

DO NOT WRITE ON THIS EXAM – ONLY WRITE ON THE ANSWER SHEET!

Multiple Choice Questions (100 points) – for each question, please choose the best answer and fill in your answer on the Scantron sheet (**do not write on this exam**). One point each.

1. The study of the origin and evolution of Earth is:

- A. astronomy
- B. historical geology
- C. astrobiology
- D. physical geology
- E. paleontology

2. Plates are composed of:

- A. the crust and upper mantle
- B. the asthenosphere and upper mantle
- C. the crust and asthenosphere
- D. continental and oceanic crust only
- E. the core and mantle

3. The movement of plates is thought to result from:

- A. density differences between the inner and outer core
- B. rotation of the mantle around the core
- C. gravitational forces
- D. the Coriolis Effect
- E. convection cells

4. Which of the following statements about a scientific theory is not true?

- A. It is an explanation from some natural phenomenon
- B. It is a conjecture or guess
- C. It has a large body of supporting evidence
- D. It is testable
- E. Predictive statements can be derived from it

5. What two observations led scientists to conclude that the Big Bang occurred approximately 14 billion years ago?

- A. A steady-state universe and background radiation of 2.7K above absolute zero
- B. A steady-state universe and opaque background radiation
- C. An expanding universe and opaque background radiation
- D. An expanding universe and background radiation of 2.7K above absolute zero
- E. A shrinking universe and opaque and opaque background radiation

6. Any rock that has been altered from a previous state by heat, pressure and chemical fluids is a _____ rock.

- A. plutonic
- B. metamorphic
- C. ferromagnesian
- D. sedimentary
- E. evaporite

7. Lithification is the processes whereby:

- A. lava cools and forms an aphanitic texture
- B. atoms of two different elements join together
- C. organic matter is converted in granite
- D. rocks are altered by heat at the margin of a pluton
- E. sediment is converted into a sedimentary rock

8. Which one of the following is a phaneritic igneous rock?

- A. gabbro
- B. sandstone
- C. coal
- D. phyllite
- E. dolostone

9. If a naturally occurring solid substance has all of its atoms arranged in a specific three-dimensional framework it is said to be:

- A. covalently bonded
- B. crystalline
- C. porphyritic
- D. biochemical
- E. sedimentary

10. If you were to encounter an igneous rock in which the minerals were clearly visible, you would be justified in concluding that the rock is:

- A. detrital
- B. foliated
- C. plutonic
- D. metamorphic
- E. extraterrestrial

11. An atom with 6 protons and 8 neutrons has an atomic mass of:

- A. 14
- B. 2
- C. 6
- D. 8
- E. 48

12. The particles ejected by volcanoes during explosive eruptions are collectively called:

- A. biochemical constituents
- B. volcanic compounds
- C. carbonates minerals
- D. pyroclastic materials
- E. intrusive metamorphics

13. The man credited with developing the continental drift hypothesis is:

- A. Wilson
- B. Hess
- C. Vine
- D. Wegener
- E. du Toit

14. The southern part of Pangaea, consisting of South America, Africa, India, Australia and Antarctica is called:

- A. Gondwana
- B. Laurentia
- C. Atlantis
- D. Laurasia
- E. Pacifica

15. Hot spots and aseismic ridges can be used to determine:

- A. location of divergent boundaries
- B. absolute motion of plates
- C. location of magnetic anomalies in the oceanic crust
- D. relative motion of plates
- E. location of convergent plate boundaries

16. Magnetic surveys of the ocean basins indicate that:

- A. the oceanic crust is youngest adjacent to mid-oceanic ridges
- B. the oceanic crust is oldest adjacent to mid-oceanic ridges
- C. the oceanic crust is youngest adjacent to the continents
- D. the oceanic crust is the same age everywhere
- E. answers b and c

17. The driving mechanism of plate movement is thought to be:

- A. isostasy
- B. Earth's rotation
- C. thermal convection cells
- D. magnetism
- E. polar wandering

18. Convergent plate boundaries are areas where:

- A. new continental lithosphere is forming
- B. new oceanic lithosphere is forming
- C. two plates come together
- D. two plates slide past each other
- E. two plates move away from each other

19. The most common biotic province boundaries are:

- A. geographic barriers
- B. biologic barriers
- C. climatic barriers
- D. answers a and b
- E. answers a and c

20. The Andes Mountains are a good example of what type of plate boundary?

- A. continental-continental
- B. oceanic-oceanic
- C. oceanic-continental
- D. divergent
- E. transform

21. If a radioactive element has a half-life of 16 million years, what fraction of the original amount of parent material will remain after 96 million years?

