TeachEngineering

STEM Curriculum for K-12

How Can We Prevent the Corrosion Crisis?

Warm-Up

1) Go to the table with the nail samples and observe each nail.
   DO NOT touch the test tubes or nails!

2) Get a printout of today's notes *(next to the nails)*
   and head back to your seat.

3) Individually *(yes, without talking)*...
   Write your observations, explanations, and any questions that you have at the top of your notes.

Turn, Talk, & Share

1) In small teams (2-4), take turns discussing what you wrote about the nail samples.

2) After a few minutes of discussing, we will share out as a class!
*Students will be called on **randomly**... be ready to share one of your notes!*

Picture Credit: https://torange.biz/nails-screw-fasteners-2909#

What do you already KNOW about Corrosion?

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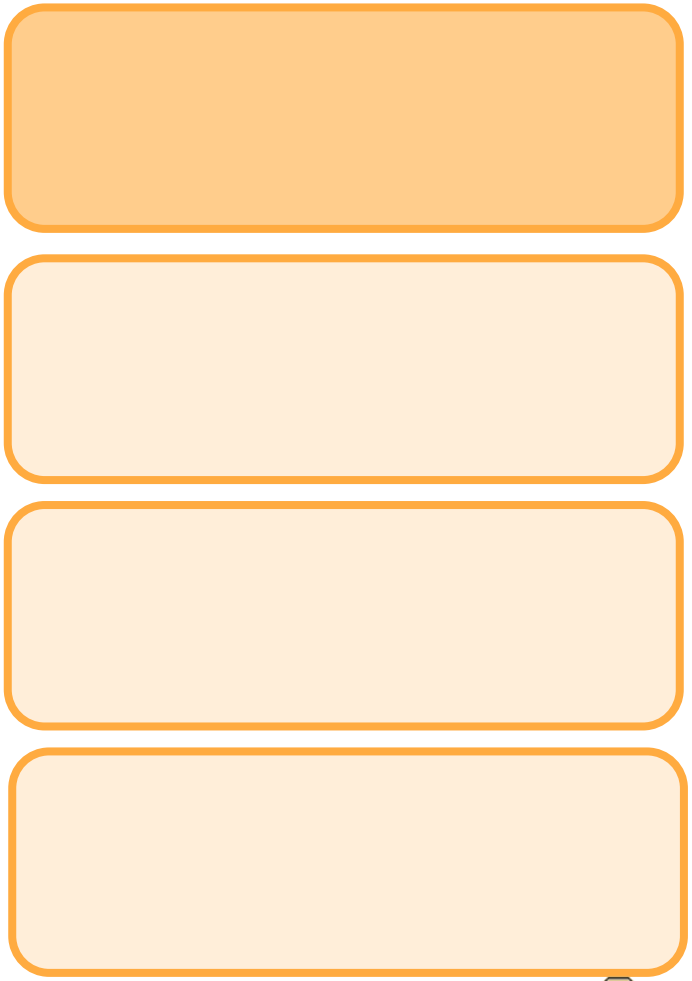

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What do you
WANT
to know
about Corrosion?

