Y10 topic 1 C2 (b): Groups on the Periodic Table

Lesson sequence

1. Group 1
2. Group 7
3. Reactivity of halogens
4. Group 0

1. Group 1	
***Alkali metals**	The name of the metals in group 1 – lithium, sodium, potassium and so on.
***Group 1 symbols**	Li – lithium Na – sodium K – potassium
****Reaction of alkali metals with water**	Metal + water → metal hydroxide + hydrogen E.g: sodium + water → sodium hydroxide + hydrogen $2Na + 2H_2O \rightarrow 2NaOH + H_2$
****Lithium and water**	Lithium floats and bubble vigorously
****Sodium and water**	Sodium melts into a ball and moves around the surface bubbling vigorously.
****Potassium and water**	Potassium melts into a ball, catches fire (lilac) and moves around the surface bubbling vigorously.
***Group 1 reactivity**	Reactivity increases as you move down the group.
****Explaining group 1 reactivity**	When metals react they lose their outer electrons. Further down the group there are more shells of electrons so the outer electrons are less attracted to the nucleus and easier to remove.

2. Group 7	
***Halogens**	The names given to the non-metals in group 7 – fluorine, chlorine, bromine and iodine.
***Chlorine**	Cl_2. A pale green gas.
***Bromine**	Br_2. A red-brown liquid.
***Iodine**	I_2. A shiny purple-black solid.
****Reaction of halogens with metals**	Halogen + metal → metal halide E.g: Bromine + sodium → sodium bromide $Br_2 + 2Na \rightarrow 2NaBr$
****Reaction of halogens with hydrogen**	Halogen + hydrogen → hydrogen halide E.g: Chlorine + hydrogen → hydrogen chloride $Cl_2 + H_2 \rightarrow 2HCl$
***Hydrogen halides**	Hydrogen halides dissolve in water to form acids, for example hydrogen chloride makes hydrochloric acid.
***Chlorine test**	Chlorine gas turns damp blue litmus red then quickly bleaches it white.

3. Reactivity of halogens	
***Group 7 reactivity**	Reactivity increases as you go up the group.
****Explaining group 7 reactivity**	When non-metals react they complete their outer shells. Further up the group the elements have fewer shells so the nucleus attracts electrons more strongly.
****Displacement reactions**	Reactions in which a more reactive metal displaces a less reactive metal from a salt eg: *copper sulfate + zinc → zinc sulfate + copper* Does not work backwards as copper is less reactive than zinc.
****Displacement reactions of halogens**	A more reactive halogen displaces a less reactive halide ion by taking its electrons. E.g: bromine + sodium iodide → iodine + sodium bromide
*****Redox reactions of halogens**	The more reactive halogen oxidises the less reactive halide by taking its electrons. The more reactive halogen is reduced. E.g: $Br_2 + 2I^- \rightarrow 2Br^- + I_2$

4. Group 0	
***Noble gases**	The name given to the non-metals in group 0 – helium, neon, argon, krypton and xenon.
***Melting point of noble gases**	They are all gases at room temperature but the melting and boiling point increase down the group.
***Reactivity of group 0**	The noble gases do not (easily) do any reactions – they are inert.
****Explaining reactivity of group 0**	When elements react they try to complete their outer shells. Because group 0's outer shells are already complete, they do not react.
****Uses of noble gases**	-Helium is used in airships because it is inert and has low density - Argon is used in fire extinguishers because it is inert and denser than air. - Neon is used in lighting because it glows red when electricity is passed through it.