School of Chemistry

Aims and Objectives: Session 2023-2024, Semester 2

CH1402: Inorganic and Physical Chemistry 1

Course Title: Properties of Solids

Duration: 6 lectures

Lecturer: Professor F. D. Morrison

Aims: To introduce the students to the basic concepts of the behaviour of solids. To understand the optical and magnetic properties of solids and to distinguish the different types of electrical/electronic behaviour in materials. To introduce the chemical principles which govern these differing types of behaviour and highlight a few uses of these properties in real-world situations.

Objectives:

1. **Introduction -** Overview of the different types of properties: thermal, magnetic, electrical and optical. To know the characteristics of each type of behaviour and have a feeling, in chemical terms, of the types of material having each property.

2. **Thermal Properties** - to understand the role of bonding in thermal properties such as thermal expansion and thermal conductivity.

3. **Magnetic Properties -** to understand the origin of magnetism and appreciate the types of magnetic behaviour such as ferro-, ferri-, antiferro-, and paramagnetic materials.

4. **Metals, Semiconductors and Insulators** - To understand the relation between the band theory of solids and the nature of the atomic orbitals. To be able to differentiate between metal, semiconductor and insulator band structures.

5. **Semiconductors** - To understand the concepts of n- and p-type doping. To be able to explain the temperature dependence of the number of carriers in extrinsic semiconductors. To be able to differentiate between intrinsic and extrinsic semiconductivity. Applications of semiconductors, *e.g.*, in transistors.

6. **Optical Properties –** To understand the optical properties of solids i.e. their interaction with light, as determined by bonding and their band structure.

Text: Materials Science and Engineering, W.D. Callister.