

---

## Geology 250 – Old Exam Questions

---

### *Introduction, the Scientific Methods and the Metric System*

- Identify and explain any one criterion scientists use to define the “natural world?”
  - Identify and briefly explain any one criterion scientists use to define the “natural world?”
  - Briefly describe any one criterion scientists use to define the “natural world.”
  - A scientifically accurate model of the natural world must be reliable. What does “reliable” mean in this context?
  - A scientifically accurate model of the natural world must be non-arbitrary. What does “non-arbitrary” mean in this context?
  - A scientifically accurate model of the natural world must be consistent. What does “consistent” mean in this context?
  - Which is more likely to be an accurate representation of the natural world, a scientific theory or a scientific hypothesis?
  - What distinguishes an *accepted* theory from a normal scientific theory?
  - What is a null hypothesis?
  - What is a scientific theory?
- 
- What is the definition of the metric unit of volume, the liter?
  - What is the definition of a liter?
  - What is the definition of the metric unit of mass, the gram?
  - What is the definition of the metric unit of mass, the kilogram?
  - Which has a larger volume, 1 m<sup>3</sup> or 10,000 cm<sup>3</sup>?
  - (For more metric system questions, scroll down to the section on metric conversions)
- 

### *The Universe*

- What is the strong nuclear force, and why is it important?
- What are the four fundamental forces of our Universe?
- List the four fundamental forces of our Universe
- Which fundamental force is responsible for the functioning of chemistry?
- Which of the following are composed of quarks (circle all that apply): electrons, neutrons, protons
- (True or False) Protons, electrons, and neutrons are composed of quarks.
- Is the statement “electrons are leptons with a negative charge” true (yes or no)
- What force is responsible for the functioning of chemistry?
- Of what elements would the Universe be composed if stars had never formed?
- What elements were produced during the Big Bang?
- What observable phenomenon do scientists cite to support the hypothesis that the universe used to be much more tightly compacted than it is today?
- Why do scientists believe that the universe used to be much more tightly compacted than it is today?

### *Stars and elemental synthesis*

- Elements heavier than iron are produced during supernovas. How else are these elements produced naturally (i.e., not produced by humans)?
- Hydrogen, helium and some lithium and beryllium formed from energy left over from the Big Bang. Where did heavier elements form in the billions of years since then?
- How does absolute luminosity differ from plain old luminosity?
- Define: absolute luminosity
- Outside of nuclear reactors on Earth, where is nuclear fusion taking place in the Universe right now?
- What important characteristic do all Main Sequence stars share which distinguishes them from most other stars?

- What is the primary energy source for Main Sequence stars?
- (True or False) The primary nuclear reaction in main sequence stars is the conversion of hydrogen to helium.
- What is the ultimate fate of stars about the size of the Earth's Sun when they reach the end of their usable fuel?
- What is the ultimate fate of stars much larger than the Earth's Sun when they reach the end of their usable fuel?
- What happens to a very large star after its core synthesizes iron?
- Which is hotter – a green star or a red star?
- Which is hotter – a green star or an orange star?
- Which is hotter – an orange star or a yellow star?
- Which is hotter – a yellow star or a red star?
- Which is hotter – a blue star or an orange star?
- Which kind of Main Sequence star burns longer, a dim red star or a bright blue star?
- Which kind of Main Sequence star burns longer, a small red star or a big blue star (circle one)?
- How do main sequence stars form? Be sure to include all of the important processes.

### *Earth's Solar System*

- (True or False) The Sun radiates only in the visible spectrum.
- List any one feature that the four outer planets have, but the four inner planets generally lack.
- List three ways in which the four inner planets of Earth's Solar System differ from the outer planets.
- Most of the mass in the Solar System is contained in what object?
- The inner four planets are characterized by (low / high) density and (low / high) mass (circle your answers).
- What is the largest object in the Solar System?
- What is the only rocky, inner planet to have a relatively large moon?
- Which planet has a faster orbital velocity, Earth or Saturn?
- Which is the only one of the four inner planets to have a big moon?
- Which planet has a faster orbital velocity, Mercury or Mars?
- Which planet has a faster orbital velocity, Earth or Uranus (circle one)?
- Which planet has a faster orbital velocity, Earth or Jupiter (circle one)?
- Which planet would be easier for humans to colonize: Mars or Venus?
- Name the eight planets of the Solar System in order starting with the one closest to the Sun.

