**Unit 2: Minerals, Rocks and Layers of Earth**

**Lab #1: Identifying Minerals – Answer Key**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mineral**  **Name** | **Hardness**  **(scratch)** | **Streak**  **(color of powder)** | **Luster**  **(light reflects)** | **Color** | **Fracture**  **&**  **Cleavage** | **Crystal System**  **(geometry)** | **Special/Other Properties** | **Common Habit/Appearance** | **Density**  **(g/cm³)** |
| 1.  Quartz (milky) | 7 | Colorless | Glassy (vitreous) | Colorless to white | No Cleavage  Fracture Conchoidal (curved) | Hexagonal | None  (tested)  (Piezoelectricity Property not tested) |  | 2.7 |
| 2.  Calcite | 3 | White to grayish | Glassy (vitreous) to Pearly | Colorless to white | Perfect Cleavage  Fracture  Conchoidal (curved) | Hexagonal Family  (Rhombohedral) | **Reactive**  Double Optics (not tested) |  | 2.7 |
| 3.  Feldspar | 6 | Colorless, white | Glassy (vitreous) to Pearly | colorless to pink | Good Cleavage  Poor Fracture | Triclinic | None |  | 2.6 |
| 4.  Hornblende | 5.5 | White to dark gray-green | Glassy (vitreous) to Dull | Dark green, brown, black | Poor Cleavage  Fracture | Monoclinic | None |  | 3-3.4 |
| 5.  Biotite  (mica) | 2.5 | Colorless to pale greenish | Glassy (vitreous) to Pearly | Dark green to black | Perfect Cleavage  Fracture | Monoclinic | None  (tested)  (Heat resistant property not tested) |  | 2.8-3.4 |

**Lab #2: Mineral Formation, Weathering, and Soil – Answer Key**

**Minerals from Solution**

Minerals form in two different ways; from molten material and solution. Moreover, minerals form from a **solution** in two different ways; from evaporation and hot water. Minerals that form from a solution crystalize out of water in which they were dissolved (i.e., solution). In the case of a hot water solution, minerals form from water that is heated by magma inside the Earth (i.e., intrusive). The hot water solution eventually cools in cracks in the ground, known as veins. This process (i.e., cooling of hot water solution) is how many precious metals (i.e., minerals) are formed (e.g., gold, silver, copper). The second way that minerals form from a solution is by evaporation. In evaporation, minerals crystalize out of the solution by losing their water and leaving behind the mineral crystals. Evaporite minerals often form on the surface (i.e., extrusive) of the Earth. Many times these minerals form on the edge of a lake, ocean, or dried seabed (e.g., Dead Sea, Salt Lake).

**LAB #1: Supersaturated Solution – How Minerals form from Hot Water Solutions**

**Background:** A supersaturated solution, is one that has more dissolved particles (i.e., solute) than normal. At room temperature, there is a point when no more minerals can dissolve in a liquid (i.e., solution is saturated). However, if the solvent (i.e., water) is heated, more minerals can dissolve into a solution. You will create a supersaturated solution by heating water and adding minerals. This will demonstrate how a hot water solution can carry large amounts of dissolved minerals.

Minerals form from Solution or Molten Material

**Questions:**

1. What is the difference between a solution and a supersaturated solution?

**Solution:** dissolved solute/minerals in solvent/water, but **could** dissolve more in solution

**Supersaturated:** solvent/water heated to dissolve more solute/minerals than the solution

Solution

Molten Material

can hold at room temperature (i.e., extra solute, beyond normal capacity)

1. What is crystallization?

**The process by which atoms are arranged to form a material with a crystal structure.**

**Lava**

**Magma**

**Evaporation**

**Hot Water**

1. Explain how mineral crystals form from a hot water solution.

**When water solution begins to cool, the elements and compounds leave the**

**solution and crystallize as minerals.**

1. Explain how this lab is similar to how silver, gold, or copper forms.

**In the lab a supersaturated solution cooled in a cup and the minerals crystalized out of solution. Silver/gold/copper also form from a hot water solution by which the solution cools and the minerals crystalize out into a vein (i.e., crack in ground).**

1. Complete the left side of the graphic organizer (i.e., solution).

**LAB #2: Minerals from Evaporation**

**Background:** As you have learned, minerals can crystallize out of a hot water solution. Minerals can also crystallize from evaporation of a solution. In this lab you will learn how an evaporating liquid (i.e., solution) leaves its minerals behind.

