TAMU GEOL 101 Exam 1

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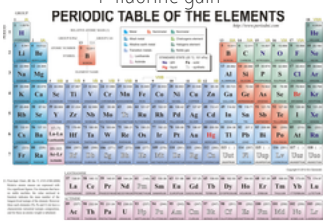
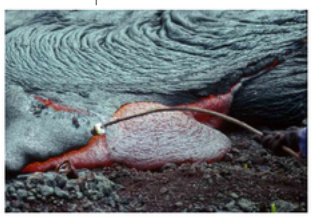
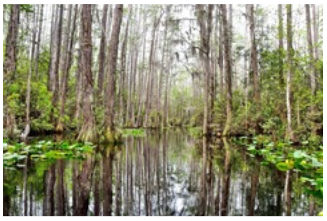
How old is the Earth?	4.6 billion years old
Which of the following is the thickest sphere on Earth?	geosphere
Wet mud and earthworm found on the edge of a lake would be considered to be part of which sphere?	biosphere, hydrosphere, geosphere
On Earth, chemical differentiation lead to the formation of layers in Earth based on the _____ of the materials that make up those layers.	density
Between continental and oceanic crust, _____ crust is denser and _____ crust is thicker.	oceanic ; continental
Which layers in Earth's geosphere are liquid (check all that apply)?	outer core
What defines the boundary between the lithosphere and asthenosphere?	This is a temperature boundary, where peridotite mantle is hot enough to behave more like a plastic than a rigid solid.
If you have a metamorphic rock, and you bury it and heat it until it melts, and then bring it closer to the surface where it cools and solidifies again, the resulting rock would be _____.	igneous
Which of the following issues initially prevented widespread acceptance of Alfred Wegener's continental drift hypothesis?	Wegener's lack of a good mechanism to explain why the continents moved
Seafloor spreading is driven by volcanic activity that occurs:	Along mid-ocean ridges
In the Atlantic Ocean, where does the youngest oceanic crust occur?	Adjacent to the mid-ocean ridge.
Based on the map image below, where do you think the spreading rate is greatest?	In the Pacific Ocean
Where would you expect to find volcanoes in an oceanic-continental convergence zone?	Always on the continental plate.
Why are rocks that formed in an oceanic environment found in the highest parts of the Himalayan Mountains today?	Ocean sediments were trapped and deformed during the continent-continent collisions that formed the Himalayan Mountains.
As the map above shows, the oldest seafloor is generally less than 200 million years old. Why?	Most oceanic lithosphere eventually gets subducted beneath the continents by the time it is 200 million years old because the older it gets, the colder and denser it gets.
Many people say that California is going to fall off the face of the Earth, using what we know about plate tectonics, which of the following is most likely?	The western most edge of California and the Baja Peninsula will slowly move north relative to the rest of the North American continent.
Magnetic anomalies result from seafloor spreading in conjunction with:	Magnetic polarity reversals
What is the significance of the ages of the Hawaiian Islands in terms of plate tectonics?	The ages decrease toward the big island of Hawaii, showing that the Pacific plate is moving NW over a stationary hot spot.
Convection works because _____.	cold material is denser than the same material when it is hot
Which processes contribute to plate motions?	Slab pull, Ridge push, Convection
Why are mid-ocean ridges higher elevation than surrounding abyssal plains? (2 reasons)	Newly formed oceanic crust is more buoyant than older oceanic crust and upwelling mantle at mid-ocean ridges causes these features to be elevated.
Since temperatures in Earth increase with depth, why is the inner core solid?	The pressures in the core are immense and keep it in a solid state despite the temperature.