- A. 1/2
- B. 1/16
- C. 1/32
- D. 1/4
- E. 1/64

22. Because of the heat and pressure exerted during metamorphism, daughter atoms were driven out of a mineral being analyzed for a radiometric date. The date obtained will therefore be _____ the actual age of the formation.

- A. younger than
- B. older than
- C. that same as
- D. can't be determined
- E. none of the previous answers

23. Placing geologic events in sequential or chronological order as determined by their position in the geologic record is:

- A. absolute dating
- B. correlation
- C. historical dating
- D. relative dating
- E. uniformitarianism

24. If a flake of biotite within a sedimentary rock (such as a sandstone) is radiometrically dated, the date obtained indicates when:

- A. the biotite crystal formed
- B. the sedimentary rock formed
- C. the parent radioactive isotope formed
- D. the daughter isotope(s) formed
- E. none of the previous answers

25. The atomic number of an element is determined by the number of:

- A. protons
- B. neutrons
- C. electrons
- D. protons and neutrons
- E. protons and electrons

26. Who is generally considered the father of modern geology?

- A. Werner
- B. Lyell
- C. Steno
- D. Cuvier
- E. Hutton

27. The most commonly used time-stratigraphic unit is the:

- A. system
- B. period
- C. epoch
- D. member
- E. formation

28. According to the principle of fossil (faunal) succession:

- A. a dike is older than the sedimentary rock it cuts through
- B. time-stratigraphic units are defined by rock type
- C. fossil assemblages succeed one another in a regular and predictable order
- D. a marine regression takes place when the sea rises and invades a continent
- E. the geologic column and time scale are based on the theory of evolution

29. The principle of inclusion holds that:

- A. all aspects of the fossil record are important to deciphering Earth history
- B. Walter's law applies on to conformable sequences of strata
- C. fragments in a layer of rock are older than the layer itself
- D. an eon is made up of two or more eras
- E. concurrent range zones are useful in time-stratigraphic correlation

30. The geologic time column and relative geologic time scale were established by the 1840s based on:

- A. the theory of evolution
- B. the principle of unconformities
- C. superposition and faunal succession
- D. lithostratigraphic biozones
- E. the rate of radioactive decay

31. Which of the following is a trace fossil?

- A. clam shell
- B. dinosaur bone
- C. worm burrow
- D. disconformity
- E. biozone

32. Which one of the following statements is not correct?

- A. Among other things, a guide fossil must be geographically widespread
- B. An era consists of two or more periods
- C. Biozone boundaries do not necessarily coincide with lithostratigraphic boundaries
- D. Most fossils are found in igneous and metamorphic rocks
- E. Offshore facies are superposed on the nearshore facies during a marine transgression

33. Braided stream deposit mostly

- A. sheets of sand and gravel
- B. evaporites
- C. turbidity current sequence
- D. limestone and pelagic ooze
- E. submarine fans

34. Deltas form where

- A. the shells of microscopic organisms settle from suspension
- B. rivers and streams spread across their floodplains
- C. glaciers deposit till and outwash
- D. sediment is transported through submarine canyons
- E. a fluvial system flows into a standing body of water

35. The process whereby organisms burrow through and thoroughly mix sediment is:

- A. lithification
- B. sedimentation
- C. bioturbation
- D. sorting
- E. rounding

36. Which one of the following is not a sedimentary structure?

- A. Outwash
- B. Ripple mark
- C. Mud crack
- D. Cross-bed
- E. Lamination

37. Which of the following statements is correct?

- A. Rounding refers to how nearly spherical sedimentary grains are
- B. The sand in desert dunes is poorly sorted
- C. The deep seafloor is covered by sand and gravel
- D. Cross-beds are good indicators of ambient current directions
- E. Limestone made of broken shells is called micrite

38. A sand body with a blanket geometry that has large-scale cross beds, wave-formed ripple marks, and bioturbation probably was deposited on(in):

- A. a braided stream system
- B. desert dunes
- C. inner continental shelf
- D. barrier island complex
- E. submarine fans

39. The alternating dark- and light-colored laminations that form in glacial lakes are:

- A. graded beds
- B. current ripples
- C. tidal flat muds
- D. varves
- E. tills

