sketch and explain conductometric titration of weak acid against strong base.
b) Mention any two limitations of Hydrogen gas electrode. **(4+2)**
12. a) Write a note on calomel electrode. What is its potential value if 0.1 m KCl solution is used ?
b) Calculate the free energy change for an electrochemical cell whose $E^\circ = 0.675$ v at 298 K ($n = 2$ and $F = 96500$) **(4+2)**
13. a) Explain how Glass electrode is used to determine the pH of the given solution.
b) Mention any two disadvantages of quinhydrone electrode. **(4+2)**
14. a) Describe an experiment to determine solubility of sparingly soluble salts using concentration cells.
b) Mention any two advantages of conductometric titrations. **(4+2)**
15. a) Derive an expression for pH of a acidic buffer.
b) Calculate the hydrolysis constant of 0.05 m ammonium cyanide solution at 298 K ($K_a = 4.0 \times 10^{-10}$, $K_b = 1.8 \times 10^{-5}$ and $K_w = 1.0 \times 10^{-14}$) **(4+2)**
16. a) Derive an expression for hydrolysis constant of a salt of weak acid and weak base.
b) Calculate the conductance ratio of NaCl if its molar conductance at 0.1 m concentration is $1.067 \times 10^{-2} \text{ sm}^2 \text{ mol}^{-1}$. **(4+2)**
17. a) i) Write Clausius-Mossotti equation and indicate the terms in it.
ii) State Curie-Weiss law.
b) What is meant by Induced dipole moment ? **(4+2)**



18. a) Write the differences between Raman spectra and IR spectra.
b) Hydrogen does not show rotational spectrum while HCl shows rotation spectrum. Give reason. (4+2)
19. a) Explain the origin of Stokes and Antistokes lines.
b) State Franck - Condon principle. (4+2)
20. a) The bond length of HF molecule is 0.092 nm. Calculate the wave number for the lines in rotational spectrum of HF molecule for the transitions $J = 0$ to $J = 1$, $J = 1$ to $J = 2$, Reduced mass of HF = 1.589×10^{-27} Kg, $h = 6.626 \times 10^{-34}$ JS $C = 3 \times 10^8$ ms⁻¹.
b) What is the selection rule for (i) rotational, (ii) vibrational transitions. (4+2)
21. a) Explain the terms with an example :
i) Chemiluminescence
ii) Bioluminescence.
b) What is photosensitization ? (4+2)
22. a) Explain the mechanism of photochemical combination of H₂ and Cl₂ and account for it's high quantum yield.
b) State Beer-Lambert's law. (4+2)
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V Semester B.Sc. Examination, Nov./Dec. 2016

(Semester Scheme)

CHEMISTRY – V

Organic Chemistry (Paper – V)

Time : 3 Hours

Max. Marks : 60

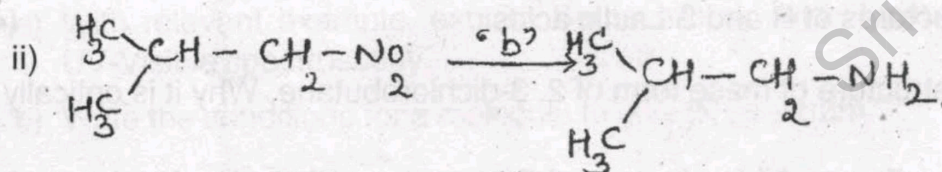
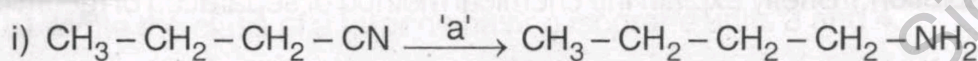
Instructions : 1) The question paper has **two** Parts, **both** the Parts should be answered.

2) Structures and equations are to be given **wherever** necessary.

PART – A

Answer **any six** of the following questions. **Each** question carries **two** marks. (6×2=12)

1. Define specific rotation. Give its expression.
2. Identify the number of asymmetric carbon atoms and number of optical isomers possible in 2, 3-dichlorobutane.
3. Identify the reagents 'a' and 'b' in the following reactions.



