

# Cambridge IGCSE Chemistry

## Topic 10: Metals

### Reactivity series

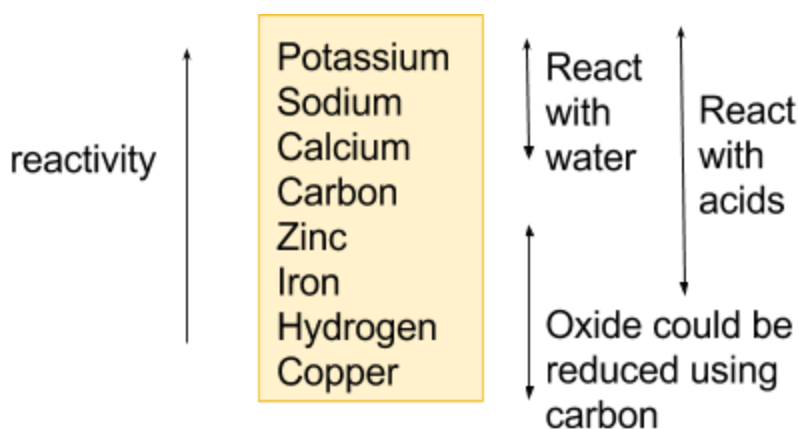
#### Notes





Place in order of reactivity: potassium, sodium, calcium, magnesium, zinc, iron, (hydrogen) and copper, by reference to the reactions, if any, of the metals with: water or steam, dilute hydrochloric acid and the reduction of their oxides with carbon

- Metals can be arranged in order of their reactivity in a reactivity series
  - Metals potassium, sodium, calcium, magnesium, zinc, iron and copper can be put in order of their reactivity from their reactions with water and dilute acids
  - Non-metals hydrogen and carbon are often included in the reactivity series



(Extended only) Describe the reactivity series as related to the tendency of a metal to form its positive ion, illustrated by its reaction, if any, with: the aqueous ions and the oxides of the other listed metals

- When metals react with other substances, metal atoms form positive ions
- Reactivity of a metal is related to its tendency to form positive ions
- A more reactive metal can displace a less reactive metals from a compound e.g. oxide or aqueous solution with the aqueous ions (think about how this is similar as well to halogens)

(Extended only) Describe and explain the action of heat on the hydroxides, carbonates and nitrates of the listed metals

- Metal carbonate  $\xrightarrow{\text{heat}}$  metal oxide + carbon dioxide
  - Calcium, sodium, magnesium and copper decompose in this way

These two reactions help to determine places of metals in the reactivity series:

- Metal hydroxide  $\xrightarrow{\text{heat}}$  metal oxide + steam
  - Zinc, iron, copper decompose





- o Potassium, sodium, calcium, magnesium are too stable and therefore do not decompose in this way
- Metal nitrate  $\xrightarrow{\text{heat}}$  metal oxide + nitrogen dioxide + oxygen
  - o Zinc, iron, copper
- Metal nitrate  $\xrightarrow{\text{heat}}$  metal nitrite + oxygen
  - o Potassium, sodium, calcium, magnesium

*(Extended only) Account for the apparent unreactivity of aluminium in terms of the oxide layer, which adheres to the metal*

- Aluminium metal reacts with oxygen in the air to form  $\text{Al}_2\text{O}_3$ , aluminium oxide
  - o This coats the surface of the aluminium and is very unreactive
- Therefore, it can prevent the aluminium metal from further oxidation

*Deduce an order of reactivity from a given set of experimental results*

- use the results from either reactions written on the reactivity series or action of heat on metal hydroxides/nitrates/carbonates.
- generally, less reactive metals will remain unchanged as they will not undergo reaction