The temperature of the Earth _____ with depth.	increases
Which of the following describes sedimentary rocks?	formed by lithification of pre-existing rock
Which of the following describes igneous rocks?	formed by the cooling and crystallization of a magma or lava
Which of the following describes metamorphic rocks?	formed by the heating and squeezing of pre-existing rock
The "Big Bang" describes _____ and is estimated to have occurred_____.	the formation of the Universe; between 10 billion and 15 billion years ago
The largest layer of the Earth (by volume) is the_____, and it is composed primarily of_____.	mantle; peridotite
	Preserved magnetism

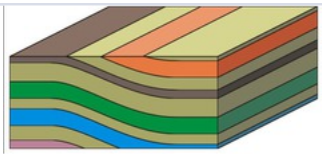
_____ occurs when magnetic minerals in lavas align their magnetic fields with magnetic north, preserving a record of that pole's location at that moment in time.	
How can hot spots leave evidence of plate motion?	Hot spot tracks of volcanic islands are created as plates move over mantle plumes
A typical rate of plate motion is:	~3 centimeters/year
Why does subduction occur?	Because the oceanic lithosphere becomes more dense than the asthenosphere with age
Why have geologists not obtained information about Atlantic Ocean basin that is older than ~ 200 million years?	There was no Atlantic Ocean 200 million years ago.
Rigid lithospheric plates move _____.	over the more ductile asthenosphere
_____ was an early-twentieth-century hypothesis that was at first rejected by geologists, but replaced in the 1960s by the more comprehensive theory called _____.	Continental drift; Plate Tectonics
Continental crust is mainly composed of _____, whereas oceanic crust is mainly composed of _____.	granite; basalt
What is Uniformitarianism?	the idea that the present is key to the past since physical, chemical, and biological processes that operate today have also operated in the geologic past
A very old, stable region of the continent composed of igneous and metamorphic rock is called a continental _____. The edge of the continent that is submerged below sea level is called the continental_____.	craton/sheild; shelf
Transform faults are different from convergent and divergent plate boundaries because	there is neither the creation nor the destruction of lithosphere at a transform fault, and plate movement is parallel to the length of a transform fault.
What is a mantle plume?	An upwelling of hot mantle from the Earth's interior that is cylindrical in shape
_____ is a feature of a divergent plate boundary. (select all that apply)	An ocean ridge (this would form at a divergent plate boundary in the ocean); A rift valley (this would form in a divergent boundary on a continent)
When Earth's magnetic field reverses polarity, it is recorded in _____ formed at that time. Paleomagnetic researchers of the find fairly _____ patterns of alternating magnetism that parallel _____ . Such a pattern forms when an older crust is carried away in an opposite directions by_____.	oceanic crust; symmetric; mid-ocean ridges; sea floor spreading
Appalachian Mountains are located on what type of tectonic boundary?	continent-continent convergence
Andes Mountains are located on what type of tectonic boundary?	continent-ocean convergence
The Arabian Peninsula and Madagascar are located on what type of tectonic boundary?	continental rift
San Andreas fault is located on what type of tectonic boundary?	transform
Which of the following is true of an ore mineral?	any mineral that contains enough of a valuable metal that it is economically viable to mine.
What is the Texas state mineral?	silver
The mineral composed of calcium carbonate that reacts with hydrochloric acid to produce carbon dioxide bubbles and a solution of water and calcium ions is called:	calcite
When mineral crystals grow into a void space in the ground, this typically forms a _____. Amethyst often forms in this way.	geode
Minerals with nice crystal faces can grow:	as long as there is open space
Is glass a mineral?	no because it has no crystal structure
Why does quartz have this pyramid shape?	this shape results from the ordered crystal structure of SiO2
How do rocks differ from minerals?	Minerals aggregate to form rocks, but rocks do not aggregate to form minerals.
Minerals can be destroyed by:	

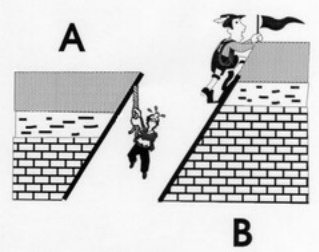
	chemical reaction, where reactive materials like acid breaks atomic bonds; dissolving, where water breaks atomics bonds; melting, where addition of heat breaks atomic bonds.
