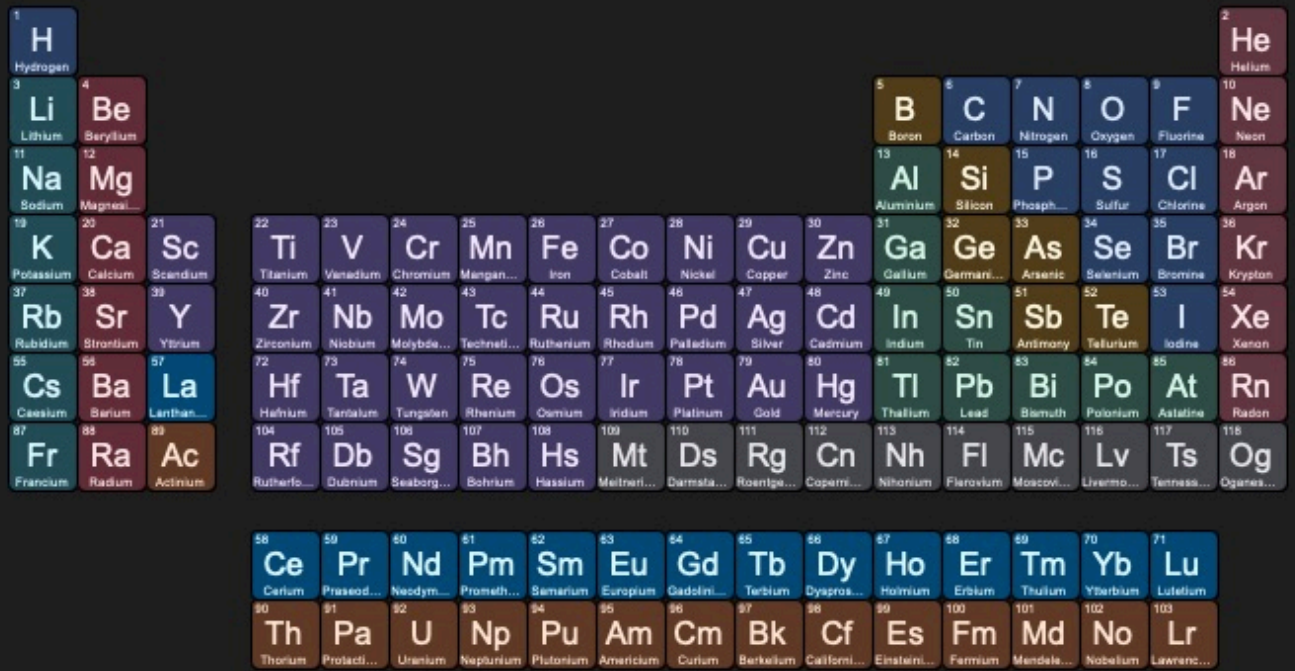
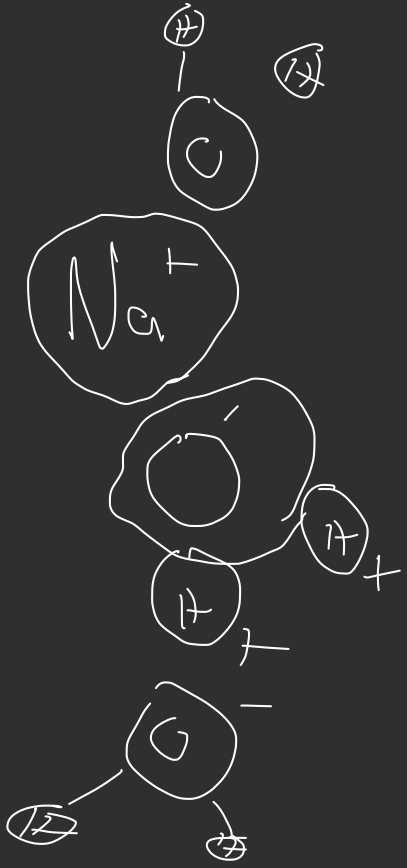
Periodic Table



- Alkali metals
- Alkaline earth metals
- Transition metals
- Post-transition metals
- Metalloids
- Reactive nonmetals
- Noble gases
- Lanthanides
- Actinides
- Unknown properties

Hydration



Hydrolysis

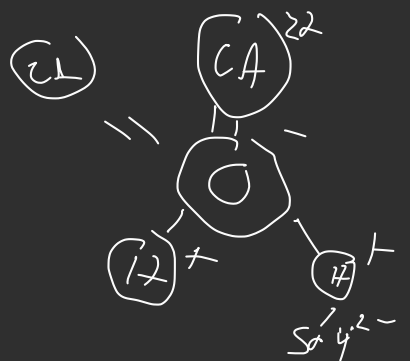
$$H_2O \longrightarrow H^+ + OH^-$$

Dissolution

Water dissolves minerals by hydrating cations and anions

Gypsum

$$\underset{\text{(solid)}}{CaSO_4 \cdot H_2O} + H_2O \longrightarrow \underbrace{Ca^{2+} + SO_4^{2-} + 2H_2O}_{\text{solution}}$$



Acid Reactions

→ Weathering by Acids

→ increase in Hydrogen ions and thus increased activity by how the act in water.

$$CO_2 + H_2O \rightleftharpoons H_2CO_3$$

$$H_2CO_3 + \underbrace{CaCO_3}_{\text{solid}} \rightleftharpoons \underbrace{Ca^{2+} + 2HCO_3^-}_{\text{solution}}$$

Oxidation - Reduction Reactions

↳ Losing electrons ↳ Gaining electrons

Ferrous → Iron, Manganese, Sulfer

↑

$Fe^{2+} + H_2O_2 + 2H^+ \rightarrow 2Fe^{3+} + 2H_2O$

↑ Ferric

Solid

↑ Red coloring

Solution

Synthesized by life (!)

