

NAME: _____

DATE: _____

GEOLOGY PROGRAM
PART I: QUANTITATIVE STUDENT ASSESSMENT

1. The Earth is _____ years old.
 - a. 6000
 - b. 100 million
 - c. 4.6 million
 - d. 4.6 billion
 - e. 10-20 billion

2. The Earth's crust is _____ thick.
 - a. 7 to 70 kilometers
 - b. 600 to 6000 kilometers
 - c. 1.1 to 11 millimeters
 - d. 10 to 20 meters

3. Igneous rocks are those that form by
 - a. lithification of sediment
 - b. textural or mineralogical alteration of existing rocks
 - c. solidification of magma
 - d. precipitation of sea water

4. An interruption of deposition of sediment, usually of long duration is called
 - a. a fossil
 - b. an unconformity
 - c. the principle of horizontality
 - d. the principle of superposition

5. The principle that states that geological processes and scientific laws operating today also operated in the past is called
 - a. uniformitarianism
 - b. the principle of superposition
 - c. the principle of horizontality
 - d. the principle of cross-cutting relationships

6. Subduction occurs
 - a. at mid-ocean ridges
 - b. along transforms faults
 - c. at hot spots
 - d. at convergent plate boundaries
 - e. along continental rifts

7. Alfred Wegener postulated the theory of
 - a. uniformitarianism
 - b. continental drift
 - c. catastrophism
 - d. plate tectonics
 - e. seismic discontinuity

8. Waves that travel through rock are called
 - a. cosmic waves
 - b. earth waves
 - c. regular waves
 - d. seismic waves
 - e. radio waves

9. An anticline is a fold that arches
 - a. downward
 - b. up and down
 - c. upward
 - d. across an oceanic trench
 - e. under a monocline

10. The San Andreas fault is an example of a
 - a. reverse fault
 - b. normal fault
 - c. strike-slip fault
 - d. thrust fault
 - e. tight fold

11. The distinction between the ornithischian and saurischian dinosaurs is based on
 - a. shape of the cranial cavity
 - b. function of teeth
 - c. arrangement of hip socket
 - d. method of reproduction
 - e. position on food chain

12. Ammonites of the Mesozoic were characterized by:
 - a. very complex indenture pattern
 - b. very complex feeding mechanism
 - c. very complex growth suture pattern
 - d. very complex locomotor mechanism

13. The shift in subduction related magmatism from west to east during the Nevadan orogeny was probably related to
 - a. depletion of the crust in material that could be melted in the western zone
 - b. change in the angle of the subduction zone from low to high angle
 - c. change in the angle of the subduction zone from high to low angle
 - d. change from subduction to transform motion along the western margin

14. The periods of the Late Paleozoic include all but which of the following
 - a. Silurian
 - b. Mississippian
 - c. Devonian
 - d. Permian
 - e. Pennsylvanian

15. Reefs typically form
 - a. as a build-up along a beach
 - b. circular features in deep basins
 - c. linear masses that separate a shallow platform from deep marine environment
 - d. only in high turbulence, wave zones

16. Areas of elongate mountain building activity are called
 - a. shields
 - b. mobile belts
 - c. platforms
 - d. immobile belts

17. The two main rock types that characterize Archean shield areas are
 - a. limestone and granite
 - b. granite and gneiss
 - c. greenstone and granite-gneiss
 - d. greenstone and blueschist

18. The theory that evolutionary changes occur both gradually with little or no changes, and then suddenly with rapid change is called
 - a. suddenism
 - b. punctuated equilibrium
 - c. species gradualism
 - d. transitionalism
 - e. allotropic speciation

19. A rock unit deposited during marine transgression
 - a. becomes younger in the landward direction
 - b. is the same age over its entire geographic extent
 - c. is a time-stratigraphic unit
 - d. becomes younger in a seaward direction

