

FINAL EXAM

* Mark your choice on the answer sheet. * Choose the best answer for each question. Read all the answers before making your choice. * Be sure to thoroughly erase any mistakes on the answer sheet.

1. During Early Archean, most of the upper layer of Earth was
 - a. covered with solid komatiite.
 - b. a magma ocean.
 - c. one giant subduction zone.
 - d. covered with water.
 - e. immune to the effects of outgassing.

2. During outgassing, this was a gas NOT found in atmosphere.
 - a. O₂
 - b. H₂O
 - c. CO₂
 - d. CO
 - e. HCl

3. In Archean banded-iron formations, the red layer has a composition of
 - a. O₂.
 - b. Fe₂O₃ and Fe₃O₄.
 - c. sulfides such as FeS₂.
 - d. SiO₂.
 - e. clay minerals.

4. Select the characteristic below that does NOT pertain to Archean.
 - a. high internal heat flow
 - b. elevated surface temperatures
 - c. limited continent crust
 - d. oxygenated atmosphere
 - e. well-established hydrologic cycle

5. A rock that did NOT form during Archean sedimentation is:
 - a. limestone.
 - b. graywacke.
 - c. cross-bedded sandstone.
 - d. conglomerates.
 - e. dark shales.

6. A large mass of fossilized cyanobacterial mats binding fine particles of calcium carbonate are called
 - a. molecular fossils.
 - b. extremophiles.
 - c. stromatolites.
 - d. chondrites.

e. organelles.

Proterozoic

7. The first stage in Wilson Cycle is
 - a. opening of an ocean basin.
 - b. sedimentation along the margins of separating continents.
 - c. closing of the ocean basin through plate tectonics.
 - d. onset of the glacial cycle.
 - e. formation of banded iron deposits.

8. The Late Proterozoic supercontinent is called
 - a. Pangaea.
 - b. Gondwanaland.
 - c. Rodinia.
 - d. Laurasia.
 - e. Levinia.

9. Select the interval that is not characterized by glaciation.
 - a. Late Proterozoic
 - b. Ordovician-Silurian
 - c. Cambrian
 - d. Carboniferous-Permian
 - e. Quaternary

10. Select the lithology below that is NOT found in the deposits of Varangian glaciation.
 - a. dropstones
 - b. varved clays
 - c. tillites
 - d. magnetized basalts
 - e. coarse clastics

11. The Vishnu Schist of the Grand Canyon was formed in this orogeny.
 - a. Mazatzal
 - b. Wopmay
 - c. Hudsonian
 - d. Grenville
 - e. Labrador

12. The age of the Grand Canyon Supergroup is
 - a. Paleoproterozoic.
 - b. Mesoproterozoic.
 - c. Neoproterozoic.
 - d. Paleozoic.
 - e. Mesozoic.

13. A carbonate fossil that is rather rare in Archean rocks, but is much more common during Proterozoic is called
 - a. acritarchs.

- b. eukaryotes.
 - c. prokaryotes.
 - d. stromatolites.
 - e. iron-reducing bacteria.
14. The name for Proterozoic passive-margin sediments in the Grand Canyon.
- a. Shinumo Quartzite
 - b. Vishnu Schist
 - c. Muav Limestone
 - d. Bright Angel Shale
 - e. Tapeats Sandstone
15. Atmospheric oxygen level is 3 to 10 percent by:
- a. 4.0 billion years
 - b. 3.0 billion years
 - c. 2.0 billion years
 - d. 1.0 billion years
 - e. 0.6 billion years
16. Proterozoic climates were warm and arid at a high latitude as shown by
- a. boulder deposits in the Gowganda.
 - b. limestone and dolomites in reeflike colonies.
 - c. red beds.
 - d. greenstone belts.
 - e. evaporite deposits.

Paleozoic strata

17. During Early Paleozoic, Laurentia lay near
- a. the North Pole.
 - b. the equator.
 - c. the South Pole.
 - d. 45 degrees north.
 - e. 45 degrees south.
18. The first great transgression during the Early Paleozoic (began in Late Proterozoic) was
- a. Kaskaskia.
 - b. Tippecanoe.
 - c. Sauk.
 - d. Absaroka.
 - e. Zuni.
19. The nature of transcontinental arch of Laurentia during Sauk transgression was
- a. great barrier reefs.
 - b. totally submerged lands.
 - c. chain of low islands.
 - d. deep marine basins.
 - e. volcanoes.

20. Initial deposits of Tippecanoe transgression, a pure quartz sandstone, is called
- St. Peter.
 - Queenston.
 - Lockport.
 - Grimsby.
 - Rochester.
21. The Iapetus started closing during Early Paleozoic, thus initiating the first eastern-U.S. margin orogeny known as
- Caledonain.
 - Taconic.
 - Acadian.
 - Antler.
 - Levinian.
22. Clastic deposits of the Taconic orogeny in the eastern U.S. are called
- Queenston clastic wedge.
 - Ouachita-Marathon trough.
 - Caledonian.
 - Cordilleran reefs.
 - Taconic highlands.
23. The name of Silurian iron-ore deposits in southern Appalachians is
- Bush.
 - Clinton.
 - St. Peter.
 - Taconic
 - Queenston.
24. This means “ancient life”:
- Mesozoic
 - Paleozoic
 - Cenozoic
 - Proterozoic
 - Archean
25. Between the Cambrian Appalachian seaway and the Transcontinental arch was
- Cordilleran seaway.
 - lowlands of the Canadian shield.
 - Franklinian seaway.
 - shallow, epicontinental sea.
 - sand deposition.
26. A major dome structure of the central platform is
- Illinois.
 - La Salle.
 - Ozark.
 - Cincinnati.
 - Nemaha.

27. What orogeny commences at about the same time as the brief interval between the Sauk and Tippecanoe sequences?
 - a. Taconic
 - b. Antler
 - c. Sonoma
 - d. Nevadan
 - e. Alpine

28. Upper Cambrian lithofacies characteristics of the U.S. mid-continent
 - a. sandstone
 - b. limestone
 - c. shale
 - d. siltstone
 - e. volcanics

29. What formation is the lowermost part of the Sauk sequence?
 - a. Bright Angel
 - b. Vishnu
 - c. Mauv
 - d. Dolomite
 - e. Tapeats

30. Evaporation of the Michigan Basin created
 - a. reefs.
 - b. salt and gypsum.
 - c. red beds.
 - d. chert.
 - e. sandstone.

31. The Taconic orogeny occurred during
 - a. Cambrian.
 - b. Ordovician.
 - c. Silurian.
 - d. Devonian.
 - e. Permian.

32. Vascular plants first appear during
 - a. Cambrian.
 - b. Ordovician.
 - c. Silurian.
 - d. Devonian.
 - e. Triassic.

33. Early Paleozoic equatorial dry conditions are indicated by
 - a. limestones.
 - b. evaporites.
 - c. tillites.
 - d. shales.
 - e. cherts.

Late Paleozoic

34. The first sedimentary event of Late Paleozoic was
 - a. transgression of the Absaroka sea.
 - b. regression of the Absaroka sea.
 - c. transgression of the Kaskaskia sea.
 - d. regression of the Kaskaskia sea.
 - e. transgression of the Zuni sea.

35. A very common marine fossil of the Kaskaskia sea was
 - a. oöids.
 - b. crinoids.
 - c. *Uintatherium*.
 - d. cyclothem animals.
 - e. flatirons.

36. An indicator of global sea-level fall at the end of Mississippian.
 - a. Chattanooga shale
 - b. chert layers
 - c. widespread unconformity
 - d. time transgression
 - e. arches and domes

37. In a cyclothem, the transition from predominantly marine to non-marine deposits occurs within the bed of
 - a. underclay.
 - b. coal.
 - c. shale.
 - d. sandy shale or siltstone.
 - e. freshwater limestone.

38. Global control on cyclothem formation is shown by
 - a. regional subsidence in Illinois.
 - b. cyclothem in same-age strata elsewhere in the world.
 - c. modern glacial meltwater returning to the sea.
 - d. a lack of understanding of global paleogeography.
 - e. exploration in the Williston Basin.

39. Absaroka strata in Permian Basin that were formed on the basin's margins are called
 - a. dark limestone and shale.
 - b. massive reefs.
 - c. thin limestones, evaporites, red beds.
 - d. chert.
 - e. novaculite.

40. The "four corners" area of the common boundary of Utah, Colorado, Arizona, and New Mexico was the Pennsylvanian location of the
 - a. Amarillo-Wichita-Arbuckle Mountains.
 - b. Kaibab-Defiance-Zuni uplift.

- c. Front Range-Pedernal uplift.
 - d. Paradox Basin.
 - e. Oquirrh Basin.
41. Steeply dipping strata that represent sediments shed off the ancestral Rocky Mountains are called
- a. Guadalupe Mountains.
 - b. flatirons of the Fountain Formation.
 - c. cyclothems of the Carbonate Formation.
 - d. Pecos arch and Diablo uplift.
 - e. Central Kansas uplift.
42. Collision with northwestern Africa caused the
- a. Avalonian orogeny.
 - b. Acadian orogeny.
 - c. Alleghenian orogeny.
 - d. Appalachian orogeny.
 - e. Antler orogeny.
43. Catskill red beds represent deposition in
- a. shallow seas.
 - b. meandering and braided streams.
 - c. desert areas without vegetation.
 - d. deltas and beaches.
 - e. volcanic terranes.
44. The physiographic province of Appalachian orogen characterized by thrust faults and intensive folding of sedimentary rocks is called
- a. plateau.
 - b. valley and ridge.
 - c. piedmont.
 - d. coastal plain.
 - e. basin and range.
45. The bedded chert of the Ouachita orogenic belt is also called
- a. graywacke.
 - b. novaculite.
 - c. oölitic limestone.
 - d. sludge.
 - e. coal.
46. The cause of the Antler orogeny was collision involving
- a. an island arc and western Laurentia.
 - b. eastern Laurentia and an island arc.
 - c. northwestern Africa and the southern margin of Laurentia.
 - d. the eastern margin of Laurentia and northwestern Africa.
 - e. an island arc and the southern margin of Laurentia.
47. In forming the Antler Mountains, thrust faults moved crustal rocks from
- a. north to south.

- b. west to east.
 - c. east to west.
 - d. south to north.
 - e. west to north.
48. Emplacement of Late Paleozoic metallic ores accompanies
- a. compaction of coal.
 - b. orogenic volcanism.
 - c. continental rifting.
 - d. algal reef growth.
 - e. climatic change.

Life of Paleozoic

49. The age of Burgess shale fauna is mainly
- a. Neoproterozoic.
 - b. Early Cambrian.
 - c. Middle Cambrian.
 - d. Late Cambrian.
 - e. Middle Ordovician.
50. The unique calcareous and phosphatic fossil group spanning the Neoproterozoic-Cambrian boundary is called
- a. tetrapods.
 - b. amniotes.
 - c. therapsids.
 - d. small shelly faunas.
 - e. Ediacaran faunas.
51. The largest predator of the Burgess Shale was
- a. *Cloudina*.
 - b. *Aldanella*.
 - c. *Anomalocaris*.
 - d. *Opabini.a*
 - e. *Hallucigenia*.
52. Three-lobed, swimming or crawling arthropods of the Paleozoic were
- a. trilobites.
 - b. eurypterids.
 - c. nautiloids.
 - d. goniatites.
 - e. ostracodes.
53. The class of Echinoderms that includes sea lilies
- a. asteroidea
 - b. blastoidea
 - c. crinoidea
 - d. cystoidea
 - e. eoasteroidea

54. Extinct, planktonic creatures with chitinous skeletons that are related to primitive living chordates are called
- receptaculids.
 - deuterostomes.
 - protostomes.
 - pterobranchs.
 - graptolites.
55. The “plate-skinned” fish that arose during Late Silurian are called
- agnathan.
 - acanthodian.
 - placoderm.
 - chondrichthyan.
 - osteichthyan.

Mesozoic

56. Mexico separated from South America during
- Cenozoic.
 - Triassic.
 - Cretaceous.
 - Jurassic.
 - Archean.
57. This rock unit fills many of the Triassic rifts on eastern coast of North America.
- Newark Group
 - Ripley Formation
 - Franciscan Formation
 - Shinarump Conglomerate
 - Carmel Formation
58. What is the name of the pre-Mediterranean sea?
- Palisades
 - Gulf of Mexico
 - Deccan
 - Tethys
 - Nova Scotia
59. Triassic-Lower Jurassic sediments of Gulf of Mexico are called
- deltas and barrier-island deposits.
 - salt and gypsum evaporites.
 - flood basalts and ophiolites.
 - shallow submarine limestones.
 - extensive chalk layers.
60. In the western U.S., Lower Jurassic clean quartz sandstones, which are coastal dune and shallow-marine deposits, are called
- Sundance Formation.
 - Navajo Sandstone.
 - Chinle Formation.

- d. Moenkopi Formation.
 - e. Shinarump Conglomerate.
61. In the western U.S., Upper Jurassic swampy plain deposits rich in dinosaur fossils are collectively called
- a. Chinle Formation.
 - b. Sundance Formation.
 - c. Navajo Sandstone.
 - d. Morrison Formation.
 - e. Shinarump Conglomerate.
62. During Late Cretaceous, there was a continental seaway that connected the Arctic Ocean with the
- a. Tethys.
 - b. Gulf of Mexico.
 - c. South Atlantic Ocean.
 - d. Pacific Ocean.
 - e. Sundance Sea.
63. During Mesozoic, the continent on the northern margin of the western Tethys was
- a. North America.
 - b. Europe
 - c. Africa.
 - d. Australia-New Zealand.
 - e. India.
64. During Mesozoic, the general direction of movement of India was
- a. north.
 - b. south.
 - c. east.
 - d. west.
 - e. in no direction (stationary).
65. During Cretaceous, the general direction of motion of the subducting Pacific plate under western North America was
- a. north.
 - b. south.
 - c. east.
 - d. west.
 - e. in no direction (stationary).
66. Cretaceous Deccan Traps formed on this continent.
- a. Africa
 - b. South America
 - c. North America
 - d. India
 - e. Europe
67. Characteristic tectonic features of eastern rifted margin of North America were
- a. salt domes.

- b. fall lines.
 - c. subduction zones.
 - d. downfaulted basins.
 - e. mélanges.
68. The location of Palisades volcanic units is
- a. Nova Scotia.
 - b. North Carolina.
 - c. New England.
 - d. Northern Florida.
 - e. Africa.
69. Location of Middle Jurassic Sundance Sea was
- a. eastern North America.
 - b. eastern Africa.
 - c. western Eurasia.
 - d. western North America.
 - e. India.
70. Arizona's Painted Desert is developed mainly in this formation.
- a. Moenkopi
 - b. Shinarump
 - c. Chinle
 - d. Kayenta
 - e. Wingate

life of Mesozoic

71. Increased CO₂ in atmosphere results in
- a. continental rifting.
 - b. basaltic volcanism.
 - c. global warming.
 - d. global cooling.
72. Warmest geological time interval listed below.
- a. Early Triassic
 - b. Jurassic
 - c. Early Cretaceous
 - d. Late Cretaceous
73. Characterizes end of Cretaceous
- a. vast regression
 - b. vast transgression
 - c. biotic stability
 - d. subtropical flora at 70° latitude
74. Name for all flowering plants
- a. Wollemi pines
 - b. cycadales
 - c. conifers

- d. angiosperms
 - e. diatoms
75. Common small oysters of Cretaceous seas
- a. pulmonate snails
 - b. *Exogyra*
 - c. *Gryphaea*
 - d. rudistids
 - e. echinoids
76. Key to taxonomy of all ammonoid cephalopods
- a. helicoid conchs
 - b. belemnites
 - c. suture patterns
 - d. planispiral coiling
77. Name for the “thumbs up” dinosaur
- a. *Tyrannosaurus*
 - b. *Iguanodon*
 - c. *Brontosaurus*
 - d. *Eoraptor*
 - e. *Coelophysis*
78. Quadrupedal ornithischian with spiked tail and bony plates along back and tail
- a. *Edmontonia*
 - b. *Euoplocephalus*
 - c. *Stegosaurus*
 - d. *Eoraptor*
 - e. *Maiasaura*
79. This element, which enriches the boundary clay layer at the top of Cretaceous, was cited by Alvarez (1977) as evidence of extraterrestrial influence in biotic crisis.
- a. antimony
 - b. iridium
 - c. arsenic
 - d. platinum
 - e. gold

Cenozoic

80. The geological period Quaternary began _____ million years ago.
- a. 65
 - b. 2.8
 - c. 1.8
 - d. 0.01
 - e. 37
81. Depositional environment of Eocene Green River Formation
- a. delta
 - b. braided stream

- c. lake
 - d. ocean
 - e. glacier
82. Oligocene lacustrine deposits with spectacular preservation of insects, leaves, fish, birds, spores, and pollen occur in
- a. White River Formation.
 - b. Green River Formation.
 - c. Florissant beds.
 - d. Wasatch Formation.
 - e. Ft. Union Formation.
83. Proposed hypothesis to explain tensional stress in Basin and Range Province relating San Andreas fault to province's structure
- a. subduction of spreading zone
 - b. oblique shearing
 - c. buoyant plate
 - d. continental rifting
84. Cenozoic erosional feature of the Colorado Plateau
- a. San Francisco Mountains
 - b. Columbia Plateau
 - c. Cascade volcanic range
 - d. Grand Canyon
 - e. Great Lakes
85. Created by subduction of Farallon plate but not exposed until uplifted by 4000 m during Pliocene-Pleistocene
- a. Mt. Lassen
 - b. Sierra Nevada
 - c. Juan de Fuca
 - d. Columbia Plateau
 - e. Crater Lake
86. Geological age of conversion from subduction to strike-slip movement in California coastal region of western N. America
- a. Jurassic
 - b. Cretaceous
 - c. Paleocene
 - d. Miocene
 - e. Pliocene
87. Orogenic belt developed during Cenozoic deformation by South Pacific plate on S. America.
- a. Andes
 - b. Aleutians
 - c. Iceland
 - d. Spitsbergen
 - e. Amazon

88. Himalayas were built during Cenozoic by a collision between Eurasia and
- Antarctica.
 - Australia.
 - Aleutians.
 - India.
 - Iceland.
89. Major volcanic feature formed by rifting in east Africa during Cenozoic
- East African rift valleys
 - Antarctic Peninsula
 - Mt. Rainier
 - Mt. Kilimanjaro
 - Andes
90. Climate in Antarctica during Paleocene-Oligocene
- mild, semi-tropical
 - frigid, barren rock
 - polar ice cap
 - dry, torrid desert
 - lots of hurricanes
91. Percent of Earth's surface covered by ice during maximum effect of Pleistocene glaciation
- 40
 - 33
 - 50
 - 100
 - 0
92. Number of intervals of severe cold (and possible glaciation) during last 3 million years of Earth's history
- 4
 - 30
 - 300
 - 40
 - 8,000
93. During glacial intervals, the lowering of base level causes
- increased stream erosion and incisional down-cutting.
 - increased stream deposition of clastics in channels and floodplains.
 - floods from impounded melt-water creating channeled scablands.
 - soil being stripped off high-latitude cratons.
 - loss of hair in male mammals.
94. Select the item below that is not a Milankovitch astronomical cycle.
- precession
 - tilt
 - eccentricity
 - reflectivity
 - kovitch

95. Warmest interval during the overall Cenozoic global cooling trend
 - a. Early Paleocene
 - b. Late Paleocene-Eocene
 - c. Oligocene
 - d. Miocene-Pliocene
 - e. Pleistocene
96. Extensive oil shales occur within Eocene
 - a. basins of Libya and North Sea.
 - b. placer deposits in California.
 - c. Ft. Union Formation.
 - d. Gulf Coastal Plain deltaic clastics, U.S.
 - e. Green River Formation.

Life of Cenozoic

97. Remarkable large Cenozoic zooplankton in the Gizeh limestone are called
 - a. coccolithophores.
 - b. dinoflagellates.
 - c. diatoms.
 - d. nummulites.
 - e. mollusks.
98. The animal group that evolved a sternum keel for support of flight muscles is
 - a. squamates.
 - b. bats.
 - c. birds.
 - d. turtles.
 - e. rhycocephalians.
99. A flying mammal that eats fruit is the
 - a. monkey.
 - b. squirrel.
 - c. bat.
 - d. mammoth.
 - e. rodent.
100. Select the mammalian inner ear bones that developed from reptilian jaw bones.
 - a. carapace and plastron
 - b. incus and malleus
 - c. cervical vertebra
 - d. molar and pre-molars
 - e. yin and yang
101. Extinguished in North America by overkilling by humans during Holocene
 - a. tapirs
 - b. titanotheres
 - c. eohippus
 - d. pigs

- e. horses
102. This animal became extinct in North America during Holocene.
- a. *Mammut*
 - b. woolly mammoth
 - c. mouse deer
 - d. ancestral giraffe
 - e. *Palaeomastadon*
103. Maximum continental glaciation of Pleistocene occurred this many years ago.
- a. 1.9 million
 - b. 100,000
 - c. 8,000
 - d. 17,000
 - e. 1,700

Old test

1. The sequence, from bottom to top, in a transgressive sequence consists of the following rock types:
- a) granite, gneiss, sandstone.
 - b) sandstone, shale, limestone.
 - c) limestone, shale, sandstone.
 - d) granite, conglomerate, shale.
 - e) sandstone, gneiss, granite.
2. The Cambrian formations in the Grand Canyon consist of the following formations, from bottom to top:
- a) Coconino Sandstone, Toroweap Formation, Kaibab Limestone.
 - b) Supai Formation, Hermit Shale, Coconino Sandstone.
 - c) Dox Sandstone, Hakatai Shale, Bass Limestone.
 - d) Tapeats Sandstone, Muav Shale, Redwall Limestone.
 - e) Tapeats Sandstone, Bright Angel Shale, Muav Limestone.
3. What is the Burgess Shale fauna?
- a) An assemblage of animals without hard parts from the Middle Cambrian.
 - b) Contains an early chordate with a notochord called Pikaia.
 - c) Contains a giant predator with a circular mouth called Anomalocaris.
 - d) All of the above.
 - e) None of the above.
4. Why did stromatolites decline during Ordovician time?
- a) they were abundant in the reducing conditions of the Precambrian, but could not survive in highly oxygenated waters.
 - b) the temperatures became too hot for them.
 - c) there was an impact of a large meteor.

d) they were subject to being eaten by grazing animals which became abundant in the Ordovician seas.

e) they could not survive in the colder waters that were common throughout the Ordovician.

5. Why did sea level drop suddenly near the end of the Ordovician?

- a) there was a major ice age.
- b) there was a continental assembly event.
- c) there was a major period of mountain building.
- d) all of the above.
- e) none of the above.

6. The Ordovician Period was a time of:

- a) major global extinctions of many species.
- b) extensive inundation of North America by shallow seas.
- c) rapid subduction in the mid-continent region.
- d) the Acadian orogeny.
- e) extensive coal formation.

7. Good evidence for the prior existence of a mountain range where today there is only low relief would be:

- a) an extensive clastic wedge.
- b) conodonts.
- c) a paraconformity.
- d) tillites.
- e) clastic dikes.

9. What kinds of ores occur in the Clinton group near Birmingham, Alabama?

- a) copper.
- b) iron.
- c) salt.
- d) lead.
- e) coal.

10. The Devonian Period is known as "the age of Fishes" because:

- a) this is when the fishes appeared in the fossil record.
- b) fishes are the only fossils present in rocks of this age.
- c) fishes were the only occupants of Devonshire at that time.
- d) fishes were the most "advanced" animal common at that time.
- e) The whole premise of this question is wrong; the Devonian was "the age of the Reptiles."

11. The Catskill clastic wedge represents what age, environment, rock composition, and location.

- a) Devonian clastic rocks of oceanic environments in New York.
 - b) Mississippian clastic rocks of continental environments in Nevada.
 - c) Devonian redbed sandstones deposited in alluvial fans in New York.
 - d) Silurian redbed sandstones deposited in deltas in Pennsylvania.
 - e) Devonian marine shales deposited in lagoons in Ohio.
13. What types of fishes were common in the Devonian?
- a) cartilaginous fishes and bony fish.
 - b) bass, trout, and catfish.
 - c) agnathids, acanthodians, and placoderms.
 - d) chondrichthyes and Osteichthyes.
 - e) ostracoderms and plesiosaurs.
14. What types of rock formations occur throughout the central and western U.S. of Mississippian age and what occurred to produce those rocks?
- a) thick sandstones in a clastic wedge.
 - b) thick limestone deposited in a widespread shallow sea.
 - c) thick black shale deposited in alluvial fans.
 - d) thick coal measures from swamps.
 - e) thick salt deposits from a restricted marine seaway.
15. What was the paleogeography of most of the U.S. during the Mississippian?
- a) mountainous and continental deposits.
 - b) numerous small islands throughout the mid-continent.
 - c) predominantly a vast, shallow inland sea.
 - d) continental assembly event in the east coast.
 - e) glaciation in the northern US and Canada.
16. What types of fossils are most common in the Mississippian?
- a) brachiopods.
 - b) angiosperms.
 - c) crinoids.
 - d) starfish.
 - e) corals.
18. Most coal in the eastern U.S. is of what age?
- a) Cretaceous & early Tertiary.
 - b) Pennsylvanian.
 - c) Permian.
 - d) Devonian.
 - e) Precambrian.
19. Coal in the western U.S. formed:
- a) mostly during Pennsylvanian time.
 - b) in the same climatic and environmental situations as petroleum.
 - c) mostly during the Cretaceous and early Tertiary periods.

