

Subject	Year	Term
Chemistry	12	6
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		
Properties		
<p>(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)</p> <p>(b) the elements Ti–Cu as transition elements i.e. d-block elements that have an ion with an incomplete d-sub-shell</p> <p>(c) illustration, using at least two transition elements, of:</p> <ul style="list-style-type: none"> (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		
<p>(d) explanation and use of the term ligand in terms of coordinate (dative covalent) bonding to a metal ion or metal, including bidentate ligands</p> <p>(e) use of the terms complex ion and coordination number and examples of complexes with:</p> <ul style="list-style-type: none"> (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) <p>(f) types of stereoisomerism shown by complexes, including those associated with bidentate and multidentate ligands:</p> <ul style="list-style-type: none"> (i) cis–trans isomerism e.g. $\text{Pt}(\text{NH}_3)_2\text{Cl}_2$ (see also 4.1.3 c–d) (ii) optical isomerism e.g. $[\text{Ni}(\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2)_3]^{2+}$ (see also 6.2.2 c) <p>(g) use of cis-platin as an anti-cancer drug and its action by binding to DNA preventing cell division</p>		
Ligand substitution		
<p>(h) ligand substitution reactions and the accompanying colour changes in the formation of:</p> <ul style="list-style-type: none"> (i) $[\text{Cu}(\text{NH}_3)_4(\text{H}_2\text{O})_2]^{2+}$ and $[\text{CuCl}_4]^{2-}$ from $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ (ii) $[\text{Cr}(\text{NH}_3)_6]^{3+}$ from $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ (see also 5.3.1 j) <p>(i) explanation of the biochemical importance of iron in haemoglobin, including ligand substitution involving O_2 and CO</p>		
Precipitation reactions		
<p>(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:</p> <ul style="list-style-type: none"> (i) precipitation reactions (ii) complex formation with excess aqueous sodium hydroxide and aqueous ammonia 		
Redox reactions		
<p>(k) redox reactions and accompanying colour changes for:</p> <ul style="list-style-type: none"> (i) interconversions between Fe^{2+} and Fe^{3+} (ii) interconversions between Cr^{3+} and $\text{Cr}_2\text{O}_7^{2-}$ (iii) reduction of Cu^{2+} to Cu^+ and disproportionation of Cu^+ to Cu^{2+} and Cu <p>(l) interpretation and prediction of unfamiliar reactions including ligand substitution, precipitation, redox.</p>		

Future Learning (Topic) 5.3.2 Qualitative analysis & 5.2.3 Redox titrations**How will knowledge and skills be taught?
(Implementation)**

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.

How will your understanding be assessed & recorded (Impact)

- 1 x standard homework (Grade given.
Written feedback. Response expected.)

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**

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

Vocabulary Lists

coloured ions
catalysts
incomplete d-sub-shell
oxidation number
ligand
coordinate bond
complex ion
redox
ligand substitution
precipitation
bidentate

Careers Links

Medicine
Veterinary science
Material science
Biomedical sciences
Environmental science
Toxicologist
Pharmacist
Dentist
Patent law
Forensic science