**Questions:**

6. What is the crystal system for the mineral Halite (i.e., rock salt)? (e.g., hexagonal, monoclinic, triclinic, tetragonal, orthorhombic, cubic)

**Cubic**

7. Explain how crystals form from evaporation. (p. 79)

**When a water solution slowly evaporates, the elements and compounds combine together and crystalize as a mineral.**

8.Explain why the crystals would have been larger if you would have allowed the water to evaporate slowly, over the course of days. (p. 77)

**Slow evaporation allows the elements and compounds time to combine together and form large crystals. A rapid/fast evaporation process does NOT allow enough time for the dissolved material to clump together into big crystals. In other words, it takes time to grow large.**

**Minerals from Molten Material**

Minerals form in two different ways; from molten material and solution. When minerals form from molten material they can crystalize from lava inside of the Earth or magma on the surface of the Earth. In the case of mineral crystallization from lava, the crystals form extrusively. Extrusive means that the crystals formed on the surface, outside of Earth. When crystals form extrusively, they form quickly. They form quickly because the outside air cools the lava rapidly (i.e., quickly). This fast cooling does not allow the crystals time to grow and the minerals form small crystals; sometimes the crystals are nonvisible. When the minerals cool inside the Earth or intrusively, the crystals form slowly. This slow cooling of the minerals causes them to have large crystals. In other words, the crystals have sufficient time to grow when the minerals slowly cool inside (i.e., intrusive) the Earth.

**LAB #3: Intrusive and Extrusive Crystals that Form in Lava or Magma**

**Background:** The rocks Granite and Rhyolite are made from the same minerals. This means that they are from the same magma source. Moreover, these igneous rocks are found at stratovolcanoes and generally occur at continental volcanic arcs.Even though these rocks are made from the same material and found at the same volcanoes, they look **distinctly** different.

**Questions:**

9. Explain the **formation** difference between intrusive magma and extrusive lava mineral crystals (i.e., where they form). (p. 77 & 98-99)

**Intrusive: magma/inside crust/underground Extrusive: lava/ surface/outside**

10. Explain the crystal **size** difference for intrusive and extrusive rocks (i.e., why one rock’s crystals are larger than the other).

**Intrusive: Large crystals due to slow cooling inside ground/magma Extrusive: small crystals due to rapid cooling outside ground/lava**

11. Explain how the formation of Rhyolite was different from Granite. (p. 77)

**Granite:** cools slowly as it rises up the magma chamber; slow, intrusive cooling inside Earth allows time for crystals to grow large

**Rhyolite:** cooled rapidly outside of Earth as lava; fast, extrusive cooling did NOT allow time for crystallization and small crystals were formed

12.On Lab #1 there is a graphic organizer, complete the right side of the graphic organizer (i.e., molten material).

**Weathering v. Erosion**

Two Forms

of

Weathering

**LAB #4: Physical/Mechanical Weathering** (p.240-241)

**Questions:**

13. Classify the type of weathering in the illustration (e.g., freezing & thawing, animal actions, abrasion).

**Answer varies**

14. Write a sentence explaining why the example demonstrates this type of weathering.

**Chemical**

**Physical/Mechanical**

**Answer varies**

**LAB #5: Chemical Weathering**

Types

**1. Ice Wedging (freeze/thaw)**

**2. Release of Pressure**

**3. Plant Growth**

**4. Action of Animals**

**5. Abrasion**

**Questions:**

Types

**1. Water**

**2. Oxygen**

**3. Carbon Dioxide**

**4. Living Organisms**

**5. Acid Rain**

15. Explain how this lab simulates chemical weathering on Earth. (p. 242-243)

a. Note the type of chemical weathering that is taking place.

**The marble stone was chemically broken down by the weak acid (i.e., vinegar).**

**This was evident in the carbon dioxide bubbles that were coming from the marble chip.**

**This is similar to carbonic acid; this is a week acid made of carbon dioxide and water.**

16. Complete the graphic organizer. (p. 240-243)

a. Note: One of the boxes represents erosion.

Label & give a short definition in this box.

17. Tombstones used to be made from marble; however they are now made from granite.

After completing this lab on chemical weathering, why do you think marble tombstones are

no longer used? (p. 245)

**Marble weathers easily when in contact with a weak acid. Tombstones are meant to exist for**

**centuries. However, weathering of marble by acid rain, water, and plants can happen quickly.**

18. Weathering and erosion are two different processes, what would be a good lab to demonstrate

**Erosion: is the removal of rock particles by wind, water, ice, or gravity.**

erosion? (p. 239)

**Answers will vary. Answers should contain a lab that shows the movement of sediment,**

**because erosion is the transporting of weathered material.**

**In other words, the lab should move something away.**

**Soil**

**LAB #6: Examining Dirt**

**Questions:**

19. Which “horizon” of soil was present in the soil sample? (From Procedure: Step 2)

**Horizon A:** made of topsoil; a crumbly, dark brown soil that is a mixture of hummus, clay, and other minerals.

20. Compare what you read about the composition of soil to what you observed in the soil sample.

**Answers will vary. Students should mention decomposition of organic material and topsoil.**

21. Based on your observations, what type of soil do you have (p. 250-251)

**The soil is topsoil; most likely a type of northern forest soil. Northern forest soils: form in cool, wet climates; range from thick and fertile to thin with little hummus.**