

# **BHAKTA KAVI NARSINH MEHTA UNIVERSITY**



**FACULTY OF SCIENCE**

## **Chemistry**

**B. Sc. SEMESTER – 2**

**Effective From June-2018**

**Bhakta Kavi Narsinh Mehta University**

**Junagadh-362263**

**Website: [www.bknmu.edu.in](http://www.bknmu.edu.in)**

**Subject: Chemistry**

**Faculty: Science**

**Semester: 2**

Sr. No	Level UG or PG	Sem	Course Group Core Elective-1 Elective-2 Allied /SEC/DSE	Course (Paper) Title	Paper No.	Credit	Teaching Hours	Internal Marks	External Marks	Practical internal Marks	Practical external Marks	Total Marks
1	UG	2	Core	Chemistry (Theory)	C-201	4	60	30	70	-----	-----	100
2	UG	2	Core	Chemistry (Practical)	C-202	2	-----	-----	-----	15	35	50

**BHAKTA KAVI NARSINH MEHTA UNIVERSITY**  
**B. Sc. SEMESTER – II**

**EFFECTIVE FROM JUNE-2018**

**C-201**

**4 CREDITS**

**UNIT – I: INORGANIC CHEMISTRY**

**[20 hours]**

**Chapter-1 Chemistry of Some Special Compounds of p block elements**

**[12 hours]**

Oxides and its Properties, Classification of oxides based on their chemical behavior and based on their oxygen content,

Study of the following compounds with emphasis on structure, bonding, preparation, properties and uses;

Borax, Boric acid, Boron nitrides, Borohydrides (diborane), Boron halide and Aluminum halide acidity comparison,

Oxides of nitrogen ( $N_2O$ ,  $NO$ ,  $N_2O_3$ ,  $NO_2$ ,  $N_2O_4$ ,  $N_2O_5$ ), Oxo acids of nitrogen ( $H_2N_2O_2$ ,  $HNO_2$ ,  $HNO_3$ ),

Oxo acids of Phosphorus ( $H_3PO_2$ ,  $H_3PO_3$ ,  $H_3PO_4$ ,  $H_3PO_5$ ,  $H_4P_2O_7$ ,  $H_4P_2O_8$ ,  $H_4P_2O_5$ ,  $H_4P_2O_6$ ,  $HPO_3$ ,  $(HPO_3)_3$  and  $(HPO_3)_n$ ,

Oxo acids of Sulphur (Sulphurous acid series, Sulphuric acid series, Thionic acid series, Peroxy acid series,

Oxo acids of halogen, Oxides of chlorine ( $Cl_2O$ ,  $ClO_2$ ,  $Cl_2O_6$ ,  $Cl_2O_7$ ) and oxide of iodine ( $I_2O_5$ ),

Inter-halogen compounds and Polyhalide ions,

Valence bond and VSEPR approach of following xenon compounds;

Oxides of xenon ( $XeO_3$ ,  $XeO_4$ ), Fluorides of xenon ( $XeF_2$ ,  $XeF_4$ ,  $XeF_6$ ), Oxy-fluorides of xenon ( $XeOF_4$ ,  $XeO_2F_2$ ,  $XeOF_2$ )

## **Chapter-2 Ionic solids**

**[8 hours]**

Introduction, characteristics of ionic solids,

Born Haber cycle and its application,

Lattice and Solvation energy and their importance in the context of stability and solubility of ionic compounds,

Max Born equation, limiting radius ratio,

Relation between radius ratio, co-ordination number and crystal structure,

Derivation of  $r^+/r^-$  ratio in triangular planar, square planar, body centered and tetrahedral crystal lattice,

Defects in ionic crystal lattice (stoichiometric and non-stoichiometric), study of N & P type of semi-conductor.

## **UNIT – II: ORGANIC CHEMISTRY**

**[20 hours]**

### **Chapter-3 Aliphatic Hydrocarbons-II**

**[06 Hours]**

Reactions of alkenes: Oxymercuration-demercuration, Hydroboration oxidation, Ozonolysis, Reduction (catalytic), Syn and anti-hydroxylation (oxidation), 1, 2- and 1,4 -addition reactions in conjugated dienes, Diels-Alder reaction.

