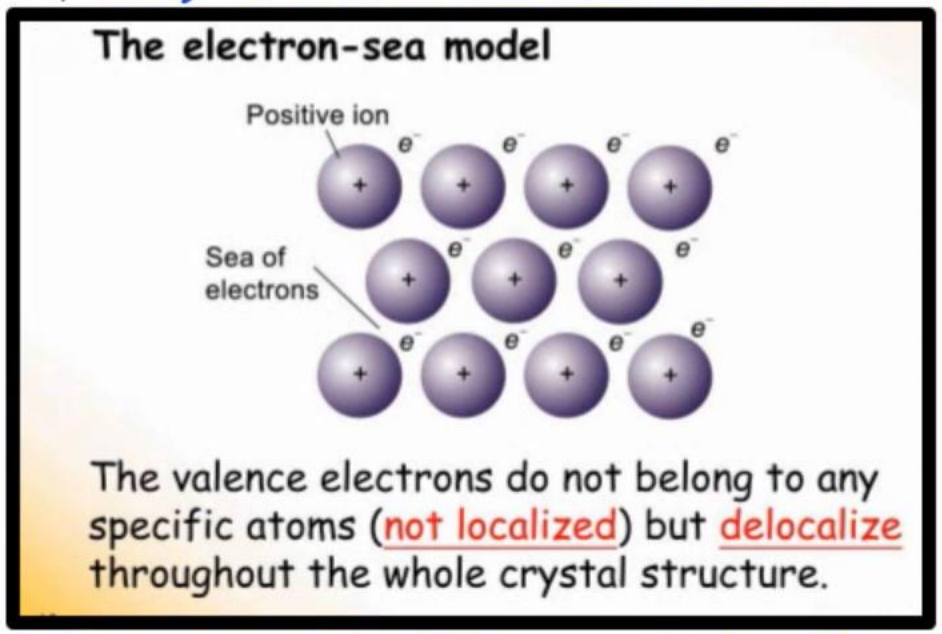
Properties of Metals and its Uses

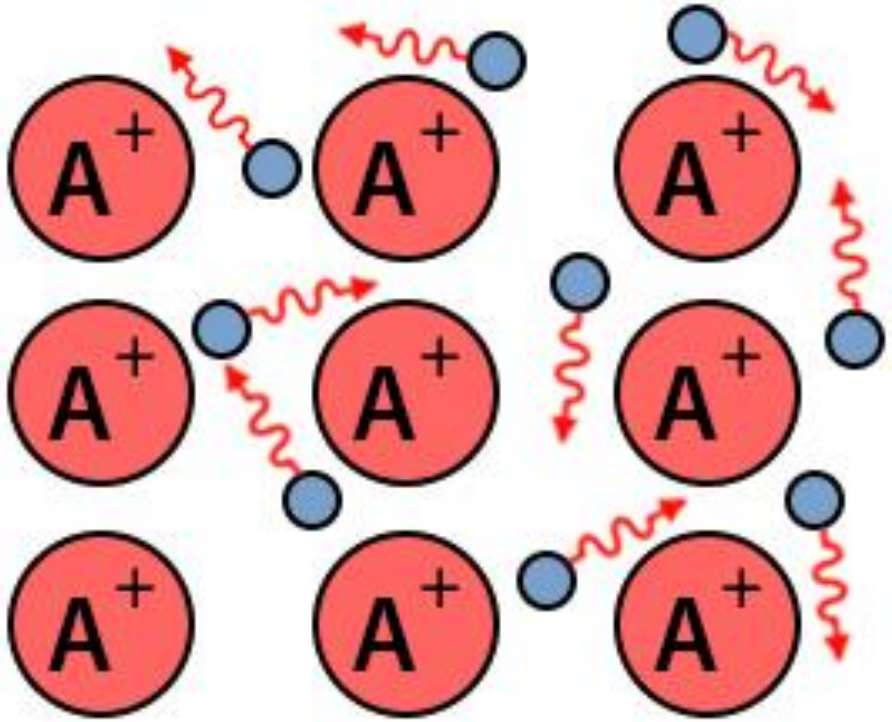
Metallic Crystals

- Based on the metallic structure, metals are characterized by high electrical and thermal conductivity, bright luster, malleability, ductility, and high tensile strength
- Metals have low ionization energy because the valency electrons can be taken out relatively easy
- The valency electron in metal are weakly bound to the kernel; they are not localized at each atom, they are mobile in the crystal
- Acc. to this model, metal behaves as if it is an assemblage of positive ions immersed in a sea of mobile electrons (Fig.)
- Thus, each electron belongs to a number of positive ions and each positive ion belongs to a number of electrons
- The high electrical conductivity and thermal conductivity of metals is due to the presence of mobile valency of electrons
- The bright metallic lustre can also be explained as due to the presence of high mobile electrons



- The model of free valency electrons can also explain the softness, malleability, and ductility associated with metals
- The force of attraction between the M+ ions and the valency electrons is uniform in all directions
- The bonds holding the crystal lattice in metals are not rigid as in covalent solids

Metallic Bond



Electrostatic attraction between the electrons (●) and metal ions (A+)

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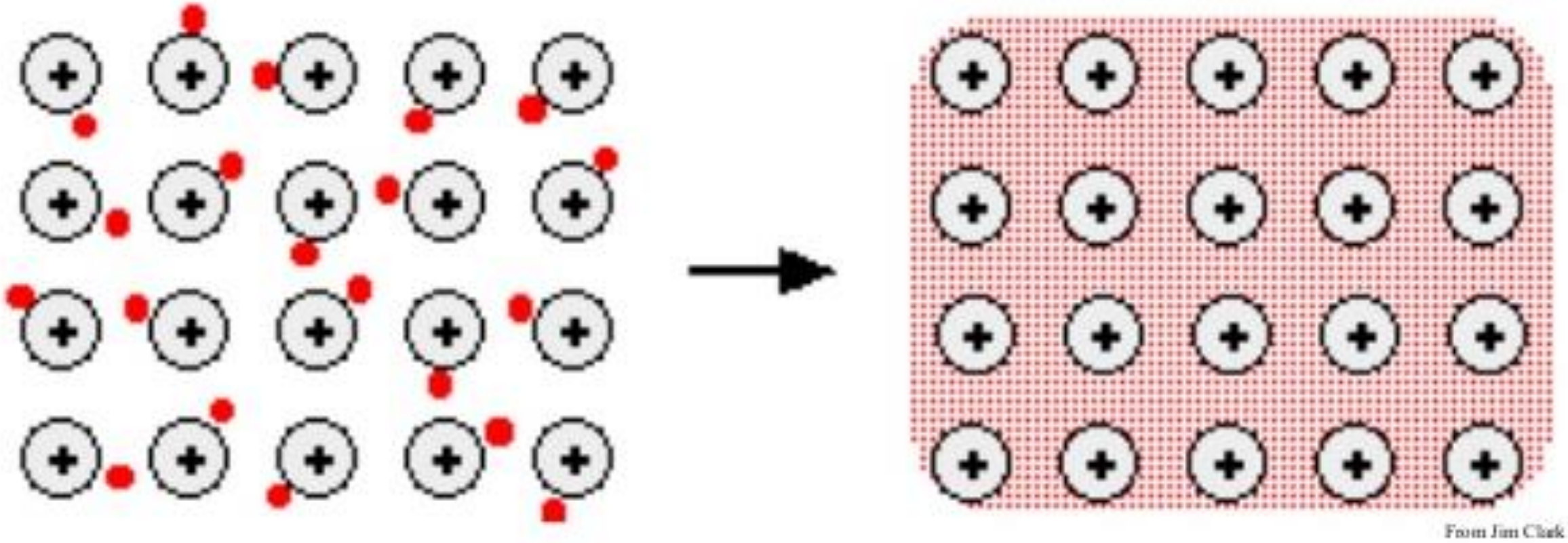
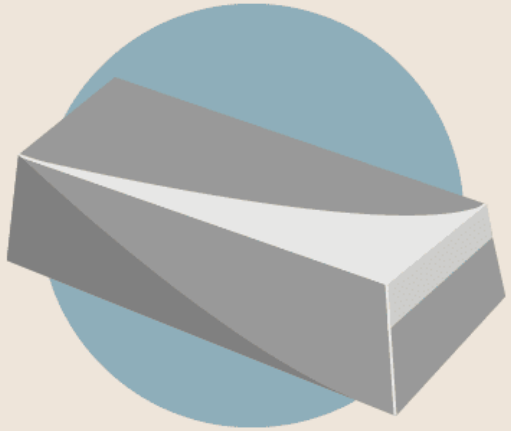