### *Seasons*

- The Earth revolves around the Sun once per \_\_\_\_\_ (fill in blank)
- The Earth revolves around the Sun once every \_\_\_\_\_ (fill in blank)
- How often does the Earth revolve around the Sun?
- At what latitude is the Sun directly overhead during the Southern Hemisphere's summer solstice?
- Compare and contrast: equinox and solstice.
- (True or False) On the fall equinox, the Sun is directly overhead of the Tropic of Cancer at midday.
- Explain one line of evidence that disproves the hypothesis that seasonality on Earth is caused by differences in the distance between the Sun and Earth.
- Briefly describe one observed natural phenomenon that specifically disproves the hypothesis that seasonality on Earth is caused by differences in the distance between the Sun and Earth. (Note: indicating that there is evidence to support another hypothesis is not evidence that disproves this hypothesis).
- What causes seasonality on Earth?
- What do the Arctic and Antarctic circles delineate?
- Which latitude would have more severe seasonality: 10° North or 85° North (circle one)
- (True or False) On a solstice, the Sun is directly overhead at noon along the equator.
- When it is autumn in the Southern Hemisphere, what season is it in the Northern Hemisphere?
- When it is fall in Rock Hill, what season is it in Sydney, Australia?
- (True or False) On the equinox, which will occur later this month, the Sun will be directly overhead of the Tropic of Cancer.

- When it is summer in Rock Hill, what season is it in Antarctica?
  - When it is January 13th in New York, what season is it in Tokyo, Japan?
  - When it is January 13th, what season is it in Paris, France?
  - When it is spring in Europe, what season is it in the South Carolina?
  - When it is summer inside the Arctic Circle, what season is it in Antarctica?
  - Which season was it in Sidney, Australia during the closing ceremonies of the Summer Olympics (October 1, 2000)?
  - Why do Earth and Uranus have seasons, but Jupiter does not?
  - Why does the tilt of the Earth's axis relative to its orbital plane cause seasonal temperature variability?
- 

### *Earth's Atmosphere*

- Name the four layers of the atmosphere.
- Name the four layers of the atmosphere in order starting from the layer closest to the Earth.
- Why is the troposphere warmest at low altitude?
- (True or False) The solar budget of the Earth is balanced.
- What chemical reaction is responsible for the increase of temperature with altitude in the stratosphere?
- Which system usually changes the most rapidly on Earth: [the hydrosphere / the atmosphere]
- What directly controls atmospheric pressure?
- What are aerosols?
- Dry air in the atmosphere is composed primarily of oxygen and what other gas?
- What two gases make up most of the dry air in the Earth's atmosphere?
- Dry air in Earth's atmosphere is primarily composed of two gases. Name both.

### *Weather I and Weather II*

- What are the 3 phases of water?
- What are the 3 phases of water commonly encountered on Earth?
- What is latent heat?
- During melting, latent heat is (absorbed / released – circle one) by the melting material.
- During evaporation, latent heat is (absorbed / released – circle one) by the evaporating material.
- What is the opposite of condensation?
- What is the opposite of evaporation?
- What is the opposite of melting?
- How does absolute humidity in a packet of air differ from its relative humidity?
- How does the absolute humidity of a packet of air differ from the relative humidity of that air?
- How is relative humidity calculated?
- What is the mathematical formula for calculating relative humidity?
- If the relative humidity of a parcel of air increases but the moisture content of the air remains the same, what physical parameter changed?
- The dew point temperature of a cloudless packet of air is almost always [ higher / lower ] than the actual temperature of the packet of air. Circle your answer
- (True or False) Orographic lifting causes cloud formation in mountainous areas.
- What is the relationship between the dew point and saturation of a packet of air?
- Unstable air is more likely to form over [snow drifts / parking lots]. Circle one
- Unstable air is more likely to form over: [tropical rainforest / snow-covered arctic tundra] Circle one
- What is the major defining difference between unstable air and stable air?
- What is the *defining difference* between unstable air and stable air?
- How does unstable air differ from stable air?
- What is adiabatic cooling?
- (True or False) In adiabatic cooling, the temperature does not change.

