UNIVERSITY OF MUMBAI

No. UG/73of 2018-19

CIRCULAR:-

Attention of the Principals of the affiliated Colleges and Directors of the recognized Institutions in Science & Technology Faculty is invited to this office Circular Nos. UG/156 of 2016-17, dated 16th November, 2016 relating to syllabus of the Bachelor of Science (B.Sc.) degree course.

They are hereby informed that the recommendations made by the Board of Studies in Chemistry at its meeting held on 28th May, 2018 have been accepted by the Academic Council at its meeting held on 14th June, 2018 **vide** item No. 4.41 and that in accordance therewith, the revised syllabus as per the (CBCS) for the Chemistry of T.Y.B.Sc. Physical Chemistry, Inorganic Chemistry, Organic Chemistry and Analytical Chemistry (Sem - V & VI) (3 and 6 Units) including Applied Component Drugs and Dyes, Heavy Fine Chemicals and Petrochemicals has been brought into force with effect from the academic year 2018-19, accordingly. (The same is available on the University's website www.mu.ac.in).

(Dr. Dinesh Kamble)
I/c REGISTRAR

MUMBAI – 400 032
6th ~~June~~ July, 2018

To

The Principals of the affiliated Colleges & Directors of the recognized Institutions in Science & Technology Faculty. (Circular No. UG/334 of 2017-18 dated 9th January, 2018.)

A.C./4.41/14/06/2018

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No. UG/ 73 -A of 2018 MUMBAI-400 032 6th ~~June~~ July, 2018

Copy forwarded with Compliments for information to:-

1) The I/c Dean, Faculty of Science & Technology,
2) The Chairman, Board of Studies in Chemistry,
3) The Director, Board of Examinations and Evaluation,
4) The Director, Board of Students Development,
5) The Co-Ordinator, University Computerization Centre,

(Dr. Dinesh Kamble)
I/c REGISTRAR

T.Y.B.Sc. CHEMISTRY (3 UNITS)
Choice Based Semester and Grading System
To be implemented from the Academic year 2018-2019

SEMESTER V

PHYSICAL CHEMISTRY

COURSE CODE: USCH501 CREDITS: 01 LECTURES: 30

UNIT	TOPIC	NO. OF Lectures
UNIT I	1.0 MOLECULAR SPECTROSCOPY	15L
	1.1 **Rotational Spectrum**: Introduction to dipole moment, polarization of a bond, bond moment, molecular structure, .Rotational spectrum of a diatomic molecule, rigid rotor, moment of inertia, energy levels, conditions for obtaining pure rotational spectrum, selection rule, nature of spectrum, determination of internuclear distance and isotopic shift. 1.2 **Vibrational spectrum**: Vibrational motion, degrees of freedom, modes of vibration, vibrational spectrum of a diatomic molecule, simple harmonic oscillator, energy levels, zero point energy, conditions for obtaining vibrational spectrum, selection rule, nature of spectrum. 1.3 **Vibrational-Rotational spectrum of diatomic molecule**: energy levels, selection rule, nature of spectrum, P and R branch lines. Anharmonic oscillator - energy levels, selection rule, fundamental band, overtones. Application of vibrational-rotational spectrum in determination of force constant and its significance. Infrared spectra of simple molecules like H_2O and CO_2. 1.4 **Raman Spectroscopy :** Scattering of electromagnetic radiation, Rayleigh scattering, Raman scattering, nature of Raman spectrum, Stoke's lines, anti-Stoke's lines, Raman shift, quantum theory of Raman spectrum, comparative study of IR and Raman spectra, rule of mutual exclusion- CO_2 molecule.	
UNIT II	2.0 CHEMICAL THERMODYNAMICS	10 L
	2.1.1**Colligative properties:** Vapour pressure and relative lowering of vapour pressure. Measurement of lowering of vapour pressure - Static and Dynamic method.	
	2.1.2 **Solutions of Solid in Liquid:** 2.1.2.1 Elevation in boiling point of a solution, thermodynamic derivation relating elevation in boiling point of the solution and molar mass of non-volatile solute.	

	2.1.2.2 Depression in freezing point of a solution, thermodynamic derivation relating the depression in the freezing point of a solution and the molar mass of the non-volatile solute. Beckmann Method and Rast Method.	
	2.1.3 **Osmotic Pressure :** Introduction, thermodynamic derivation of Van't Hoff equation, Van't Hoff Factor. Measurement of Osmotic Pressure - Berkeley and Hartley's Method, Reverse Osmosis.	
	2.2 CHEMICAL KINETICS	5 L
	2.2.1 **Collision theory of reaction rates** : Application of collision theory to 1. Unimolecular reaction Lindemann theory and 2. Bimolecular reaction. (derivation expected for both) 2.2.2 Classification of reactions as slow, fast and ultra -fast. Study of kinetics of fast reactions by Stop flow method and Flash photolysis (No derivation expected).	

References

1. Physical Chemistry, Ira Levine, 5th Edition, 2002 Tata McGraw Hill Publishing Co.Ltd.

2. Physical Chemistry, P.C. Rakshit, 6th Edition, 2001, Sarat Book Distributors, Kolkota.

3. Physical Chemistry, R.J. Silbey, & R.A. Alberty, 3rd edition , John Wiley & Sons, Inc [part 1]

4. Physical Chemistry, G. Castellan, 3rd edition, 5th Reprint, 1995 Narosa Publishing House.

6. Fundamental of Molecular Spectroscopy, 4th Edn., Colin N Banwell and Elaine M McCash Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2008.