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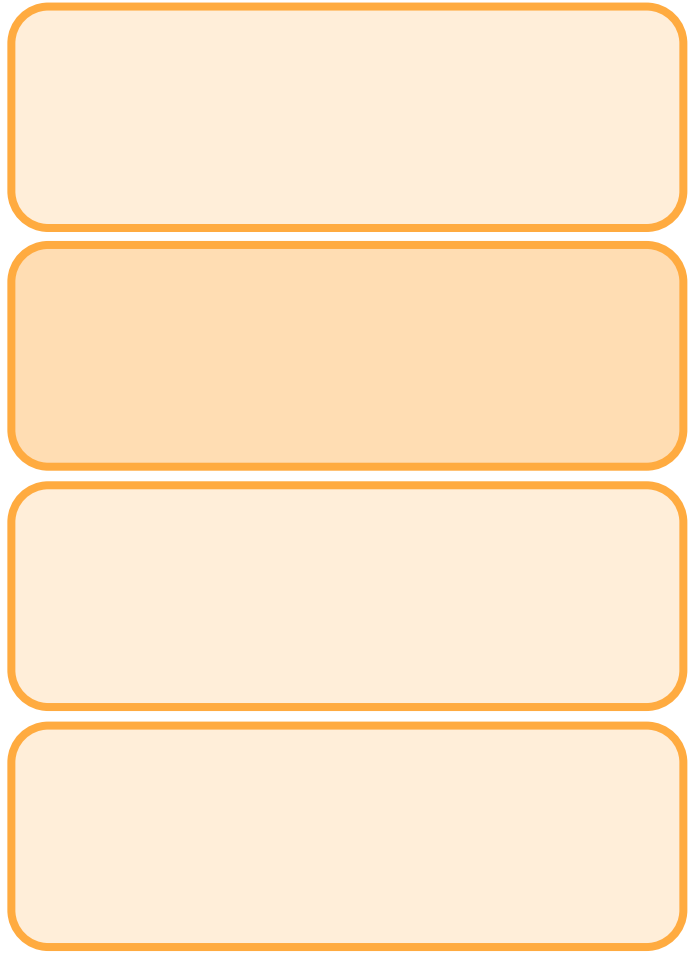


How Can We
Prevent the
Corrosion Crisis?

I will be able to...

- explain corrosion in my own words.
- explain why some metals rust or oxidize.
- provide examples of corrosion in everyday life.

The Cost of Corrosion

- Public Health & Safety
  - Infrastructure
    - bridges
    - roadways
    - Buildings
  - Water pipes and tanks
    - Flint Water Crisis

Picture Credit: https://upload.wikimedia.org/wikipedia/commons/6/6b/I35_Bridge_Collapse_4crop.jpg

The Cost of Corrosion

- Corrosion Costs Money
  - In 2013, the total cost of corrosion in the U.S. was $451.3 billion.
    - Agriculture
    - Industry
    - Services
  - It's estimated that corrosion costs about 3.1% of the country's total GDP.

Video Credit: Transhield

Time to Read!

- Read the article from CK12.org
- Highlight or underline key ideas
- Look for vocabulary
- Write comments or questions

We will refer to this later!

Video Credit: The Fuse School

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What did you LEARN about Corrosion?