- Unstable air can cause which of the following (circle all that apply): cloud formation, thunderstorms, hurricanes, updrafts
- Are high-pressure systems generally associated with warm or cold air masses?
- Cold air is generally associated with [ high / low ] pressure systems.
- What is an atmospheric cyclone?
- Wind blows [ clockwise / counterclockwise ] around the center of a high-pressure system in the Northern Hemisphere.
- Wind blows [ clockwise / counterclockwise ] around the center of a low-pressure system in the northern hemisphere. *Circle one*
- (True or False) Low-pressure systems are usually warm and wet.
- (True or False) In general, wind flows from low pressure to high pressure.
- Which of the following are directly caused by condensation (circle all that apply): cooling caused by perspiration, snowflake formation, cloud formation
- How do clouds form?
- What three factors greatly increase the probability of cloud formation?
- What three factors encourage the formation of clouds?
- List and explain three factors that encourage the formation of clouds in Earth's atmosphere.
- Which of these 10 conditions tends to increase the probability of cloud formation (circle all that apply): high atmospheric pressure / low atmospheric pressure / unstable air / stable air / a cold front / a warm front / high dew point temperature / low dew point temperature / high aerosol count in atmosphere / low aerosol count in atmosphere /
- Why is the carbon cycle important in the study of global climate change?
- (True or False) CO<sub>2</sub> in the lithosphere and hydrosphere leads to increased global temperatures.
- Explain one way that carbon dioxide can be added to the atmosphere naturally.
- For visible, infrared, and ultraviolet radiation, the Earth's atmosphere tends to [transmit/absorb] short wavelength radiation and [transmit/absorb] long wavelength radiation. (Circle your answers)
- How is carbon dioxide added to the atmosphere by natural processes?
- List two ways that carbon dioxide is added to the atmosphere by natural processes.
- Explain one way carbon dioxide can be removed from the atmosphere.
- On the back of this sheet of paper, briefly explain what is meant by "Greenhouse Warming" of Earth's atmosphere.
- Describe one natural process that removes carbon dioxide from the atmosphere.
- How do hurricanes differ from tropical storms?
- What is the *defining difference* between hurricanes and tropical storms (i.e. what has to change for a tropical storm to be considered a hurricane)?
- Define: cold front
- Define: warm front
- (True or False) Both warm and cold fronts are associated with precipitation.
- Through the upcoming Saturday, Rock Hill's weather forecast predicts warm temperatures under partly cloudy skies. Sunday's forecast includes showers and much cooler temperatures. What will cause these conditions?
- Over the last three days, the Rock Hill area has experienced warm temperatures and nice weather (Monday), followed by rain, powerful storms and lower temperatures (Tuesday), followed by cold but relatively clear weather (today). What caused this 3-day weather pattern?
- Last week, residents of the city of Cleveland, Ohio experienced the following weather: Monday, 60°, partially cloudy; Tuesday, 40°, snow and freezing rain; Wednesday, 38°, clear. What caused this weather pattern?
- Thunderstorms are associated with many atmospheric phenomena. List three.
- Briefly describe two severe hazards (i.e., things that can kill you) commonly associated with thunderstorms.
- What is a warm front and what kind of weather changes can you expect if one moves through?

### *Hydrology*

- What is the energy source that drives the upward movement of water in the hydrologic cycle?

- What force is primarily responsible for the skyward (upward) movement of water vapor in the hydrologic cycle?
- What source of energy is primarily responsible for the skyward (upward) movement of water vapor in the hydrologic cycle?
- What force is primarily responsible for the downward movement of water in the hydrologic cycle?
- List and explain the major processes in the hydrologic cycle.
- What is a watershed?
- Most of the Earth's freshwater is found in what form?
- Most of the Earth's freshwater is in what phase of matter?
- What are the 3 phases of water commonly encountered on Earth?
- What is the largest reservoir of freshwater on Earth?
- (True or False) Over 95% of the Earth's water is not freshwater.
- Define: natural levee.
- How do meandering streams differ from braided streams?
- (True or False) A 1,000-year flood has an average recurrence frequency of 1,000 years.
- (True or False) A 100-year flood has an average recurrence frequency of 100 years.
- (True or False) A 10,000-year flood has an average recurrence frequency of 1,000 years.
- (True or False) A 1,000-year flood has an average recurrence frequency of 10,000 years.

