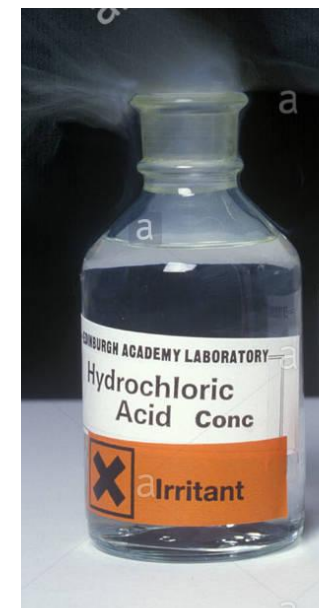


Hydrochloric acid

HCl

Physical properties

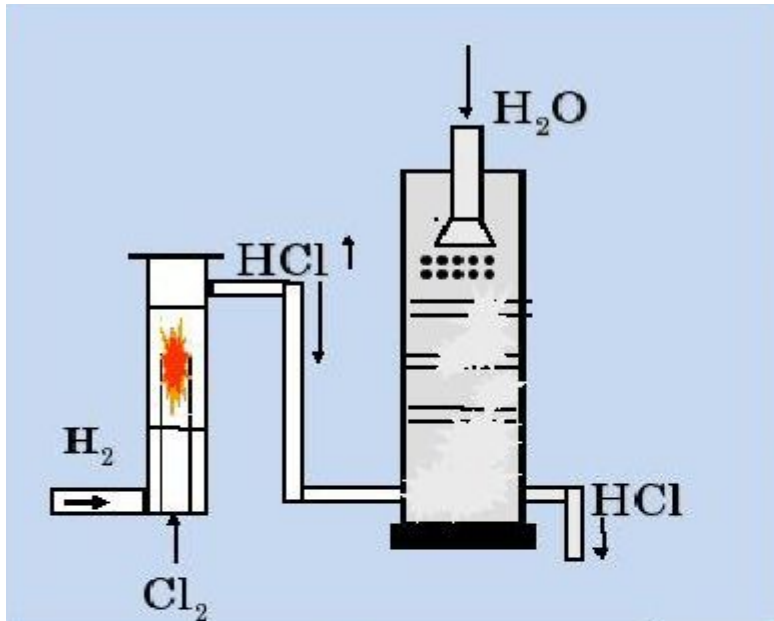
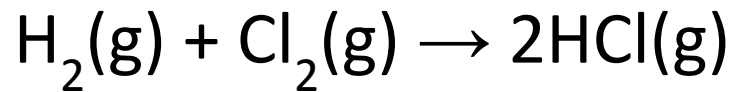
- Hydrogen chloride is a gas with an irritating odour.
- An aqueous solution of HCl is called hydrochloric acid.
- The concentrated HCl used in the laboratories is 36 %. It is a colourless acid with a sharp odour. It fumes in moist air and hydrogen chloride, gas is evolved.