4. What is Chichibabin reaction? Write the reaction.
5. Write the Haworth's projection formulae of α -D-galactopyranose and β -D-galactopyranose.
6. State isoprene rule. Write the structure of menthol.
7. Define the terms wavelength and wavenumber of Electromagnetic Radiation (EMR).
8. What are equivalent and non-equivalent protons with reference to NMR spectroscopy?
9. What are mordant dyes? Give an example.
10. Classify the following drugs based on their therapeutic action :
Paracetamol, pentothal, sulphanilamide chloramphenicol.

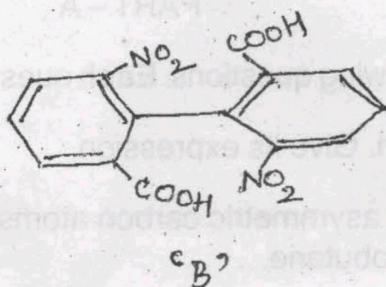
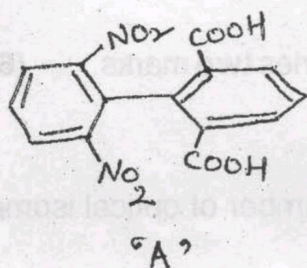
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PART - B

Answer any eight of the following questions. Each question carries six marks. (8×6=48)

11. a) What are enantiomers and diastereomers? Write the structures of optical isomers of tartaric acid and identify a pair of enantiomers and a pair of diastereomers.
- b) In the following two biphenyl derivatives, compound 'A' is achiral while compound 'B' is chiral. Give reasons. (4+2)

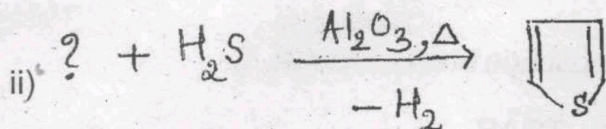
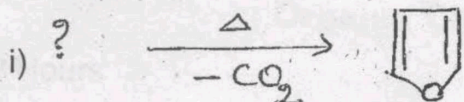


12. a) What is resolution? Briefly explain the chemical method of separation of racemic mixture.
- b) Write the structures of R and S Lactic acids. (4+2)
13. a) i) Write the structure of meso form of 2, 3-dichlorobutane. Why is it optically inactive?
- ii) What are erythro and threo isomers? Give an example for each.
- b) Which isomer is stable among cis and trans geometrical isomers? Give reasons. (4+2)
14. a) Outline the synthesis of primary amines by Gabriel synthesis.
- b) What is diazotisation reaction? Give an example. (4+2)
15. a) How do you prepare
- i) Chlorobenzene from aniline
- ii) P-hydroxy azobenzene from aniline.
- b) Write the uses of quinine and morphine. (4+2)



16. a) Explain the synthesis of indole by Fischer's indole method.

b) Write the structures of the reactants in the following :



(4+2)

17. a) Discuss the aromaticity of pyridine.

b) Write the structures of Nicotine and Hygrinic acid.

(4+2)

18. a) Describe the conversion of Glucose into Fructose.

b) What is glycosidic bond ? What type of glycosidic linkage is present in Maltose. (4+2)

19. a) Outline the synthesis of citral from methyl heptenone.

b) Write the class of a terpene having isoprene units 3 and 4. (4+2)

20. a) With relevant example, explain Bathochromic and Hypsochromic shifts in UV-Visible spectroscopy.

b) Write the conditions for a molecule to give IR spectrum. (4+2)

21. a) i) Give any two applications of IR spectroscopy.

ii) How do you distinguish ethanol and ethane by using NMR spectrum ?

b) What are soaps and detergents ? Give an example for each. (4+2)

22. Outline the synthesis of

a) Malachite green

b) Sulphanilamide.

(3+3)



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V Semester B.Sc. Examination, Nov./Dec. 2016
(Semester Scheme)
CHEMISTRY – VI
Physical Chemistry (Paper – VI)

Time : 3 Hours

Max. Marks : 60

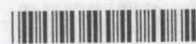
Instructions : The question paper has **two** Parts.
Both the Parts should be answered.

