Contents

TEACHER GUIDE

- Assessment Rubric 4
- How Is Our Resource Organized? 5
- Bloom's Taxonomy for Reading Comprehension 6
- Vocabulary 6

STUDENT HANDOUTS

- Earth's Atmosphere .....
- Global Warming 7
- Greenhouse Gases: Water Vapor .....
- Greenhouse Gases: Carbon Dioxide .....
- Greenhouse Gases: Methane .....
- Greenhouse Gases: Ozone .....
- Greenhouse Gases: Nitrous Oxide .....
- Greenhouse Gases: Synthetic Gases .....
- Hands-on Activities, Writing Tasks 12
- Crossword 16
- Word Search 17
- Comprehension Quiz 18

EASY MARKING™ ANSWER KEY 20

MINI POSTERS 22

NAME: _____

Before You Read

Global Warming

Answer the questions in complete sentences.

1. Have you ever heard of the term **global warming**? What do you think it means? How does it differ from climate change?

_____

_____

_____

2. Match the term on the left to its definition on the right. You may use a dictionary to help you.

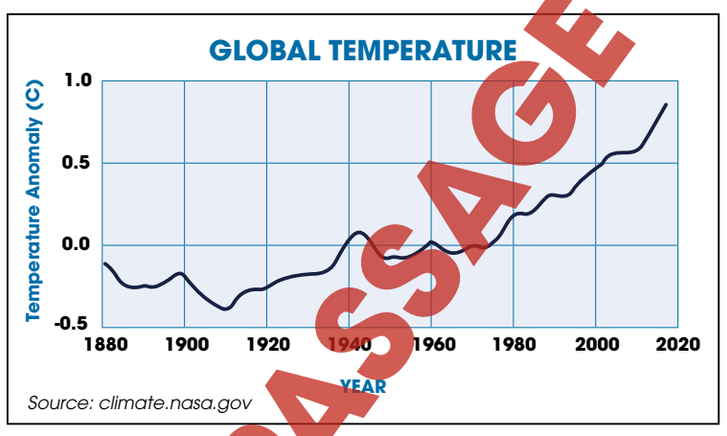
1	**average**	a form of heat energy that can travel through empty space	A
2	**escape**	to take in	B
3	**radiation**	a measure of the middle value of a set of data	C
4	**surface**	a series of events that happen over and over again	D
5	**absorb**	a group of related things that act together to form a whole	E
6	**cycle**	to break away from or get free of	F
7	**natural**	the outer edge of a body	G
8	**system**	a substance that can be found on Earth	H

Reading Passage

NAME: _____

Global Warming

You may have heard about **global warming**. But what is it? Global warming means the rise in the average temperature of Earth's lower atmosphere and oceans. The diagram shows how the average temperature of Earth has been rising for about the last 100 years.



Source: climate.nasa.gov

So how does global warming fit within **climate change**? Climate change means every kind of change that happens across the globe. This includes the average rise of Earth's temperature—otherwise known as global warming. It also includes the rise in sea level, the melting of the polar ice caps, changes in plants, and extreme weather conditions. Most scientists now agree that humans play a role in these global changes. These changes are the result of more greenhouse gases being added to the atmosphere. **Greenhouse gases** are gases that absorb heat energy from Earth's surface. When the Sun's radiation goes through the atmosphere, it is absorbed by Earth's surface. This causes the land and water to heat up. The land and water lose some of that heat by radiation. Without an atmosphere, this radiation would escape to space and Earth would be much cooler.

STOP

What are greenhouse gases?

_____

_____

Most greenhouse gases are found in nature. Natural greenhouse gases include water vapor, carbon dioxide, methane, ozone, and nitrous oxide. Some greenhouse gases are made only by people. These are called **synthetic** gases. Both natural and synthetic greenhouse gases have been added to the atmosphere for many years. Greenhouse gases are added every time fossil fuels—such as gas, oil and coal—are burned. Fossil fuels are burned in order to power factories, create electricity and run cars.

After You Read

NAME: _____

Global Warming

1. Complete each sentence with a word from the list. Use a dictionary to help you.

evaporates	**biogeochemical cycle**	**synthetic**
greenhouse gases	**albedo effect**	**global warming**

a) _____ is the rise of Earth's average temperature.

b) If a greater area of Earth was covered with ice, Earth would have a higher _____ _____.

c) When water _____ it turns to water vapor.

d) The path that water takes between ice caps, the ocean, and the atmosphere is one example of a _____.

e) Materials that cannot be found in nature but are made by people are called _____.

f) _____ trap heat energy from Earth's surface.

