Rating Guide
ESS Cluster-25

Item Alignment
Earth and Space Sciences
Earth's Climate Cluster

Item Number	

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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 mi Tw 14.695 0 Td[(m)8pT142he Moo