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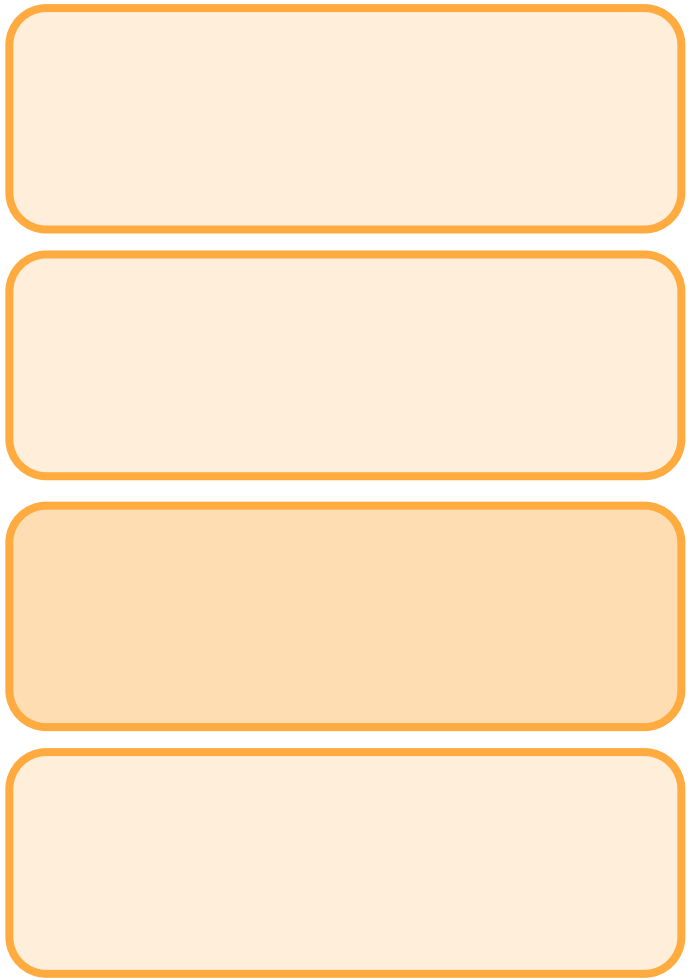
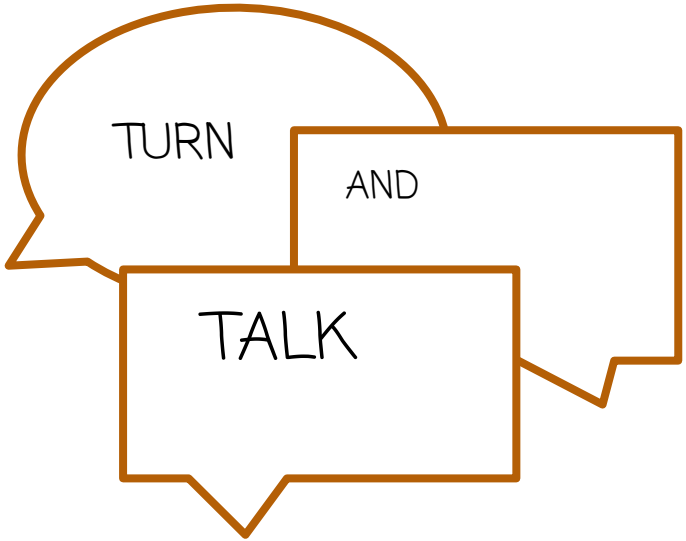
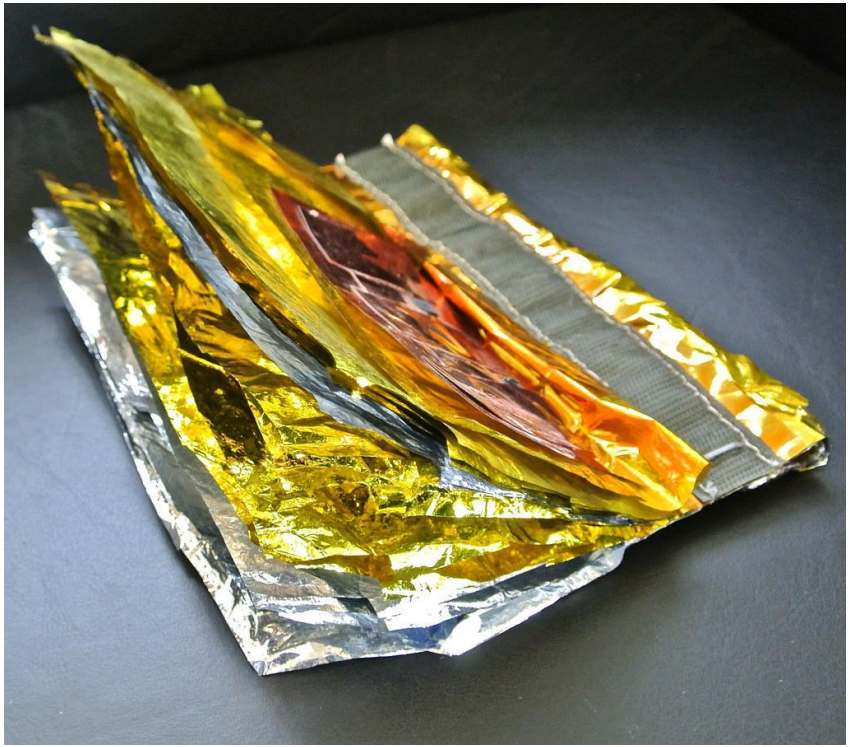