Which of the following are true of light colored silicate minerals?	low density; low melting temperatures; common in Earth's continental crust
Is gold nugget a mineral?	yes
Is seawater a mineral?	no
Is quartz a mineral?	yes
Is glacial ice a mineral?	yes
Is calcite a mineral?	yes
Is sugar a mineral?	no
Is table salt a mineral?	yes
Which of the following are true about the minerals diamond and graphite?	They are polymorphs, meaning they have the same chemical composition but different structures; Graphite is used for pencil lead; Diamond forms at very high pressures deep in the Earth, and graphite forms at lower pressures; Graphite is softer than diamond because it contains weaker bonds.
Which of the following make up the eight most common elements on Earth's crust?	Silicon, Oxygen, Potassium, Calcium, Magnesium, Iron, Sodium, Aluminum
Given the periodic table below, are the following elements more likely to gain or lose electron(s) when forming an ion?	Ca-calcium lose F-fluorine gain 
Why does a higher temperature cause the viscosity of a magma to decrease?	heat breaks bonds between atoms and allows them to move easily past one another
What is one way glassy texture forms?	rapid cooling of lava
Why do we find coarse grained igneous rock at the Earth's surface?	These rocks have been exposed by uplift and erosion. (possibly: These rocks were formed from a lava flow that eventually cooled and solidified.)
What is the geothermal gradient?	the increases in temperature of the Earth with increased depth
Why does a more felsic magma have a higher viscosity than a mafic magma at the same temperature?	felsic magmas contain more silica tetrahedrons which can link together in the melt and resist flowing past one another
My cat is named after a glassy textured igneous rock that is black in color. What rock is this?	obsidian
Water-induced melting at subduction zones come from where?	Water contained within minerals in the subducting plate is released during metamorphism.
felsic magma SiO2 content %	66-76%
intermediate magma SiO2 content %	52-66%
mafic magma SiO2 content %	45-52%
ultramafic magma SiO2 content %	38-45%
Based on the following figure, an andesite would have about _____% quartz in it.	Between 0 and 12
Which of the following could cause rock to melt?	increase in temperature; change in composition; decrease in pressure
Based on the following figure, a granite would have about _____% MAFIC minerals in it.	Between 0 and 30
Magma rises for two reasons:	1. It is more buoyant than surrounding rock. 2. Overlying rocks creates pressure on the magma causing it to rise.

What is the general temperature range that most silicate magmas exist?	650-1100 degrees Celsius
Is olivine-Mg2SiO4 mafic or felsic?	mafic
Is quartz-SiO2 mafic or felsic?	felsic
Is biotite mica-KMg3AlSi3O10(OH)2 mafic or felsic?	mafic
Is feldspar-KAlSi3O8 mafic or felsic?	felsic
In general, mafic igneous rocks are rich in which of the following elements?	magnesium, iron
The image shows Krakatau Volcano, Indonesia, based on the shape of this volcano, it is best described as what type of volcano?	stratovolcano 
Effusive volcanoes are those with low viscosity lavas that are likely _____ in composition. A _____ volcano is usually effusive.	mafic; shield
The character of a lava flow depends on the viscosity of the lava erupted. _____ lava is less viscous than _____ lava.	basaltic; rhyolitic
Which of the following terms best describes this extrusive igneous feature?	pahoehoe lava 
Rhyolite lava:	Tends to erupt explosively due to pressure buildup from the high viscosity of the lava
Volatile-rich magmas are generated by melting due to addition of volatiles. At what plate tectonic setting does this occur?	convergent—subduction
A caldera forms by:	Draining of a magma chamber beneath a volcano during an eruption
Which of these types of volcanic settings produced 70% of the Earth's surface?	Lavas erupted at mid-ocean ridges
Hot spot volcanism	Hot spots form volcanoes independent of tectonic boundaries; Hot spots are thought to be plumes of hot mantle that rise up in the Earth from the core-mantle boundary; Hot spots can form below oceanic or continental plates
Mt. Vesuvius erupted in a very violent explosion in 79 C.E. and buried the residents of Pompeii in ash. On the basis of this information, which of the following would you LEAST expect to find at Vesuvius?	basaltic (mafic) lava
lahars	can carry away people, buildings, and other structures; high-density, fast-flowing, floods of water and tephra; can occur even if an eruption has not occurred recently
What makes CO2 gas hazardous to humans?	it is colorless and odorless; it is denser than air so it will not rise rapidly and can easily be breathed in without one's knowledge of its presence; It can deprive the brain of oxygen and cause fainting and/or death
The main difference between lavas that form pahoehoe texture and lavas that form a'a' texture is:	temperature

In which of the following lava types would you expect to see the development of pahoehoe?	basalt
Identify the FALSE statement about lahar flow hazards.	Lahars occur when hot lava mixes with water and flows away from the volcano along river channels. (true: If lava comes into contact with water, it will freeze rapidly (quench) and form a glass.)