### *Groundwater*

- How does permeability differ from porosity?
  - What is porosity?
  - Define: permeability
  - What is porosity and how does it differ from permeability?
  - How do confined aquifers differ from unconfined aquifers?
  - Define water table.
  - Define aquifer.
  - What is a groundwater potentiometric surface?
  - Are artesian wells associated with confined or unconfined aquifers?
  - Artesian wells are associated with [ confined aquifers / unconfined aquifers ]. *Circle one*
  - (True or False) Artesian wells produce higher quality water than non-artesian wells
  - (True or False) Unconfined aquifers are found below aquicludes.
  - List and explain two reasons that groundwater pollution is harder to clean up than surface water pollution.
  - List two reasons why polluted groundwater is more difficult to clean up than polluted surface water.
  - How does non-point source pollution differ from point source pollution?
- What is the defining difference between non-point source pollution and point source pollution?
- 

### *Minerals I and Minerals II*

- How are the minerals on Moh's Hardness Scale assigned values (1-10)?
- How are the minerals on Moh's Hardness Scale assigned their relative values (1-10).
- List the 8 most abundant elements in the Earth's crust.
- What are the 8 most abundant elements in the Earth's crust?
- Name two common rock forming minerals.
- List the five characteristics a material must possess to be considered a mineral
- Two minerals can have the same chemical formulas, but very different physical properties. What can cause a difference in specific gravity (density) in such a case?
- The minerals cerrusite ( $\text{PbCO}_3$ ) and aragonite ( $\text{CaCO}_3$ ) have nearly identical crystal structures but cerrusite is 4 times denser than aragonite. What causes the difference in specific gravity in this case?
- [True or False] (circle one) Minerals have metallic lusters because they are made of metal.

- (True or False) Streak refers to the color of a powdered mineral.
- List and briefly explain two reasons that color is far less useful than other properties in identifying most minerals.
- What common material (other than quartz) has the chemical formula  $\text{SiO}_2$ ?
- On Moh's Hardness Scale, quartz has a hardness of 7 and corundum has a hardness of 9. How could you confirm that a given specimen of corundum is indeed harder than a given specimen of quartz? Be specific in your answer.
- What is hardness and why is it important in identifying minerals?
- What is mineral fracture, and how does it differ from cleavage?
- What is the difference between cleavage and fracture?
- What is one reason why crystal symmetry form is not usually useful in identifying a mineral that is part of rock.
- (True or False) Mineral cleavage is caused by plate tectonics.
- What two very abundant crustal elements do all of the most common rock-forming minerals have in common (hint: to what class of minerals do they belong?)
- What two very abundant elements do all of the most common rock-forming minerals have in common? (hint: to what class of minerals do they belong?)
- Why is color far less useful than other properties in identifying minerals?
- List and briefly explain two reasons that is color far less useful than other properties in identifying most minerals.
- List the five characteristics a material must possess to be considered a mineral
- Why is streak color more useful than crystal color when identifying minerals?

### *Igneous Rocks and Processes*

- Define felsic.
- Define mafic.
- (True or False) The interior of the Earth is hot because of the intensity of sunlight.
- What two factors are responsible for the Earth being hot enough for magma to form.
- Igneous rocks A and B have the exact same mineral composition. A has coarse-grained texture, while B has a fine-grained texture. What specific difference in the process of formation is most likely responsible for this difference?
- Andesite and diorite are both intermediate igneous rocks, meaning they have the same (texture / composition).
- Rhyolite and granite are both felsic igneous rocks, meaning they have the same [texture / composition]. (circle one)
- A student hands you a phaneritic rock containing primarily plagioclase feldspar, augite and olivine. Name the rock.
- A rock formed when magma cools to form a glass is a(n): [igneous / metamorphic / sedimentary] rock (circle all that apply)
- Obsidian generally contains no minerals. Why not?
- Batholiths, sills and dikes are all examples of what kind of geologic feature?
- Of what kind of minerals will a felsic igneous rock be composed?
- List one mafic and one felsic igneous rock. Be sure to indicate which is which.
- Name an igneous rock that is not composed of minerals.
- What information can you infer from the texture of an igneous rock?
- How does the continuous series differ from the discontinuous series in Bowen's Reaction Series?
- Why is the interior of the Earth hot enough for magma to form?
- What process keeps the interior of the Earth warm enough to make magma?
- What is the main difference between plutonic rock forming environments and volcanic rock forming environments?