Complexation

1000 x faster with life!

→ Organic acids (oxalic, citric, tantric acid)

↳ These acids engage in acid weathering but also produce organic compounds with Al

muscovite + oxalic acid

$$K_2[Si_6Al_2]Al_4O_{20}(OH)_4 + 6C_2O_4H_2 + 8H_2O \rightleftharpoons \underbrace{K^+ + OH^-}_{\text{solution}} + C_2O_4Al^+ + \underbrace{Si(OH)_4}_{\text{solution}}$$

Completation

↑

Rock

→

Integrated Weathering

Physical + Chemical weathering happen simultaneously

Soil Genesis → Soil Formation

$$S_i = f(cl, b, T, \underline{P}, t)$$

A Soil

1. Climate
2. Time
3. Parent Material
   ↳ Rock
4. Topography
5. Biota

Soils can...

Be formed in place or

be deposited somewhere.

Water: Alluvial (fluvial) → rounds

Lacustrine (lakes)

Marine

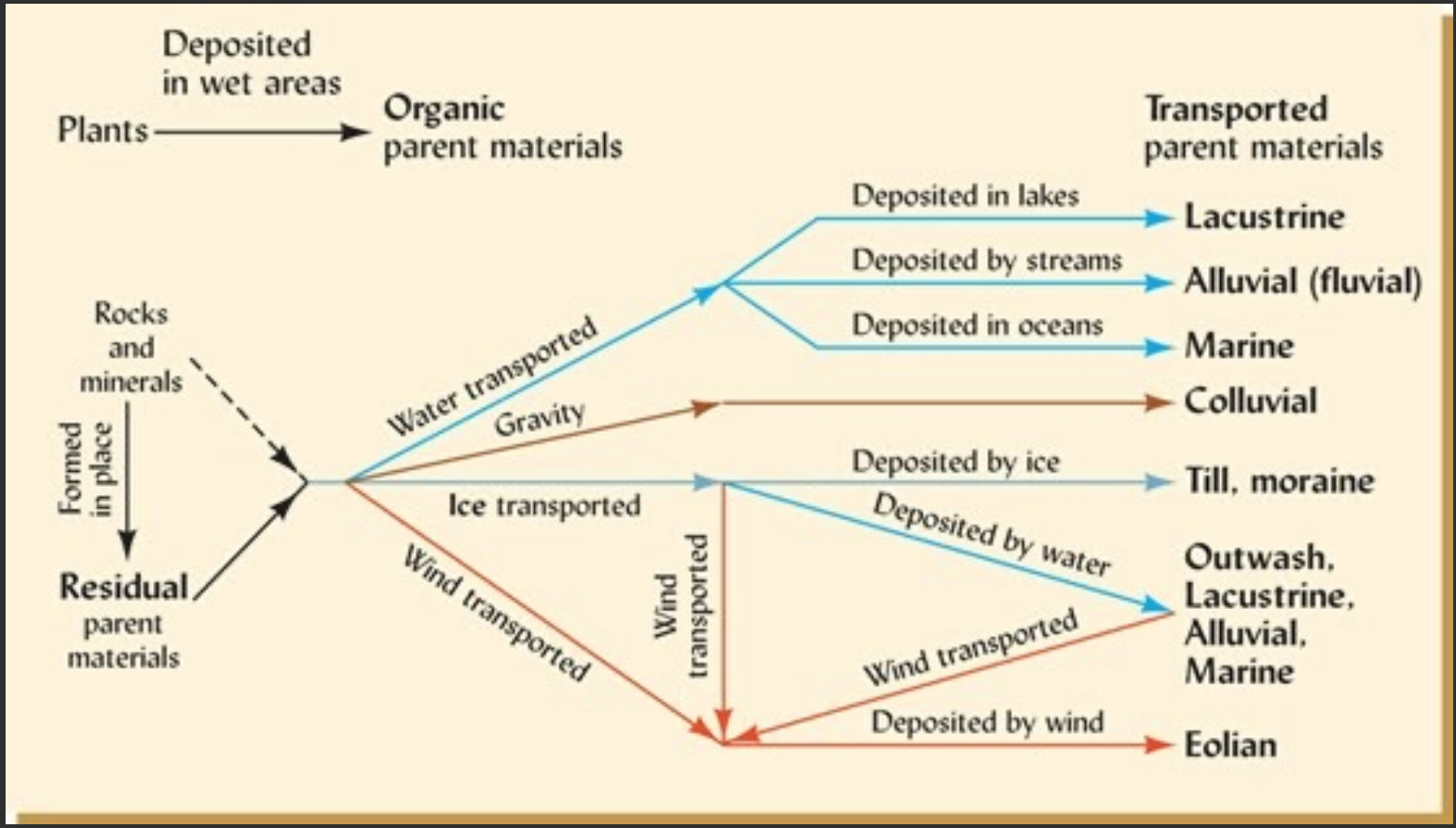
Ice Moraines: Till

Outwash!

Wind → Eolian

Gravity → Colluvium

↗ Angular


Deposited
in wet areas
Plants
Organic
parent materials
Transported
parent materials
Deposited in lakes
Lacustrine
Deposited by streams
Alluvial (fluvial)
Deposited in oceans
Marine
Rocks
and
minerals
Formed
in place
Residual
parent
materials
Water transported
Gravity
Colluvial
Deposited by ice
Till, moraine
Ice transported
Deposited by water
Outwash,
Lacustrine,
Alluvial,
Marine
Wind transported
Wind
transported
Wind transported
Deposited by wind
Eolian

Climate → H_2O

→ Evapotranspiration and precipitation