

SI Geology - Full Discipline Demo

Minerals - No Materials

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Geology - Full Discipline Demo
Course	SI Geology - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

Categorize each statement as true or false.

⚡ Minerals are naturally occurring organic substances. ⚡ Minerals can be identified using a single characteristic. ⚡ Minerals have a characteristic chemical composition and crystal structure. ⚡ Rocks are aggregates of one or more minerals.	
True	False
1	2

Correct answers:

- 1 Minerals have a characteristic chemical composition and crystal structure.
Rocks are aggregates of one or more minerals.
- 2 Minerals are naturally occurring organic substances.
Minerals can be identified using a single characteristic.

Match the mineral property to its definition.

Diagram illustrating the relationship between mineral properties and their definitions:

- Clarity
- Cleavage
- Fracture
- Hardness
- Luster
- Specific Gravity
- Streak

Definitions:

- The way the surface of a mineral reflects light
- The color of a mineral after it has been ground to a fine powder
- The measure of a mineral's resistance to scratching
- A measurement that determines how heavy a mineral is by its relative weight to water
- Breakage of a mineral along a flat surface
- A relative measure of the amount of light that can pass through a mineral
- Breakage of a mineral along an irregular or curved surface

Correct answers:

- | | | | | | | | | | |
|---|---------|---|----------|---|----------|---|------------------|---|----------|
| 1 | Luster | 2 | Streak | 3 | Hardness | 4 | Specific Gravity | 5 | Cleavage |
| 6 | Clarity | 7 | Fracture | | | | | | |

Exploration

Minerals have a characteristic chemical composition and a ____ structure.

- ☒ crystalline ✓
 - ☐ organic
 - ☐ effervescent
 - ☐ translucent
-

What is the luster of a nonmetallic mineral that is described as iridescent?

- ☐ vitreous
 - ☒ pearly ✓
 - ☐ adamantine
 - ☐ silky
-

Minerals with high hardness have weaker atomic bonds.

- ☐ True
 - ☒ False ✓
-

____ occur as a result of parallel planes of weakness between repeating, parallel layers of atoms in a crystal.

- ☐ Cleavage planes
 - ☐ Cleavage directions
 - ☒ Cleavage surfaces ✓
 - ☐ Conchoidal fractures
-

Specific gravity is a unitless measurement that determines how heavy a mineral is by its relative weight to water.

- ☒ True ✓
 - ☐ False
-

Exercise 1

Which mineral sample had the highest specific gravity? What does this tell you about the elements or compounds that make up this mineral?

Why is it helpful to know the specific gravity of an unknown mineral?

How would a mineral's specific gravity be affected if the mineral contained impurities (i.e., other elements not normally part of a mineral's atomic structure)?

Data Table 1: Specific Gravity of the Mineral Samples
(SAMPLE ANSWER BELOW)

Sample	Dry Mass (g)	Total Volume (mL)	Mineral Volume (mL)	Specific Gravity
1	16.1	205-206	5-6	3.22-4.03
2	15.0	205-206	5-6	2.5-3.0
3	16.7	206-207	6-7	2.39-2.78
4	39.1	208-209	8-9	4.34-4.89
5	19.0	206-207	6-7	2.71-3.17
6	21.9	208-209	8-9	2.43-2.74
7	47.9	209-210	9-10	4.79-5.32
8	18.9	208-209	8-9	2.1-2.36
9	19.8	207-208	7-8	2.48-2.83
10	14.9	207	7	2.13
11	32.8	206-207	6-7	4.69-5.47

12	1.0	200	0.30-0.35	2.86-3.33
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Exercise 2

Which mineral sample had the highest specific gravity? What does this tell you about the elements or compounds that make up this mineral?

Why is it helpful to know the specific gravity of an unknown mineral?

How would a mineral's specific gravity be affected if the mineral contained impurities (i.e., other elements not normally part of a mineral's atomic structure)?

List three possible sources of error in this exercise. How would each source or error impact your final specific gravity calculation?

What physical property or combination of properties were the most helpful in helping you identify the minerals? Why?

Examine the properties of gold listed in the table below and compare them to properties of Mineral Sample 1 listed in Data Table 2. What properties of Mineral Sample 1 could be used to distinguish it from gold?

Property	Native Gold
Luster	Metallic
Color/Clarity	Yellow/opaque
Streak	Yellow
Hardness	2.5–3.0
Cleavage	Absent (ductile and malleable)
Specific Gravity	19.3

What is the common nickname for Mineral Sample 1? Based on your answer to Question 6, do you think the common nickname for Mineral Sample 1 is accurate? Why or why not?