### *Weathering*

- How does biologic weathering differ from the other kinds of weathering?
- What chemical weathering process is responsible for breaking down most of Earth's rock forming minerals?
- (True or False) Two important types of reactions in chemical weathering are acid/base reactions and oxidation/reduction reactions.
- Hydrolysis is an important process in the chemical breakdown of what kind of minerals?
- Weathering is associated with what rock-forming process?
- Hydrolysis breaks down \_\_\_\_\_ minerals and produces \_\_\_\_\_ minerals.

- Acid mine drainage is caused by what kind of chemical weathering?
- Which weathers faster on the surface of the Earth: mafic rocks or felsic rocks?
- Which chemically weathers more quickly on the surface of the Earth, olivine or muscovite?

### *Sedimentary Rocks and Processes*

- (True or False) Sedimentary rocks form under conditions hot enough to form magma.
- Cementation and compaction are important for what process?
- Cementation and compaction are important for what sedimentary rock-forming process?
- How do evaporite minerals form? To which of the three main rock types do rocks composed of evaporites belong?
- To which of the three main rock types do rocks composed of evaporite minerals belong (circle all that apply): [ sedimentary / igneous / metamorphic ]
- Why is Bowen's Reaction Series important in the study of sedimentary rocks?
- What are the four main types of non-clastic sedimentary rocks?
- Name one sedimentary rock that is not composed of minerals.
- Which non-clastic sedimentary rock is not composed of minerals?
- What is the name of sedimentary rocks composed primarily of calcite?
- What two processes generally occur during lithification of sedimentary rocks?
- List one clastic and one non-clastic sedimentary rock. Be sure to indicate which is which.
- List two characteristics of clastic sediment that has been transported a long distance from the source area of the clasts.
- Briefly explain one physical or chemical difference between sediment deposited in a proximal environment versus a distal environment.
- Larger clasts require ( more / less ) energy to transport than smaller clasts.
- Pore space [ increases / decreases ] during sedimentary lithification (circle one).
- Weathering during transport will tend to do which of the following to clasts (circle all that apply): [increase roundedness / increase sorting / increase grain size]
- What are the four main processes in the formation of clastic sedimentary rocks?

### *Metamorphic Rocks and Processes and the Rock Cycle*

- Deviatoric stress is a factor controlling the development of which one of the three types of rock?
- (True or False) Foliation and lineation are both associated with metamorphic processes.
- (True or False) Metamorphic rocks form under conditions hot enough to form magma.
- How does deviatoric stress differ from pressure in a metamorphic rock-forming environment?
- How does slaty cleavage differ from gneissic banding?
- Which metamorphic rock is not composed of minerals?
- What is foliation in metamorphic rocks?
- What specific process causes slate and schist to look so different from each other?
- What is the name of metamorphic rocks composed primarily of calcite?
- What is the name of a metamorphic rock composed entirely of quartz?
- By definition, what do all rocks of the same metamorphic facies have in common?
- What is a metamorphic index mineral?
- What process causes slate and schist to appear so different?
- (True or False) The first appearance of a metamorphic index mineral marks an isograd.
- What is deviatoric stress?
- What is a protolith?
- What must happen to a sedimentary rock in order to transform it into an igneous rock?
- What must happen to the material in a metamorphic rock in order to transform it into an igneous rock?
- What must happen to a metamorphic rock in order to transform it into a sedimentary rock?

- Assume you have a metamorphic rock at the surface of the Earth. What processes are absolutely necessary to produce a clastic sedimentary rock from the materials in the metamorphic rock?
- Starting with a metamorphic rock exposed on the surface of the Earth, list and briefly describe all processes that are absolutely necessary to convert the material in the metamorphic rock into a clastic sedimentary rock.
- A rock formed when magma cools to form a glass is a(n) [ igneous / metamorphic / sedimentary ] rock (circle all that apply)
- Starting with an igneous rock exposed on the surface of the Earth, list and briefly describe all processes that are absolutely necessary to convert the material in the igneous rock into a clastic sedimentary rock.

