School of Chemistry

Aims and Objectives: Session 2023-2024, Semester 2

Module CH1402: Inorganic and Physical Chemistry 1

Course Title: Chemistry of the 3d Elements

Duration: 8 hours

Lecturer: Dr B. A. Chalmers

Aims: To introduce the chemistry of 3d elements with particular reference to trends along the series Sc-Zn and the types of compounds formed and properties thereof.

Objectives:

1. To describe the various types of ligands and coordination geometries in complexes and carry out a brief introduction to coordination chemistry.

2. To understand the basic ideas of crystal field theory and the removal of the
d-orbital energy degeneracy as a consequence of complexation of ligands to 3d metal centres and how this directs much of the chemistry of the 3d metal compounds across the series.

3. To understand the concept of high spin and low spin complexes and how we know these are formed *via* determining unpaired d-electron numbers from measurements of magnetic moments.

4. To understand the trends in accessible oxidation states; why high and variable in the first half (e.g. V, Mn), but low and restricted in the second half (e.g. Ni, Cu).

5. To understand the redox behaviour of oxidation states, define oxidising and reducing properties. Why are the lower states reducing over the first half becoming more stable, even oxidising, over the second half; i.e. Ti^{3+}_{aq} reduces water whereas Co^{3+}_{aq} oxidizes it.