

Multiple Choice (60 pts). Please circle the letter that best answers the question or completes the sentence.

1. The rusting of iron and iron-rich minerals is an example of _____.
 - A. hydrolysis
 - B. hydration
 - C. dissolution
 - D. oxidation

2. A famous example of hot-spot volcanism occurs at _____.
 - A. the Aleutian Islands of Alaska
 - B. the Andes Mountains
 - C. Hawaii
 - D. Mt. St. Helens, Washington

3. Frost wedging, root wedging, and salt wedging are all examples of _____.
 - A. erosion
 - B. chemical weathering
 - C. physical weathering
 - D. deposition

4. A primary force opposing motion on all faults is _____.
 - A. magnetic attraction among iron-rich minerals
 - B. gravity
 - C. friction
 - D. the dark side

5. Explosive eruptions may cause the volcano to collapse into the (now empty) magma chamber, producing a broad depression termed a _____.
 - A. crater
 - B. lahar
 - C. caldera
 - D. fissure

6. Buried shale is subjected to differential stress, causing clay minerals to realign producing slate. This is _____.
 - A. diagenesis
 - B. contact metamorphism
 - C. regional metamorphism
 - D. weathering

7. Mt. Fuji in Japan is an example of a _____.
 - A. stratovolcano
 - B. cinder cone
 - C. shield volcano
 - D. caldera

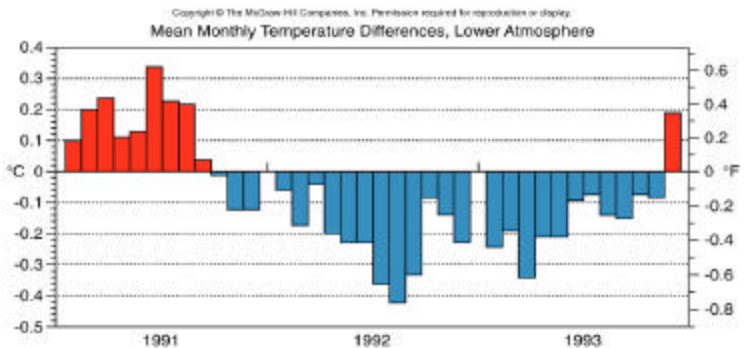
8. As compared to arkose, quartz sandstone _____.
 - A. is more mature
 - B. does not contain significant amounts of feldspar
 - C. is likely to be found farther away from weathering granitic source rock
 - D. All of the above are correct

9. A sill is _____.
A. a horizontal tabular intrusion that lies parallel to existing layers
B. a cooled layer of lava
C. an intrusion formed within the magma chamber of volcano
D. a vertical tabular intrusion that cuts across preexisting layers
10. Chemical changes in metamorphic rock induced by reaction with hot groundwater is termed _____.
A. foliation
B. metasomatism
C. anachronism
D. regional metamorphism
11. The difference between breccia and conglomerate is that _____.
A. conglomerate is finer-grained than breccia
B. conglomerate is coarser-grained than breccia
C. conglomerate possesses more angular grains than breccia
D. conglomerate possesses more rounded grains than breccia
12. Slaty cleavage, schistosity, and compositional banding are all examples of _____.
A. mineral cleavage
B. foliation
C. recrystallization
D. sedimentary structures

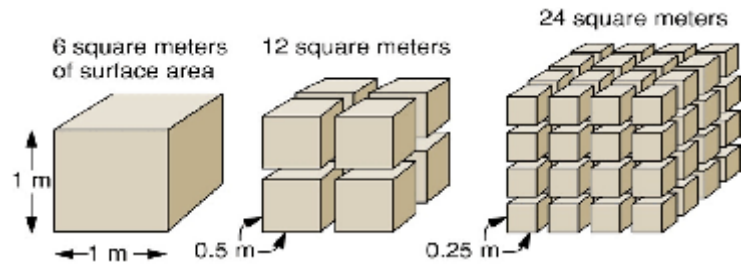
The next two questions refer to the *graph at lower right*

13. Contrary to global warming trends, atmospheric cooling was observed for 2 years following the eruption of Mount Pinatubo in the Philippines. Why?