Metallic Bonds



From Jim Clark

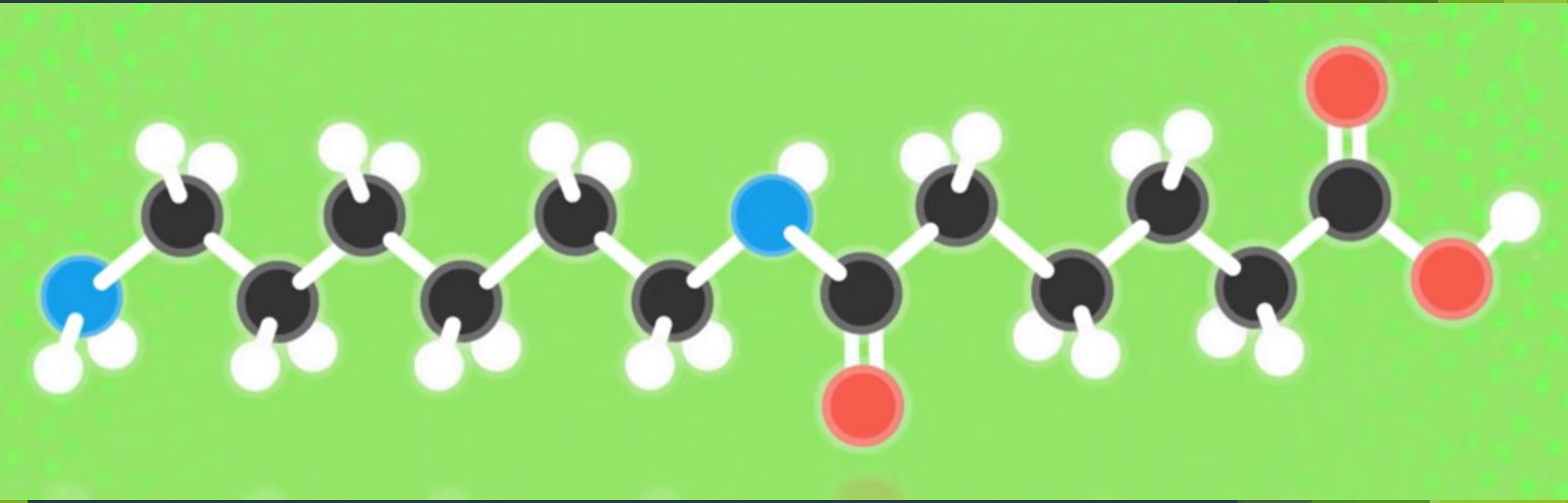
Metals vs. Nonmetals: Physical Properties

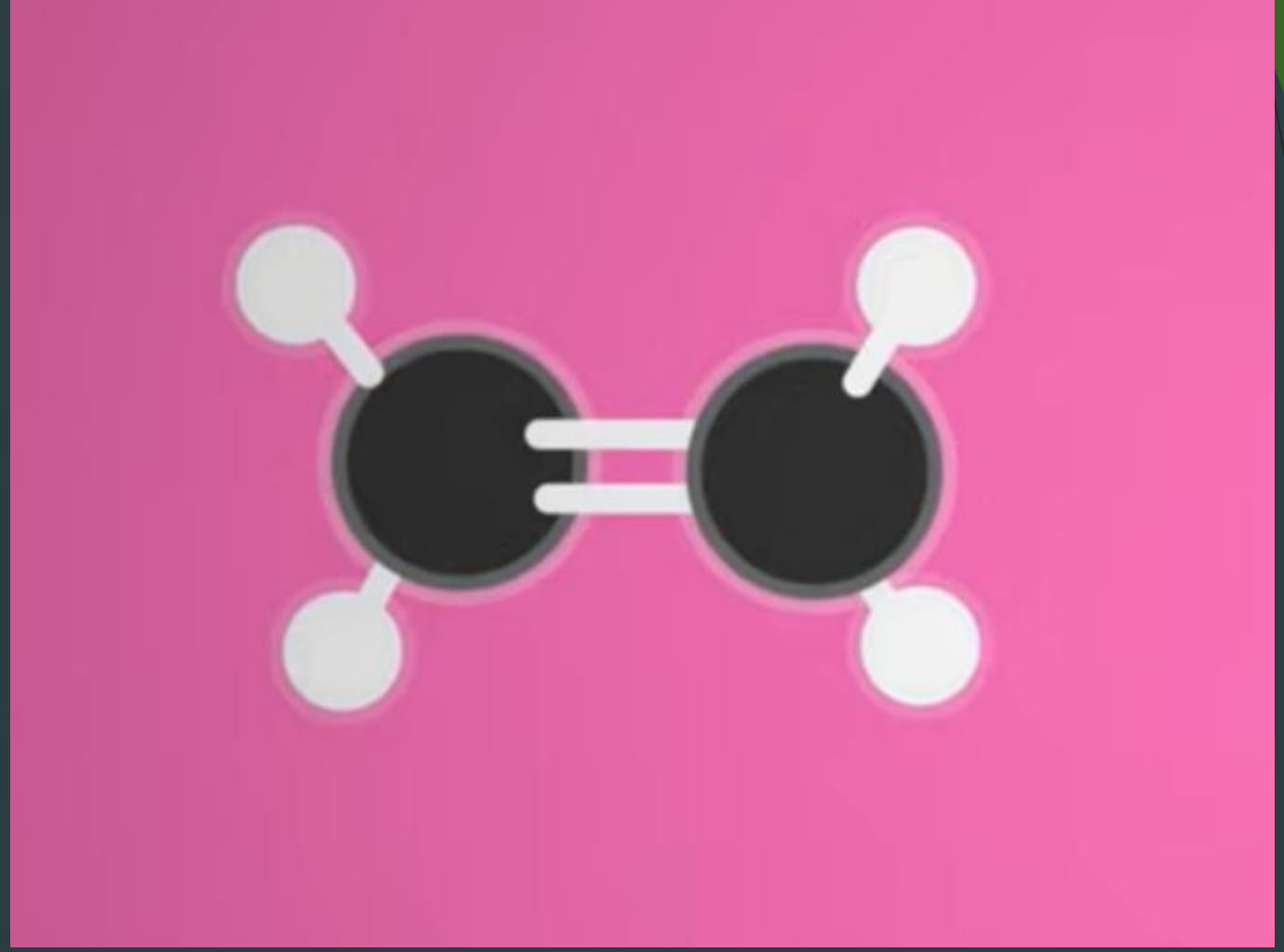


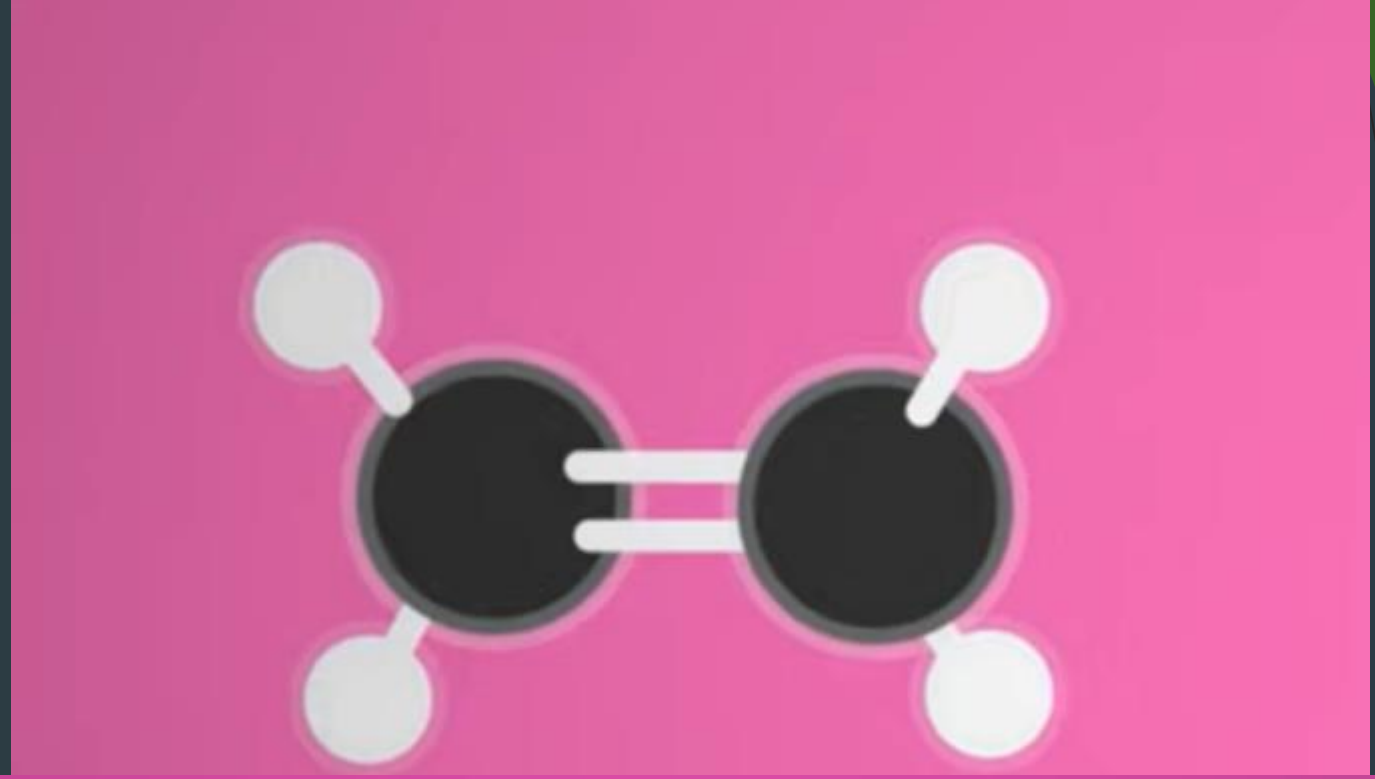
- Lustrous
- Good conductors
- High melting point
- High density
- Malleable
