



OFFICE OF THE REGISTRAR :: DIBRUGARH UNIVERSITY :: DIBRUGARH

Ref. No. DU/DR-A/131st AC/Syllabus-Ph.D.CW-Chemistry/2024/1204

Date: 21.06.2024

NOTIFICATION

As recommended by the Board of Studies in Chemistry and Joint Meeting (Special) of the Under Graduate Board (128th) and Post Graduate Board (155th), Dibrugarh University held on 06.06.2024, the 131st Meeting (Special) of the Academic Council, Dibrugarh University held on 13.06.2024 vide **Resolution No. 14** has approved the syllabus for paper-III (Guide specific Course) of Ph.D. Course Work in Chemistry with effect from the academic session 2023-2024.

The syllabus is attached herewith.

Issued with due approval.

Aleganta 21/06/2024
Deputy Registrar (Academic)
Dibrugarh University
phedi

Copy for kind information and necessary action to:

1. The Hon'ble Vice-Chancellor, Dibrugarh University.
2. The Deans, Dibrugarh University.
3. The Registrar, Dibrugarh University.
4. The Head, Department of Chemistry, Dibrugarh University.
5. The Controller of Examinations i/c, Dibrugarh University.
6. The Joint / Deputy Controller of Examinations – 'B', 'C' & 'A', Dibrugarh University.
7. The Programmer, Dibrugarh University with a request to upload the notification in the Dibrugarh University Website.
8. File.

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Ph.D. Course Work
Course-III
Molecular Solids and Magnetism (Optional)
Course Teacher: Dr. P. P. Mudoi
Marks 60 + 40 (Int. Ass) = 100

Unit I: Solid State

25

Crystalline solids, symmetry in crystal systems, point groups and space groups, space lattice and unit cell, Bravais lattice: crystal systems, lattice energy of an ionic crystal, law of rational indices, Miller indices, interplanar spacing in a crystal system, X-ray diffraction, Bragg equation, experimental methods: The rotating crystal and the powder (The Debye-Scherrer) techniques, X-ray diffraction pattern for a cubic system, X-ray diffraction pattern for tungsten crystal, Fourier synthesis of electron density in a crystal, Patterson synthesis, electron diffraction, neutron diffraction, Band theory of solids, energy band theory of conductors, semiconductors and insulators, superconductivity: LTSC and HTSC.

Unit II: *d* and *f* block elements:

20

Electronic states and terms for transition metals. Selection rules, Orgel diagram and Tanabe Sugano diagrams: application in transition metal electronic spectroscopy. Electronic spectra and structure, *d-d* and charge transfer transitions, spinel and perovskite structures: ABX₃ perovskite structure and magnetic properties.

Chemistry of lanthanides and actinides: electronic configuration, lanthanide contraction, magnetic and spectral properties of lanthanides and actinides, stability of lanthanide and actinide complexes.

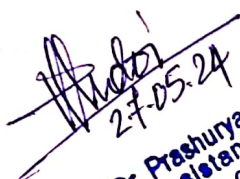
Unit III: Magnetism

15

Types of magnetic bodies (e.g. diamagnetic, paramagnetic, ferromagnetic and antiferromagnetic), antiferromagnetic coupling, magnetic properties based on crystal field theory: spin only magnetic moments, diamagnetic corrections, spin-state equilibrium in octahedral stereochemistry: cross-over region, quenching of orbital magnetic moment by crystal field, orbital contribution, effect of temperature on magnetic behaviour, magnetic exchange interactions: Goodenough-Kanamori rule, magnetic properties of octahedral, tetrahedral, tetragonally distorted octahedral and square planar complexes.

Reference Books:

1. B. R. Puri, L. R. Sharma, M. S. Pathania, *Principles of Physical Chemistry*.
2. W. Massa, *Crystal Structure Determination*, Berlin: Springer, 2004.
3. C. E. Housecroft, A. G. Sharpe, *Inorganic Chemistry*, Pearson Education.
4. R. J. D. Tilley, *Perovskites: Structure-Property Relationships*, John Wiley & Sons, Ltd., 2016.
5. R. L. Dutta and A. Syamal, *Elements of Magnetochemistry*.
6. M. Reis, *Fundamentals of Magnetism*. Elsevier, 2013.


27-05-24
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