PART – A

Answer **any six** of the following questions. **Each** question carries **two** marks. (6×2=12)

1. Define molar conductance. How is it related to specific conductance ?
2. Why glass electrode cannot be used for the determination of pH of highly alkaline solution ?
3. How do you predict the spontaneity of any redox system using EMF value ?
4. Write the mathematical expression of Debye-Huckel Onsagar equation and explain the terms.
5. Using the relationship between solubility product and ionic product values, write the conditions for saturation and precipitation.
6. What is meant by induced polarization ?
7. State Beer-Lambert's law.
8. What do you understand by stretching and bending vibrations ?
9. Write selection rules for rotational and vibrational transitions in a diatomic molecule.
10. What is the role of mercury vapour in the dissociation of hydrogen molecule ?

P.T.O.



PART - B

Answer **any eight** of the following questions. **Each** question carries **six** marks. **(8×6=48)**

11. a) The specific conductance of a saturated solution of AgCl at 298K after subtracting the specific conductance of conductivity water is $2.28 \times 10^{-6} \text{ Sm}^2 \text{ mol}^{-1}$. Find the solubility product of AgCl at 298K ($\Lambda^{\circ}_{\text{AgCl}} = 138.3 \times 10^{-6} \text{ Sm}^2 \text{ mol}^{-1}$).
- b) What is meant by single electrode potential? Name any two factors that affect the magnitude of single electrode potential. **(4+2=6)**
12. a) Describe the moving boundary method of determining the transport number of an ion.
- b) A zinc electrode is placed in a 0.1 M solution of zinc sulphate at 298 K. Calculate the electrode potential of the electrode at 298 K, given that $E^{\circ}_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}$. **(4+2=6)**
13. a) Explain electrophoretic and asymmetric effects using Debye-Huckel theory of strong electrolytes.
- b) Calculate the EMF of the cell $\text{Zn}/\text{Zn}^{2+} (0.05 \text{ M}) // \text{Zn}^{2+} (0.25 \text{ M}) / \text{Zn}$ at 298 K. **(4+2=6)**
14. a) Derive an expression for the variation of electrode potential with concentration of the ions and temperature of the cell.
- b) Lithium ion is smaller in size compared to sodium/potassium ion, but has a low transport number? Give reasons. **(4+2=6)**
15. a) Derive an expression for the degree of hydrolysis of a salt of weak acid and weak base in terms of dissociation constants of weak acids and weak bases and ionic product of water.
- b) What is meant by buffer capacity and at what condition it will be maximum? **(4+2=6)**
16. a) Discuss the applications of dipole moment measurements.
- b) Benzene on nitration yields three different dinitrobenzenes with dipole moments i) 3.90 D ii) 0, iii) 6.0 D. Write the structures of the molecules in the given order. **(4+2=6)**



17. a) Calculate the pH of a solution of 0.01 M solution of ammonium chloride.
($K_b = 1.8 \times 10^{-5}$ and $K_w = 1.0 \times 10^{-14}$ at 298 K)
- b) Define the term polarisability of a molecule. (4+2=6)
18. a) Using the rotational energy equation for a diatomic molecule, show that the rotational spectral lines are equally spaced.
- b) State Franck-Condon principle. (4+2=6)
19. a) The fundamental vibrational frequency of HCl is 2890 cm^{-1} . Calculate the force constant of the molecule. The atomic masses are $^1\text{H} = 1.673 \times 10^{-27} \text{ Kg}$; $^{35}\text{Cl} = 58.06 \times 10^{-27} \text{ Kg}$.
- b) Sketch the normal modes of vibration in carbon dioxide molecule. Which of these are IR active ? (4+2=6)
20. a) Give the differences between IR and Raman spectra.
- b) Electronic spectra exhibit bands. Why ? (4+2=6)
21. a) Explain fluorescence and phosphorescence phenomena using Jablonski diagram.
- b) Why quantum yield in photodimerisation of anthracene is low ? (4+2=6)
22. a) Derive the mathematical expression of Beer-Lambert's law.
- b) State Curie-Weiss law. (4+2=6)

Fifth Semester B.Sc. Degree Examination, November 2017

(Semester Scheme)

Chemistry

Paper V – ORGANIC CHEMISTRY

Time : 3 Hours]

[Max. Marks : 60

Instructions to Candidates :

1. The question paper has two Parts A and B. Both the parts should be answered.
2. Equations and structures are to given wherever necessary.

