EARTH SCIENCE CONTENT FACTS

The following is a list of facts related to the course of Earth Science. A deep foundation of factual knowledge is important; however, students need to understand facts and ideas in the context of the conceptual framework. This list is not intended to provide a comprehensive review for State and National Assessments. Its purpose is to provide a highlight of the factual material covered in Earth Science. This list is not all inclusive, be sure to check Nevada State Standards and your district syllabi.

GEOLOGY

Earth Chemistry

- Minerals have different physical and chemical properties (i.e. hardness, streak, luster, radioactivity…) due to their internal atomic arrangement
- The same substance always has the same density, no matter what the size
- **Igneous Rock** ("fire-formed") formed from the solidification/crystallization of magma or lava, classified by color and texture (grain size)
- Rate of cooling affects texture, mineral composition affects color
    - Coarse texture (large grains) = Intrusive (cooled slowly below surface)
    - Fine texture (small grains) = Extrusive (cooled quickly)
    - Glassy texture (no visible crystals) = Extrusive (cooled very quickly)
- **Metamorphic Rock** – changed by heat and/or pressure through the process of recrystallization
    - Shows banding/foliation and distorted structure
    - Higher density, very resistant rock
- **Sedimentary Rock –** formed from the compaction and cementation of loose particles (sediments) or by crystallization from dissolved minerals
    - Rock type most likely to contain fossils

Geologic History

- The Age of the earth is 4.6×10^9 years old, 4.6 billion years old, 4,600 million years.
- Radioisotope decay (half-life) is constant and unaffected by environmental changes (i.e. mass of substance, temperature, pressure…)
- Uranium-238 dates very old rocks (half-life 4.5 billion years)
- Carbon-14 dates recent organic (once living) remains up to ~50,000 years old (half-life 5,700 years)
- Undisturbed rock layers – the oldest layer is on the bottom (principle of superposition)
- Intrusions and faults are younger than the rock they cut through (principle of cross-cutting relations)
- Unconformity is a buried erosional surface (represents a gap in the rock record)
- Index fossils are good time markers (widely spread, abundant, lived a short time)

Weathering and Soil

- Weathering is the breakdown of rock into sediments
- When a rock is broken into smaller pieces, surface area increases and weathering rate increases
- Chemical weathering occurs mostly in warm, humid climates
- Physical (mechanical) weathering occurs mostly in cold and/or arid climates
- Porosity (% of open space) does not depend on particle size
- Permeability is the ability of fluids to flow through ground material (pores must be connected)
- As particle size increases, permeability also increases
- Capillarity (upward movement of water through the ground, depends on surface area), as particle size decreases, capillarity increases

Erosional/Depositional Systems

- Erosion is the transporting of weathered sediments
- Gravity is the main **force** behind all erosion
- Running water (streams, rivers) is the #1 agent of erosion
- Stream velocity depends on slope and discharge (amount of water moving though the stream)
- In a meander, velocity is greater (therefore erosion is greater also) on the outside of the curve
- Heavy, round, and dense particles settle out first
- In graded bedding (vertical sorting) the largest sediments are on the bottom.
- Water and Wind create sorted deposits of sediments
- Gravity and Glaciers create unsorted deposits of sediments
- Streams and rivers carve a V-shaped valley, Glaciers carve a U-shaped valley

Mapping/Topography

- The best model for the shape of the Earth is a sphere
- The true shape of the Earth is an Oblate Spheroid (flattened at the poles and bulging at the equator)
- Positions on earth are located using the coordinate system of latitude and longitude
- Latitude is based on the altitude of Polaris (the North Star)
- Latitude lines (parallels) go east/west, just like the Equator, but measure distances north/south
- Longitude is based on the observations of the sun
- Longitude lines (meridians) go north/south, just like the Prime Meridian, but measure distances east/west
- The closer the isolines (i.e. isotherms, isobars, contour lines), the steeper the gradient (slope)

Structural Forces

- Mountains form by uplift, folding and faulting
- Subsidence – the sinking of the crust
- Isostasy: earth's crust in equilibrium (uplift & subsidence)
- Marine fossils (trilobites, seashells…) on mountain tops indicate that the land has been uplifted
- Landscape development is dependant on bedrock structure and climate
- Arid landscape: steep slopes with angular features
- Humid landscape: smooth with rounded slopes and features
- P-waves travel faster than S-waves (and L-waves)
- P-waves travel through solids and liquids
- S-waves travel through solids only (cannot pass through the inferred partially molten outer core)
- The difference in the arrival time of P-waves and S-waves can be used to determine the distance to an earthquake (and the origin time of the earthquake)
- A minimum of three seismograph stations are required to determine the epicenter (location) of the earthquake
- Earth's plates move due to convection currents in the upper-mantle (asthenosphere)
- At Mid-Ocean ridges (spreading center) new crust is created (Divergent Plate Boundary)
- The age of the rock increases as distance from the ridge increases
- At Ocean trenches (subduction zone) old crust is destroyed (Convergent Plate Boundary)
- Continental crust is thick and made of granite
- Ocean crust is thin and made of basalt