KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ

Tele: 0836-2215224
e-mail: academic.st@kud.ac.in
Pavate Nagar,Dharwad-580003
ಪಾವಟೆ ನಗರ, ಧಾರವಾಡ – 580003

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'A' Grade 2014

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No. KU /Aca(S&T)/ RIH-290/CBCS/2020-21/ 315 Date: 13 AUG 2020

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2020–21ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್ ಸಿ.ಬಿ.ಸಿ.ಎಸ್. ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

ಉಲ್ಲೇಖ: 1. DO No. 1-1/2016(SECY), dt. 10.08.2016.
2. Academic Council Res. No. 2, 21.05.2020.
3. KU/Aca(S&T)/RIH-194/20-21/71, dt. 08.06.2020.
4. KU/VCS/2020-21, dt. 11.08.2020.
5. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ 13.08.2020.

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳಿಗೆ ಸಂಬಂಧಿಸಿದಂತೆ, 2020–21ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸಗಳ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್‌ಗಳಿಗೆ ಸಿ.ಬಿ.ಸಿ.ಎಸ್. ಮಾದರಿ ಪಠ್ಯಕ್ರಮವನ್ನು ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದನೆಯನ್ನು (Pending Approval of Academic Council Meeting) ನಿರೀಕ್ಷೆಯಲ್ಲಿರಿಸಿ ಅಳವಡಿಸಲಾಗಿದೆ.

ಮುಂದುವರೆದು, ಈ ಮೇಲಿನ ಸಿ.ಬಿ.ಸಿ.ಎಸ್. ಪಠ್ಯಕ್ರಮವು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಬಿತ್ತರಿಸಲಾಗಿದೆ ಎಂದು ಈ ಮೂಲಕ ತಿಳಿಸಲಾಗಿದೆ.

13/08/2020

(ಡಾ. ಹನುಮಂತಪ್ಪ ಕೆ.ಟಿ)
ಕುಲಸಚಿವರು

ಗೆ,
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ.

ಪ್ರತಿ ಮಾಹಿತಿಗಾಗಿ: ಡೀನರು, ಕಲಾ, ಸಮಾಜ ವಿಜ್ಞಾನ, ವಿಜ್ಞಾನ ಹಾಗೂ ತಂತ್ರಜ್ಞಾನ, ವಾಣಿಜ್ಯ, ಕಾನೂನು, ಶಿಕ್ಷಣ ಮತ್ತು ಮ್ಯಾನೇಜಮೆಂಟ್ ನಿಕಾಯ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

ಪ್ರತಿ:
1. ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕುಲಪತಿಗಳ ಕಾರ್ಯಾಲಯ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕುಲಸಚಿವರ ಕಾರ್ಯಾಲಯ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕುಲಸಚಿವರು(ಮೌಲ್ಯಮಾಪನ) ಕಾರ್ಯಾಲಯ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ನಿರ್ದೇಶಕರು, ಇಂಟರನೆಟ್ ಸೆಕ್ಷನ್, ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕವಿವಿ, ಧಾರವಾಡ.
5. ಅಧೀಕ್ಷಕರು, ಸಿಡಿಸಿ (ಸಂಯೋಜನೆ) ವಿಭಾಗ, ಕವಿವಿ, ಧಾರವಾಡ

Discipline Specific Course(DSC) under CBCS

B.Sc. Semester - I

CHEMISTRY: CHT: A

Credits: I. Theory	**: 04**	**Theory class 4hrs /wk. Total theory: 60 Lectures**
		80 marks for Sem end Examination(3 hrs) & 20 marks IA
II. Practical	**: 02**	**Practical: 4 hrs./wk. Total Practical: 52 hrs.**
		40 marks for Sem end Examination(3 hrs) & 10 marks IA
Total Credits	**: 06**	**Total Theory marks 100 and Practical marks 50**

Atomic Structure: Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure. What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2, Schrödinger equation for hydrogen atom. Radial and angular parts of the hydogenic wave functions (atomic orbitals) and their variations for 1*s*, 2*s*, 2*p*, 3*s*, 3*p* and 3*d* orbitals (Only graphical representation). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1*s* and 2*s* atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers m_l and m_s. Shapes of *s*, *p* and *d* atomic orbitals, nodal planes. Discovery of spin, spin quantum number (*s*) and magnetic spin quantum number (m_s).

Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations. **(14 Lectures)**

Chemical Bonding and Molecular Structure: Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Concept of resonance and resonating structures of NO_3^-, CO_3^{2-}, and SO_4^{2-}.

MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for *s-s*, *s-p* and *p-p* combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of *s-p* mixing) and heteronuclear diatomic molecules such as CO, NO and NO^+. Comparison of VB and MO approaches. **(16 Lectures)**

Fundamentals of Organic Chemistry: Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals. Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule. **(8 Lectures)**

Stereochemistry: Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (up to two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds. Threo and erythro; D and L; *cis* - *trans* nomenclature; CIP Rules: R/ S (for up to 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems). **(10 Lectures)**

Aliphatic Hydrocarbons

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Alkanes: (Up to 5 Carbons). Preparation*:* Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions*:* Free radical Substitution: Halogenation.

Alkenes: (Up to 5 Carbons) Preparation*:* Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition(alk. $KMnO_4$) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymercuration-demercuration, Hydroboration-oxidation.

Alkynes: (Up to 5 Carbons) Preparation: Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides. Reactions: formation of metal acetylides, addition of bromine and alkaline $KMnO_4$, ozonolysis and oxidation with hot alk. $KMnO_4$. **(12 Lectures)**

CHEMISTRY LAB: CHPr: A

1) Volumetric analysis – Meaning of terms such as standard solution, Normality, Molarity, Molality, Equivalent mass. Types of titrations, equations and indicator used in the titration. Calibration of glass wares (burette, pipette, volumetric flask) and weights (both grams and milligrams).Use of analytical balance.

2) Standardization of NaOH solution using standard oxalic acid solution and estimation of HCl in the given solution.

3) Standardization of HCl solution using standard sodium carbonate solution and estimation of total alkalinity or sodium carbonate and sodium bicarbonate in the given solution using double titration method.

4) Standardization of $KMnO_4$ solution using standard oxalic acid solution and estimation of Mohr's salt and water of crystallization in Mohr's salt.

5) Standardization of $K_2Cr_2O_7$ solution using standard Mohr's salt solution and estimation of ferrous and ferric ions in a given mixture.

6) Standardization of $Na_2S_2O_3$ solution using standard $K_2Cr_2O_7$ solution and estimation of iodine in the given solution.

7) Standardization of EDTA solution using standard $ZnSO_4$ solution and estimation of Zn^{2+} in the given solution.

8) Estimation of temporary, permanent and total hardness of water using standard EDTA solution.

9) Estimation of Phenol/Aniline by bromination method.

10) Estimation of acetamide by hydrolysis method.

11) Estimation of Ethyl benzoate by hydrolysis method.

12) Estimation of aspirin in the tablet by hydrolysis method.

- Standard solution for all the experiments shall be prepared by students for both regular practicals and examinations.

Note: There shall be instructions / training for the students about laboratory etiquettes, handling of reagents, laboratory safety measures, use of apparatus / instruments pertaining to the semester before commencement of the regular practicals. The same shall be recorded in the Journal.

Examination

In a batch of ten students, at least five different experiments may be given in the practical examination. Selection of experiments may be done by the students based on the picking up of chits. Viva questions may be asked on any of the experiments prescribed in the practical syllabus.

Distribution of Marks:

Accuracy for Standardization/blank titration - 09 marks , Accuracy for main titration 15 marks, Reactions and calculations – 4 marks, Technique and Presentation-2 marks, Journal-5 marks, Viva-Voce-5 marks, Total=40 marks.

Deduction of Marks for accuracy:

Standardization /blank titration: ±0.2 CC -09 marks, ± 0.4 CC- 07 marks, ±0.6 CC- 06marks, ±0.8 CC- 04 marks, above ±0.8 CC- zero marks.

Main titration: ±0.2 CC -15 marks, ± 0.4 CC- 12 marks, ±0.6 CC- 09 marks, ±0.8 CC- 06 marks, ±0.9 CC- 03 marks, above ±0.9 – zero marks.

Discipline Specific Course (DSC) under CBCS

B.Sc. Semester - II

CHEMISTRY: CHT: B

Credits: I. Theory	**: 04**	**Theory class 4hrs /wk. Total theory: 60 Lectures**
		80 marks for Sem end Examination(3 hrs) & 20 marks IA
II. Practical	**: 02**	**Practical: 4 hrs./wk. Total Practical: 52 hrs.**
		40 marks for Sem end Examination(3 hrs) & 10 marks IA
Total Credits	**: 06**	**Total Theory marks 100 and Practical marks 50**

Kinetic Theory of Gases: Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation. Deviation of real gases from ideal behavior, compressibility factor, causes of deviation. van der Waals equation of state for real gases. Boyle temperature (derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation (numerical problems). Andrews isotherms of CO_2. Maxwell Boltzmann distribution laws of molecular velocities and molecular energies (graphic representation – derivation not required) and their importance.

Temperature dependence of these distributions. Most probable, average and root mean square velocities and their comparisons. Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules. Viscosity of gases and effect of temperature and pressure on coefficient of viscosity (qualitative treatment only).

