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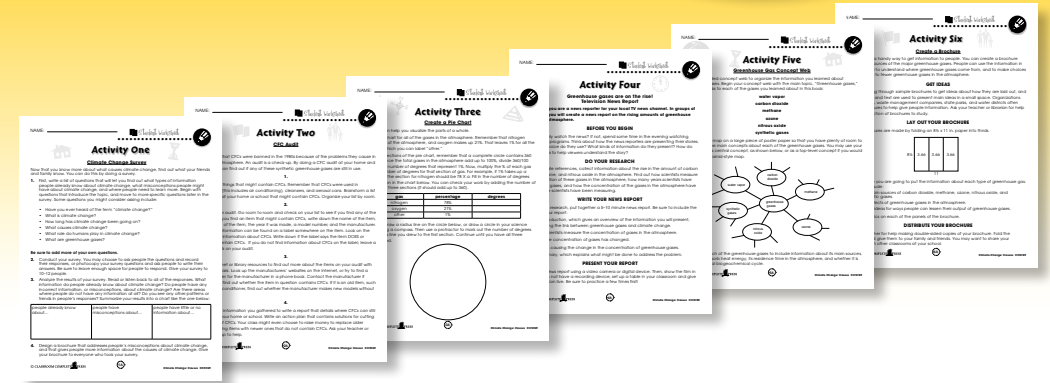
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Greenhouse Gases: Methane

1. Use the words in the box to answer each question. You may use a dictionary to help you.

particle	radiation	limestone	wetlands
termites	landfill	wastewater treatment	factories

- a) What is the name of a place where trash is buried?
- b) How can heat energy move from one place to another?
- c) What is the name of a carbon-rich rock?
- d) What is the smallest piece that has the features of its material?
- e) What insects eat wood?
- f) What is the name of places where goods are made?
- g) What places on Earth are covered with shallow water?
- h) What is it called when used water is cleaned before being put back?

2. Look up the term **residence time** in a dictionary. Rewrite the definition in your own words on the lines below.



Greenhouse Gases: Methane

There is less methane in the atmosphere than carbon dioxide or water vapor. However, methane absorbs 84 times more radiation than carbon dioxide or water. Methane also has a shorter **residence time** in the atmosphere than carbon dioxide. Residence time is about how long materials spend in a part of Earth. The residence time of carbon dioxide in the atmosphere is over a hundred years. On the other hand, methane spends a short time in the atmosphere, only a few years.



What is the residence time of methane in the atmosphere?



In nature, methane is released into the atmosphere from sources like wetlands, oceans and termites. Human activities also release methane into the atmosphere. These include landfills, farming, the use of natural gas, coal mining, wastewater treatment, and certain types of factories. Oil and gas companies now have a limit on how much methane they are allowed to emit. The short residence time of methane gives people a way to fight climate change. If we release much less methane, than the amount in the atmosphere should lower quickly. We must also release much less carbon dioxide. But, because of its longer residence time, the carbon dioxide that we have already added will stay there for a long time.



Greenhouse Gases: Methane

1. Fill in each blank with the correct word from the reading. You may use the same term more than once.

- a) The amount of methane in the atmosphere is _____ than the amount of water vapor in the atmosphere.
- b) Methane has a shorter _____ in the atmosphere than carbon dioxide.
- c) _____ is how long materials spend in a part of Earth.
- d) The residence time of carbon dioxide in the atmosphere is _____.
- e) The residence time of methane in the atmosphere is _____.
- f) If people stop releasing methane into the atmosphere, than the amount of it should _____ quickly.

2. a) ~~Cross out~~ the words that are NOT sources of methane.

respiration coal mining farming automobiles natural gas

b) Circle the words that are NATURAL sources of methane.

termites landfills oceans farming limestone

c) Underline the words that are sources of methane from HUMAN ACTIVITIES.

wastewater treatment wetlands farming factories evaporation



Greenhouse Gases: Methane

3. Answer each question with a complete sentence.

- a) There is less methane in the atmosphere than other greenhouse gases, like carbon dioxide. Why is methane important in causing climate change?

- b) Explain how the short residence time of methane in the atmosphere could help people fight climate change.

Research

4. How can people put less methane in the atmosphere?

List the main human sources of methane.

Pick one of the sources from the list. Use the library or Internet resources. Find ways that people can make changes so that less methane is released into the atmosphere from the source that you picked. Write a short report to share with your class.

How does an object's color affect how much radiation the object absorbs?

You will need:

- 4 thermometers
- 4 shoe boxes (or boxes of similar size)
- White, yellow, green, and black construction paper

This activity must be done on a sunny day.

Different places on Earth reflect and absorb different amounts of the Sun's radiation. Some things, like thick clouds and ice, reflect a lot of radiation. Other things, like asphalt and soil, absorb a lot of radiation. The color of a place plays a big role in telling how much radiation the thing will absorb.