- Ductile (can be drawn into wires)
- Usually solid at room temperature
- Opaque as a thin sheet
- Sonorous

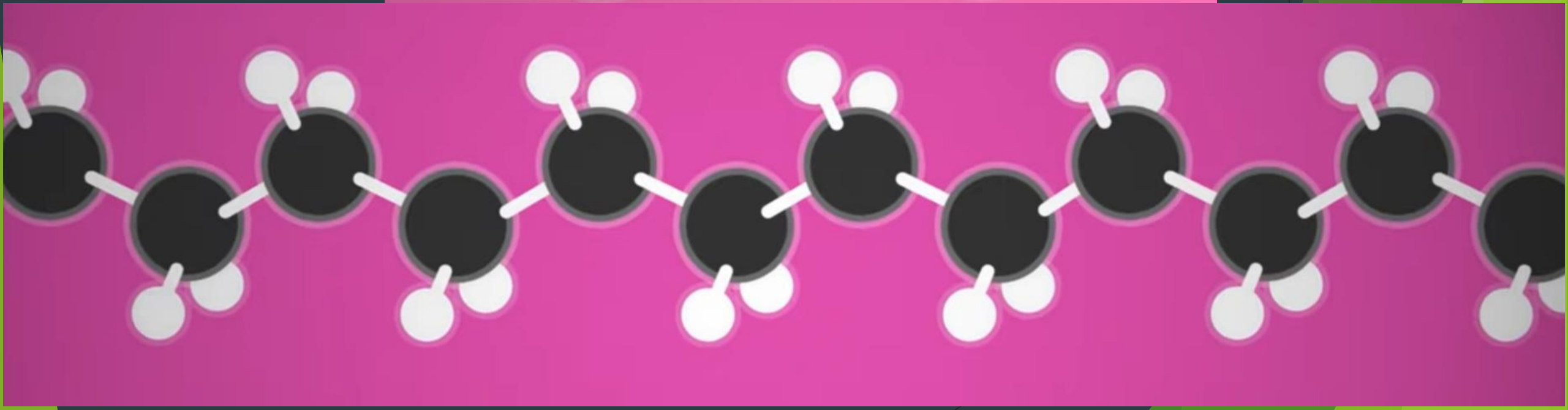
- Dull
- Poor conductors
- Nonductile
- Brittle
- May be solids, liquids or gases at room temperature
- Transparent as a thin sheet
- Not sonorous

