BHAKTA KAVI NARSINH MEHTA UNIVERSITY

FACULTY OF SCIENCE

Chemistry

B. Sc. SEMESTER – 1

Effective From June-2018

Bhakta Kavi Narsinh Mehta University

Junagadh-362263

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BHAKTA KAVI NARSINH MEHTA UNIVERSITY
B. Sc. SEMESTER – I

EFFECTIVE FROM JUNE-2018

C-101

UNIT – I: INORGANIC CHEMISTRY

4 CREDITS
[20 hours]

Chapter-1 Atomic structure and Periodic properties [08 hours]

Basic concept of Wave particle duality of electron, De-Broglie's equation, Heisenberg's uncertainty principle, Schrödinger's wave equation and significance of ψ and ψ^2,

Quantum numbers, Shapes of orbital, Aufbau rule, Pauli's Principle, and Hund's rule for electron configuration,

Periodicity in atomic properties and its causes, Magic number, explanation of general trends of periodic properties: atomic radii (covalent, metallic and van der Walls radii), Ionic radii, ionization potential, electron affinity, electronegativity,

Calculation of Ionic radii by Pauling method and calculation of Electronegativity by Mullikan and Pauling method, Example based on de-Broglie's equation, Heisenberg's uncertainty principle, Ionic radii(Pauling method and Electronegativity),

Special characteristics such as metallic character, polarizing power, hydration energy, Inert pair effect, relative stability of different oxidation state, complex formation tendency of s and p – block elements, diagonal relationship of (1) lithium with magnesium (2) boron with silicon and (3) beryllium with aluminum, anomalous behavior of Li, Be and B, Catenation.

Chapter-2 Chemical bonding [12 hours]

Basics of Ionic bond, Covalent bond, Co-ordinate covalent bond and H- bond,

Valence Bond Theory; Covalent bond: Valence bond theory and its limitations,

Concept of hybridization: sp (C_2H_2 and $BeCl_2$), sp^2 (BF_3, C_2H_4), sp^3 (CH_4), sp^3d (PCl_5) and sp^3d^2 (SF_6),

Hybridization of elements involving π-bonds (SO_2, SO_3, XeO_3)

Stereochemistry of inorganic molecules: Sidgwick Powell rule and VSEPR theory,

Calculation of total electron pair, loan pair, bond pair in $SnCl_2$, SO_4^{-2}, I^{3-}, CO_3^{-2} (with Structure),

Basic concept of MO theory,

Bonding and anti-bonding molecular orbital, gerade and ungerade molecular orbital, σ-molecular orbital andσ*-molecular orbital, π- molecular orbital and π*- molecular orbital,

Conditions for effective combinations of atomic orbitals,

Energy level diagrams of B_2, C_2, N_2, O_2, F_2, CO, and NO with calculation of bond order and magnetic moment,

Comparison of MO theory and VB theory,

Intermolecular forces; H-bonds, Types and application of H-bond

UNIT – II: ORGANIC CHEMISTRY

[20 hours]

Chapter-3 Basic Organic Chemistry and introduction to stereochemistry

[12 hours]

Nomenclature of organic compounds (Acyclic and cyclic - IUPAC-1993)

Electronic displacements: Inductive effect, electromeric effect, mesomeric effect and hyper conjugation, Applications of inductive effect to bond length, dipole-moment, reactivity of alkyl halides, relative strength of acid, basicity of amines.

Homolytic and heterolytic fission, curly arrow rules,

Reaction intermediates: Carbocation, carbanion, free radical, carbenes and benzynes (Formation by cleavage type, structure, relative stabilities, generation) Types of organic reagents: Nucleophiles and electrophiles.

Types of organic reactions: Substitution, addition, elimination and rearrangement.

Introduction to Stereochemistry: Projection formulae and their interconversion: Fisher, sawhorse and Newmann, Definition of Configuration, Homomers, enantiomers and diastereomers, Geometrical isomerism: cis–trans, syn-anti, E/Z notations using CIP rules.

Chapter-4 Aliphatic Hydrocarbons-I and alkyl halides [08 hours]

Alkanes:Formation of alkanes by Wurtz reaction, Wurtz-Fittig reaction. Free radical substitutions reactions, Relative reactivity and selectivity in Halogenation and alkylhalides.

Reactions of alkylhalides:Nucleophilic substitution reaction mechanism (SN^1& SN^2) for alkyl halides

Hydrocarbons containing Carbon-Carbon π bonds:I
Formation of alkene by Elimination reactions, dehydration of alcohol, dehydrohalogenation of alkyl halide, dehalogenation of vicinal and germinal dihalides,
Mechanism of E1, E2, E1cb reactions,
Saytzeff and Hofmann eliminations,
Electrophilic addition reaction and its mechanism (Markownikov/ Anti Markownikovrule).

