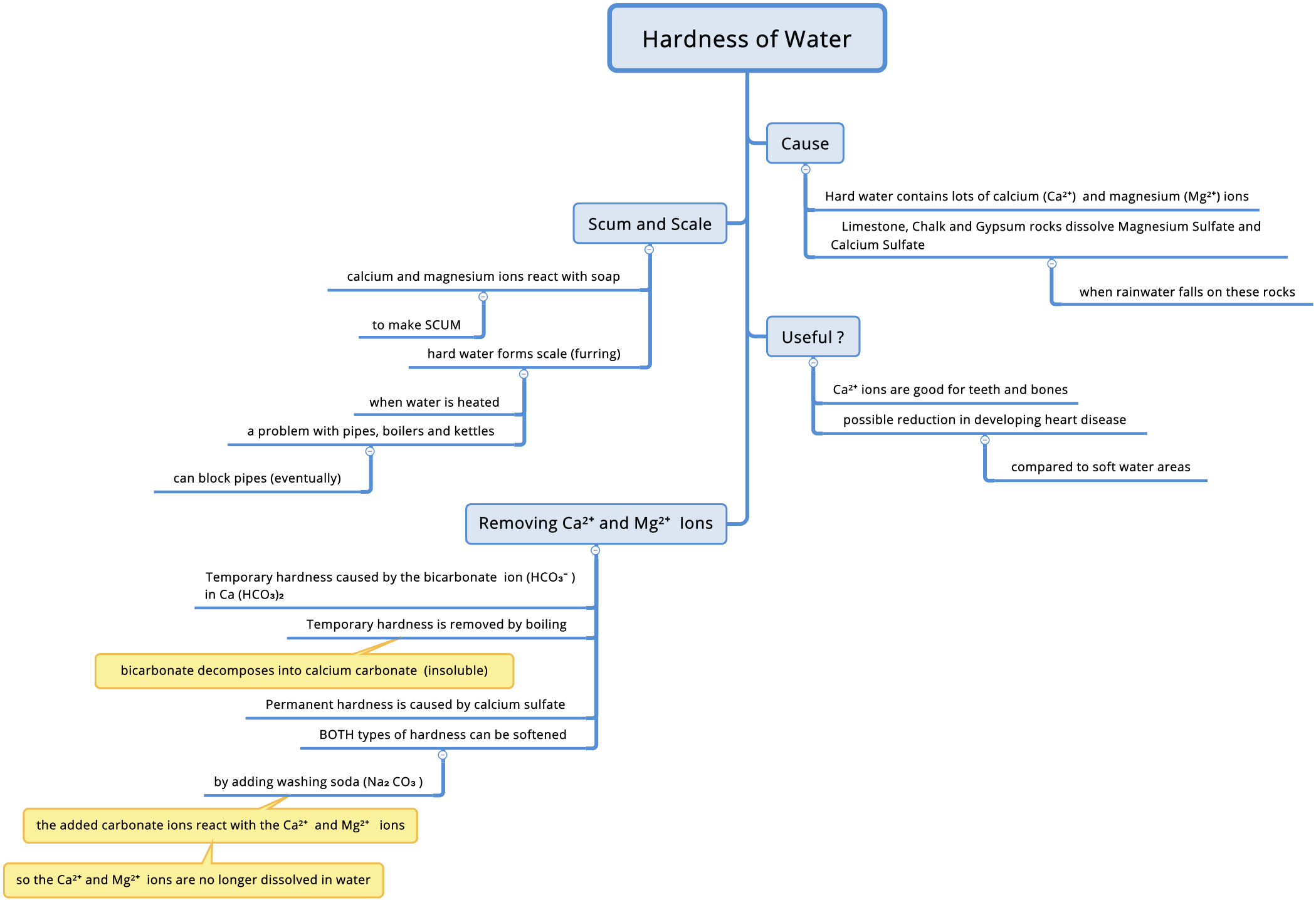
Hardness of Water
Cause
Hard water contains lots of calcium (Ca^{2+}) and magnesium (Mg^{2+}) ions
Limestone, Chalk and Gypsum rocks dissolve Magnesium Sulfate and Calcium Sulfate
when rainwater falls on these rocks
Scum and Scale
calcium and magnesium ions react with soap
to make SCUM
hard water forms scale (furring)
when water is heated
a problem with pipes, boilers and kettles
can block pipes (eventually)
Useful ?
Ca^{2+} ions are good for teeth and bones
possible reduction in developing heart disease
compared to soft water areas
Removing Ca^{2+} and Mg^{2+} Ions
Temporary hardness caused by the bicarbonate ion (HCO_3^-) in $Ca(HCO_3)_2$
Temporary hardness is removed by boiling
bicarbonate decomposes into calcium carbonate (insoluble)
Permanent hardness is caused by calcium sulfate
BOTH types of hardness can be softened
by adding washing soda (Na_2CO_3)
the added carbonate ions react with the Ca^{2+} and Mg^{2+} ions
so the Ca^{2+} and Mg^{2+} ions are no longer dissolved in water