Topic 3: Periodicity (6 hours)
TOK: The early discoverers of the elements allowed chemistry to make great steps with limited apparatus, often derived from the pseudoscience of alchemy. Lavoisier's work with oxygen, which overturned the phlogiston theory of heat, could be discussed as an example of a paradigm shift.
Int: The discovery of the elements and the arrangement of them is a story that exemplifies how scientific progress is made across national boundaries by the sharing of information.

3.1 The periodic table
1 hour

	Assessment statement	Obj	Teacher's notes
3.1.1	Describe the arrangement of elements in the periodic table in order of increasing atomic number.	2	Names and symbols of the elements are given in the *Chemistry data booklet*. The history of the periodic table will not be assessed. **TOK:** The predictive power of Mendeleev's periodic table could be emphasized. He is an example of a "scientist" as a "risk taker".
3.1.2	Distinguish between the terms *group* and *period*.	2	The numbering system for groups in the periodic table is shown in the *Chemistry data booklet*. Students should also be aware of the position of the transition elements in the periodic table.
3.1.3	Apply the relationship between the electron arrangement of elements and their position in the periodic table up to $Z = 20$.	2	
3.1.4	Apply the relationship between the number of electrons in the highest occupied energy level for an element and its position in the periodic table.	2	

3.2 Physical properties
2 hours

	Assessment statement	Obj	Teacher's notes
3.2.1	Define the terms *first ionization energy* and *electronegativity*.	1	
3.2.2	Describe and explain the trends in atomic radii, ionic radii, first ionization energies.	3	Data for all these properties is listed in the *Chemistry data booklet*. Explanations for the first four trends should be given in terms of

	electronegativities and melting points for the alkali metals (Li $\rightarrow$ Cs) and the halogens (F $\rightarrow$ I).		the balance between the attraction of the nucleus for the electrons and the repulsion between electrons. Explanations based on effective nuclear charge are not required.
3.2.3	Describe and explain the trends in atomic radii, ionic radii, first ionization energies and electronegativities for elements across period 3.	3	**Aim 7:** Databases and simulations can be used here.
3.2.4	Compare the relative electronegativity values of two or more elements based on their positions in the periodic table.	3	

3.3 Chemical properties

3 hours

	Assessment statement	Obj	Teacher's notes
3.3.1	Discuss the similarities and differences in the chemical properties of elements in the same group.	3	The following reactions should be covered. • Alkali metals (Li, Na and K) with water • Alkali metals (Li, Na and K) with halogens (Cl_2, Br_2 and I_2) • Halogens (Cl_2, Br_2 and I_2) with halide ions (Cl^-, Br^- and I^-)
3.3.2	Discuss the changes in nature, from ionic to covalent and from basic to acidic, of the oxides across period 3.	3	Equations are required for the reactions of Na_2O, MgO, P_4O_{10} and SO_3 with water. **Aim 8:** Non-metal oxides are produced by many large-scale industrial processes and the combustion engine. These acidic gases cause large-scale pollution to lakes and forests, and localized pollution in cities.