40. Geologists use the principle of superposition to determine:

- A. how long ago a fossil organism lived
- B. the duration of a marine regression
- C. absolute ages for geologic events
- D. whether fossil remains have been altered
- E. the relative ages of rocks in a vertical sequence

41. The Burgess Shale fauna is significant because it contains the:

- A. first shelled animals
- B. carbonized impressions of many extinct soft-bodied animals
- C. fossils of rare marine plants
- D. earliest known benthic community
- E. conodont animal

42. The age of the Burgess shale is:

- A. Cambrian
- B. Ordovician
- C. Silurian
- D. Devonian
- E. Mississippian

43. The three invertebrate groups that comprised the majority of Cambrian skeletonized life were:

- A. trilobites, archaeocyathids, brachiopods
- B. echinoderms, corals, bryozoans
- C. brachiopods, archaeocyathids, corals
- D. trilobites, echinoderms, corals
- E. trilobites, brachiopods, corals

44. During which Paleozoic cratonic sequence were cyclothem common?

- A. Sauk
- B. Absaroka
- C. Kaskaskia
- D. Zuni
- E. Tippecanoe

45. During which period did extensive glaciation of the Gondwana continent occur?

- A. Cambrian
- B. Silurian
- C. Devonian
- D. Carboniferous
- E. Permian

46. Which was the first Paleozoic orogeny to occur in the Cordilleran mobile belt?

- A. Acadian
- B. Alleghanian
- C. Antler
- D. Caledonian
- E. Ellesmere

47. The economically valuable deposit in a cyclothem is:

- A. gravel
- B. metallic ore
- C. coal
- D. carbonates
- E. evaporites

48. Which orogeny was not involved in the closing of the Iapetus Ocean?

- A. Alleghanian
- B. Acadian
- C. Taconic
- D. Caledonian
- E. Antler

49. Which was the first major transgressive sequence onto the North American craton?

- A. Absaroka
- B. Sauk
- C. Zuni
- D. Kaskaskia
- E. Tippecanoe

50. What type of plate interaction produced the Taconic orogeny?

- A. divergent
- B. transform
- C. oceanic-oceanic convergent
- D. oceanic-continental convergent
- E. continental-continental convergent

51. During which sequence did the eastern margin of Laurentia change from a passive plate margin to an active plate margin?

- A. Zuni
- B. Tippecanoe
- C. Sauk
- D. Kaskaskia
- E. Absaroka

52. An elongated area marking the site of mountain building is a(n):

- A. cyclothem
- B. mobile belt
- C. platform
- D. shield
- E. craton

53. The ocean separating Laurentia from Baltica is called the:

- A. Panthalassa
- B. Tethys
- C. Iapetus
- D. Atlantis
- E. Perunica

54. Which mobile belt is located on the eastern side of North America?

- A. Franklin
- B. Cordilleran
- C. Ouachita
- D. Appalachian
- E. answers A and B

55. During the deposition of the Sauk sequence, the only area above sea level besides the Transcontinental Arch was the:

- A. Cratonic margin
- B. Canadian shield
- C. Queenston Delta
- D. Appalachian mobile belt
- E. Taconic highlands

56. One type of Proterozoic rock that indicates some free oxygen was present in the atmosphere is:

- A. continental red beds
- B. carbon-conglomerate assemblages
- C. ultramafic lava flows
- D. Wilson Cycle deposits
- E. prokaryotic accumulates

57. A large landmass composed mostly of Greenland and North America that evolved during the Proterozoic is called:

- A. Grenvillia
- B. Ediacara
- C. Laurentia
- D. Pannotia
- E. Romania

58. Cells with a membrane-bound nucleus and internal structures called organelles are called ____ cells.

- A. komatiitic
- B. endosymbiotic
- C. porphyritic
- D. aphanitic
- E. eukaryotic

59. A sequence of rocks on land made up of mantle rocks overlain by oceanic crust and deep sea sediments is a(n):

- A. granite-gneiss complex
- B. turbidite sequence
- C. ophiolite
- D. continental red bed
- E. Supercycle

60. Columnar masses of rock resulting from the activities of cyanobacteria (blue-green algae) are:

- A. heterotrophs
- B. endosymbionts
- C. orogens
- D. stromatolites
- E. trilobites

