Name:_____

DEMONSTRATION #2:
ROCKS AND THE ROCK CYCLE

Excersice #1: The Rock Cycle Game:

Instructions:

We will break up into 10 groups. Each group will go to one of the 10 stations in the hallway outside the room. Each station is a type of rock or other material that is part of the rock cycle. When you get to your station:

- Read the station description below to find out what you are and where in the earth you are located.
- If you are a rock, **look carefully at the rock samples and read their labels**. Look at the rock I.D. notes on the last page of this handout. Think about how you might identify that rock type if you were to see it again.
- Roll the dice. There is only one at each station, so take turns if need be. Below is a list of numbers (1-6) for each station. Each number tells you what to do if you roll it. Go where you are instructed and repeat the process at the next station.

Station #1. Intrusive Igneous Rock. You are now a granite, diorite, etc. in the earth's crust.

1) Stay an intrusive igneous rock. Roll again.
2) Stay an intrusive igneous rock. Roll again.
3) Get uplifted, exposed, and eroded. Take the chemical weathering pathway and become ions dissolved in water. Go to hydrosphere/biosphere.
4) Get uplifted, exposed, and eroded. Take the mechanical weathering pathway and become sediment. Go to uconsolidated sediments.
5) Another magma body intrudes nearby. Experience high heat and get re-melted. Go to magma.
6) Get pushed to great depths because mountains pile up on top of you. You experience high heat and get re-melted. Go to magma.

Station #2. Volcanic Rock. You are now a basalt, rhyolite, etc. on the earth's surface.

1) Stay a volcanic rock. Roll again.
2) Stay a volcanic rock. Roll again.
3) Get eroded. Take the chemical weathering pathway and become ions dissolved in water. Go to hydrosphere/biosphere.
4) Get eroded. Take the mechanical weathering pathway and become sediment. Go to uconsolidated sediments.
5) Get buried deeply by sediments. Another magma body intrudes nearby. Experience high heat and get re-melted. Go to magma.
6) Get buried deeply by sediments and get pushed to great depths as mountains pile up on top of you. You experience high heat and get re-melted. Go to magma.

Station #3. Clastic Sedimentary Rock. You are now a sandstone, conglomerate, etc. in the upper part of the earth's crust.

1) Stay a clastic sedimentary rock. Roll again.
2) Get uplifted, exposed, and eroded. Take the chemical weathering pathway and become ions dissolved in water. Go to hydrosphere/biosphere.
3) Get uplifted, exposed, and eroded. Take the mechanical weathering pathway and become sediment. Go to unconsolidated sediments.
4) A magma body intrudes nearby. Experience high heat and pressure get metamorphosed. Go to metamorphic rock.
5) A magma body intrudes nearby. Experience extreme heat, melt, and get incorporated into the magma. Go to magma.
6) Get pushed to great depths because mountains pile up on top of you. You experience high heat and pressure and get metamorphosed. Go to metamorphic rock.

Station #4. Metamorphic Rock. You are now a gneiss, schist, etc. deep in the earth's crust.

1) Stay a metamorphic rock. Roll again.
2) Stay a metamorphic rock. Roll again.
3) Stay a metamorphic rock. Roll again.
4) Get uplifted, exposed, and eroded. Take the chemical weathering pathway and become ions dissolved in water. Go to hydrosphere/biosphere.
5) Get uplifted, exposed, and eroded. Take the mechanical weathering pathway and become sediment. Go to unconsolidated sediments.
6) A magma body intrudes nearby. Experience extreme heat, melt, and get incorporated into the magma. Go to magma.

Station #5. Unconsolidated Sediments. You are now silt, sand, clay, etc. at the earth's surface.

1) Stay unconsolidated sediments. Roll again.
2) Stay unconsolidated sediments. Roll again.
3) Stay unconsolidated sediments. Roll again.
4) Get buried deeply by other sediments. Undergo compaction and cementation and become clastic sedimentary rocks. Go to clastic sedimentary rocks.
5) Get buried deeply by other sediments. Undergo compaction and cementation and become clastic sedimentary rocks. Go to clastic sedimentary rocks.
6) Get buried deeply by other sediments. Undergo compaction and cementation and become clastic sedimentary rocks. Go to clastic sedimentary rocks.

Station #6. Magma. You are now magma in the earth's crust.

1) Stay magma. Roll again.
2) Stay magma. Roll again.
3) Crystallize in the crust and become an intrusive igneous rock. Go to intrusive igneous rock.
4) Crystallize in the crust and become an intrusive igneous rock. Go to intrusive igneous rock
5) Get erupted and crystallize on the earth's surface. Go to volcanic rock.
6) Get erupted and crystallize on the earth's surface. Go to volcanic rock.

Station #7. Nonclastic (Chemical) Sedimentary Rock. You are now a limestone, evaporite, etc. near the earth's surface.

