SN EDUCATOR GUIDE

March 28, 2020

Rover Peers Beneath Moon's Farside

Activity Guide for Students: Geologist for a Day

Directions:
You are working in a university geology lab for the summer, helping identify the types of rock in samples from dig sites and figuring out how the sample formed. A field geologist asks for your assistance on two new samples. Review the geologist's notes (provided by your teacher) and use them to answer the questions that follow. Your lab has been developing a table of rock types and their characteristics that, though not yet complete, will also aid your efforts.

1. Look at the notes and the pictures of the samples. What other information should be requested from the geologist and added to the notes?

2. Based on the geologist's notes, determine the volume of each sample in cm^3. Then use the mass and volume of each sample to find their densities in g/cm^3.

Sample 1:
v =
d =

Sample 2:
v =
d =

3. One column on the table is for the "hardness" of the rocks. What is hardness and how is it measured?

4. The word "silicates" appears several times in the "Material/mineral classification" column of the table. What does this term mean?

5. How can several rocks be different types but still have the same material/mineral classification?

6. Before you proceed with your research, you need to fill in some missing details in your table. Research the properties of granite, feldspar, limestone and quartz and add them where appropriate on your rock table.

7. Based on your table, do you think either of your samples is granite? Why? What could you do to further support your hypothesis?

8. Based on your table, what do you think the identity of sample 1 is? Why? What could you do to further support your hypothesis?

9. Does it make sense that these two materials would be found in the same quarry? Why or why not?

10. Based on your knowledge and any necessary research, how did these rocks form?

11. What can you infer from the relative depths of the two samples? How may this relate to your understanding of how the two samples formed?

Geology of the future

After completing your work, you get a new message from the geologist. She notes that the rocks are not from a quarry on Earth, but from a quarry on the moon! Read a bit about the geology of the moon in "Rover peers beneath moon's farside." Consider how this new information might change your understanding of the rocks and their formation by answering the following questions.

12. Some quick research suggests that moon rocks brought back from the Apollo missions were igneous. Why might it make sense that the moon rocks were igneous when most of the rocks on Earth's surface are sedimentary?

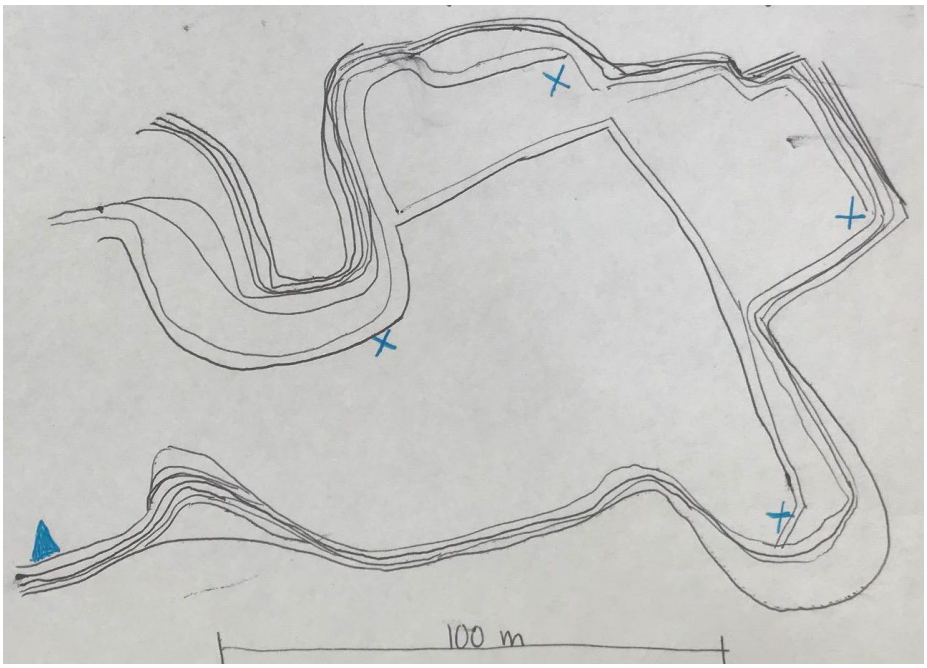
13. How do the rocks on the moon's farside (the side facing away from Earth) and the nearside differ? What might that suggest about the moon's history?

14. Oxygen and silicon are the two most common elements found on both Earth's and the moon's surfaces. Based on the new information, could your identification of the samples still be correct? Why or why not?

15. Why would geologists compare rocks from Earth and the moon? Why might geologists be interested in rocks from other planets?

Geologist's notes

Granite Quarry—May 27, 2019
Small eastern corner of the quarry.
Arrived at 9 a.m., weather conditions are calm with clear skies, temperature is 18° C (65° F).
Team consists of two graduate students and myself.
Discussed mine operations with the quarry manager.
Drew map and started working.



Marked the map with location of samples: Δ for sample 1, X for sample 2.
Samples have been submitted to the lab for analysis.

Sample 1: white sample
Mass is 17.6 grams
Size is 2.3 cm by 3 cm by 1 cm
Found at 3 meters deep

Sample 2: white/light gray sample
Has small black spots
Size is 2 cm by 2 cm by 1.8 cm
Mass is 19.8 grams
Found at 15 meters deep

Rock table

Type	Color(s)	Hardness (Mohs)	Identification	Material/mineral classification	Density (g/cm^3)
Amphibole	green or brown	5.5	mineral	silicates	2.90
Diamond	colorless	10	mineral	carbon (C)	3.51
Granite					
Feldspar					
Graphite	black or gray	1	mineral	carbon (C)	2.26
Gypsum	colorless	2	mineral	calcium sulfate ($CaSO_4$)	2.96
Limestone					
Marble	white	3	metamorphic	calcite ($CaCO_3$)	2.71
Mica	black	2.5	mineral	silicates	2.88
Quartz					