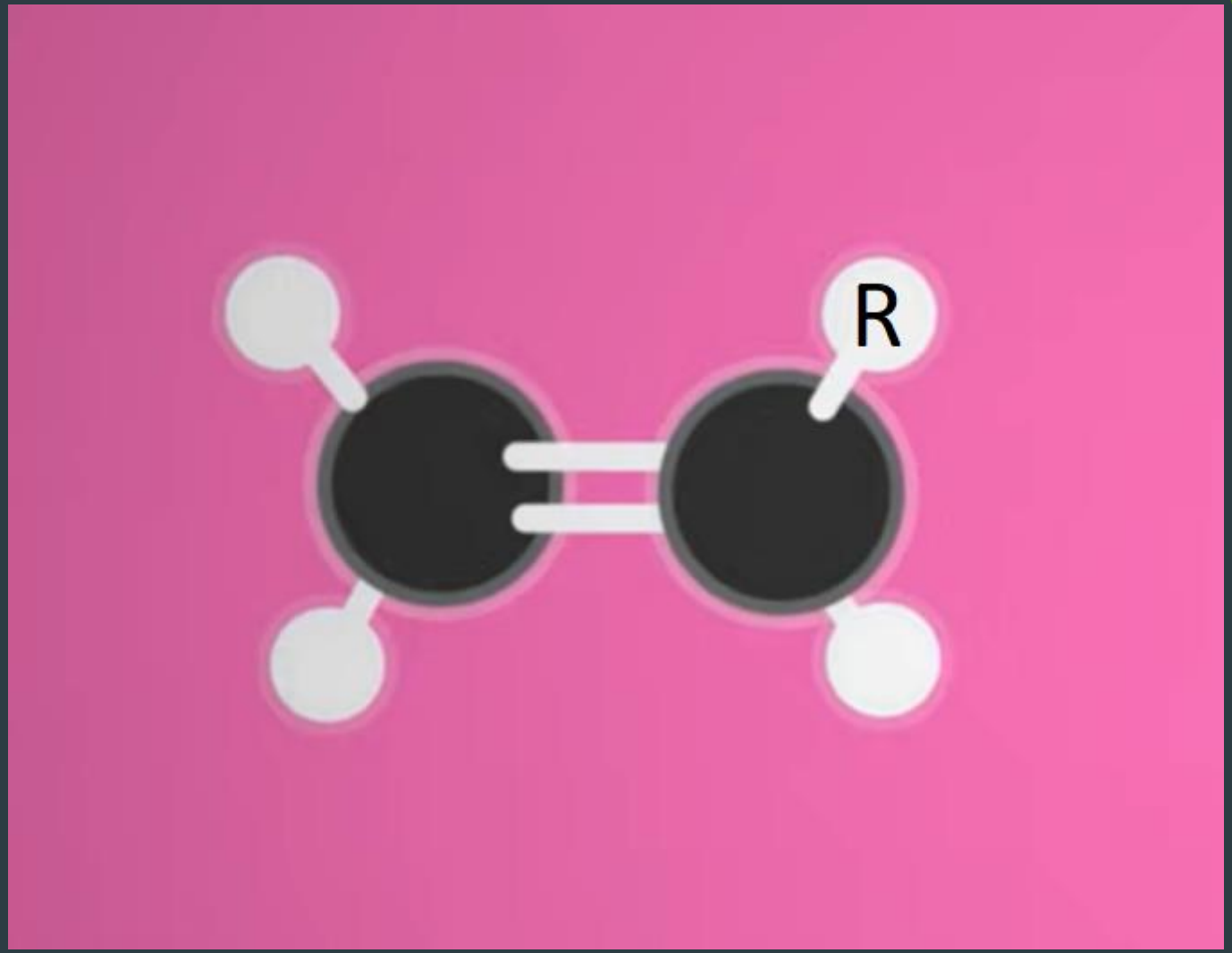
Polymers







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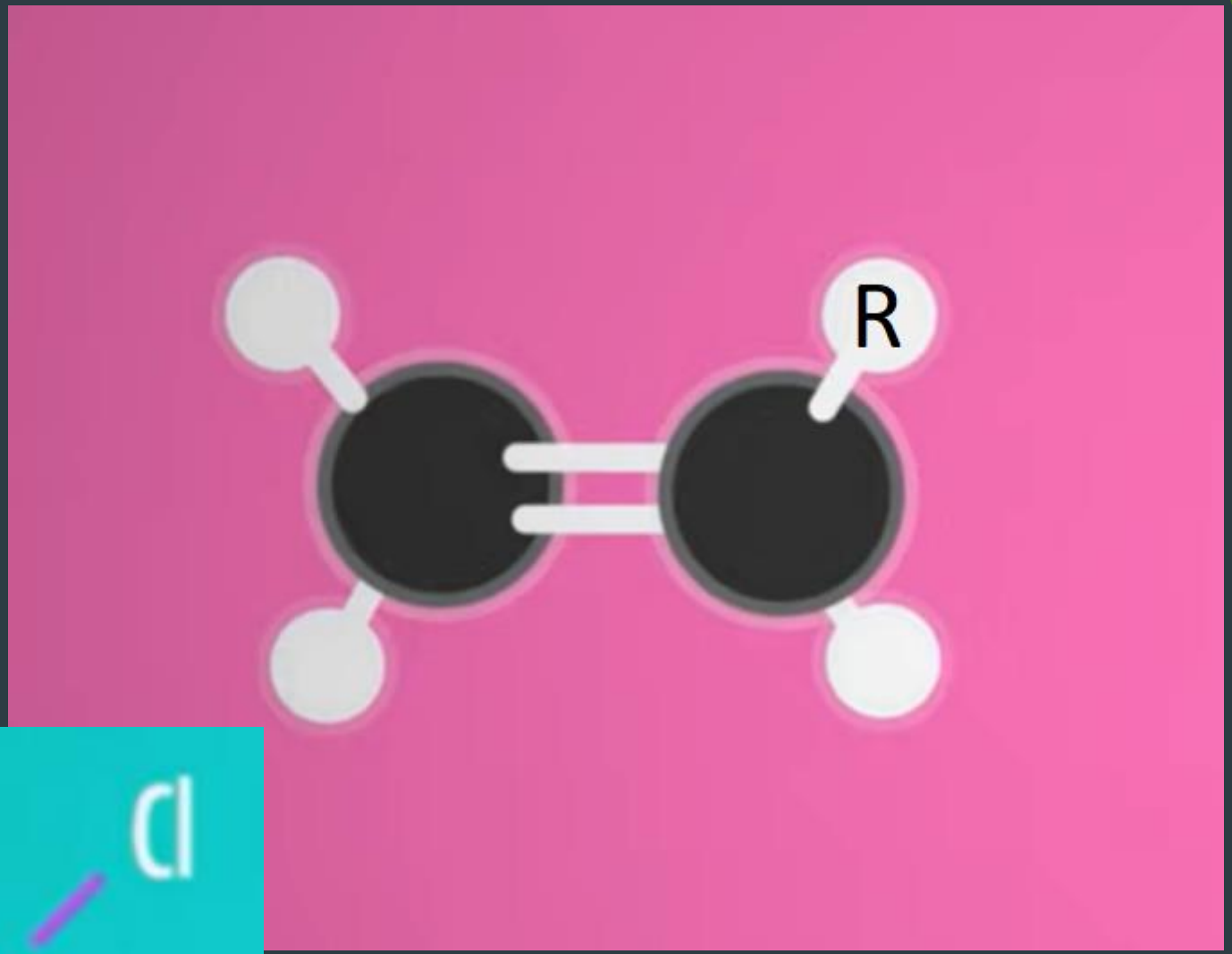
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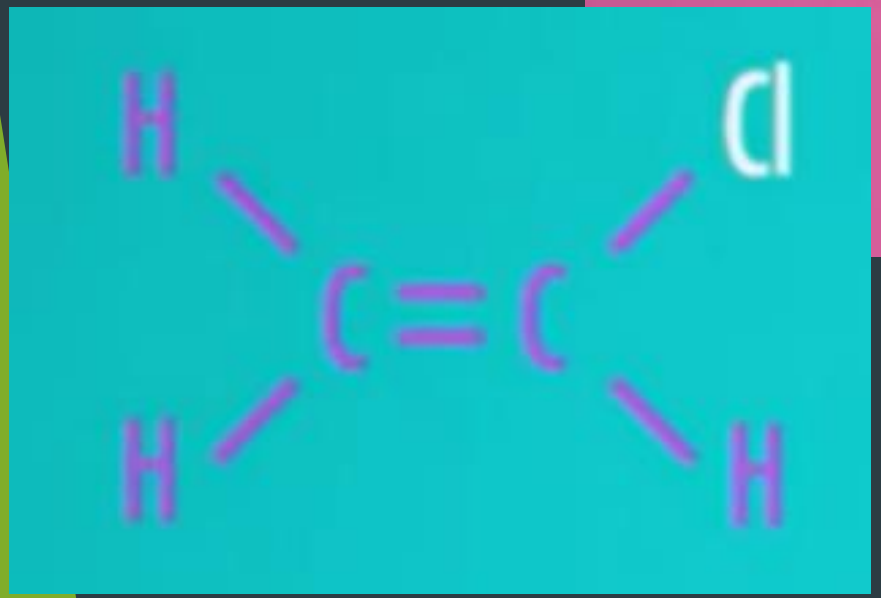
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