1) Stay a nonclastic sedimentary rock. Roll again.
2) Get uplifted, exposed, and eroded. Take the chemical weathering pathway and become ions dissolved in water. Go to hydrosphere/biosphere.
3) Get uplifted, exposed, and eroded. Take the mechanical weathering pathway and become sediment. Go to unconsolidated sediments.
4) Get buried under other sedimentary rocks. A magma body intrudes nearby. Experience high heat and pressure get metamorphosed. Go to metamorphic rock.
5) Get buried under other sedimentary rocks. A magma body intrudes nearby. Experience extreme heat, melt, and get incorporated into the magma. Go to magma.
6) Get pushed to great depths because mountains pile up on top of you. You experience high heat and pressure and get metamorphosed. Go to metamorphic rock.

Station #8. Mantle Rock. You are a peridotite, eclogite, etc. in the earth's upper mantle.

1) Stay mantle rocks. Roll again.
2) Stay mantle rocks. Roll again.
3) Stay mantle rocks. Roll again.
4) Stay mantle rocks. Roll again.
5) Stay mantle rocks. Roll again.
6) Get partially melted and become magma. Rise at mid-ocean ridge and cool to form oceanic crust. Go to oceanic crust.

Station #9. Oceanic Crust. You are now basalt or gabbro in the oceanic crust drifting away from a mid-ocean ridge.

1) Stay oceanic crust. Roll again.
2) Get subducted and re-assimilated into upper mantle. Go to mantle rocks.
3) Get subducted and re-assimilated into upper mantle. Go to mantle rocks.
4) Get subducted and re-assimilated into upper mantle. Go to mantle rocks.
5) Get subducted, experience extreme heat, and melt. Become magma that rises upward. Go to magma.
6) Get subducted, experience extreme heat, and melt. Become magma that rises upward. Go to magma.

Station #10. Hydrosphere/Biosphere. You are now dissolved ions in an ocean, river, plant, animal, etc.

1) Stay in the hydrosphere/biosphere. Roll again.
2) Stay in the hydrosphere/biosphere. Roll again.
3) Get utilized by marine organisms and precipitate in the form of shells, coral, or other "hard part". Accumulate on the ocean floor and become limestone. Go to nonclastic sedimentary rock.
4) Get utilized by marine organisms and precipitate in the form of shells, coral, or other "hard part". Accumulate on the ocean floor and become limestone. Go to nonclastic sedimentary rock.
5) Precipitate in a saline lake or restricted by in a desert climate and become evaporite. Go to nonclastic sedimentary rock.
6) Precipitate at a hot spring and become tufa. Go to nonclastic sedimentary rock.

Exercise #2: Rock Identification

Instructions:

We will walk together down to the rock garden outside the Browning Building. Five rocks have been labeled with numbers 1-5. Identify each one using the same category names (intrusive igneous rock, metamorphic rock, etc.) that we used in the rock cycle game. Use the attached rock I.D. handout to help you. After identifying the rock, state the main rock forming process that created it. **You must at least attempt to answer the questions below and pass this in to get credit for participating.**

Rock #1:

What is it?

Formation process?

Rock #2:

What is it?

Formation process?

Rock #3:

What is it?

Formation process?

Rock #4:

What is it?

Formation process?

Rock #5:

What is it?

Formation process?

IDENTIFICATION OF BASIC ROCK TYPES

Intrusive Igneous Rocks

- clearly distinguishable crystals (i.e., phaneritic texture)
- not layered
- main types: granite, diorite, and gabbro

Volcanic Rocks

- most crystals are too small to distinguish (i.e., aphanitic texture), but commonly contain some larger crystals called "phenocrysts"
- often have "vesicles", which are holes created by gas bubbles in the magma (reason why pumice is light)
- main types: rhyolite, andesite, and basalt

Clastic Sedimentary Rocks

- composed of clasts, which are rounded grains (clay, silt, sand, or gravel) cemented together
- if coarse-grained (sand and gravel), grains are clearly distinguishable
- if fine-grained (silt and clay), grains cannot be distinguished and I.D. can be difficult
- layered; layering is called "bedding" (or "stratification"); remember, though, that the bedding may be larger in scale than the sample you are looking at, so you may not see it!
- look for sedimentary structures (cross-bedding, ripple marks, etc.)
- main types: conglomerate, sandstone, siltstone, and shale

Nonclastic (Chemical) Sedimentary Rocks

- crystal size varies, but they are usually too small to distinguish
- limestone most common type; usually gray, chunky (not layered), and often has fossils of small marine creatures (corals, shells, etc.)
- most of the rest are "crust-like" deposits that look something like the scale that forms on old water faucets
- in addition to fossils, look for crystals of calcite, halite, and gypsum, which are all soft, water soluble minerals
- main types: limestone, evaporite (salt flats), travertine (cave deposits), and tufa (hot spring deposits)

Metamorphic Rocks

- crystal size varies
- most are layered; layers are called "foliation"; can either be light/dark bands of minerals or thin "leaf-like" layers defined by micas
- layers often folded or corrugated
- main types: gneiss, schist, slate, and quartzite