---

### *Seismology and the Earth's Interior*

- ( P-waves / S-waves ) move faster through the bulk of the Earth.
- ( True / False ) circle one: The interior of the Earth is solid rock.
- (True or False) Seismic wave travel-time discontinuities are caused by differences in the speed of waves traveling through different layers of the Earth.
- Can P-waves move through liquids ( yes or no )?
- For what kind of treaty verification is seismic data used?
- How are an earthquake's epicenter and focus related?
- How is the epicenter of an earthquake related to the focus of that earthquake?
- Assume there is an earthquake somewhere in the world and that you are monitoring a seismograph. The instrument records P-waves and surface waves, but no S-waves. What does this tell you about where the earthquake occurred relative to your station?
- What are the 3 major layers of the Earth's interior?
- ( True / False ) The interior of the Earth is solid rock.
- Our understanding of the interior of the Earth comes primarily from what kind of data?

### *Plate Tectonics I and Plate Tectonics II*

- What is a scientific paradigm?
- (True or False) A build-up of scientific anomalies sometimes brings about the adoption of new paradigms.
- List and explain one way that an accumulation of anomalies within a paradigm can be resolved.
- What do velocity discontinuities (e.g., the Moho discontinuity) tell us about the structure of the Earth?
- Recognition of 3 different plate boundaries came ( before / after ) the theory of continental drift was proposed.
- Briefly explain any one line of evidence that supports the theory of plate tectonics.
- Is the following statement accurate? "The theory of continental drift/plate tectonics was so obvious to other scientists that it was immediately adopted and lauded as the great unifying theory of geology."
- Sir Francis Bacon was the first person (at least that we know of) to propose what about the shapes of Africa and South America?
- List and explain two lines of evidence that Wegener used to support his theory of continental drift.
- List and explain two lines of evidence that support plate tectonics, but were not available to Wegener.
- List four lines of evidence that support the theory of plate tectonics but were not available to Alfred Wegener.
- The recognition of the different plate boundary types came ( before / after circle one) the theory of continental drift.
- What is the driving force of plate tectonics?
- List three physiochemical differences between continental crust and oceanic crust.
- (True or False) Divergent boundaries include both rifts and mid-oceanic ridges.
- (True or False) Subduction zones are found at transform boundaries.
- (True or False) Subduction zones are found at divergent boundaries.
- (True or False) Convergent boundaries are associated with primarily transform stress.
- Igneous activity is characteristic of what type(s) of plate tectonic boundary(s)?
- Benioff Zones are associated with which type of plate boundary?
- List two neogenic features associated with oceanic-oceanic convergent plate boundaries



- (True / False) A tectonic plate can be composed of both oceanic and continental crust. *Circle one*
- What are the physical differences between continental and oceanic crust?
- What is the driving force of plate tectonics?
- What kind of tectonic plate boundary is associated with significant orogenies?
- Which type(s) of plate boundaries are commonly associated with igneous activity?
- Igneous activity is characteristic of what type(s) of plate tectonic boundary(s)?

### *Geologic Time I and II*

- What is the Principle of Uniformitarianism?
- What was William Smith's great contribution to the science of correlating rocks and determining relative timing of geologic events?
- Briefly explain the logic behind the principle of inclusion.
- What is an angular unconformity?
- How does geologic relative age dating differ from geologic absolute age dating?
- Explain the difference between absolute (numerical) dating and relative dating in geology.
- The latest scientific research indicates that the age of the Earth is closest to (circle one): 4,500,000,000,000 years; 4,500,000,000 years; 4,500,000 years
- A sample of rocks contains 1 kilogram of radioactive element A and 7 kilograms of its daughter product, element B. Assuming that all of B present in the sample is the result of the decay of A, how many half-lives have passed since the formation of the rock sample? Element A has a half-life of 20 million years. How much time has passed since the formation of the rock sample?
- What does the statement " $^{40}\text{K}$  has a half-life of 1.3 billion years" mean about the radioactive isotope  $^{40}\text{K}$ ?
- $^{40}\text{K}$  decays to  $^{40}\text{Ar}$  with a half-life of 1.3 billion years. Analysis of minerals in a meteorite indicates that only 25% of the original  $^{40}\text{K}$  remains. How old is the meteorite?
- $^{40}\text{K}$  decays to  $^{40}\text{Ar}$  with a half-life of 1.3 billion years. Analysis of minerals in a meteorite indicates that only 50% of the original  $^{40}\text{K}$  remains. How old is the meteorite?
- A zircon crystal contains the radioactive isotope  $^{235}\text{U}$  that decays into  $^{207}\text{Pb}$  with a half-life of 713,000,000 years. If the crystal contains 12.5%  $^{235}\text{U}$  atoms and 87.5 %  $^{207}\text{Pb}$  atoms, how much time has elapsed since the crystal formed?
- During radioactive decay of isotopes on Earth, the atomic number can: increase, decrease, stay the same (circle all that apply).