2. a) **Circle** the words that are fossil fuels.

gasoline	**biofuel**	**coal**	**oil**	**hydrogen**

b) **Underline** the words that are greenhouse gases.

methane	**carbon dioxide**	**nitrogen**	**water vapor**	**oxygen**

NAME: _____

After You Read

Global Warming

3. Answer each question with a complete sentence.

a) What is the relationship between greenhouse gases and global warming?

_____

_____

_____

b) How would melting ice caps change the albedo effect? What effect would this change have on global warming?

_____

_____

_____

_____

Research

4. What path does heat energy take between the Sun, Earth's surface and atmosphere? Reread this section from the Reading Passage. Trace the path of heat energy from the Sun, to Earth's surface, to greenhouse gases in the atmosphere. Using the library or Internet resources, find out more about:

- the difference between shortwave and longwave radiation. What role each type of radiation plays.
- What happens to greenhouse gases after they absorb radiation.

Create a diagram or model. It should show the path that heat energy takes between the Sun, Earth's surface and atmosphere. Include short written descriptions telling how greenhouse gases warm Earth's surface and lower atmosphere.

Hands-On Activity # 2

Create a model of the carbon cycle

Working with a small group, create a model that shows all of the processes of the carbon cycle.

1. First, use the library or Internet resources. Learn more about the details of your biogeochemical cycle. As you research information, ask questions like:

- In what parts of Earth can carbon be found?
- What form does carbon take in each part of the carbon cycle?
- How do natural processes move carbon from one part of the nitrogen cycle to another?
- How do human activities move carbon from one part of the carbon cycle to another?
- What is the residence time of carbon in each part of the cycle?

2. Then, decide how you want to model your cycle. Be creative! You could choose a diorama. Or, a model with moving parts. Or even a song, dance or play. Before creating your model, make a plan. In your plan, be sure your model has information about:

- All of the parts of the carbon cycle.
- The form carbon takes in all of the different parts of the cycle.
- The way that carbon moves from one part of the cycle to another.
- The amount of time different parts of the cycle take to complete.
- How human activities play a role in the carbon cycle.

3. Make your model. If you are making a physical model, get all of your materials together. This can include clay, glue, tape, construction paper, scissors, etc. If you are doing a performance, write down all of the parts. Practice many times with your group.

4. Present your model to the class. If you have a physical model, show it to the class. Be sure to explain what each part represents. If you are doing a performance, give a short introduction explaining how you will show the parts of the carbon cycle. Leave time in your presentation to answer questions from the class.

NAME: _____ After You Read

Word Search

Find all of the words in the Word Search. Words are written horizontally, vertically, diagonally, and some are even written backwards.

absorb	coal	gaseous	plants	stratosphere
air	cycle	liquid	poles	sun
albedo	factories	matter	radiation	temperature
biogeochemical	feedback	nitrogen	residence time	troposphere
carbon	fossil fuel	oil	respiration	water vapor
chlorofluorocarbon	gas	photosynthesis	smog	

A	I	R	P	C	R	F	A	P	D	E	M	Z	Y	W	R	Q	T
H	N	A	I	L	Z	L	Y	A	O	D	E	B	L	A	E	G	A
B	Y	D	Z	O	A	G	P	C	A	L	A	G	A	T	C	A	N
I	M	I	L	F	R	N	T	C	O	B	E	A	V	E	A	S	D
O	C	A	B	I	V	A	T	X	C	A	C	S	Y	R	Z	E	W
G	B	T	T	E	Q	S	D	S	Z	Y	L	M	N	V	H	O	E
E	F	I	N	T	H	U	V	I	L	C	W	R	G	A	C	U	A
O	T	O	A	G	E	T	I	Y	A	Z	Y	I	O	P	A	S	O
C	E	N	S	A	W	R	L	D	C	T	A	N	B	O	I	L	M
H	M	K	A	S	M	N	B	O	S	Y	I	Z	T	R	A	T	N
E	P	J	B	D	I	O	K	P	Y	T	N	O	C	Y	C	L	E
M	E	A	S	B	N	L	R	D	R	S	C	I	N	T	L	O	S
I	R	D	O	K	L	B	F	O	M	K	C	A	B	D	E	E	F
C	A	B	R	F	N	F	G	U	F	A	C	T	O	R	I	E	S
A	T	W	B	L	G	E	K	J	E	V	X	N	Q	Z	T	F	A
L	U	T	A	O	N	M	C	F	H	L	R	U	I	B	X	B	D
W	R	Y	M	V	E	M	I	T	E	C	N	E	D	I	S	E	R
Q	E	S	T	R	A	T	O	S	P	H	E	R	E	G	T	H	W
Y	M	U	Y	R	O	U	M	V	W	J	L	K	R	Y	S	A	Q
M	F	N	R	Y	U	W	E	R	E	H	P	S	O	P	O	R	T
A	P	H	O	T	O	S	Y	N	T	H	E	S	I	S	Z	S	A
C	H	L	O	R	O	F	L	U	O	R	O	C	A	R	B	O	N
D	W	H	I	W	N	O	I	T	A	R	I	P	S	E	R	W	T

NAME: _____ After You Read

Comprehension Quiz

Part C

Answer the questions in complete sentences.