- A. fossil fuel consumption ceased
B. lava from the eruption warmed the ocean
C. volcanic ash and aerosol blocked sunlight
D. pyroclastic flows destroyed forests
14. What can you infer about Mount Pinatubo magma?
A. It was gabbroic
B. It was basaltic
C. It was andesitic
D. It was ultramafic
15. If a body of magma becomes more silicic, its viscosity will _____.
A. increase
B. decrease
C. stay the same
D. magma doesn't have viscosity
16. Intermittent fault motion due to alternating stress buildup and stress release is termed _____.
A. chaotic faulting
B. thrust faulting
C. stick-slip behavior
D. reverse faulting

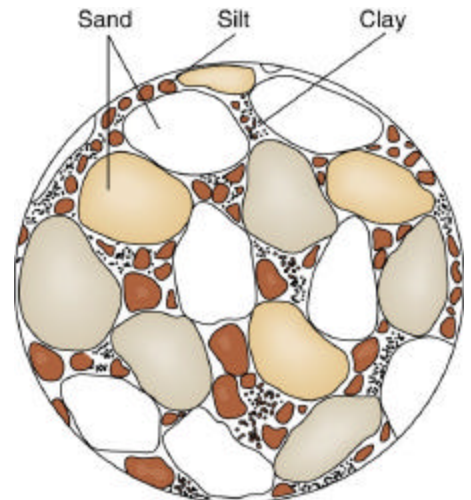


17. Which statement “fits” the *illustration to the right*?
- A. chemical weathering breaks rocks into fragments
 - B. one cubic meter is equal to 24 square meters
 - C. legos rule
 - D. physical weathering enhances chemical weathering



18. Well sorted fine sandstone composed nearly entirely of quartz is said to be _____.
A. physically and chemically mature
B. physically mature but chemically immature
C. chemically mature but physically immature
D. physically and chemically immature
19. Fragments of country rock that fall into an intrusive magma body and don't melt are called _____.
A. porphyroblasts
B. phenocrysts
C. xenoliths
D. gastroliths
20. Most commonly, silicic igneous rocks _____.
A. contain more iron and magnesium than intermediate rocks
B. are lighter in color than mafic rocks
C. are darker in color than mafic rocks
D. are found in oceanic crust
21. The geothermal gradient is the rate of change _____.
A. of pressure with depth in Earth's interior
B. of temperature with depth in Earth's interior
C. of temperature with altitude in Earth's atmosphere
D. of temperature with latitude on Earth's surface
22. Which list properly orders metamorphic rocks from lowest to highest grade?
A. conglomerate, sandstone, siltstone, shale
B. shale, slate, phyllite, quartzite
C. slate, phyllite, schist, gneiss
D. gneiss, phyllite, schist, slate
23. The chemical reaction that transforms feldspar into clay is an example of _____.
A. hydrolysis
B. hydration
C. dissolution
D. oxidation
24. The point along a fault where an earthquake initiates is termed the _____.
A. focus
B. epicenter
C. eye of the fault
D. vertex

25. Obsidian _____.
A. is volcanic glass
B. possesses conchoidal fractures
C. typically is silicic in composition
D. All of the above are correct.
26. Chemical weathering takes place most rapidly in environments that are _____.
A. cool and dry
B. cool and wet
C. warm and dry
D. warm and wet
27. Foliated metamorphic rocks possess _____.
A. leafy plant fossils (ancient foliage)
B. a homogenous texture resulting from randomly oriented grains
C. a planar fabric consisting of mineral grains in preferred orientations
D. minerals precipitated directly from sea water
28. Two common metamorphic rocks which typically lack foliation are _____.
A. slate and phyllite
B. gneiss and migmatite
C. quartzite and marble
D. schist and metaconglomerate
29. Hydrolysis, oxidation, dissolution and hydration are all examples of _____.
A. erosion
B. chemical weathering
C. physical weathering
D. deposition
30. Volcanic eruptive style (flow vs. blow) is influenced by _____.
A. the viscosity of the lava
B. the composition of the lava
C. the proportion of volatiles within the lava
D. All of the above are correct.
31. An arkose with well rounded, well sorted sand grains of feldspar and quartz is said to be _____.
A. physically and chemically mature
B. physically mature but chemically immature
C. chemically mature but physically immature
D. physically and chemically immature
32. The *picture to the right* is described by which of the following terms?
A. Subangular
B. Arkose
C. Poorly sorted
D. Mature