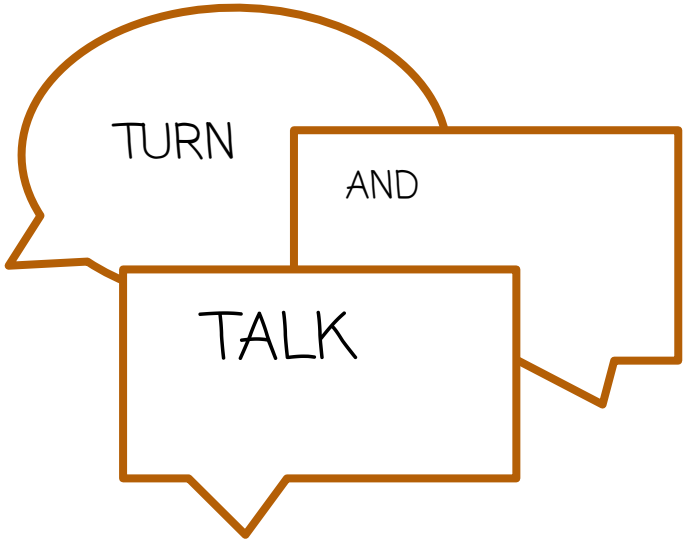


- What is a metal?
- What types of properties do they have?

What is a Metal?

- A type of matter that is a good conductor of heat and electricity.
  - Typically hard
  - Lustrous
  - Ductile
  - Malleable
  - Fusible





- What is corrosion of a metal and why does it occur?
- Is corrosion the same as rust?

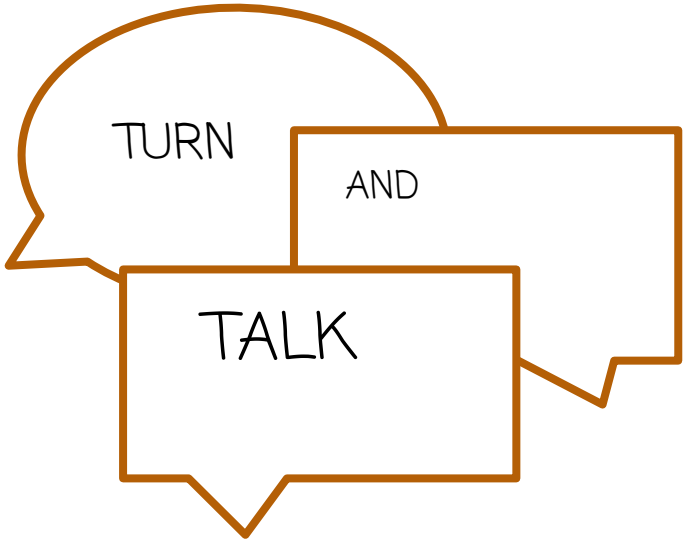
Corrosion

- Chemical change of a metal surface when it's exposed to oxygen in the environment.

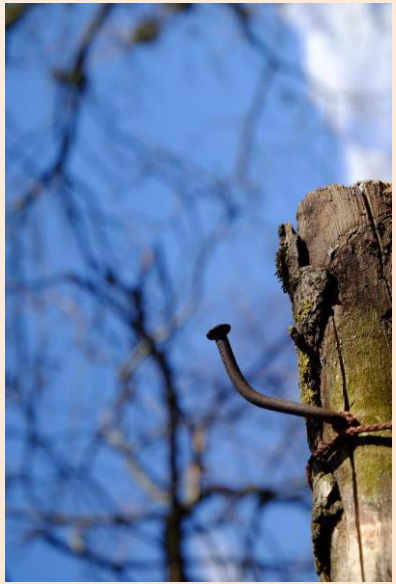
Rust

- Form of corrosion, specifically for iron and its alloys.
- A reddish- or yellowish-brown flaky coating of iron oxide.

Picture Credit: Creative Commons

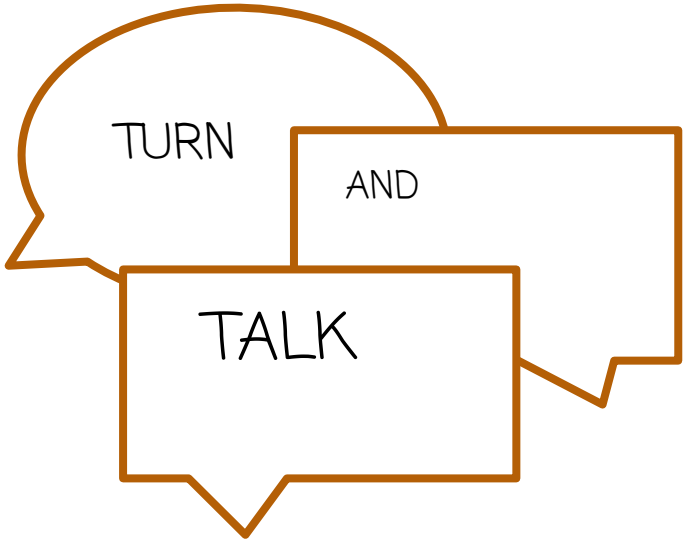


- What are some examples of corrosion that you've seen in your everyday life?