1. Describe the main characteristics of the **troposphere** and the **stratosphere**. (3)

2. Explain how **greenhouse gases** affect the temperatures on Earth's surface. (3)

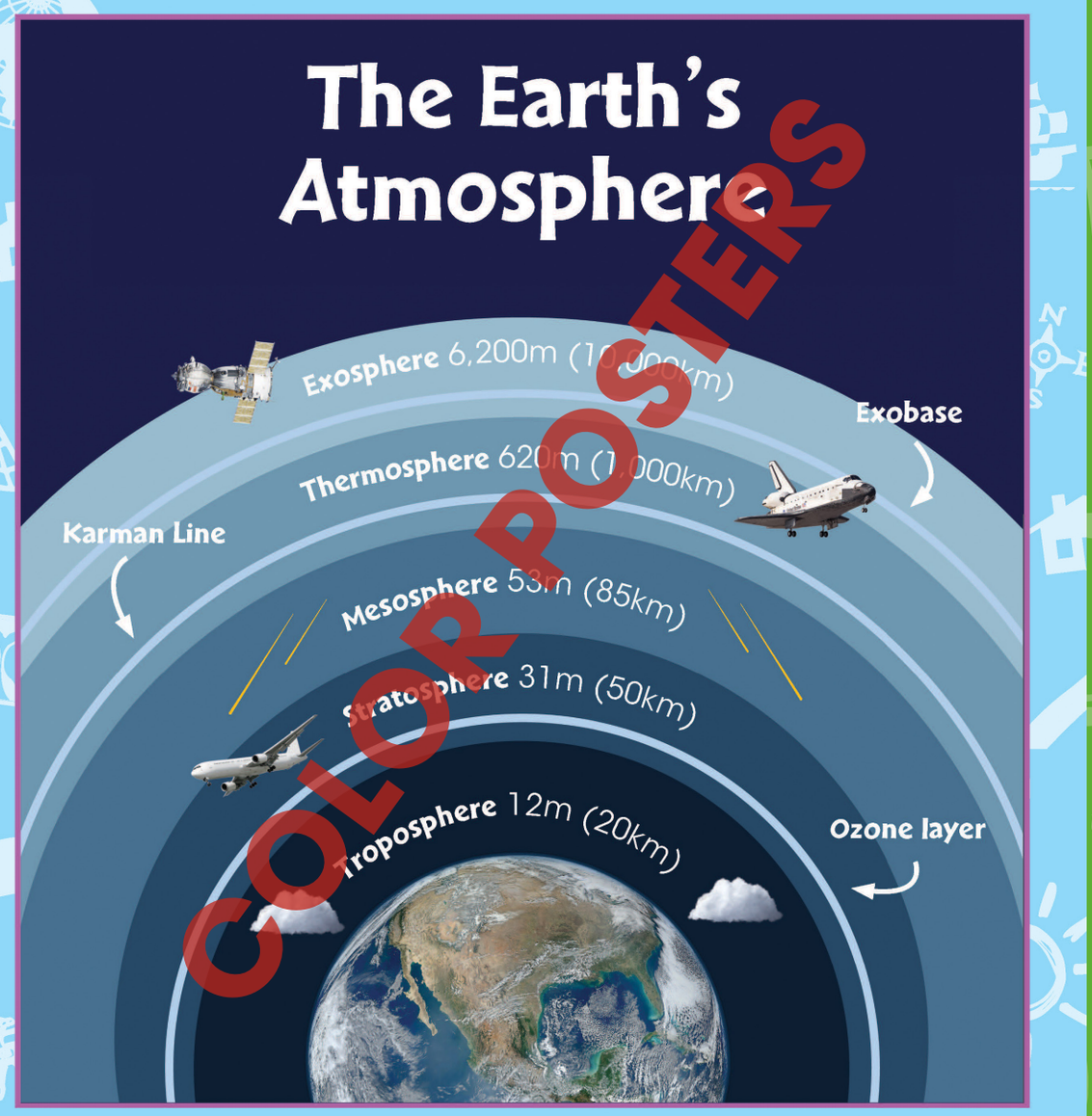
3. What is the **albedo effect**? Give an example of how the albedo effect could cause a positive feedback cycle that would speed up climate change. (4)

4. How does the **residence time** of a greenhouse gas relate to its role in causing climate change? (3)

5. Why has the amount of carbon dioxide in the atmosphere been increasing for the past 100 years or so? (3)

SUBTOTAL: /16

Layers of the Atmosphere



NAME: _____

After You Read

Global Warming

3. Answer each question with a complete sentence.

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EZ

3.

a) An increase in greenhouse gases in the atmosphere has led to global warming.

b) Melting ice caps would reflect less sunlight, which decreases the albedo effect, and leads to more warming.