active volcanoes are...	those that are currently erupting or have recently erupted.
extinct volcanoes are...	those that are not capable of erupting.
dormant volcanoes are...	those that have not erupted in hundreds or thousands of years.
Continental rifts produce magma that is formed by _____ melting in the mantle with felsic magmas produced by _____.	decompression; partial melting of continental crust
True or False. Landslides can cause volcanic eruptions even in extinct volcanoes.	false
If you find a 500 meter depression atop a volcano, it is likely a:	crater
Identify the FALSE statement about volcanic ash hazards.	It is not hazardous if breathed in because the size of particles is too small.
Based on the hazard map of Mt. Rainier below, which of the following volcanic hazards has the furthest reaching effects?	lahars 
the tectonic setting at a seamount:	hot spots
the tectonic setting at island arcs:	subduction zone
the tectonic setting at a mid-ocean ridge:	divergent plate boundary
the form of melting most likely at a mid-ocean ridge:	decompression melting
the form of melting most likely at a felsic magma in a continental rift:	heat-transfer melting
the form of melting most likely at an oceanic hot spot:	decompression melting
the form of melting most likely at a subduction zone:	volatile melting
the form of melting most likely at a continent-continent collision:	no melting
Mauna Loa on Hawaii is an example of:	a shield volcano
What main hazard do lava flows pose to humans?	destruction of immovable property
Identify the FALSE statement about volcanic gas hazards.	All volcanic gasses are toxic to people living near volcanoes.
At which tectonic setting so most volcanoes exist?	convergent-subduction
Which of the following are the most important indicators of magma movement in a magma chamber?	changes in earthquake patterns; changes in the amount and/or composition of gasses released from a volcano; inflation/deflation of a volcanic cone
Which of the following is true of sedimentary rocks?	- Sedimentary rocks are made of weathered and eroded bits of preexisting rocks. - Sedimentary rock classification includes clastic, organic, and chemical types. - Most of Earth's continents are covered in a thin veneer/layer of sedimentary rocks.
Rainwater is often slightly acidic because:	CO2 combines with water to form carbonic acid.
_____ weathering is the physical breakup of rocks. An example is _____.	mechanical; frost wedging

Glaciers (ice) can pick up any sediment they flow over and transport that sediment long distances. The sediment is dropped out when the glaciers melt. Which of the following would best describe a glacial deposit?	VERY poorly sorted sediments
Which of the following is not a category of sedimentary rocks?	Mechanical
Which of the soil profile make up the topsoil?	O horizon, A horizon
True or false, slightly acidic water is necessary for water to chemically erode a rock or material.	False
What would be an example of carbon sequestration?	removal of CO2 from the atmosphere by limestone formation
Which of the following are examples of sedimentary rock structures that preserve features in the sedimentary record?	dinosaur footprints; ripple marks; mudcracks
Which of the following examples of cities experience the fast rate of weathering of roads (formation of potholes) in the wintertime?	A city with nightly average low temperatures of 15 degrees F, and average daytime highs of 40 degrees F.