PART – A

1. Answer any **SIX** of the following questions. Each question carries **2** marks.
(6 × 2 = 12)
1. What are diastereomers? Give example.
2. Explain plane of symmetry with suitable example.
3. Draw the two chair conformations of trans 1, 4 – dimethyl cyclohexane, compare their stability.
4. Between methylamine and dimethylamine which is more basic and why?
5. Pyridine is more basic than pyrrole. Why?
6. Write the Haworth structure of α -Lactose. Mention the glycosidic linkage.
7. Mention any two uses of each of (a) Atropine (b) Reserpine.
8. What is Chemical Shift? How is it expressed?
9. Mention any two applications of IR spectroscopy.
10. Mention the differences between soaps and detergents.

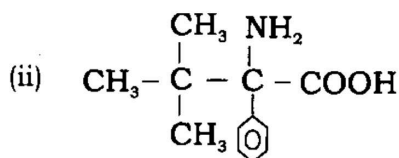
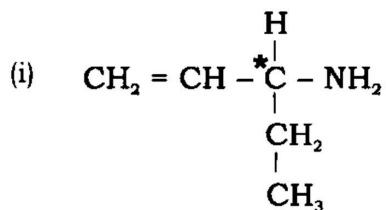
PART – B

II. Answer any **EIGHT** of the following questions. Each question carries **6** marks.

(8 × 6 = 48)

11. (a) Explain the necessary and sufficient conditions for a compound to exhibit geometrical isomerism.

(b) Assign R (or) S configuration for the following compounds. **(4 + 2)**



12. (a) What is racemisation? Explain the Bio-chemical method resolution of racemic mixture.

(b) Using any one method how do you show that maleic acid is the cis – isomer and fumaric acid is the trans isomer? **(4 + 2)**

13. (a) Explain the optical inactivity due to internal compensation and due to external compensation with suitable example.

(b) Write a note on optical isomerism exhibited by substituted biphenyls. **(4 + 2)**

14. Explain

(a) Hofmann's bromamide reaction

(b) Sandmaeyers reaction

(c) Carbylamine reaction. **(2 + 2 + 2)**

15. (a) How are primary, secondary and tertiary amines distinguished by using Hinsberg reagent?

(b) Describe Skrups synthesis of Quinoline. **(4 + 2)**

16. (a) Discuss the aromaticity of pyridine on the basis of Molecular orbital theory.
(b) Explain Diel's – Alders reaction of furan with maleic anhydride. (4 + 2)
17. (a) Describe the periodic acid method of determining the ring size of glucose molecule.
(b) What happens when isoquinoline on oxidation with alkaline potassium permanganate? (4 + 2)
18. (a) How does citral reacts with each of the following :
(i) Solid potassium bisulphate
(ii) Alkaline KMnO_4
(b) Outline the synthesis of α -terpineol by Diel's Alder's reaction method. (4 + 2)
19. (a) Describe the reaction which helps to locate the point of linkage between pyridine and pyrrolidine rings in nicotine.
(b) What are anomers? Give an example. (4 + 2)
20. (a) Calculate the number of stretching and bending modes of vibrations of (i) C_2H_2 (ii) CH_4 .
(b) What is meant by bathochromic shift and hypsochromic shift? (4 + 2)
21. (a) Outline the synthesis of pentathol.
(b) Write the structure of congored. Mention the chromophore and auxochrome present in it. (4 + 2)
22. (a) How many PMR signals are given by pure acetone and propane?
(b) Explain the mechanism of cleansing action of detergents.
(c) Outline the synthesis of Alizarin from Anthraquinone. (2 + 2 + 2)



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V Semester B.Sc. Examination, Nov./Dec. 2015

(Semester Scheme)

CHEMISTRY

Organic Chemistry (Paper – V)

Time : 3 Hours

Max. Marks : 60

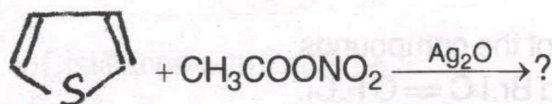
Instructions : 1) The question paper has **two** Parts, **both** the Parts should be answered.