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

Reading Passage

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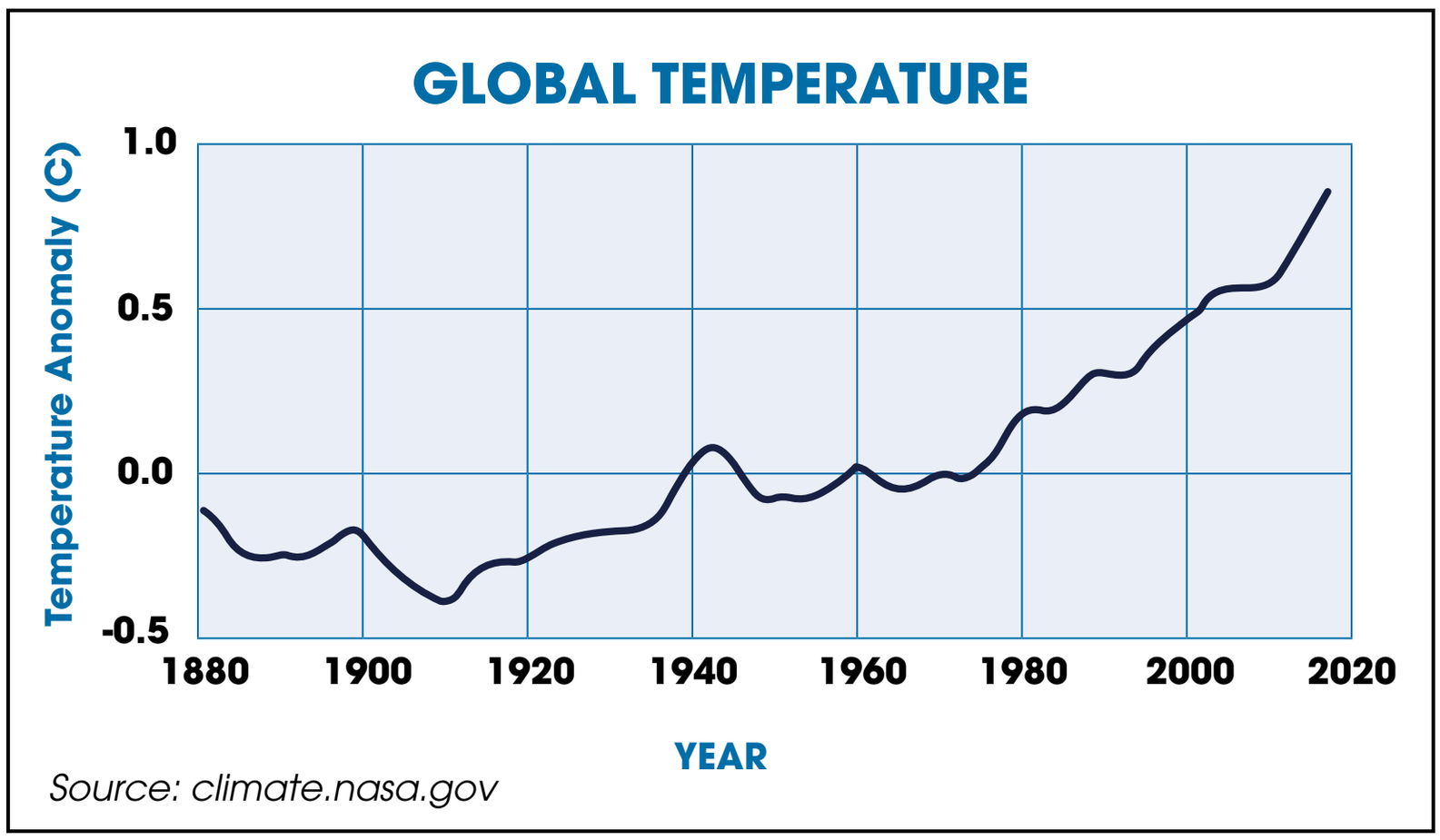

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The Earth's Atmosphere

Exosphere 6,200m (10,000km)

Thermosphere 620m (1,000km)

Exobase

Karman Line

Mesosphere 53m (85km)

Stratosphere 31m (50km)

Troposphere 12m (20km)

Ozone layer