Production

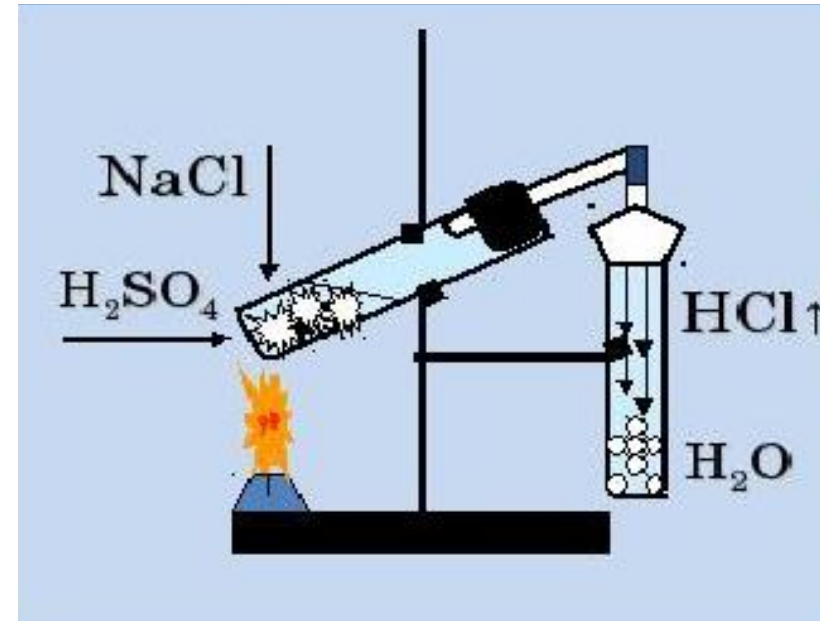
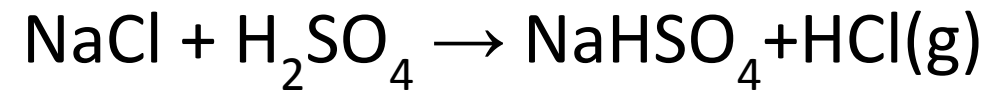
In industry

- It is formed by the reaction of chlorine with hydrogen:



In lab

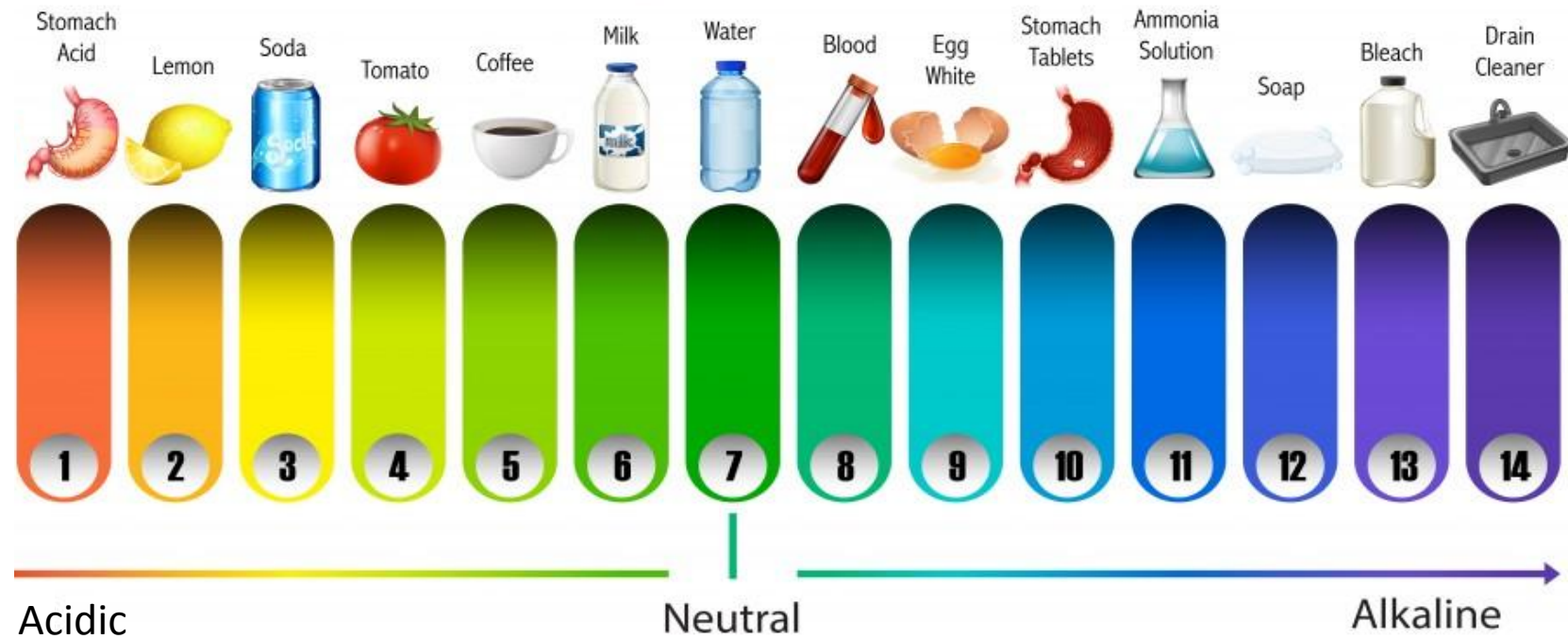
- It is formed by the reaction of NaCl with H_2SO_4 :



