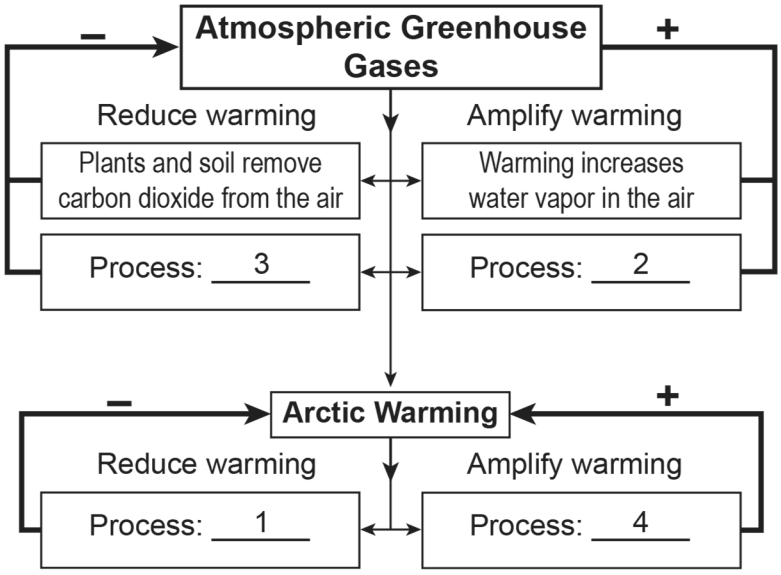
Rating Guide
ESS Cluster-25

1 [1] Allow 1 credit for an acceptable response. Acceptable responses include, but are not limited to:

— Heat released by the warming ocean will enter into the atmosphere, lowering atmospheric pressure and causing the Arctic region to warm.

— Increased Arctic heating will reduce the amount of sea ice and expose more ocean water to absorb heat, which enters the atmosphere, lowering average air pressure by adding moisture to the atmosphere and warming the climate.

2 [1] Allow 1 credit for *four* correctly placed process numbers, as shown on the model below:



3 [1] Allow 1 credit for 1.

4 [1] Allow 1 credit for 2.

5 [1] Allow 1 credit for 3.

Item Alignment
Earth and Space Sciences
Earth's Climate Cluster

Item Number	Performance Expectation
1	HS-ESS2-4
2	HS-ESS2-4
3	HS-ESS2-2
4	HS-ESS3-5
5	HS-ESS2-2

Rating Guide
ESS Cluster-25

1 [1] Allow 1 credit for *both* a correct spatial and temporal change. Acceptable responses include, but are not limited to:

Spatial change:

— After Theia impacted Earth, the Moon was 14,000 miles way from Earth. Now, the Moon is 239,000 miles away from Earth because it is moving away from Earth.

— The Moon is 17 times farther away from Earth now compared to the Moon's position one month after Theia's collision.

Temporal change:

— The initial collision of Theia took place over 20 hours and the Moon formed within a month with Theia material scattered throughout Earth's mantle.

— 4.5 billion years after post-impact, material from Theia had settled to the bottom of Earth's mantle.

2 [1] Allow 1 credit for 4.

3 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Zircons found in Moon rocks must have contained 50% Uranium-238 and 50% Lead-206, which indicated that the rocks were approximately 4.5 billion years old, which is the same age as Earth.

— Zircons in the Moon rocks contained amounts of Uranium-238 and Lead-206 that indicated a decay rate of one half-life, which means the zircons were about 4.5 billion years old. This is about the same age as Earth.

4 [1] Allow 1 credit for 3.

5 [1] Allow 1 credit for 1.

6 [1] Allow 1 credit for checking the correct boxes to complete each statement as shown below.

Statement 1
A comparison of earthquake depths and moonquake depths indicates
☒ all earthquakes occur at depths less than 700 km in Earth's crust and upper mantle
☐ all moonquakes occur at depths between 700-1200 km in the Moon's lower solid mantle

Statement 2
Locations of circulation by thermal convection occur
☐ in the Moon's lower solid mantle
☒ in Earth's upper mantle and crust

Statement 3
The Moon's formation from a collision with a planetary body called Theia is best evidenced by
☒ the basalts on Earth and the Moon are made from the same minerals
☐ the Moon and Earth both have a crust, mantle, and solid inner core

Item Alignment
Earth and Space Sciences
Theia and the Moon Cluster

Item Number	Performance Expectation
1	HS-ESS2-1
2	HS-ESS1-6
3	HS-ESS1-6
4	HS-ESS2-1
5	HS-ESS1-6
6	HS-ESS2-3