2) Structures and equations are to be given **wherever** necessary.

PART – A

Answer **any six** of the following questions. **Each** question carries **two** marks : (6×2=12)

1. Define 'centre of symmetry' and 'alternating axis of symmetry'.
2. Explain how are the cis-trans isomers differentiated based on their physical properties.
3. What is Hofmann's bromamide reaction ? Give an example.
4. Complete the following reaction and name the product.



5. What is mutarotation ?
6. State isoprene rule. Write the structure of Limonene.
7. Give one use each of Morphine and Strychnine.
8. How do you distinguish between $\text{CH}_3 - \text{CO} - \text{CH}_3$ and $\text{H}_2\text{C} = \text{CHCOCH}_3$ using UV spectroscopy ?
9. What are Direct dyes ? Give an example.
10. Classify the following drugs based on combating pathogenic parasites :

Paracetamol, Chloramphenicol, Sulphanilamide, Ibuprofen.

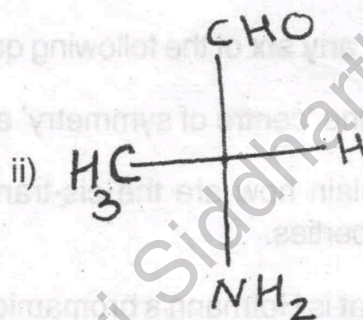
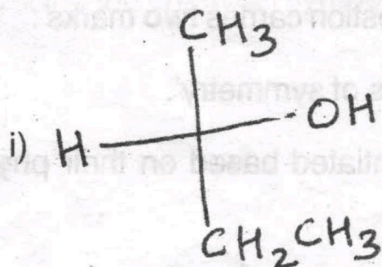
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PART - B

Answer any eight of the following questions. Each question carries six marks : (8×6=48)

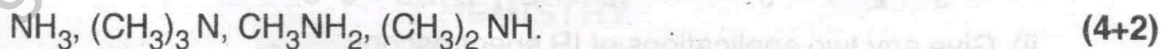
11. a) Draw the stereoisomeric forms of tartaric acid. Identify a pair of enantiomers and a pair of diastereoisomers.
- b) The presence of chiral centre is not an essential condition for a compound to exhibit optical isomerism. Justify the statement. (4+2)
12. a) How will you resolve racemic lactic acid into optically active forms ? Explain.
- b) Assign R and S configuration to the following : (4+2)



13. a) i) Differentiate between a meso compound and a racemic mixture.
- ii) Write the E and Z-configurations of the compounds, 1-bromo-2-chloroethene and Br.I C = C F.Cl.
- b) Draw the two chair conformations of trans-1,2-dimethyl cyclohexane. (4+2)
14. a) Explain Gabriel's synthesis of primary amines with an example.
- b) How do you distinguish between primary, secondary and tertiary amines using Hinsberg's test ? (3+3)
15. a) How do you prepare ?
- i) Thiophene from acetylene and
- ii) Furan from mucic acid.



b) Arrange the following amines in the decreasing order of base strength. Justify your answer.



