Name _____

FEEDBACKS

Intro:

1. Based on class last week, write 2 ways humans have contributed to climate change:

2. We have focused a lot on carbon and the carbon cycle. Why is carbon so important in climate change?

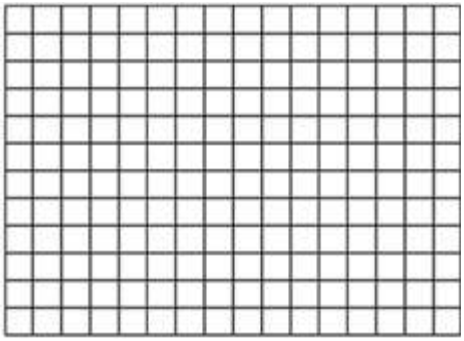
Feedback Loops Videos

FEEDBACKS - information about reactions to a product, a person's performance of a task, etc.

Draw the feedback loop:

What is a positive feedback loop? Is it always beneficial?

On the grid, draw what happens to a population / phenomenon when positive feedbacks occur:



Positive feedback loop

- **Positive feedback loop** = instead of stabilizing a system, it drives it further toward one extreme or another
  - Exponential growth in human population, erosion, melting sea ice
- Rare in nature
  - But is common in natural systems altered by humans

EXAMPLE 1: You stay after school and discover you enjoy playing basketball, which makes you better at basketball:

EXAMPLE 2: When you receive a compliment, you feel more confident in yourself:

EXAMPLE 3: Population growth: there are more people being born, so the population increases

GREENHOUSE EFFECT

1. Draw a picture of how the greenhouse effect works:

2. What would happen if we did not have greenhouse gases in the atmosphere?

NOW: Let's think about how anthropogenic emissions create a positive feedback loop with the greenhouse effect:

Draw the feedback loop:

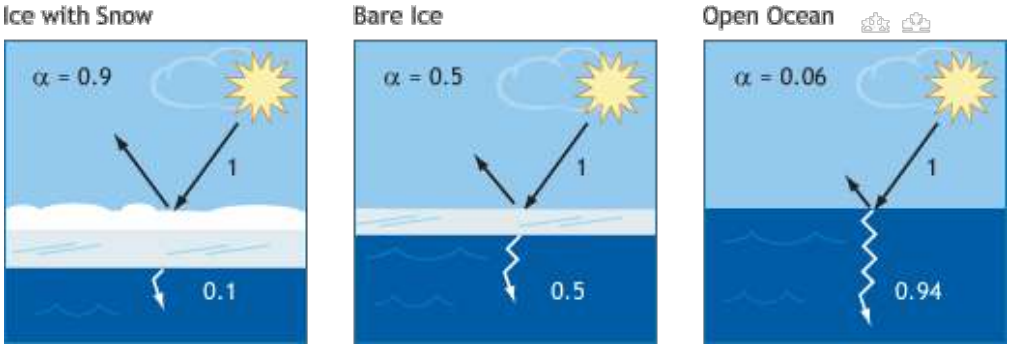
Scenario: *Humans burn fossil fuels to create energy, CO2 is released into the air, more CO2 traps heat*

Can you think of any other scenarios or feedback loops that occur because of anthropogenic activity?

ICE

1. Which would keep you cooler in summer, a white shirt or a dark shirt? Why?

Consider this: light-colored objects reflect more solar energy (i.e., heat), and stay cooler as a result. In contrast, dark-colored objects absorb more solar energy, becoming warmer.
When light from the Sun strikes Earth's surface, some of the energy is absorbed as heat and some is reflected back into space. The darker the object, the more radiation is absorbed. The fraction of radiation that is reflected back into space is known as ***albedo*.** These diagrams illustrate how albedo (α) is higher over ice and snow than over bare ice or open ocean.



2. In your own words, what is albedo?

3. *Circle the correct response:*

Ice has a *high or low* albedo. Ice heats up *faster or slower* than the ocean.

Ice-Albedo Feedback One significant factor affecting Earth's albedo is the melting of snow and ice. Because of its light appearance, ice reflects much of the Sun's radiation back into space, whereas dark ocean water and exposed land absorb more of the Sun's energy. As ice melts, more exposed ocean water and land change Earth's albedo. This leads to increased absorption of energy that further warms the planet in what is called *ice-albedo feedback*.
Now let's draw the feedback loop for this scenario! As this ice begins to melt (from warmer air and water temperatures, for instance), less sunlight gets reflected into space. The sunlight is instead absorbed into the oceans and land, raising the overall temperature, and fueling further melting of the surrounding ice:
Feedback loop:

Ice-Sea Level Feedback Ice melt can also create a feedback with sea level. When ice is surrounded by more and higher sea level, more ice melts. CHALLENGE: Try to create a feedback loop for Ice Melt and Sea Level Rise:
Feedback loop:

Warmer Temperature and Permafrost Feedback. Since ice up north is melting, so is the ground that is typically frozen solid (for at least 2 years). This previously frozen ground held methane, which is now being released into the atmosphere. What changes will happen to the planet if methane is released and permafrost is melting?
Feedback loop: