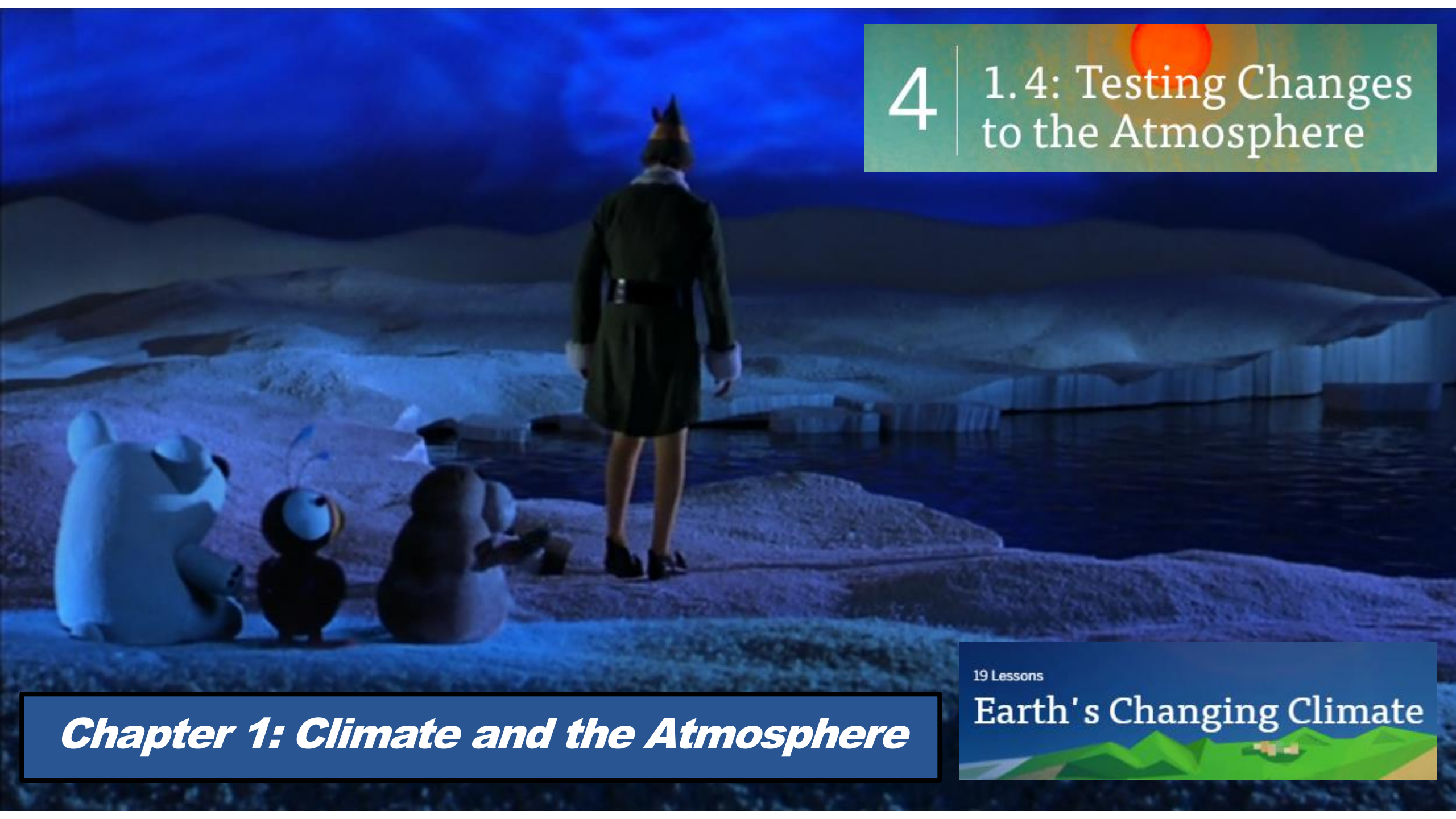

4
1.4: Testing Changes to the Atmosphere
19 Lessons
Earth's Changing Climate
Chapter 1: Climate and the Atmosphere

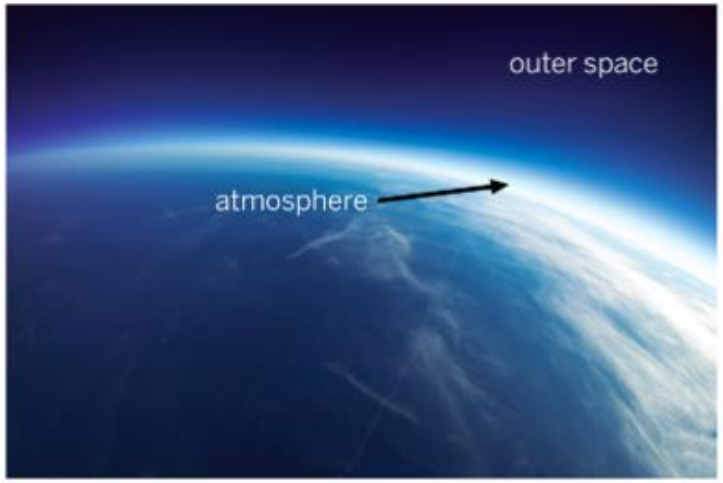
1 WARM UP
Warm-Up

ECC: 1.4.1 WARM-UP

HAND IN

Students record their initial ideas about the atmosphere, and then learn that it is a mixture of different gases. (7 min)

Go to SIM and finish model drawing from Friday. to be stamped (3 min)



What is the atmosphere made of?