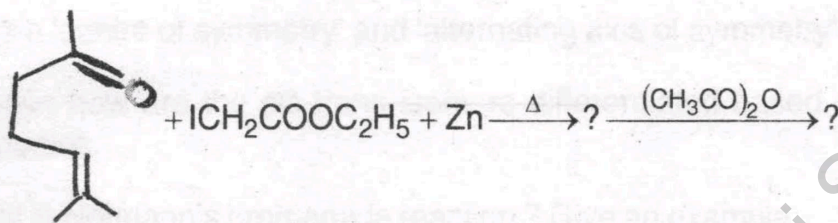
16. a) Outline Fischer's Indole synthesis.

b) Explain Chichibabin reaction of pyridine. (4+2)

17. a) Describe the periodic acid oxidation method of determining the ring size of glucose.

b) Write the Haworth structures of α - D - galactose and α - D - maltose. (4+2)

18. a) Complete the following sequence of reactions.



i) Hydrolysis $\rightarrow ?$

ii) Distillation with $\text{Ca}(\text{OH})_2$

b) How do you convert benzene diazonium chloride into bromo benzene ? Write equation. (4+2)

19. a) How do you convert Nicotine into Hygrinic acid ? Give equations.

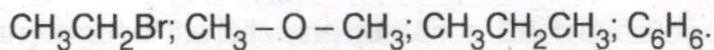
b) Write the structure of α - Terpeneol and indicate its asymmetric carbon atom. (4+2)

20. a) What are soaps and detergents ? Describe the mechanism of cleansing action of detergents.

b) Outline the synthesis of Paracetamol. (4+2)



21. a) i) Predict the number of NMR signals in the following compounds :



ii) Give any two applications of IR spectroscopy.

b) Explain the terms :

i) Chromophore

ii) Auxochrome with suitable examples. (4+2)

22. a) i) Explain briefly the principle of NMR spectroscopy.

ii) What are the different types of vibrations associated with bonds in a molecule ?

b) Outline the chemical synthesis of Congo Red. (4+2)

Fifth Semester B.Sc. Degree Examination, November 2017

(Semester Scheme)

Chemistry**Paper VI - PHYSICAL CHEMISTRY**

Time : 3 Hours]

[Max. Marks : 60

Instructions to Candidates :

- 1) The question paper has two Parts, A and B.
- 2) Answer both the parts.

 $(h = 6.626 \times 10^{-34} \text{ Js}; C = 3 \times 10^8 \text{ ms}^{-1}; F = 96500 \text{ C})$ **PART - A**Answer any **SIX** of the following questions. Each question carries **2** marks.**(6 × 2 = 12)**

1. Name the indicator electrolyte used in determining the transport number of H^{\oplus} in HCl and what is the criteria to select it.
2. 0.5 m solution of a salt placed between two electrodes which are at a distance of 20 cm with surface area 4.0 cm^2 has a resistance of 25 Ω . Calculate the conductivity of the solution.
3. What are concentration cells? Write the expression for emf of such cells.
4. An aqueous solution of Sodium Carbonate is basic to litmus. Explain using equation.
5. State Kohlrausch's law.
6. Write Clausius - Mossotti equation.
7. What is Raman Shift?
8. Sketch different modes of vibrations in a molecule of CO_2 and which of them is IR active?

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9. Calculate the value of Einstein corresponding to radiation of wavelength 280 pm.
10. What is meant by
- (a) Chemiluminescence
 - (b) Fluorescence

PART - B

Answer any **EIGHT** of the following questions. Each question carries **6** marks.
(8 × 6 = 48)

11. (a) How is equivalent conductance of a strong electrolyte determined by conductance method?
- (b) Specific conductance decreases but molar conductance of an electrolyte solution increases as concentration decreases. Give reason. **(4 + 2)**
12. (a) Explain :
- (i) Assymetry effect
 - (ii) Electrophoretic effect on the conductance of a solution.
- (b) In a moving boundary method, the boundary of 20 mol m^{-3} of NaCl moved a distance of $8 \times 10^{-2} \text{ m}$ when a current of $2 \times 10^{-2} \text{ A}$ was passed for 200 S. Calculate the transport number of Na^+ in NaCl if area of cross section of the glass tube used is $12 \times 10^{-6} \text{ m}^2$. **(4 + 2)**
13. (a) What are conductometric titrations? Discuss the variation of conductance when a weak acid is titrated with a strong base.
- (b) Calculate the molar conductance of acetic acid at infinite dilution at 298 K. Given : Molar conductivities of HCl, sodium acetate and Sodium chloride are 42.6×10^{-3} , 9.1×10^{-3} and $12.65 \times 10^{-3} \text{ Sm}^2 \text{ mol}^{-1}$ respectively at ∞ dilution. **(4 + 2)**
14. (a) Describe the construction and working of calomel electrode. How it is used in determining the pH of the solution.
- (b) What is red-OX potential? **(4 + 2)**
15. (a) What is salt hydrolysis? Derive the expression for the hydrolysis constant of a salt of weak acid and strong base.
- (b) Calculate the degree of hydrolysis of 0.1 M NH_4Cl solution at 298 K if $K_b = 1.8 \times 10^{-5}$; $K_w = 1 \times 10^{-14}$. **(4 + 2)**