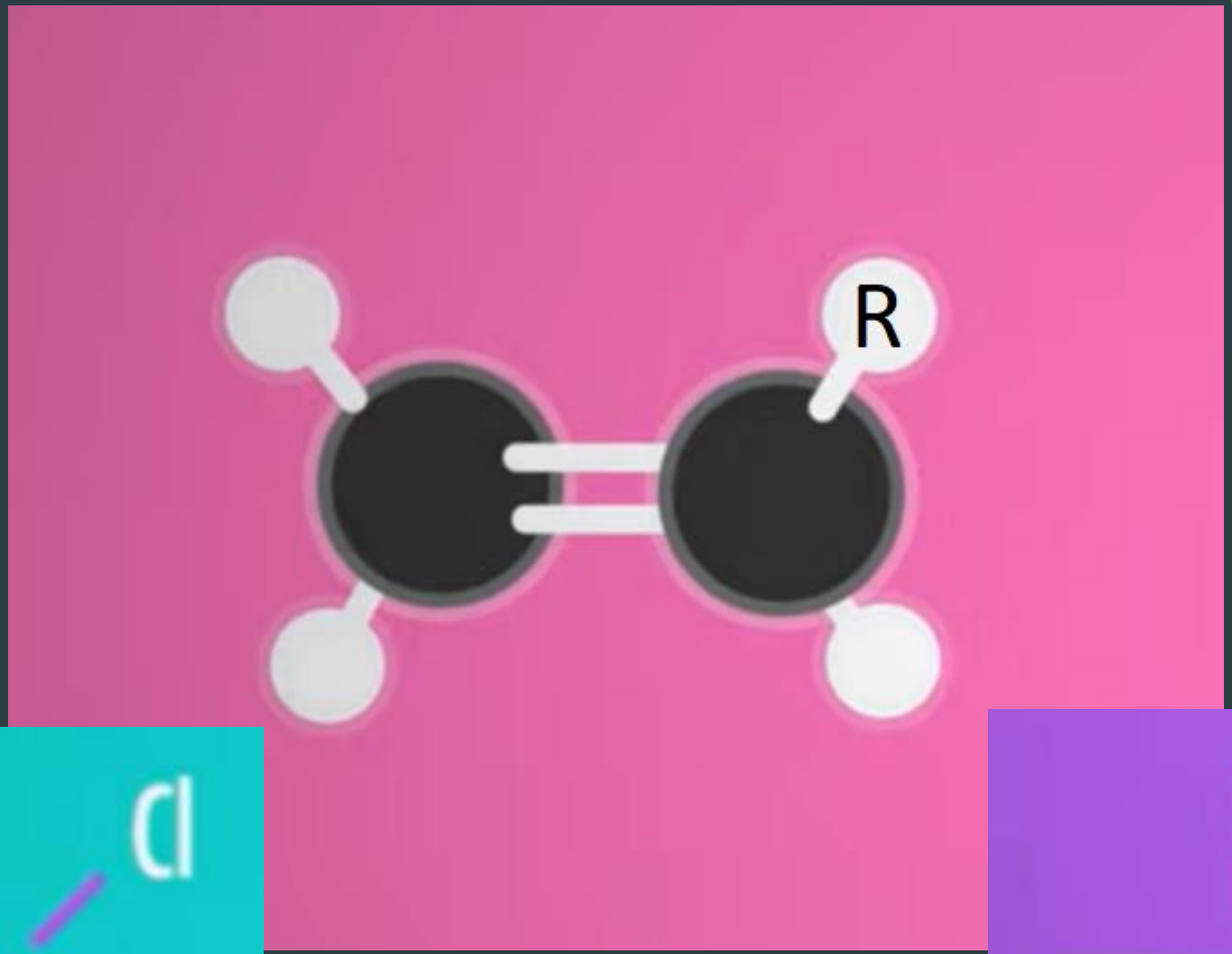
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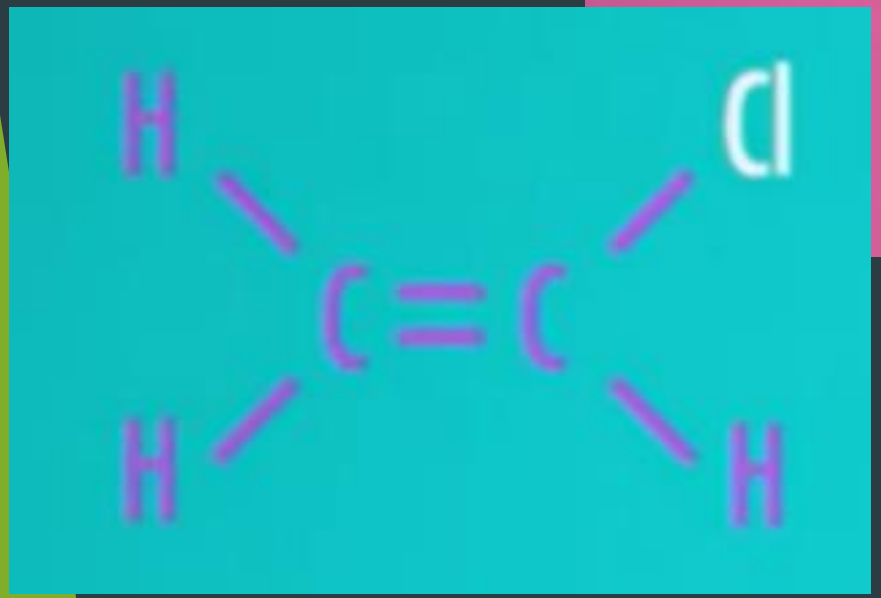
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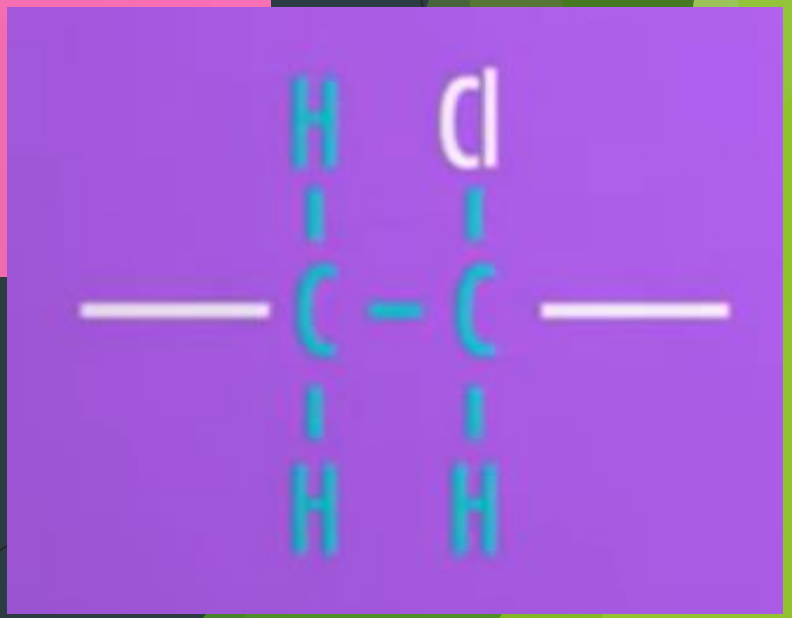
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