Subject	Year	Term
Chemistry	13	4

Topic

5.3.1 Transition elements

Content (Intent)

Prior Learning (Topic) 1. Practical skills, 2.1 Atoms and reactions 2,2.1 (especially 2.1.5), 2.2.1 Electron structure, 3.2.2 Rates, 4.1.3 E/Z isomerism, 6.2.2 Chirality, 5.2.3 Redox

Properties

(a) the electron configuration of atoms and ions of the d-block elements of Period 4 (Sc–Zn), given the atomic number and charge (see also **2.2.1 d**)

(b) the elements Ti–Cu as transition elements i.e. d-block elements that have an ion with an incomplete d-sub-shell

(c) illustration, using at least two transition elements, of:

(i) the existence of more than one oxidation state for each element in its compounds **(see also 5.3.1 k)**

(ii) the formation of coloured ions **(see also 5.3.1 h, j–k)**

(iii) the catalytic behaviour of the elements and their compounds and their importance in the manufacture of chemicals by industry **(see 3.2.2 d)**

Ligands and complex ions

(d) explanation and use of the term ligand in terms of coordinate (dative covalent) bonding to a metal ion or metal, including bidentate ligands

(e) use of the terms complex ion and coordination number and examples of complexes with:

(i) six-fold coordination with an octahedral shape

(ii) four-fold coordination with either a planar or tetrahedral shape **(see also 2.2.2 g–h)**

(f) types of stereoisomerism shown by complexes, including those associated with bidentate and multidentate ligands:

(i) cis–trans isomerism e.g. $Pt(NH_3)_2Cl_2$ **(see also 4.1.3 c–d)**

(ii) optical isomerism e.g. $[Ni(NH_2CH_2CH_2NH_2)_3]^{2+}$ **(see also 6.2.2 c)**

(g) use of cis-platin as an anti-cancer drug and its action by binding to DNA preventing cell division

Ligand substitution

(h) ligand substitution reactions and the accompanying colour changes in the formation of:

(i) $[Cu(NH_3)_4(H_2O)_2]^{2+}$ and $[CuCl_4]^{2-}$ from $[Cu(H_2O)_6]^{2+}$

(ii) $[Cr(NH_3)_6]^{3+}$ from $[Cr(H_2O)_6]^{3+}$ **(see also 5.3.1 j)**

(i) explanation of the biochemical importance of iron in haemoglobin, including ligand substitution involving O_2 and CO

Precipitation reactions

(j) reactions, including ionic equations, and the accompanying colour changes of aqueous Cu^{2+}, Fe^{2+}, Fe^{3+}, Mn^{2+} and Cr^{3+} with aqueous sodium hydroxide and aqueous ammonia, including:

(i) precipitation reactions

(ii) complex formation with excess aqueous sodium hydroxide and aqueous ammonia

Redox reactions

(k) redox reactions and accompanying colour changes for:

(i) interconversions between Fe^{2+} and Fe^{3+}

(ii) interconversions between Cr^{3+} and $Cr_2O_7^{2-}$

(iii) reduction of Cu^{2+} to Cu^{+} and disproportionation of Cu^{+} to Cu^{2+} and Cu

(l) interpretation and prediction of unfamiliar reactions including ligand substitution, precipitation, redox.

Future Learning (Topic) 5.3.2 Qualitative analysis & 5.2.3 Redox titrations

How will knowledge and skills be taught? (Implementation)	How will your understanding be assessed & recorded (Impact)
Practical work Ligand substitution reactions Precipitation reactions Redox reactions **Written** Presentations Worked through examples Past paper question examples and answers Explanation of complex ion formation. Explanation of how ligand substitution is important in gaseous exchange.	- 1 x standard homework (Grade given. Written feedback. Response expected.) -1 x paper 1 (Grade given. Verbal feedback to class and individuals.)

How can parents help at home?

Look at the topic specific resources on the VLE
Use appropriate websites: MachemGuy, Allery Chemistry, Chemistry World – by Royal Society of Chemistry, ChemGuide.
Take an interest! Ask your children what they have learnt and be curious about their learning.

Helpful further reading/discussion

Reading	**Vocabulary Lists**	**Careers Links**
Text book: A level chemistry for OCR by Rob Ritchie and Dave Gent. Chapter 24 p.400-423 The Science of Everyday Life by Marty Jopson Why Chemical Reactions Happen by Keeler and Wothers	coloured ions catalysts incomplete d-sub-shell oxidation number ligand coordinate bond complex ion redox ligand substitution precipitation bidentate	Medicine Veterinary science Material science Biomedical sciences Environmental science Toxicologist Pharmacist Dentist Patent law Forensic science