Formation of alkynes: Dehydrohalogenation of vicinal and geminal dihalides, Dehalogenation of tetrahalides

Reactions of alkynes: Acidity, electrophilic addition reactions like halogenation, hydrohalogenation, hydration, hydroboration, addition of carbene and catalytic hydrogenation. Nucleophilic addition with hydrogen cyanide and alcohol, hydration to form carbonyl compounds, alkylation of terminal alkynes.

### **Chapter-4 Alicyclic compounds and conformations**

**[06 Hours]**

Introduction and classification of ring systems (Based on number of rings, size, number of carbon atom common between the two rings).

IUPAC nomenclature of cycloalkanes (including simple spiro compounds, fused ring and bridged ring systems-bicyclic only)

Method of preparation of small ring cycloalkanes:

Intra-molecular Wurtz' reaction, Simmons-Smith, Diels-Alder reaction.

Chemical Properties of Cycloalkanes: Substitution Reactions, Addition Reactions,

Baeyer's Strain Theory and its limitations (puckering).

Definition of conformations and factors affecting its stability,  
Conformation of ethane, propane and butane.

## **Chapter-5 Aromatic Hydrocarbons**

**[08 Hours]**

Aromaticity: Criteria for aromatic, non-aromatic and antiaromatic compounds, applications of Huckel's rule to simple annulene, cyclic carbocation/anion.

Electrophilic aromatic substitution reactions of benzene with mechanisms, theory of effect of substituents on reactivity and orientation (with resonating structures for activating and deactivating groups).

Electrophilic aromatic substitution reactions with mechanisms: Halogenation, nitration, sulphonation, Friedel-Crafts alkylation, Friedel-Crafts acylation.

### **UNIT – III: PHYSICAL CHEMISTRY**

## **Chapter-6 Ionic Equilibrium**

**[12 Hours]**

Types of electrolytes, degree of dissociation and factors affecting degree of dissociation,

Ionic product of water, dissociation constants of weak acids and bases,

Common ion effect and calculation of concentrations of  $\text{OH}^-$  ions ( $\text{NH}_4\text{Cl} + \text{NH}_4\text{OH}$ ) and  $\text{H}^+$  ions ( $\text{H}_2\text{S} + \text{HCl}$ ),

Solubility and solubility products of sparingly soluble salts,

Applications of solubility product principle (solubility, whether precipitate out, salt out, and inorganic qualitative analysis)

Hydrolysis of salts: Definition of hydrolysis of salts, Salts of strong acids and bases,

Relation among  $K_h$ ,  $K_a$ , or  $K_b$  and  $K_w$ ,

Degree of hydrolysis and pH of the solution of salts of weak acids and strong bases, salts of weak bases and strong acids and salts of weak bases and weak acids.

Buffer solutions: Definition and types of buffer solutions, Buffer action, Derivation of Henderson-Hasselbalch equation, Numerical

## Chapter-7 Solid State

[8 Hours]

Introduction, Crystalline and amorphous solid, Forms of solids (molecular, ionic, metallic and network solid) unit cells, crystal systems, Bravais lattices,

Laws of crystallography: (1) Law of Symmetry, (2) Law of constancy of interfacial angles and (3) law of rational indices,

Miller and Weiss indices.

Bragg's law, X-Ray diffraction methods: Rotating crystal method and Powder method. Structures of NaCl and KCl,

Density of unit cell,

Numerical based on Bragg's law, Miller indices and density.