Cover four different shoe boxes with different color paper: white, yellow, green, and black. Place a thermometer inside each shoe box. Write down the temperature reading of each in the chart below. Then, place all of the shoe boxes in a sunny location for a few hours. While the sun is still on the boxes, take each thermometer out and immediately write down the new temperature reading in the chart below. Which box had the highest temperature? Which box had the lowest temperature? Based on your data, draw some conclusions. How does color affect the amount of radiation that an object absorbs?

Box Color	Starting Temperature	New Temperature
White		
Yellow		
Green		
Black		

Crossword Puzzle!

WORD LIST

albedo
atmosphere
carbon dioxide
cycle
energy
evaporate
fertilizer
gas
global warming
greenhouse
heat
hydrogen
methane
nitrogen
oxygen
ozone
synthetic

Across

2. The thin layer of air that surrounds Earth.
5. Temperature is a measure of this.
6. ___ gases absorb radiation from Earth's surface.
9. A series of events that happen over and over again.
10. Radiation is a form of this.
11. The rise in the average temperature at Earth's surface (two words).
13. The second most common gas in the atmosphere.
15. A substance that helps plants grow.

Down

1. A greenhouse gas released by termites.
2. Effect caused by reflection of Sun's radiation.
3. A main ingredient in smog.
4. One of the elements in both methane and water.
7. Liquid water changes to gas.
8. A substance made only by humans.
9. A gas released by burning fossil fuels (two words).
12. The most common gas in the atmosphere.
14. State of matter that has no definite shape or volume.

Comprehension Quiz

Part A

30

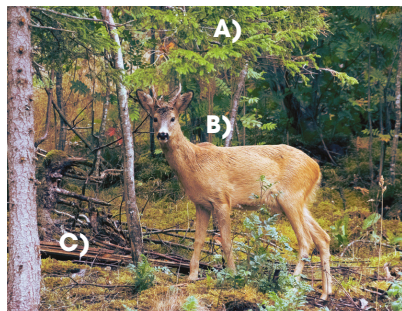
Circle the word **TRUE** if the statement is TRUE or **Circle** the word **FALSE** if it is FALSE.

1. Nitrogen and oxygen are the most common gases in the atmosphere.
TRUE **FALSE**
2. In a gas, the particles of matter are close together.
TRUE **FALSE**
3. Without the atmosphere, the average temperatures on Earth's surface would be much colder.
TRUE **FALSE**
4. Heat energy travels from the Sun to the Earth in the form of radiation.
TRUE **FALSE**
5. The kind of change that brings back balance in a system is called positive feedback.
TRUE **FALSE**
6. Fossil fuels are formed from the remains of plant and animals that lived millions of years ago.
TRUE **FALSE**
7. Residence time describes the amount of time it takes to complete a biogeochemical cycle.
TRUE **FALSE**
8. Farms are a source of the greenhouse gas methane.
TRUE **FALSE**

Part B

Label the diagram by doing the following:

1. Label the diagram to show some of the processes in the **carbon cycle**.
1 decay _____
2 photosynthesis _____
3 respiration _____
2. What is the main human source of carbon dioxide in the atmosphere?



6

SUBTOTAL: /14

Earth



"The atmosphere is the glowing blue ring around Earth, and the white areas of Earth are clouds and ice caps that reflect the most radiation from the Sun."



Greenhouse Gases: Methane

3. Answer each question with a complete sentence.

a) There is less methane in the atmosphere than other greenhouse gases, like carbon dioxide. Why is methane important in causing climate change?

b) Explain how the short residence time of methane in the atmosphere could help people fight climate change.

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3.

a) Methane absorbs 84 times more heat energy than carbon dioxide.

b) If people stop putting greenhouse gases into the atmosphere, methane will come out of the atmosphere fast because of its short residence time.

Across:

- 2. atmosphere
- 5. heat
- 6. greenhouse
- 9. cycle
- 10. energy
- 11. global warming
- 13. oxygen
- 15. fertilizer

Down:

- 1. methane
- 2. albedo
- 3. ozone
- 4. hydrogen
- 7. evaporate
- 8. synthetic
- 9. carbon dioxide
- 12. nitrogen
- 14. gas



EASY MARKING ANSWER KEY



Greenhouse Gases: Methane

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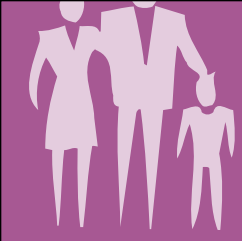
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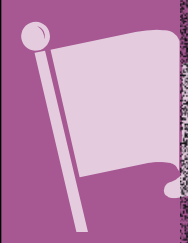
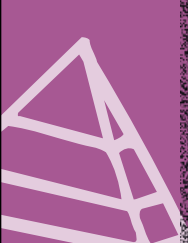
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Earth



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