20. The term facies in sedimentary rocks refers to
 - a. lateral changes resulting from deposition in different depositional environments that had existed simultaneously
 - b. vertical variation resulting from deposition in the same environment separated by significant time intervals
 - c. lateral variation resulting from deposition in the same environment separated by significant time intervals
 - d. laterally homogeneous strata deposited over a long time interval in the same environment

21. An example of a sulfide mineral is
- talc
 - bornite
 - olivine
 - graphite
 - magnetite
22. An example of a copper mineral is
- chromite
 - beryl
 - galena
 - malachite
 - wavellite
23. The symmetry operation generated by operations of rotation about an axis combined with inversion is known as
- rotoinversion
 - rotational translation
 - glide
 - screw
 - reflection
24. The crystal system having the highest symmetry in which the crystallographic axes are equal length and meet at right angles is
- monoclinic
 - orthorhombic
 - isometric
 - hexagonal
 - tetragonal
25. An example of polymorphous minerals is
- calcite and aragonite
 - pyrite and marcasite
 - tridymite and cristobalite
 - diamond and graphite
 - all of the above
26. The strongest chemical bond in minerals is
- ionic
 - covalent
 - van der Waals
 - metallic
27. Which one of the following minerals does NOT belong to the carbonate mineral group
- barite
 - aragonite
 - rhodochrosite
 - smithsonite

28. The process where an initially homogeneous solid solution separates into two or more distinct crystalline minerals is called
- twinning
 - metamict
 - exsolution
 - crystallization
29. Minerals that are composed of infinitely extending flat sheets of silica tetrahedral and that exhibit platy crystal habit with one prominent cleavage are classified as
- tectosilicates
 - inosilicates
 - nesosilicates
 - phyllosilicates
 - native metals
30. A mineral that exhibits different colors when viewed in transmitted light in different directions is said to be
- pleochroic
 - iridescent
 - opalescent
 - transparent
31. An igneous rock composed entirely of crystals is called
- holocrystalline
 - holohyaline
 - hypocrystalline
 - aphanitic
32. Ophitic texture refers to
- a texture in which a few minerals are euhedral, some are subhedral, and the rest are anhedral
 - an intergrowth texture of very fine wormlike blebs of quartz and sodic plagioclase
 - the enclosure of plagioclase laths by larger, subhedral augite grains
 - a volcanic texture in which there is strong parallel alignment of plagioclase laths
33. A phaneritic rock composed of orthoclase, oligoclase, quartz, biotite, and/or hornblende is a
- granite
 - gabbro
 - monzonite
 - diorite
34. Under equilibrium, the relation between compositional constraints and variation in environmental variables for chemical systems that dictates the maximum number of phases that can occur (stated as $f + p = c + 2$, where f =number of degrees of freedom, p = number of phases, and c =number of components) is called
- fractional crystallization
 - Bowen's reaction series
 - phase rule
 - differentiation

35. In the Bowen's Reaction series
- minerals higher in the sequence crystallize last
 - minerals higher on the reaction series crystallize before minerals lower on the series
 - minerals throughout the series crystallize at the same time
 - minerals higher in the series show more polymerization of silica tetrahedral
36. Augens are
- large crystals of a mineral grown in a metamorphic rock and surrounded by smaller grains of other minerals
 - a large crystal containing numerous inclusions of one or more groundmass minerals
 - large "eye-shaped" crystals of feldspar in a finer-grained gneissic matrix
 - extremely granulated and streaked-out grains
37. A medium- to coarse-grained metamorphic rock composed of hornblende-plagioclase, where the hornblende prisms are aligned to form a lineation, is called a
- eclogite
 - amphibolite
 - quartzite
 - serpentinite
 - marble
38. Which metamorphic facies is indicative of high pressures and low temperatures, such as that characteristic of a subduction zone?
- blueschist facies
 - granulite facies
 - zeolite facies
 - eclogite facies
39. A metamorphosed igneous rock dominated by quartz and feldspar in which the alumina content is greater than the sodium plus potassium plus calcium is considered
- peraluminous
 - migmatitic
 - peralkaline
 - alkalic
40. A pyroclastic rock consisting of welded fragmental material, principally glassy shards, along with individual mineral grains and rock fragments is called
- pahoehoe
 - agglomerate
 - obsidian
 - tuff
41. Life on Earth began:
- about 600 million years ago
 - at least 3.5 billion years ago
 - at least 5.6 billion years ago
 - about 1 billion years ago
 - about 800 million years ago