Data Table 2: Mineral Properties
(SAMPLE ANSWER BELOW)

Sample	Luster	Color/Clarity	Streak	Hardness	Cleavage	Specific Gravity	Magnetic (Y/N)
1	Vitreous	Red or brown/opaque to translucent	White	7.0	Uneven fracture	3.22-4.03	No
2	Vitreous or greasy	White, pink, gray/transparent	None	7.0	Conchoidal fracture	2.5-3.0	No

		or translucent					
3	Vitreous	Pink or orange-brown/opaque	White	6.0	2 at 90°	2.39-2.78	No
4	Metallic	Brassy yellow/opaque	Dark gray or black	6.0 or 6.5	Uneven fracture	4.34-4.89	No
5	Vitreous	Dark green or black/opaque	White or pale gray	5.5	2 not at 90°	2.71-3.17	No
6	Vitreous or pearly	Colorless, white, or gray/opaque	White	6.0	2 at 90°	2.43-2.74	No
7	Metallic	Silver, gray, or black/opaque	Red-brown	6.0	Uneven fracture	4.79-5.32	No
8	Dull/earthy	White or tan/opaque	White	1.0-2.0	Absent	2.1-2.36	No
9	Vitreous or iridescent	Colorless or white/transparent or translucent	White	3.0	3 not at 90°	2.48-2.83	No
10	Vitreous	Colorless or white/transparent or translucent	White	2.5	3 at 90°	2.13	No
11	Metallic	Silver, gray, or black/opaque	Dark gray	6.0	Uneven fracture	4.69-5.47	Yes
12	Vitreous	Dark brown/translucent to opaque	Gray-brown	2.5 or 3.0	One excellent	2.86-3.33	No

Data Table 3: Mineral Identification
(SAMPLE ANSWER BELOW)

Sample	Mineral Name
1	Garnet Schist
2	Milky Quartz
3	Potassium Feldspar
4	Pyrite
5	Amphibole
6	Plagioclase Feldspar
7	Hematite
8	Kaolinite
9	Calcite
10	Halite
11	Magnetite
12	Biotite

Competency Review

A mineral is described as being opaque. What mineral characteristic is being evaluated?

- ☐ Color
- ☐ Luster
- ☒ Clarity
- ☐ Hardness

Which characteristic does not describe a mineral?

- ☐ Characteristic chemical compound
- ☒ Organic
- ☐ Crystalline structure
- ☐ Naturally occurring

The color and streak of a mineral are always the same.

- ☐ True
- ☒ False

A mineral that splits into parallel sheets would exhibit what type of cleavage?

- ☐ Rhombohedral cleavage
- ☐ Cubic cleavage
- ☐ Prismatic cleavage
- ☒ Basal cleavage

A mineral has a dry mass of 30.1 g and a volume of 7.30 mL. What is the specific gravity of the mineral?

- ☒ 4.12 ✓
 - ☐ 7.30
 - ☐ 5.77
 - ☐ 3.48
-

If a mineral scratches a copper penny, but not an iron nail, it has a hardness ____.

- ☐ between 5.5 and 6.5
 - ☐ less than 2.5
 - ☒ between 3.5 and 4.5 ✓
 - ☐ greater than 7
-

Minerals containing ____ will effervesce when exposed to acid.

- ☐ sodium chloride
 - ☒ calcium carbonate ✓
 - ☐ calcium chloride
 - ☐ iron
-

____ is a metallic mineral that is magnetic and exhibits uneven fracture and a dark gray streak.

- ☐ Pyrite
 - ☐ Hematite
 - ☐ Amphibole
 - ☒ Magnetite ✓
-

A mineral displays a dull/earthy luster, a white streak and a hardness of < 2.5. What is the identity of this mineral?

- ☐ Potassium Feldspar
- ☐ Plagioclase Feldspar
- ☒ Kaolinite ✓
- ☐ Garnet

Specific gravity has units of g/mL.

- ☐ True
- ☒ False ✓

Extension Questions

Marble is a rock that is composed primarily of the carbonate minerals calcite (CaCO_3) and dolomite ($\text{Ca,Mg}(\text{CO}_3)_2$). Why do you think people who care for outdoor monuments and sculptures made of marble are concerned about acid rain? (SAMPLE ANSWER BELOW)

Calcite effervesces (degrades) when exposed to acid. Therefore, acid rain will cause marble to weather or degrade over time. Long term, this may result in the destruction of the historic monuments/sculptures.