Metric Conversions: (show all work)

- What is the volume in liters of a bucket with a capacity of  $2,300 \text{ cm}^3$ ?
  - What is the mass (in kilograms) of the volume of water that could fill the bucket above?
  - What would be the mass (in grams) of a substance with a density of  $3 \text{ kg/L}$  filling the bucket above?
- 

- What is the volume in liters of a bowl with a capacity of  $7,000 \text{ cm}^3$ ?
  - What is the mass (in kilograms) of the volume of water that could fill the bowl above?
  - What would be the mass (in grams) of a substance with a density of  $2.0 \text{ kg/L}$  filling the bowl above?
- 

- What is the volume in liters of a cube with an edge length of  $3 \text{ m}$ ?
  - What is the mass (in grams) of the volume of water that could fill the cube above?
  - What would be the mass (in kilograms) of a substance with a density of  $10.0 \text{ kg/L}$  filling the cube above?
- 

- What is the volume in  $\text{cm}^3$  of a bucket with a capacity of  $24.2 \text{ L}$ ?
  - What is the mass (in grams) of the volume of water that could fill the bucket above?
  - What would be the mass (in grams) of a substance with a density of  $0.5 \text{ kg/L}$  filling the bucket above?
- 

- What is the volume in liters of a cube  $20 \text{ cm}$  on a side?
  - What is the mass in grams of the volume of water that would fill in the cube above?
  - What would be the mass of a volume of cooking oil (density =  $0.5 \text{ g/ml}$ ) in kilograms that would fill the cube above?
- 

- What is the volume in liters of a cube  $30 \text{ cm}$  on a side?
  - What is the mass in grams of the volume of water that would fill in the cube above?
  - What would be the mass of a volume of light cooking oil (density =  $0.1 \text{ g/ml}$ ) in kilograms that would fill the cube in the question above?
- 

- ❖ What is the volume in liters of a cube with an edge length of  $3 \text{ m}$ ?
  - ❖ What is the mass (in kilograms) of the volume of water that could fill the cube above?
  - ❖ What would be the mass (in grams) of a substance with a density of  $3.0 \text{ kg/L}$  filling the cube above?
- 

- A box has a volume of  $20 \text{ liters}$ . What is the volume of the box in centimeters cubed?
  - What would be the mass of water (in grams) that would fill the box above?
  - What would be the mass (in kilograms) of a volume of cooking oil (density =  $0.1 \text{ g/cm}^3$ ) that would fill the box?
- 

- A vase has a volume of  $500 \text{ centimeters cubed}$ . What is the volume of the vase in liters?
  - What would be the mass of water (in grams) that would fill the vase above?
  - What would be the mass (in kilograms) of a volume of olive oil (density =  $0.2 \text{ g/cm}^3$ ) that would fill the vase?
- 

- Each side of a cube-shaped vase has a length of  $10 \text{ centimeters}$ . What is the volume of the vase in liters?
  - What would be the mass of water (in grams) that would fill the vase?
  - What would be the mass (in kilograms) of a volume of olive oil (density =  $0.1 \text{ g/cm}^3$ ) that would fill the vase?
- 

- Each side of a cube-shaped container has a length of  $5 \text{ centimeters}$ . What is the volume of the container in liters?
  - What would be the mass of water (in grams) that would fill the container?
  - What would be the mass (in kilograms) of a volume of peanut oil (density =  $0.5 \text{ g/cm}^3$ ) that would fill the container?
- 

- A barrel has a volume of  $10,000 \text{ cm}^3$ . What is the volume of the barrel in liters?
- What would be the mass of water (in grams) that would fill the barrel?

▪ What would be the mass (in kilograms) of a volume of mercury (density =  $14 \text{ g/cm}^3$ ) that would fill the barrel?

---

- You are given a cube-shaped box that is 30 cm long on each side. What is the volume of the box in liters?
  - What would be the mass of water (in grams) that would fill the cube-shaped box?
  - What would be the mass (in kilograms) of a volume of foam (density =  $0.001 \text{ g/cm}^3$ ) that would fill the box?
-