16. (a) Explain the following with suitable example.
(i) Common ion effect
(ii) Solubility product
(b) What are buffer solutions? Write the expression for the pH of a buffer solution. **(4 + 2)**
17. (a) What is dipole moment? Taking one example for each explain how it is used to confirm.
(i) Geometry of a molecule
(ii) Isomerism of a molecule
(b) State Curie – Weiss Law. **(4 + 2)**
18. (a) Pure rotation spectrum of CO shows spectral lines with a spacing of 384.2 m^{-1} . Calculate the moment of inertia of CO molecule and the length of C–O bond. (Reduced mass of CO = $1.14 \times 10^{-26} \text{ kg}$)
(b) What is zero point energy? What does it signify? **(4 + 2)**
19. (a) What are Stokes and anti-Stokes lines? Explain how they are caused.
(b) State Franck – Condon Principle. **(4 + 2)**
20. (a) Show that the spectral lines of pure rotational spectrum of a diatomic molecule are equally spaced.
(b) Vibrational spectrum of HCl shows an absorption band centred at $3 \times 10^5 \text{ m}^{-1}$, calculate the force constant in HCl. **(4 + 2)**
21. (a) (i) What are paramagnetic substances?
(ii) State Stark – Einstein's law.
(b) What is Phosphorescence? **(4 + 2)**
22. (a) Explain the mechanism of photochemical combination of H_2 and Cl_2 and account for its high quantum yield.
(b) When a substance is exposed to radiation for a definite time 1.2×10^{20} molecules are reacted by absorbing 2.2×10^{16} photons during that time. Calculate the quantum yield. **(4 + 2)**



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V Semester B.Sc. Examination, November/December 2015
(Semester Scheme)

CHEMISTRY
Physical Chemistry (Paper – VI)

Time : 3 Hours

Max. Marks : 60

Instructions : 1) The question paper has **two** Parts. Answer **both** the Parts.
2) Figures and equations are to be given **wherever** necessary.

PART – A

Answer **any six** of the following. **Each** question carries **two** marks. **(6×2=12)**

1. Define the terms 'ionic mobility' and 'transport number'.
2. Mention the conditions for selecting an indicator electrolyte in the determination of transport number of an ion by moving boundary method.
3. Explain how does the conductance of HCl solution vary with the addition of NaOH.
4. Study the following reactions and fix the positions of the metals H, A and B in the increasing order of their reduction potential values in the electrochemical series. Justify your answer.
 - i) $A + H_2SO_4 \rightarrow ASO_4 + H_2$
 - ii) $B + H_2SO_4 \rightarrow \text{No reaction.}$
5. Calculate the pH of 0.05 M NH_4Cl solution at 298 K.
($K_b = 1.8 \times 10^{-5}$ and $K_w = 1.0 \times 10^{-14}$)
6. Why absorption spectra is preferred over emission spectra in the study of molecular spectra ?
7. The atomic masses of hydrogen and chlorine are 1.673×10^{-27} kg and 58.06×10^{-27} kg respectively. The average internuclear distance in HCl is 0.1275×10^{-9} m. Calculate the reduced mass and moment of inertia of HCl.

P.T.O.



8. What is meant by :

- i) Induced dipole moment.
- ii) Bond moment.

9. Why the quantum efficiency of some photochemical reactions is low ?

10. A substance absorbs 4.42×10^{18} quanta of radiations in 1300 sec. In the same time, 6.023×10^{20} molecules of the substance undergo chemical reaction. Calculate the quantum efficiency.