Chemical properties

- 1. It reacts with bases to give neutralization reactions:
- $\text{HCl}(\text{aq}) + \text{KOH}(\text{aq}) \rightarrow \text{KCl}(\text{aq}) + \text{H}_2\text{O}(\text{l})$

The pH Scale



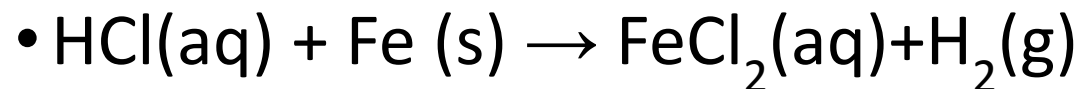
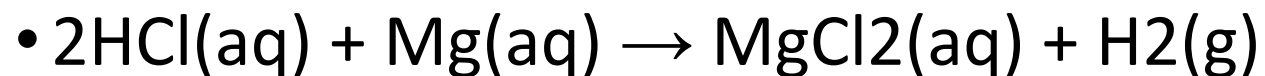
Chemical properties (qualitative reaction)

- 2. It reacts with AgNO_3 , and a white precipitate is formed:
- $\text{HCl}(\text{aq}) + \text{AgNO}_3(\text{aq}) \rightarrow \text{AgCl}(\text{s}) + \text{HNO}_3(\text{aq})$



Chemical properties

- 3. HCl reacts with active and medium active metals to produce the chloride salts and H₂ gas.



• Li K Ba Ca Na Mg Al Mn Zn Cr Fe Co Ni Sn Pb (H) Cu Ag Hg Pt Au

Chemical properties

- 4. It reacts with oxidizing agents such as KMnO_4 to produce $\text{Cl}_2(\text{g})$:
- $16\text{HCl}(\text{aq}) + 2\text{KMnO}_4(\text{aq}) \rightarrow 2\text{KCl}(\text{aq}) + 2\text{MnCl}_2(\text{aq}) + 5\text{Cl}_2(\text{g}) + 8\text{H}_2\text{O}(\text{l})$

How to solve problems? (5 steps)

1. Write down the reaction
2. Balance it
3. Find the mole
4. Find mole of another compound by proportion (you will need coefficients)
5. Find mass, volume etc

Problems

- What is the number of moles of Cl_2 required to produce 146 g HCl?

Problems

- A 30 g sample of iron reacts with 200 g of 14.6% HCl solution by mass, in order to produce iron (II) chloride and hydrogen gas. What is the percentage of iron in the sample?

Finish the reactions

- $\text{Fe}(\text{OH})_3 + \text{HCl} \rightarrow$
- $\text{Ca} + \text{HCl} \rightarrow$
- $\text{Ag} + \text{HCl} \rightarrow$
- $\text{MgCO}_3 + \text{HCl} \rightarrow$
- $\text{Na}_2\text{S} + \text{HCl} \rightarrow$
- $\text{Li}_2\text{O} + \text{HCl} \rightarrow$
- $\text{Ba}(\text{NO}_3)_2 + \text{HCl} \rightarrow$
- $\text{K}_2\text{SO}_4 + \text{HCl} \rightarrow$
- $\text{HNO}_3 + \text{HCl} \rightarrow$
- $\text{F}_2 + \text{HCl} \rightarrow$
- $\text{I}_2 + \text{HCl} \rightarrow$