42. The term "Cambrian Explosion" refers to:
- Early Paleozoic extinctions caused by a meteor impact
 - a burst of violent volcanic activity that impacted climate and extinction rates
 - a remarkable adaptive radiation and diversification of abundant animals
 - the first appearance of multicellular life
 - the sudden appearance of photosynthetic organisms
43. Extinction _____.
- of organisms happens rarely in geologic history
 - rates are typically not affected by predation or environmental change
 - rates are not affected by human activities
 - rates vary considerably through geologic time
 - rarely affects organisms living in shallow marine habitats
44. According to the fossil record, which of the following lived at the same time?
- dinosaurs, mammals, flowering plants, and amphibians
 - mammals, amphibians, reptiles and trilobites
 - eurypterids, dinosaurs, mammoths, and birds
 - ammonites, horses, birds, and humans
 - Anomalocaris*, *Tyrannosaurus rex*, *Dimetrodon*, and *Archaeopteryx*
45. Regarding plant life on Earth:
- abundant plant life in the Pennsylvanian Period produced significant coal deposits
 - flowering plants originated in the Mesozoic
 - plants can affect the carbon dioxide content of Earth's atmosphere
 - stromatolites produced oxygen that accumulated in the Precambrian atmosphere
 - all of the above are true
46. You are brought a fossil ammonite that was collected from a Cenozoic sedimentary deposit. The most likely explanation for the occurrence of this fossil is:
- the deposit represents a Cenozoic marine environment
 - the deposit represents a Cenozoic terrestrial environment
 - the ammonite fossil was redeposited in Cenozoic sediments
 - the ammonite fossil is younger than the surrounding Cenozoic sediments
 - c and d only are true
47. Which of the Following is **NOT TRUE**?
- Fish originated in the Paleozoic
 - some dinosaurs were only the size of a chicken
 - reptiles and amphibians originated in the Paleozoic
 - small mammals lived in the Mesozoic
 - crinoids, brachiopods, and nautiloids are all extinct

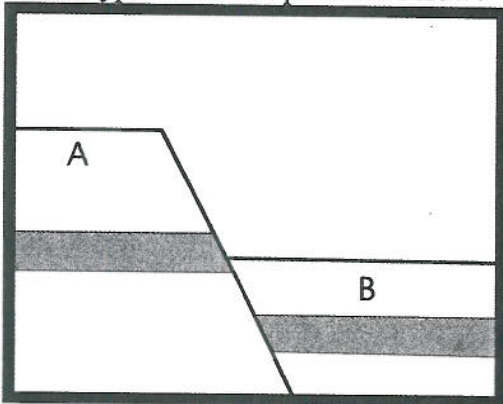
48. You find trilobite, brachiopod, and crinoid fossils preserved in a rock in Indiana. Of the following, the most likely explanation for the occurrence of these fossils in one rock is:
- the deposit represents a Paleozoic marine environment
 - the deposit represents a Mesozoic environment
 - the crinoid fossil was redeposited in Mesozoic sediments
 - the trilobite fossil is younger than the surrounding Mesozoic sediments
 - c and d only are true
49. Which of the following is **NOT TRUE**?
- Eurypterids were scorpion-shaped predators of the Paleozoic
 - Brachiopods reached their peak in abundance and diversity in the Mesozoic, and went extinct 65 million years ago
 - Nautiloids were marine creatures that had a shell and a squid-like body
 - Crinoids created reefs in the Paleozoic, and are common in some limestones in Indiana
 - Ammonites were marine creatures that had a shell and a squid-like body
50. Which of the Following is **NOT TRUE**?
- South America was home to many marsupial mammals just before the land bridge (Isthmus of Panama) connected North America to South America.
 - Giant ground sloths and opossums migrated into North America from South America
 - Many large mammals went extinct in the Cenozoic
 - Elephants are thought to have originated in North America
 - Horses and camels are thought to have originated in North America
51. Rock deformation is most critically dependent upon:
- Composition and color
 - Depth and temperature
 - Moh's hardness scale and composition
 - Mineralogy and temperature
 - Crust and composition