what sedimentary rock or feature is being deposited? (sand ripples)	sandstone 
what sedimentary rock or feature is being deposited? (coral reef)	limestone 
what sedimentary rock or feature is being deposited? (swamp)	coal 
Order silt, sand, gravel, and clay from 1-largest to 4-smallest sediment size.	gravel - 1, sand - 2, silt - 3, clay - 4
Which of the following are true of soils in rainforests?	Removal of rainforests leads to soil erosion, leaving the soil fairly infertile; Though they are some of the thickest soils, they are not particularly fertile because heavy rainfall leaches most of the nutrients from the top soil; Removal of vegetation increases sunlight exposure to the soil, allowing it to become baked in the sunlight and essentially turned to a hard brick-like substance.
Why is it important to know that every metamorphic rock has a protolith?	All metamorphic rocks form from a pre-existing solid rock, and the composition of the protolith will predict what new minerals will form during metamorphism.
In which of the following would you expect to see the least amount of change from the protolith to the metamorphic rock that forms during metamorphism.	Low grade metamorphism
The following image is best described as a _____.	monocline

	
The Black Hills of South Dakota are a large anticline that has been deeply eroded. Where would you find the youngest exposed rocks associated with the dome?	near the edges of the anticline
Which of the following is true of fractures, joints and faults?	Faults and joints are types of fractures. The difference is faults show displacement and joints do not.
Elastic deformation:	occurs when a shape temporarily responds to stress, but returns to its original shape when the stress is removed
Which of the following is the most important agent of metamorphism?	changes in temperature
The transition from one polymorph to another polymorph that occurs due to a change in temperature and/or pressure is called:	phase change
The Appalachian Mountains:	formed from three major orogenies: The Taconic, The Acadian, and the Alleghenian orogenies.
Mountains in the Basin and Range formed:	by continental rifting.
Which of the following mountain building processes can have associated volcanoes?	continental rifting, subduction
Order the following foliated metamorphic rocks from lowest-1 to highest-4 metamorphic grade.	schist 3 slate 1 shale protolith gneiss 4 phyllite 2
Order the following from lowest temperature process (1) to highest temperature process (3).	Metamorphic rock formation 2 Igneous rock formation 3 Sedimentary rock formation 1
Recrystallization:	Changes the texture (shape and size of the grains)
What is the main reason the mineralogy of a rock changes during metamorphism?	Some minerals are only stable under limited conditions of temperature and pressure, so they change when the conditions change
Tensional stress is most likely to occur at which type of plate boundary?	continental rift
Compressional stress is most likely to occur at which type(s) of plate boundaries:	collision zone, subduction zone
Which of the compressional stress orientations (red arrows) corresponds to the foliation shown in this rock sample?	C - arrows perpendicular to foliation marks
Metamorphism of sandstone produces _____ , whereas metamorphism of lime-stone produces_____.	quartzite; marble
Metamorphism involving hot fluids like water is:	hydrothermal metamorphism
Regional metamorphism is common at which of the following plate tectonic settings?	convergent—subduction zones; convergent—collision zones
Which of the following do you think are constructive and which are destructive mountain building processes? Deformation Partial melting Faulting and folding Glaciation Erosion Foliation	Deformation - constructive Partial melting - constructive Faulting and folding - constructive Glaciation - destructive Erosion - destructive Foliation - constructive Sedimentation - destructive Metamorphism - constructive

Sedimentation Metamorphism	
The major types of stress are _____.	Shear, tension, and compression
The relationship between stress and strain is:	Strain is the result of stress
Faults are examples of what kind of rock deformation?	Brittle
For the fault indicated in the figure below, which side is the hanging wall?	A is the hanging wall 
Which type of plate boundary is associated with most of the Earth's major mountain belts?	convergent
The collision of Africa and North America produced the _____ Mountains.	Appalachian
In the following figure, the block on the left is the _____ and block on the right is the _____. This is an example of a _____.	hanging wall; foot wall; reverse fault