61. The widely accepted theory explaining the origin of eukaryotic cells holds that these cells formed by:

- A. endosymbiosis
- B. parthenogenesis
- C. binary fission
- D. pangensis
- E. Autotrophism

62. The origin of life from nonliving matter is known as:

- A. outgassing
- B. abiogenesis
- C. cratonization
- D. biotic accretion
- E. polymerization

63. The ancient, stable part of a continent made up of a shield and platform is called a:

- A. stromatolite
- B. greenstone belt
- C. craton
- D. black smoker
- E. komatiite

64. Photochemical dissolution is a process whereby:

- A. plants synthesize organic molecules
- B. carbon dioxide forms as a metabolic waste product of animal respiration
- C. continents grow along their margins by accretion
- D. gases emitted from Earth's interior release methane and ammonia into the atmosphere
- E. water molecules are disrupted to yield hydrogen and oxygen

65. Stromatolites are produced by cyanobacteria which are also known as:

- A. blue-green algae
- B. eukaryotic cells
- C. black smokers
- D. heterotrophs
- E. polymers

66. Granite-gneiss complexes are:

- A. the most widespread Archean-age rocks
- B. found at oceanic spreading ridges
- C. mostly likely turbidite deposits
- D. noted from their fossil plants and animals
- E. green because they contain the minerals epidote and chlorite

67. The exposed part of the craton of North America is called the:

- A. Canadian shield
- B. Wyoming province
- C. Adirondack terrane
- D. Michigan basin
- E. Midcontinent platform

68. Which one of the following sequences of geologic time designations is in the correct order from oldest to youngest:

- A. Archean-Phanerozoic-Proterozoic
- B. Proterozoic-Phanerozoic-Archean
- C. Phanerozoic-Archean-Proterozoic
- D. Archean-Proterozoic-Phanerozoic
- E. Proterozoic-Archean-Phanerozoic

69. The origin of greenstone belts is not fully resolved, but many geologists agree that some of the formed in:

- A. continental shelf environments
- B. back-arc marginal basins
- C. carbonate-evaporite depositional areas
- D. transform boundary shear zones
- E. river floodplain environments

70. The vertical sequence of the Tapeats Sandstone, Bright Angel Shale and Muav Limestone represents:

- A. a transgression
- B. time transgressive formations
- C. rocks of the Grand Canyon, Arizona
- D. sediments deposited in the Sauk Sea
- E. All of the previous answers

71. The major organic-walled phytoplankton of the Paleozoic Era was.

- A. acritarchs
- B. coccolithophoroids
- C. diatoms
- D. dinoflagellates
- E. graptolites

72. Which group of planktonic invertebrates that were especially abundant during the Ordovician and Silurian periods are excellent guide fossils?

- A. brachiopods
- B. cephalopods
- C. fusulinids
- D. graptolites
- E. trilobites

73. What type of invertebrates dominated the Ordovician invertebrate community?

- A. epifloral planktonic primary producers
- B. infaunal nektonic carnivores
- C. infaunal benthic sessile suspension feeders
- D. epifaunal benthic mobile suspension feeders
- E. epifaunal benthic sessile suspension feeders

74. The greatest recorded mass extinction in Earth history took place at the end of which period?

- A. Cambrian
- B. Ordovician
- C. Devonian
- D. Permian
- E. Cretaceous

75. Which reptile group gave rise to mammals?

- A. labyrinthodonts
- B. acanthodians
- C. pelycosaurs
- D. protothyrids
- E. therapsids

76. The Age of Fish is which period (*GMD add – in spite of all Phanerozoic history being the “Age of Fish”*)

- A. Cambrian
- B. Silurian
- C. Devonian
- D. Pennsylvanian
- E. Permian

77. Which evolutionary innovation allowed reptiles to colonize all of the land?

- A. tear ducts
- B. additional bones in the jaw
- C. the middle-ear bones
- D. an egg that contained a food-and-waste sac and surrounded the embryo in a fluid sac
- E. limbs and a backbone capable of supporting the animals on land

78. Which of the following groups did amphibians evolve from?

- A. coelacanth
- B. ray-finned fish
- C. lobe-finned fish
- D. pelycosaurs
- E. therapsids

79. The discovery of *Tiktaalik roseae* is significant because it is:

- A. the ancestor of modern reptiles
- B. an intermediate between lobe-finned fish and amphibians
- C. the first vascular land plant
- D. the "missing link" between amphibians and reptiles
- E. the oldest known fish