Are all Metals Equal?

- Some metals do not corrode easily due to their low reactivity.
  - Gold, Platinum, Silver
- When oxidized, other metals form a coating on the surface. This protects the metal from further corrosion.
  - Aluminum
  - Copper
- Complete corrosion of metal
  - iron



- How can corrosion be prevented?

Preventing Corrosion

- The rate of reaction is how fast a chemical reaction takes place.
  - In other words, how fast a product is formed or a reactant is used up.

- One of the factors that determines the speed of a reaction is the *surface area.*
  - In this case, surface area is the amount of reactant that is exposed to other reactants in a chemical reaction.
  - The ***greater*** the surface area of a solid reactant, the ***faster*** its rate of reaction.

Preventing Corrosion

- Create a physical barrier
  - Paint, enamel, oil
  - Issues?

- Coat with another metal
  - “Tin cans”
  - Galvanizing

- Cathodic protection
  - Prevent hulls of steel ships from rusting

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What do you STILL want to know about Corrosion?

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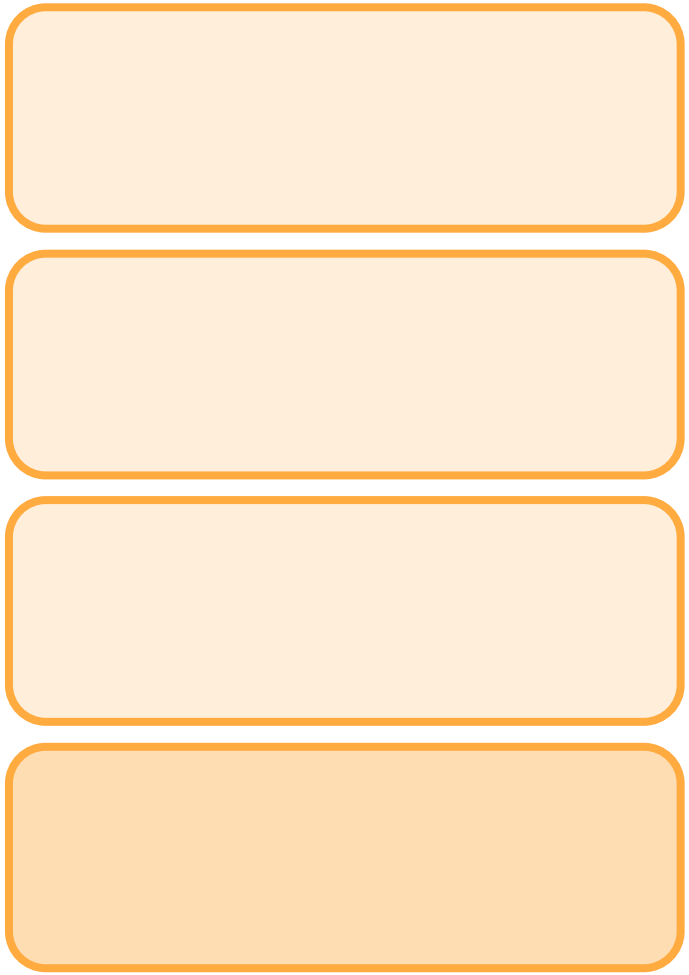

Parking Lot

- 2-3 students per group
- 1-2 sticky notes
- Each sticky note should only have ONE comment or question from the “S” category of your KWLS chart
- When you’re done, bring your sticky notes to the board.

Corrosion Classroom Challenge!

How can you design a ship that holds cargo and holds up against the elements?