## Reference books:

1. UGC Inorganic Chemistry - H. C. Khera ( PragatiPrakashan)
2. Inorganic Chemistry - J. N. Gurtu& H. C. Khera
3. Principles of Inorganic chemistry- B. R. Puri, L. R. Sharma and K. C. Kalia; Vallabh publications, Delhi.
4. Concise Inorganic Chemistry - J. D. Lee
5. Basic Inorganic Chemistry – Gurdeep & Chatwal.
6. Advanced Inorganic Chemistry - Raymond Chang
7. Advanced Inorganic Chemistry- Cotton and Wilkinson
8. Undergraduate Organic Chemistry, Vol-1, Jagdamba Singh, L. D.S. Yadav, PragatiPrakashan, 8th edition-2013
9. Organic Reaction Mechanism, including Reaction Intermediates, V. K. Ahluwalia, Ane's Chemistry active series.
10. Organic Chemistry, Vol-1, by Sultanat, Ane's Student Edition, Ane Book Pvt Ltd.
11. Organic Chemistry by Morrison and Boyd.
12. Organic Chemistry by Clayden.
13. March's Advanced Organic Chemistry Reactions, Mechanism and Structure by Michael B Smith and Jerry March.
14. Essentials of Physical Chemistry, B. S. Bahl, G. D. Tuli and Arun Bahl, S. Chand & Co. New Delhi.
15. Elements of Physical Chemistry, B. R. Puri, L. R. Sharma and Madan Pathania, Vishal Publishing Co. Jalandhar.
16. Physical Chemistry, B. K. Sharma, Goel Publication House. Meerut.
18. A text book of Physical Chemistry by Samuel Glasstone
19. Elements of Physical Chemistry by Samuel Glasstone and D Lewis

# BHAKTA KAVI NARSINH MEHTA UNIVERSITY

## B. Sc. SEMESTER – II

### CHEMISTRY PRACTICALS EFFECTIVE FROM JUNE-2018

**C-202**

**2 CREDITS**

**50 Marks**

**1. Qualitative analysis of inorganic salts: [20 Marks]**

**(Minimum 12 salts-containing two radicals)**

Inorganic salts containing anion (chloride, bromide iodide, nitrate, nitrite, sulphate, sulphite, sulphide, carbonate, phosphate (soluble & insoluble), oxide, chromate, and dichromate).

**2. Inorganic volumetric analysis [15 Marks]**

**(Standard solution should be given)**

- 1) Quantitative estimation of  $\text{Cu}^{2+}$  in a given  $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$  solution using 0.01M EDTA solution.
- 2) Quantitative estimation of  $\text{Ni}^{2+}$  in a given  $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$  solution using 0.01M EDTA solution.
- 3) Quantitative estimation of  $\text{Zn}^{2+}$  in a given  $\text{ZnCl}_2$  solution using 0.01M EDTA solution.
- 4) Determination of total hardness of water by EDTA.
- 5) Determination of acetic acid in a commercial vinegar using 0.1M NaOH solution.
- 6) Determination of alkali in antacid using 0.1M HCl solution.
- 7) Quantitative estimation of  $\text{Fe}^{2+}$  by dichromate method (Internal indicator method).

**3. Continuous internal assessment [15 Marks]**



**Bhakta Kavi Narsinh Mehta University,  
Junagadh**

**B. Sc. Examination  
Effective from June - 2018**

**Paper style New Course  
Subject: Chemistry**

**Total mark: 70**

**Time: 2:30 hours**

**All the questions are compulsory.**

- .....
- Q. 1 (a) Answer the following question. [UNIT-I] (4)**  
(1)
- Q. 1 (b) Answer any two questions out of three. [UNIT -I] (10)**  
(1)  
(2)  
(3)
- Q. 2 (a) Answer the following question. [UNIT-II] (4)**  
(1)
- Q. 2 (b) Answer any two questions out of three. [UNIT -II] (10)**  
(1)  
(2)  
(3)
- Q. 3 (a) Answer the following question. [UNIT-III] (4)**  
(1)
- Q. 3 (b) Answer any two questions out of three. [UNIT -III] (10)**  
(1)  
(2)  
(3)
- Q. 4 (a) Answer the following question. [FORM UNIT-I or II] (4)**  
(1)
- Q. 4 (b) Answer any two questions out of three. [ONE EACH FORM UNIT -I, II & III] (10)**  
(1)  
(2)  
(3)
- Q. 5 (a) Answer the following question. [FROM UNIT-II OR III] (4)**  
(1)
- Q. 5 (b) Answer any two questions out of three. [ONE Each from UNIT-I, II & III] (10)**  
(1)  
(2)  
(3)

**NOTE: Question no. 4-(a) & 5 (a) should not be asked from same unit**

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