2 **TEACHER-LED DISCUSSION**
Introducing the Claims Chart

LW: 1.4.2 CLAIMS

The teacher introduces categories of claims about the cause of melting ice, relating them to the student-generated claims. (5 min)

Why is the ice on Earth's surface melting?

2 categories of claims - claims about changes in energy from sunlight and changes to Earth's atmosphere.

Focus on earths atmosphere.

You learned that if ice is melting and temperatures are increasing, energy absorbed by Earth's surface must also be increasing.

3 **SIM**
Testing Changes to the Atmosphere

LW: 1.4.3 TESTING CHANGES TO THE ATMOSPHERE

HAND IN

In the Simulation, students test the effects of increasing or decreasing gases and observe the effects on temperature, energy, and ice. (23 min)

What kinds of changes to the atmosphere could affect how much energy is absorbed by Earth's surface?

1 of 3 NEXT >

< 2 of 3 NEXT >

< 3 of 3 HAND IN

3 **SIM**
Testing Changes to the Atmosphere

LW: 1.4.3 TESTING CHANGES TO THE ATMOSPHERE

HAND IN

In the Simulation, students test the effects of increasing or decreasing gases and observe the effects on temperature, energy, and ice. (23 min)

Testing Nitrogen Dioxide and Carbon Dioxide

Use the Simulation to investigate the claim that all gases affect energy absorbed by the surface in the same way.

One partner will test nitrogen dioxide and carbon dioxide; the other student will press NEXT to record the test results for sulfur dioxide and methane.

1. Let the Sim run until the timer reaches 20 before beginning a test.
2. Make only one change per test. When increasing, set the gas at 500 ppm; when decreasing, set the gas at 0 ppm.
3. Run the test until the timer reaches 40.
4. Observe the temperature, amount of ice, and glow of absorbed energy.
5. View the graph to observe changes in temperature, surface ice, and absorbed energy.
6. Record your results.
7. Reset the Sim before your next test.

Page 1

1. When I increased nitrogen dioxide, **energy absorbed by the surface** [ ], **temperature** [ ], and the **amount of ice** [ ].

3 **SIM**
Testing Changes to the Atmosphere

LW: 1.4.3 TESTING CHANGES TO THE ATMOSPHERE

HAND IN

In the Simulation, students test the effects of increasing or decreasing gases and observe the effects on temperature, energy, and ice. (23 min)

Testing Sulfur Dioxide and Methane

Use the Simulation to investigate the claim that all gases affect energy absorbed by the surface in the same way.

One partner will test sulfur dioxide and methane; the other student will test nitrogen dioxide and carbon dioxide.

1. Let the Sim run until the timer reaches 20 before beginning a test.
2. Make only one change per test. When increasing, set the gas at 500 ppm; when decreasing, set the gas at 0 ppm.
3. Run the test until the timer reaches 40.
4. Observe the temperature, amount of ice, and glow of absorbed energy.
5. View the graph to observe changes in temperature, surface ice, and absorbed energy.
6. Record your results.
7. Reset the Sim before your next test.

Page 2

1. When I increased sulfur dioxide, **energy absorbed by the surface** [ ], **temperature** [ ], and the **ice** [ ].

3 **SIM**
Testing Changes to the Atmosphere

LW: 1.4.3 TESTING CHANGES TO THE ATMOSPHERE

HAND IN

In the Simulation, students test the effects of increasing or decreasing gases and observe the effects on temperature, energy, and ice. (23 min)

Page 3

Analyzing Evidence from the Sim Tests

Answer the question and provide evidence to support your answer. If you have time, you can upload screenshots of graphs from your Sim testing as part of your evidence. There is room for four graphs, but you do not need to include all four. If you include screenshots, describe how they provide evidence as part of your answer. You may also annotate the graphs.

Do you agree or disagree with the claim, *A change to any gas in the atmosphere affects energy absorbed by the surface in the same way.*

a agree

b disagree

What is your evidence?

UPLOAD AN IMAGE

UPLOAD AN IMAGE

STUDENT-TO-STUDENT DISCUSSION
Using the Word Relationships Routine to Reflect

LW: 1.4.4 WORD RELATIONSHIPS

HAND IN

Students reflect on the work they did in the Sim by participating in a vocabulary routine. (10 min)

Key Concept

- When the amount of carbon dioxide or methane in the atmosphere changes, the amount of energy absorbed by the surface also changes.
- When the amount of carbon dioxide or methane increases, energy absorbed by the surface increases.
- When the amount of carbon dioxide or methane decreases, energy absorbed by the surface decreases.

4 **STUDENT-TO-STUDENT DISCUSSION**
Using the Word Relationships Routine to Reflect

LW: 1.4.4 WORD RELATIONSHIPS

HAND IN

Students reflect on the work they did in the Sim by participating in a vocabulary routine. (10 min)

Word Relationships

With a partner, use words from the Word Bank to create different sentences that answer the Investigation Question, *What kinds of changes to the atmosphere could affect how much energy is absorbed by Earth's surface?* After you discuss some different ideas, record at least two of your sentences.

Word Bank

carbon dioxide	methane	temperature
energy	increase	decrease
absorb	surface	atmosphere

Record at least two different sentences that answer the Investigation Question.

LW: 1.4.5 HOMEWORK

HAND IN

For homework, students read a short article about ozone in order to counter misconceptions about this concept.

A Hole in Earth's Ozone Layer