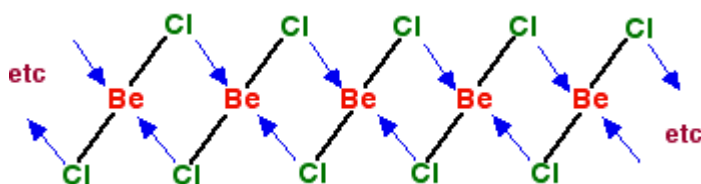


Chemguide – questions

GROUP 2: THE ATYPICAL PROPERTIES OF BERYLLIUM COMPOUNDS

- This question is about beryllium chloride.
 - The other chlorides in the group are ionic solids. Explain why beryllium chloride isn't ionic.
 - Beryllium chloride boils at a much lower temperature than the other Group 2 chlorides, and in the gas exists as a simple covalent molecule, BeCl_2 . This is said to be *electron deficient*. Draw a simple dots-and-crosses diagram (outer electrons only) of BeCl_2 to explain what that means.
 - The melting point of beryllium chloride is much too high for it to exist as simple BeCl_2 molecules in the solid. Instead its structure is polymeric, and looks like this:



Explain carefully what this means.

- Beryllium chloride reacts with water in a vigorously exothermic way that is typical of covalent chlorides. The reaction produces a colourless acidic solution, and you usually get steamy fumes of hydrogen chloride formed. In the first instance you get $[\text{Be}(\text{H}_2\text{O})_4]^{2+}$ and Cl^- ions.

Explain why you are likely to get fumes of hydrogen chloride produced.
- This question is about the coordination number in the complex that beryllium forms with water molecules, $[\text{Be}(\text{H}_2\text{O})_4]^{2+}$. This compares with the complex formed by magnesium which is $[\text{Mg}(\text{H}_2\text{O})_6]^{2+}$.

By considering the way that the water molecules bind to the beryllium or magnesium, describe briefly why the beryllium complex ion is 4-coordinated whereas the magnesium one is 6-coordinated.
 - This question is about the amphoteric nature of beryllium hydroxide. What do you understand by the term *amphoteric*?
 - Unlike, say, calcium hydroxide, beryllium hydroxide isn't ionic. Instead, it is a neutral insoluble complex with the formula $\text{Be}(\text{H}_2\text{O})_2(\text{OH})_2$ produced by adding sodium hydroxide solution to a solution containing the complex ion $[\text{Be}(\text{H}_2\text{O})_4]^{2+}$. Explain what happens during the formation of the neutral complex.
 - Write equations to show the reactions between the neutral complex and
 - hydrogen ions
 - hydroxide ions.