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33. The quantity of offset that occurs along a fault is termed _____.
A. fault gouge
B. the fault gauge
C. displacement
D. accumulation
34. Medium- and deep-focus earthquakes occur along _____.
A. convergent plate boundaries only
B. divergent plate boundaries only
C. transform plate boundaries only
D. all three major types of plate boundaries
35. In 79 C. E., the citizens of Pompeii were buried by pyroclastic debris derived from the eruption of _____.
A. Mt. Olympus
B. Olympus Mons
C. Mt. Vesuvius
D. Mt. St. Helens
36. Mudcracks indicate _____.
A. formation during alternating conditions of wet and dry in a terrestrial environment
B. deposition of fine muds in the bottom of a deep lake
C. transport of sediment by unidirectional currents in a marine setting
D. brittle fracture of mud due to compressional directed stress
37. Which of the following is an example of a volcanic island arc?
A. the Aleutian Islands of Alaska
B. the Andes Mountains
C. Hawaii
D. Mt. St. Helens, Washington
38. In addition to earthquakes, seismographs are also able to detect _____.
A. the vibrations of submarines in deep water
B. underground nuclear explosions
C. the activities of astronauts on the Moon
D. how big your feet are
39. Basaltic lavas _____.
A. contain more iron and magnesium than rhyolitic lavas
B. contain more silica than rhyolitic lavas
C. are more viscous than rhyolitic lavas
D. contain a greater proportion of trapped volatiles than rhyolitic lavas
40. In 1902, a famous, deadly pyroclastic flow killed thousands of people on the Caribbean island of _____.
A. Puerto Rico
B. Martinique
C. Aruba
D. Jamaica
41. A fine-grained clastic rock that splits into thin sheets is _____.
A. mudstone
B. shale
C. sandstone
D. arkose

42. Coarse-grained gabbro is most similar in mineral composition to fine-grained _____.
A. andesite
B. basalt
C. komatiite
D. rhyolite
43. How many seismic stations are necessary to find the epicenter of an earthquake?
A. one
B. two
C. three
D. four
44. The grain size of an igneous rock is determined primarily by _____.
A. its mineral composition
B. its volatile content
C. its pressure during formation
D. how rapidly it cooled during crystallization
45. A mineral within a metamorphic rock that can be used to provide a narrow constraint on the temperature and pressure of formation of the rock is termed a(n) _____.
A. thermomineral
B. index mineral
C. mafic mineral
D. halide mineral

True-False (20 questions; 10 points)

46. Tall masonry buildings constructed on filled wetlands are the safest during a M 7.3 earthquake.	T	F
47. Graded bedding can be used to determine the original "up" direction in folded strata.	T	F
48. Mineralogically, aa is very different than pahoehoe.	T	F
49. The five soil forming factors are: parent material, climate, topography, vegetation and time.	T	F
50. Geologists who study earthquakes are called seismologists	T	F
51. Ripple marks preserved in ancient sandstones indicate the presence of fossil life.	T	F
52. The "end-products" of weathering are quartz, clay and dissolved ions.	T	F
53. The "epicenter" refers to a new hockey arena being constructed in downtown Los Angeles	T	F
54. Metamorphism involves changes in mineralogy and texture in response to heat and pressure.	T	F
55. Shield volcanoes are the type that generate explosive eruptions.	T	F
56. Garnet is a metamorphic index mineral.	T	F
57. Lithified detritus forms biochemical sedimentary rock.	T	F
58. Collisional tectonics is responsible for producing the vast majority of metamorphic rocks.	T	F
59. Phyllite is a compositionally banded metamorphic rock.	T	F
60. Mount Saint Helen's will erupt again.	T	F
61. Feldspars chemically weather to produce minerals of the mica family.	T	F
62. Although coral reefs are tropical, they are characterized by a relatively low biodiversity.	T	F
63. Scientists have now developed methods for predicting earthquakes.	T	F
64. Compositional maturity is always the same as textural maturity	T	F
65. Common volcanic gases include H ₂ O, CO ₂ , SO ₂ and H ₂ S	T	F

Short answer (5 questions; 15 points)

66. How does a lahar form?

67. Why do tsumanis form?

68. What is magmatic assimilation?

69. What is a depositional environment?

70. How does foliation form?

71. **Essay question. On the reverse side of this page, write a brief, cogent and lucid essay on ONE of the following topic questions (15 Points).**

- A. Describe how the potential threat to humans living in volcanically active places is governed by magma composition.
- B. Describe the processes that transform a coarsely crystalline plutonic granite exposed to a humid, tropical climate into a well-sorted quartz sandstone.
- C. Describe the processes whereby a magma of basaltic composition can change into a magma of granitic composition.

72. EXTRA CREDIT (up to 10 points)

- A. Draw and correctly label Bowen's Reaction Series (BRS).
- B. What does BRS describe?
- C. How is BRS related to mineral stability?