80. Labyrinthodonts are:

- A. plants
- B. fish
- C. amphibians
- D. reptiles
- E. None of the previous answers

81. The formation of complex responsible for the spectacular scenery of the Painted Desert and Petrified Forest is the:

- A. Franciscan
- B. Morrison
- C. Chinle
- D. Wingate
- E. Navajo

82. The first Mesozoic orogeny of the Cordilleran region was the:

- A. Sevier
- B. Laramide
- C. Sonoma
- D. Antler
- E. Nevadan

83. Triassic rifting between which two continental landmasses initiated the breakup of Pangaea?

- A. India and Australia
- B. Antarctica and India
- C. South America and Africa
- D. North America and Eurasia
- E. Laurasia and Gondwana

84. The orogeny responsible for the present-day Rocky Mountains is the:

- A. Sevier
- B. Nevadan
- C. Antler
- D. Sonoma
- E. Laramide

85. The time of the greatest post-Paleozoic inundation of the craton occurred during which geologic period?

- A. Triassic
- B. Jurassic
- C. Cretaceous
- D. Paleogene
- E. Neogene

86. Which orogeny produced the Sierra Nevada, Southern California, Idaho and Coastal Range batholiths?

- A. Laramide
- B. Sonoma
- C. Nevadan
- D. Sevier
- E. None of the previous answers

87. Which formation or group filled the Late Triassic fault-block basins of the east coast of North America with red nonmarine sediment?

- A. Morrison
- B. Chinle
- C. Navajo
- D. Franciscan
- E. Newark

88. The group of organisms known as the angiosperms includes:

- A. the flowering plants
- B. ancestor of dinosaurs
- C. planktonic bivalves
- D. mammal-like reptiles
- E. bipedal ectotherms

89. All dinosaurs with bird-like pelvis belong to the order:

- A. Therapsida
- B. Crossopterygii
- C. Pterosauria
- D. Ornithischia
- E. Ceratopsia

90. A complex part of the circum-Pacific orogenic belt in the United States is:

- A. Tejas sedimentary sequence
- B. North American Cordilleran
- C. Rio Grande rift
- D. Atlantic coastal plain
- E. Pacific-Farallon ridge

91. The Basin and Range Province in the United States is:

- A. a huge area of block faulting
- B. mainly in Kansas and Nebraska
- C. made up mostly of volcanic mountains
- D. characterized by compression and coastal thickening
- E. bordered on the east and west by the Appalachians and Great Plains, respectively

92. As North America moved westward, the _____ plate was largely consumed as it was subducted beneath the continent.

- A. Zuni
- B. Orogenic
- C. Cascade
- D. Alpine
- E. Farallon

93. Geologic evidence indicates that the Laramide orogeny ceased during the:

- A. Miocene
- B. Quaternary
- C. Eocene
- D. Permian
- E. Mesozoic

94. The vast area of overlapping lava flows mostly in Washington state is known as the:

- A. Coast Range
- B. San Juan volcanic field
- C. Columbia River basalts
- D. Gulf Coastal Plain
- E. Zuni epeiric sea

95. The Himalayas formed with the _____ plate collided with the _____ plate.

- A. Farallon/Pacific
- B. Nazca/Cocos
- C. African/European
- D. Indian/Asian
- E. Australian/South America

96. The Cenozoic Era consists of two periods, the _____ and the _____.

- A. Paleogene and Neogene
- B. Permian and Cretaceous
- C. Proterozoic and Archean
- D. Mesozoic and Triassic
- E. Miocene and Eocene

97. Most of the Cenozoic-age sediment on the Atlantic coastal plain was eroded from the:

- A. Rocky Mountains
- B. Cascade Range
- C. Appalachian Mountains
- D. Ozark Plateau
- E. Farallon Ridge

98. Horses, rhinoceroses and tapirs are all members of the mammal order Perissodactyla which is also known as the _____ mammals.

- A. carnivorous/omnivorous
- B. odd-toed hoofed
- C. ruminant
- D. flightless predatory
- E. proboscidean

99. The only living egg-laying mammals are:

- A. multituberculates
- B. megadonts
- C. marsupials
- D. moerotheres
- E. monotremes

100. During the Cenozoic, Earth's temperature was highest during the:

- A. Pleistocene
- B. Pliocene
- C. Eocene
- D. Cretaceous
- E. Neogene.