7. Physical Chemistry, G.M. Barrow, 6th Edition, Tata McGraw Hill Publishing Co. Ltd. New Delhi.

8. The Elements of Physical Chemistry, P.W. Atkins, 2nd Edition, Oxford Universtity Press Oxford.

9. Physical Chemistry, G.K. Vemullapallie, 1997, Prentice Hall of India, Pvt.Ltd. New Delhi.

10. Principles of Physical Chemistry B.R. Puri, L.R. Sharma, M.S. Pathania, VISHAL PUBLISHING Company, 2008.

T.Y.B.Sc Physical Chemistry Practical

SEMESTER V

PHYSICAL CHEMISTRY

COURSE CODE: USCHP03 **CREDITS: 01**

Non-Instrumental

Chemical Kinetics

To determine the order between $K_2S_2O_8$ and KI by fractional change method.

Instrumental

Potentiometry

To determine the solubility product and solubility of AgCl potentiometrically using chemical cell.

pH-metry

To determine acidic and basic dissociation constants of amino acid and hence to calculate isoelectric point.

Reference books

1. Practical Physical Chemistry 3rd edition A. M. James and F.E. Prichard , Longman publication

2. Experiments in Physical Chemistry R.C. Das and B. Behra, Tata Mc Graw Hill

3. Experimental Physical Chemistry By V. D. Athawale.

SEMESTER VI

PHYSICAL CHEMISTRY

COURSE CODE: USCH601 CREDITS: 01 LECTURES: 30

UNIT I	1.1 ELECTROCHEMISTRY	7L
	1.1.1 **Activity and Activity Coefficient:** Lewis concept, ionic strength, Mean ionic activity and mean ionic activity coefficient of an electrolyte, expression for activities of electrolytes. Debye-Huckel limiting law (No derivation).	
	1.1.2 **Classification of cells:** Chemical cells and Concentration cells. Chemical cells with and without transference, Electrode Concentration cells, Electrolyte concentration cells with and without transference (derivations are expected),	
	1.2 APPLIED ELECTROCHEMISTRY	8L
	1.2.1 **Polarization**: concentration polarization and it's elimination	
	1.2.2 **Decomposition Potential and Overvoltage** : Introduction, experimental determination of decomposition potential, factors affecting decomposition potential. Tafel's equation for hydrogen overvoltage, experimental determination of over –voltage	
UNIT II	2.0 POLYMERS	15L
	2.1 **Basic terms :** macromolecule, monomer, repeat unit, degree of polymerization.	
	2.2. **Classification of polymers:** Classification based on source, structure, thermal response and physical properties.	
	2.3. **Molar masses of polymers:** Number average, Weight average, Viscosity average molar mass, Monodispersity and Polydispersity	
	2.4. **Method of determining molar masses of polymers :** Viscosity method using Ostwald Viscometer. (derivation expected)	
	2.5. **Light Emitting Polymers :** Introduction, Characteristics, Method of preparation and applications.	
	2.6. **Antioxidants and Stabilizers :** Antioxidants , Ultraviolet stabilizers, Colourants, Antistatic agents and Curing agents.	

Note : Numericals and Word Problems are Expected from All Units

Reference Books :

1. Physical Chemistry, Ira Levine, 5th Edition, 2002 Tata McGraw Hill Publishing Co.Ltd.

2. Physical Chemistry, P.C. Rakshit, 6th Edition, 2001, Sarat Book Distributors, Kolkota.

3. Physical Chemistry, R.J. Silbey, & R.A. Alberty, 3rd edition , John Wiley & Sons, Inc [part 1]

4. Physical Chemistry, G. Castellan, 3rd edition, 5th Reprint, 1995 Narosa Publishing House.

5. Modern Electrochemistry, J.O.M Bockris & A.K.N. Reddy, Maria Gamboa – Aldeco 2nd Edition, 1st Indian reprint,2006 Springer

7. Physical Chemistry, G.M. Barrow, 6th Edition, Tata McGraw Hill Publishing Co. Ltd. New Delhi.

8. The Elements of Physical Chemistry, P.W. Atkins, 2nd Edition, Oxford Universtity Press Oxford.

9. Physical Chemistry, G.K. Vemullapallie, 1997, Prentice Hall of India, Pvt.Ltd. New Delhi.

10. Principles of Physical Chemistry B.R. Puri, L.R. Sharma, M.S. Pathania, VISHAL PUBLISHING Company, 2008.

11. Textbook of Polymer Science, Fred W Bilmeyer, John Wiley & Sons (Asia) Ple. Ltd., Singapore, 2007.

12. Polymer Science, V.R. Gowariker, N.V. Viswanathan, Jayadev Sreedhar, New Age International (P) Ltd., Publishers, 2005.

T.Y.B.Sc Physical Chemistry Practical

SEMESTER VI

PHYSICAL CHEMISTRY

COURSE CODE: USCHP04 **CREDITS: 01**

Non-Instrumental

Viscosity

To determine the molecular weight of high polymer polyvinyl alcohol (PVA) by viscosity measurement.

Instrumental

Potentiometry

To determine the number of electrons in the redox reaction between ferrous ammonium sulphate and cerric sulphate potentiometrically.

Colorimetry

To estimate the amount of Fe(III) in the complex formation with salicylic acid by Static Method.

Reference books

1. Practical Physical Chemistry 3rd edition A.M.James and F.E. Prichard , Longman publication

2. Experiments in Physical Chemistry R.C. Das and B. Behra, Tata Mc Graw Hill

3. Experimental Physical Chemistry By V.D.Athawale.