52. What type of geologic structure is represented in the figure below?



- a. doubly-plunging NE-SW anticline
- b. doubly-plunging SW-NE syncline
- c. simple double anticline
- d. NE-plunging anticline and SW-plunging syncline
- e. NE-plunging syncline and SW-plunging anticline

53. What type of fault is pictured below?

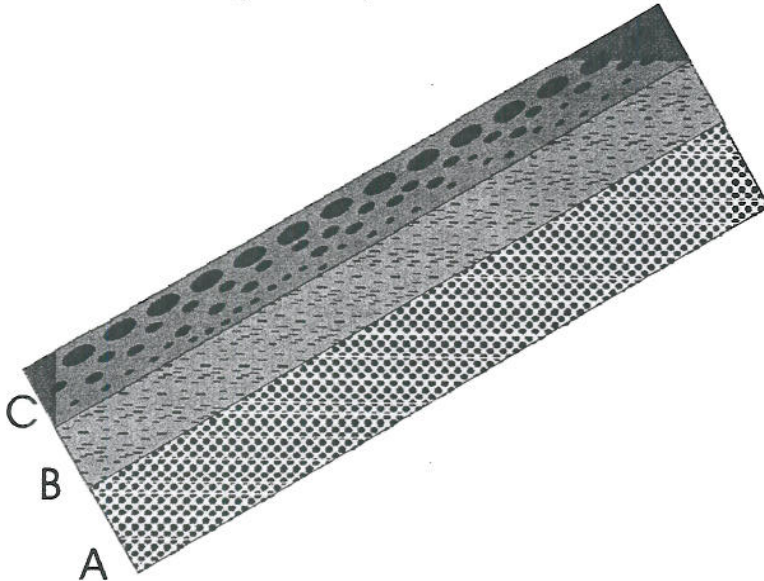


- a. normal fault
- b. Reverse fault
- c. Thrust fault
- d. Left-lateral strike slip
- e. Strike-slip fault

54. Refer to the previous fault figure for this question. In this fault, A refers to the _____ and B refers to the _____:

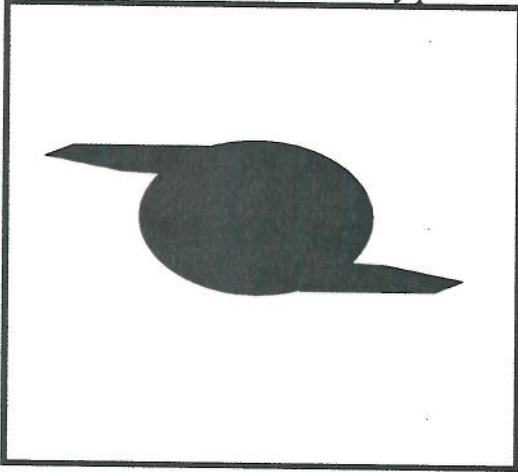
- a. A-hanging wall, B=footwall
- b. A-left side wall, B-right side wall
- c. A-footwall, B-headwall
- d. A-footwall, B-Hanging wall
- e. A-hanging wall, B-step wall

55. Refer to the following picture: What is the correct order of deposition of the following beds (A-ss, B-shale, C-conglomerate)



- a. A,B, and C
 - b. C, B and A
 - c. A, erosion, B, erosion, C
 - d. C-erosion, B-erosion, A-erosion
 - e. Not enough information to determine the answer.
56. Refer to the above picture (ABC). The approximate dip of these rocks is:
- a. 45 degrees
 - b. 135 degrees
 - c. 15 degrees
 - d. 105 degrees
 - e. 90 degrees
57. P-waves and S-waves at a remote seismic station result from:
- a. compressive elastic stress
 - b. compressive and extensional elastic stresses
 - c. shear and compressive elastic stresses
 - d. shear, compressive, extensional elastic stresses
 - e. compressive failure

58. What type of stress most likely produced this mineral grain (originally spherical)?



- a. compressive normal stress
- b. tensional normal stress
- c. compressive shear stress
- d. tensional compressive stress
- e. normal strain stress

59. Which sequence is *most likely* to be observed in an idealized collisional orogen (from suture to interior continent)?

- a. valley and ridge, fold and thrust, ophiolite belt and stable craton
- b. mélangé, fold and thrust belt, valley and ridge, stable craton
- c. fold and thrust belt, stable craton, valley and ridge, ophiolite belt
- d. ophiolite belt, stable craton, metamorphic complex, fold and thrust belt
- e. stable craton, fold and thrust belt, metamorphic complex, valley and ridge.

60. Which pair of structural and dynamic features is correct?

- a. Normal faulting-subduction zones
- b. Reverse faulting-transform zones
- c. Normal faulting-transform zones
- d. Reverse faulting-spreading centers
- e. Normal faulting-spreading centers.

61. Roundness of siliciclastic sand grains is due to:

- a. long distance transport along a river
- b. roundness acquired during crystallization
- c. abrasion between siliciclastic grains in high energy, beach and eolian environments
- d. high energy transport in density currents
- e. none of the above

62. Small scale ripples form in:

- a. coarse-grained sediments deposited in high-energy environments
- b. coarse-grained sediments deposited in low-energy environments
- c. fine-grained sediments deposited in high-energy environments
- d. fine-grained sediments deposited in low-energy environments
- e. none of the above

63. Graded bedding is generally associated with:
- fluvial environments
 - turbidity currents
 - debris flows
 - b and c
 - none of the above
64. Sandstone composition helps us to identify the:
- tectonic setting
 - climate
 - rigor of transport
 - all of the above
 - none of the above
65. An environment of deposition of clastic sediments is usually determined by using:
- lithologic associations
 - primary sedimentary structures
 - texture of sediments
 - all of the above
 - none of the above
66. A tidal-flat environment is characterized by:
- bi-modal paleocurrent pattern
 - uni-modal paleocurrent pattern
 - a fan-shaped paleocurrent pattern
 - a poly-modal paleocurrent pattern
 - none of the above
67. A disconformity is represented by:
- an angular relationship between two sets of sedimentary beds
 - a set of sedimentary beds resting on crystalline basement
 - two sets of sedimentary beds separated by an erosional surface
 - a break in sedimentation between two sets of sedimentary beds that can only be recognized by fossil evidence or radiometric dating
 - none of the above
68. Sonde is an instrument that records, as it is lowered in a drill hole:
- salinity of pore solution in rock
 - electrical resistivity of rock
 - a and b
 - oxygen isotopic composition of drilling fluid
 - none of the above

69. A partial range zone can be defined as:
- a. the interval between the lowest and highest occurrences of two taxa that do not result in stratigraphic overlap
 - b. the interval between the lowest and the highest occurrences of a single taxon
 - c. a zone characterized by taxa without regard to their range limits
 - d. the interval between first appearances of two taxa
 - e. none of the above
70. Chronostratigraphy establishes equivalency in terms of:
- a. Lithologic similarities
 - b. Characteristic fossil assemblage in rock units
 - c. Trace element chemistry of rock units
 - d. Time relationship between rock units
 - e. None of the above