SS6

CHECK YOUR KNOWLEDGE AND UNDERSTANDING

This activity helps you to check your knowledge and understanding of the new topics that you have covered in this module.

Introduction

The checklist below covers the key points in **Chemical Storylines SS1** to **SS5**.

The statements listed correspond to learning outcomes in the specification for the A2 examinations. Remember that you may come back to some of these ideas in later modules.

You will probably have made summary notes of the main ideas that you have met. Now is a good time to make sure that your notes cover all the points you need. If you feel that you are not yet able to meet the requirements of all the statements in the list, you should look again at the areas concerned, seek help from your teacher if necessary and develop your notes accordingly.

Most of the points are covered in **Chemical Ideas**, with supporting information in **Chemical Storylines** or the activities. However, if the main source of information is in a storyline or an activity, this is indicated.

What you do

Read and think about each of the statements in the checklist. Put a tick in the column that best represents your current ability to do what is described.

A – I am confident that I can do this
B – I need help to clarify my ideas on this
C – I am not yet able to do this

You will be sharing this information with your teacher so that you can work together to improve your understanding.

At the end of Chemical Storylines SS1 to SS6 you should be able to:	A	B	C
• given the necessary information, describe and explain procedures for redox titrations and carry out non-structured calculations based on the results			
• given the necessary information, describe redox reactions of d-block elements in terms of electron transfer: – combining half-equations to give the overall equation for the reaction – recognising the oxidising and reducing agents – defining oxidation and reduction in terms of loss and gain of electrons			
• use systematic nomenclature to name and interpret the names of inorganic compounds [i.e. copper(II) sulfide, lead(II) nitrate(V), potassium manganate(VII)]			
• recall and explain the procedure for carrying out a redox titration involving manganate(VII) ions **Activity SS2**			
• describe the construction of simple electrochemical cells involving: – metal ion/metal half-cells – half-cells based on different oxidation states of the same element in aqueous solution with a platinum or other inert electrode, acidified if necessary **Activities SS3.1, SS3.2**			
• explain and use the term *standard electrode potential* • understand how a standard electrode potential is measured using a hydrogen electrode			
• explain the action of an electrochemical cell in terms of half-equations and external electron flow **Activity SS3.3**			
• use standard electrode potentials to: – calculate E_{cell} – predict the feasibility of redox reactions and understand that the rate of reaction may be an important factor in deciding whether the reaction actually takes place under standard conditions **Activity SS3.4**			
• describe rusting in terms of electrochemical processes involving iron, oxygen and water, and the subsequent reactions to form rust **Chemical Storylines SS3**			
• describe and explain approaches to corrosion prevention: – sacrificial protection by galvanising and use of zinc blocks – barrier protection using oil, grease, paint or a polymer coating **Chemical Storylines SS3**			

continued

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• describe and explain the issues involved in the recycling of iron and steel: – all steel packaging except aerosols can be recycled – cleaning by incineration – ease of sorting using magnetic properties – composition of new steel easily adjusted – scrap is used to adjust temperature of furnace **Chemical Storylines SS4**			
• given the necessary information, explain the chemical processes occurring during the extraction and purification of metals from their ores			
• use conventions for representing the distribution of electrons in atomic orbitals • write out the electronic configuration, using sub-shells and atomic orbitals, for atoms and ions of the first row of the d-block elements (and the main group elements up to krypton – synoptic) • recall that transition metals are d-block elements forming one or more stable ions which have incompletely filled d orbitals • use the electron configurations to explain the existence of variable oxidation states, in terms of the stability of d-orbital electron arrangements			
• explain the catalytic activity of transition metals and their compounds: – homogeneous catalysis in terms of variable oxidation states **Activity SS4.3** – heterogeneous catalysis in terms of the ability of transition metals to use (3)d and (4)s electrons of the atoms on the catalyst surface to form weak bonds to reactants			
• recall the common oxidation states of iron and copper and the colours of their aqueous ions • describe the colour changes in and write ionic equations for the reactions of: Fe^{2+}(aq), Fe^{3+}(aq) and Cu^{2+}(aq) ions with sodium hydroxide solution, and Cu^{2+}(aq) ions with ammonia solution **Activity SS4.1**			
• explain and use the terms: *ligand, complex/complex ion, ligand substitution,* recalling the formulae of the following examples of complex ions from the chemistry of: – iron: $[Fe(H_2O)_6]^{2+}$, $[Fe(H_2O)_6]^{3+}$ – copper: $[Cu(H_2O)_6]^{2+}$, $[Cu(NH_3)_4]^{2+}$, $[CuCl_4]^{2-}$ **Activity SS4.2**			
• use and explain the term *coordination number* • draw and name the shapes of complexes with coordination numbers 4 (square planar and tetrahedral) and 6 (octahedral)			
• describe the formation of complexes in terms of coordinate (dative) bonding between ligand and central metal ion • explain the terms *bidentate* and *polydentate* as applied to ligands, exemplified by ethanedioate and $edta^{4-}$			
• recall that the ions of transition metals in solution are often coloured and explain that this is because they absorb in specific parts of the visible spectrum and transmit the complementary frequencies			
• describe and explain a simple colorimeter, and use colorimetric measurements to determine the concentration of a coloured solution: – choose suitable filter/set wavelength – make up standard solutions of coloured solution – zero colorimeter with tube of water/solvent – measure absorbance of standard solutions – plot calibration curve – measure absorbance of unknown – read off concentration from calibration curve **Activity SS1.2**			

Synoptic statements The following statements describe the knowledge and understanding that you have covered in more detail in earlier modules, but that you have met or used again when studying **The Steel Story**. Check that you are confident about these learning outcomes – they may be assessed in the A2 examinations in questions that require you to *apply* your knowledge and understanding from different areas of the subject.	**A**	**B**	**C**
• use the concept of amount of substance to perform calculations involving: molecular formulae, masses of reagents, percentage yields, volumes of gases, volumes of solutions of known concentrations, balanced chemical equations			
• write and interpret balanced equations, including ionic, given the necessary information			
• given the necessary information, describe and explain procedures for acid–base titrations			
• given the necessary information, describe redox reactions of main group elements in terms of electron transfer: – assigning oxidation states – using half-equations to represent oxidation and reduction reactions **Chemical Ideas 9.1**			
• recall that the Periodic Table lists elements in order of atomic (proton) number and groups elements together according to their common properties; recall the classification of elements into s-, p- and d-blocks			
• recall and explain the relationship between the position of an element in the Periodic Table and the charge on its ions			
• recall the names and formulae of NO_3^-, SO_4^{2-}, CO_3^{2-}, OH^-, NH_4^+, HCO_3^- • write formulae for compounds formed between these ions and other given anions and cations			

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