UNIT – III: PHSICAL CHEMISTRY

[20 hours]

Chapter-5 Chemical Kinetics [12 hours]

Concept of chemical kinetic: rate of chemical reaction, concentration dependence of reaction rate specific reaction rate constant, order and molecularityof the reaction, Factors affecting rate of the reaction.

Definition, derivation of integrated rate equations for zero, first and second (same and different reactants) order reactions, their characteristics and half -life periods. Determination of the order of reaction: (1) Hit and trial method (Integration method) and its limitations (2) Oswald's

isolation method (3) Half-life period method (4) Graph method and (5) van't Hoff differential method,

Concept of activation energy,

Derivation of Arrhenius equation and determination of activation energy by integrated equation and methods,

Theories of Reaction Rates: Collision theory and absolute reaction rate theory of bimolecular reactions and qualitative comparison and Numerical.

Chapter-6 Adsorption [04 hours]

Introduction, types of adsorption (physical and chemical), characteristics and factors affecting adsorption. Adsorption isotherm and Freundlich equation, Langmuir theory of adsorption: assumptions, derivation, modification in equation at very low and high pressure and applications of adsorption.

Chapter-7 Catalysis [04 hours]

Introduction, types of catalysis (homogeneous and heterogeneous),

Characteristics of catalysis, auto-catalysis, negative catalysis (Inhibitor), promoters, and catalytic poisoning,

Activation energy and catalysis, Theories of catalysis: (1) Intermediate compound formation and (2) adsorption theory, active centers,

Enzyme catalysis and its characteristics.

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 ArunBahl, S. Chand & Co. New Delhi.
15. Elements of Physical Chemistry, B. R. Puri, L. R. Sharma and MadanPathania, Vishal Publishing Co. Jalandhar.
16. Physical Chemistry, B. K. Sharma, Goel Publication House. Meerut.
17. Chemical Kinetics, G. R. Chatwal and Harish Mishra, 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 – I

CHEMISTRY PRACTICALS
EFFECTIVE FROM JUNE-2018

C-102

2 CREDITS
50 Marks

1. Organic qualitative analysis [20 Marks]

Compounds containing one functional group such as phenolic, carboxylic acid, ester, amide, nitro, amine, aldehyde, ketone, alcohol, halogen, anilide, carbohydrate and hydrocarbon.

For example; Benzoic acid, cinnamic acid, phenol, α-naphthol, β-naphthol, acetone, ethyl methyl ketone, methyl acetate, ethyl acetate, naphthalene, anthracene, aniline, nitrobenzene, benzamide, urea, thiourea, chloroform, acetanilide, carbon tetra chloride, chloro benzene, bromo benzene.

2. Volumetric analysis [15 Marks]

Part-1 Acid-base titration

a. To prepare a solution by dissolving 'x' g $NaHCO_3$ /Na_2CO_3 in 100 ml solution and determine its concentration in terms of normality and molarity using 0.1 N HCl solution.

b. To determine the normality, molarity and g/lit of NaOH and HCl using 0.1 N Na_2CO_3 solution.

c. To determine the normality, molarity and g/lit of each component in a given mixture of $NaHCO_3$ and Na_2CO_3 using 0.1N HCl solution.

Part-2 Redox titration

d. To determine the normality, molarity and g/lit of each component in a mixture of $H_2C_2O_4.2H_2O$ and H_2SO_4 using 0.1 N $KMnO_4$ and 0.1N NaOH solution.

e. To determine the normality, molarity and g/lit of each component in a mixture of $H_2C_2O_4.2H_2O$ and $K_2C_2O_4.H_2O$ using 0.1N NaOH and 0.1 N $KMnO_4$ solution

f. To determine the normality, molarity and g/lit of $KMnO_4$ and $FeSO_4.7H_2O$ solution using 0.1 N $H_2C_2O_4.2H_2O$ solution.

g. To determine the normality, molarity and g/lit of $FeSO_4$ $(NH_4)_2SO_4.6H_2O$ and $K_2Cr_2O_7$ solutions using 0.1 N $KMnO_4$ solution.

3. Continuous internal assessment [15 Marks]

BhaktaKaviNarsinh Mehta University, Junagadh

B. Sc. Examination **Paper style New Course**
Effective from June - 2018 **Subject: Chemistry**

Total mark: 70 **Time: 2:30 hours**

All the questions are compulsory.

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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.