(8 Lectures)

Liquids: Surface tension and parachor and its applications. Determination of surface tension using stalagmometer (drop weight and drop number method). Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only). Refractive index and its determination by Abbe's refractometer(numerical problems).

(7 Lectures)

Solids: Forms of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types and identification of lattice planes. Laws of Crystallography - Law of constancy

of interfacial angles, Law of rational indices. Miller indices. X–Ray diffraction by crystals, Bragg's law. Structures of NaCl, KCl and CsCl (qualitative treatment only). Defects in crystals. Glasses and liquid crystals. **(7 Lectures)**

Chemical Kinetics: The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half–life of a reaction(numerical problems). Methods for determination of order of a reaction by half life period and differential equation method. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).

(8 Lectures)

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure

Aromatic hydrocarbons: *Preparation* (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. *Reactions*: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).

(8 Lectures)

Alkyl and Aryl Halides:

Alkyl Halides (Up to 5 Carbons): Types of Nucleophilic Substitution (S_N1, S_N2 and S_Ni) reactions. *Preparation:* from alkenes *and* alcohols. *Reactions:* hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs. substitution.

Aryl Halides *Preparation:* (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions. *Reactions (Chlorobenzene):* Aromatic nucleophilic

substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $NaNH_2/NH_3$). Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides. **(8 Lectures)**

Alcohols, Phenols and Ethers (Up to 5 Carbons)

Alcohols: *Preparation:* Preparation of 1^o, 2^o and 3^o alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters. *Reactions:* With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. $KMnO_4$, acidic dichromate, conc. HNO_3). Oppeneauer oxidation *Diols:* (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.

Phenols: (Phenol case) *Preparation:* Cumene hydroperoxide method, from diazonium salts. *Reactions:* Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer- Tiemann Reaction, Gattermann-Koch Reaction, Houben–Hoesch Condensation, Schotten – Baumann Reaction.

Ethers (aliphatic and aromatic): Cleavage of ethers with HI.

Aldehydes and ketones (aliphatic and aromatic): (Formaldehye, acetaldehyde, acetone and benzaldehyde) *Preparation:* from acid chlorides and from nitriles.

Reactions – Reaction with HCN, ROH, $NaHSO_3$, R-NH_2 derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-Pondorff Verley reduction.

(14 Lectures)

CHEMISTRY LAB: CHPr: B

1. Explanation regarding crystallization, fractional crystallization, sublimation, reflux, distillation, fractional distillation, distillation under reduced pressure , steam distillation and determination of melting point of the crystallized solid & boiling point of the liquid. (Students should write in the journal regarding the above).
2. Experiment No 2 to 7 : **Systematic qualitative analysis** of organic compounds (without preparation of the derivative).**The following any twelve compounds may be given**.

Phthalic acid, cinnamic acid, phenol, β- naphthol, aniline , p-toluidine, benzaldehyde, acetophenone, acetanilide , benzamide, thiourea, chlorobenzene, m-dinitro benzene, di-phenyl and ethyl acetate.

3. Experiment No 8 to 12: **Preparation of organic compounds.**
   i. Bromination – Phenol / aniline to 2,4,6-tribromo phenol/aniline or acetanilide to p-bromo acetanilide (any one).
   ii. Nitration – Salicylic acid to 5-nitro salicylic acid / acetanilide to p-nitro acetanilide (any one).
   iii. Dehydration – Phthalic acid to phthalic anhydride.
   iv. Hydrolysis - Benzamide to benzoic acid.
   v. Oxidation – Benzaldehyde to benzoic acid.
   vi. Reduction – m-dinitrobenzene to m- nitro aniline.

Note: There shall be instructions / training for the students about laboratory etiquettes, handling of reagents, laboratory safety measures, use of apparatus / instruments pertaining to the semester before commencement of the regular practicals. The same shall be recorded in the Journal.

Examination

In a batch of ten students, each student should perform qualitative analysis of organic compound and preparation of organic compound. Not more than 2 students should get the same experiment. Selection of experiments may be done by the students based on the picking up of chits. Viva questions may be asked on any of the experiments prescribed in the practical syllabus.

Distribution of Marks:

Journal – 05 marks , Viva-Voce-5 marks,(Total=40 marks.)

1. For Preparation Experiments (10 Marks):

Reaction and calculation of theoretical yield – 2 mark, technique and presentation-2 marks , observed yield -04 marks, M.P- 02 marks. Total – 10 marks.

Deduction of Marks:

Error yield- less than 10%- 04 marks, 11-15% 03 marks, 16-20% 02 marks, 21-25% 01 marks, more than 25% Zero marks

2. For qualitative analysis of organic compound(20 Marks)

Nature of the compound – 4 marks. element test – 4 marks, functional group and confirmative test – 05marks , melting point/ boiling point – 3 marks, name and structure-04 marks, Total -20marks.