

Topic 13: Periodicity (4 hours)

13.1 Trends across period 3

2 hours

	Assessment statement	Obj	Teacher's notes
13.1.1	Explain the physical states (under standard conditions) and electrical conductivity (in the molten state) of the chlorides and oxides of the elements in period 3 in terms of their bonding and structure.	3	Include the following oxides and chlorides. <ul style="list-style-type: none">• Oxides: Na₂O, MgO, Al₂O₃, SiO₂, P₄O₆ and P₄O₁₀, SO₂ and SO₃, Cl₂O and Cl₂O₇• Chlorides: NaCl, MgCl₂, Al₂Cl₆, SiCl₄, PCl₃ and PCl₅, and Cl₂
13.1.2	Describe the reactions of chlorine and the chlorides referred to in 13.1.1 with water.	2	

13.2 First-row d-block elements

2 hours

	Assessment statement	Obj	Teacher's notes
13.2.1	List the characteristic properties of transition elements.	1	Examples should include variable oxidation number, complex ion formation, existence of coloured compounds and catalytic properties.
13.2.2	Explain why Sc and Zn are not considered to be transition elements.	3	
13.2.3	Explain the existence of variable oxidation number in ions of transition elements.	3	Students should know that all transition elements can show an oxidation number of +2. In addition, they should be familiar with the oxidation numbers of the following: Cr (+3, +6), Mn (+4, +7), Fe (+3) and Cu (+1).
13.2.4	Define the term <i>ligand</i> .	1	
13.2.5	Describe and explain the formation of complexes of d-block elements.	3	Include [Fe(H ₂ O) ₆] ³⁺ , [Fe(CN) ₆] ³⁻ , [CuCl ₄] ²⁻ and [Ag(NH ₃) ₂] ⁺ . Only monodentate ligands are required.
13.2.6	Explain why some complexes of d-block elements are coloured.	3	Students need only know that, in complexes, the d sub-level splits into two sets of orbitals of different energy and the electronic transitions that take place between them are responsible for their colours.

13.2.7	State examples of the catalytic action of transition elements and their compounds.	1	<p>Examples should include:</p> <ul style="list-style-type: none"> • MnO_2 in the decomposition of hydrogen peroxide • V_2O_5 in the Contact process • Fe in the Haber process and in heme • Ni in the conversion of alkenes to alkanes • Co in vitamin B_{12} • Pd and Pt in catalytic converters. <p>The mechanisms of action will not be assessed.</p>
13.2.8	Outline the economic significance of catalysts in the Contact and Haber processes.	2	Aim 8