PART - B

Answer **any eight** of the following questions. **Each** question carries **six** marks. **(8×6=48)**

11. a) Specific conductance of an electrolytic solution decreases with dilution. Give reason.

b) A conductance cell has two parallel electrodes of area of cross section $1.3 \times 10^{-4} \text{ m}^2$ and 0.12 m apart when filled with 50 mol m^{-3} of an electrolyte solution, the resistance of the solution was found to be 1500 ohm. Calculate the cell constant, specific conductance and molar conductance. **(2+4)**

12. a) The ratio of the ionic mobilities of Ag^+ and NO_3^- is 0.9. Calculate the transport number of Ag^+ ion.

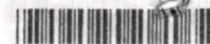
b) State Kohlrausch's law. How is this law useful in determining the molar conductance of a weak electrolyte at infinite dilution ? **(2+4)**

13. a) The transport number of cadmium ion in CdI_2 is abnormal at high concentrations. Give reason.

b) The standard reduction potentials of Cu^{2+}/Cu and Ag^+/Ag electrodes are 0.34 and 0.80 volts respectively. Construct a galvanic cell using these electrodes so that its standard emf is positive. For what concentration of Ag^+ will the emf of the cell at 298 K will be zero, if the concentration of Cu^{2+} is 0.01 M. **(2+4)**



14. a) A galvanic cell contains two hydrogen electrodes. The anode is in contact with a solution of 10^{-6} M H^+ ions. The emf of this cell is 0.118 V at 298 K. Calculate the concentration of H^+ ions at the cathode.
- b) With reference to the hydrogen electrode, answer the following.
- i) Why is the platinum foil coated with a layer of platinum black ?
 - ii) Write reactions that occur at this electrode.
 - iii) What is the potential of this electrode when it is dipped in a solution of pH 2.2 ?
 - iv) Write any two limitations of this electrode. (2+4)
15. a) Predict whether a precipitate of $PbCl_2$ be formed if 0.01 M $Pb(NO_3)_2$ solution and 0.01 M HCl are mixed (K_{sp} for $PbCl_2 = 1.6 \times 10^{-6}$).
- b) What is common ion effect ? How is the addition of ammonium chloride in Group III advantageous in qualitative analysis of basic radicals ? (2+4)
16. a) Explain photosensitization by taking an example.
- b) Derive a relationship between hydrolysis constant and degree of hydrolysis of a salt of strong acid and weak base. (2+4)
17. a) Mention any two applications of dipole moment.
- b) i) Name the different types of polarization a molecule undergoes in an electric field.
- ii) What are ferromagnetic substances ? Give examples.
 - iii) What is polarizability of a molecule ? (2+4)
18. a) i) State Grothus-Draper law.
- ii) Give an application of Beer-Lambert's law.
- b) i) Explain the following ;
- Magnetic permeability and magnetic susceptibility.
- ii) How are they related ? (2+4)



19. a) Write the expression for zero point energy. What does it signify ?
- b) i) The vibrational rotational spectrum of CO shows an absorption band centred at $2170 \times 10^2 \text{m}^{-1}$. Calculate the force constant
($C = 3 \times 10^8 \text{ms}^{-1}$; $\mu = 1.1387 \times 10^{-26} \text{kg}$)
- ii) What are hot bands ? (2+4)
20. a) Which of these molecules give pure rotational spectra and why ?
 H_2 , CO , N_2 and HBr .
- b) Show that in a rotational spectra of a molecule, the lines are at equidistant. (2+4)
21. a) Give any two advantages of Raman spectra over IR spectra.
- b) i) What are P, Q, R bands and overtones ?
- ii) What is the essential requirement for an electronic transition ? (2+4)
22. a) What is
- i) Spin multiplicity ii) Triplet state.
- b) A monochromatic radiation is incident on a solution of 0.05 M concentration of an absorbing substance, the intensity of the radiation is reduced to $\frac{1}{4}$ th of its initial value after passing through 10 cm length of the solution. Calculate the value of molar extinction coefficient and molar absorption coefficient. (2+4)