- d) in hot, arid, desert environments.
 - e) as a result of glacial activity.
20. In the U.S., the westernmost exposures of rocks that show Appalachian-style deformation and comparable timing are in the:
- a) Marathon region of west Texas.
 - b) Ouachita Mountains of eastern Oklahoma and western Arkansas.
 - c) Wichita Mountains of west-central Oklahoma.
 - d) Arbuckle Mountains of south-central Oklahoma.
 - e) Ancestral Rocky Mountains of central Colorado.
21. The colorful sandstones and shales of the Colorado Plateau:
- a) are mostly of early Paleozoic age.
 - b) are wholly devoid of hydrocarbon deposits.
 - c) were mostly deposited on land during latest Paleozoic and Mesozoic time.
 - d) cannot contain dinosaur remains.
 - e) All of the above are true.
22. What types of animals lived in the Late Triassic in the Petrified Forest area?
- a) Coelophysis.
 - b) Brontosaurus.
 - c) Tyrannosaurus.
 - d) Titanotherium.
 - e) Crocodiles.
23. Evidence of Triassic plate divergence and crustal extension in what is now the eastern U.S. can be inferred from:
- a) dinosaur extinction.
 - b) the structural geologic setting (pull-apart basins) and basaltic volcanics of the Newark Group.
 - c) Appalachian thrust faults and folded mountain belts.
 - d) the sedimentary rocks in the Atlantic coastal plain.
 - e) the metamorphic rocks in the Piedmont.
24. After the Paleozoic ended, the western U.S. became the leading edge of the plate motion. What did this mean in terms of where the mountain building was occurring and what types of rocks?
- a) mountain building and volcanism were along the east coast.
 - b) mountain building and volcanism were along the west coast.
 - c) mountain building and volcanism were along the Gulf Coast.
 - d) mountain building and volcanism were in the mid-continent.
 - e) there was no mountain building or volcanism in the U.S. in the Mesozoic.
25. Why does the Triassic Chinle Formation (Petrified Forest Member) contain petrified logs?
- a) Silica was dissolved from sandstone and turned the forest to stone.

- b) The logs were buried in place by ash falls.
 - c) The logs washed into the sea where they were petrified.
 - d) Silica was dissolved from the volcanic ash and precipitated in the standing trees.
 - e) Silica from the volcanism in southern Arizona permeated the logs that were washed into a floodplain or delta.
26. The biggest marine animal extinction event occurred at the end of what period and for what reason?
- a) at the end of the Cretaceous because of a huge meteorite impact.
 - b) at the end of the Permian because of global cooling and ice age.
 - c) at the end of the Cambrian because of global cooling and ice age.
 - d) at the end of the Mesozoic because of excessive volcanism.
 - e) at the end of the Pleistocene because of predation by early man.
27. The current theory that dinosaur extinction was the result of the aftermath of a great meteorite impact was initially prompted by:
- a) fear of nuclear war.
 - b) chemical studies of petroleum derived from dinosaurs.
 - c) the discovery of much higher than usual content of iridium in a layer of clay in an Italian marine limestone sequence.
 - d) high levels of cadmium found in shells of dinosaur eggs.
 - e) all of the above played a role in developing our current beliefs regarding the cause of the final dinosaur extinctions.
28. What orogeny occurred at the end of the Cretaceous, beginning of the Tertiary?
- a) Taconic.
 - b) Nevadan.
 - c) Sevier.
 - d) Laramide.
 - e) Basin and Range.
29. What ore deposits are associated with the above orogeny here in Arizona?
- a) porphyry copper.
 - b) porphyry gold.
 - c) lead and zinc.
 - d) silver.
 - e) uranium.
30. Dinosaurs are (were):
- a) various walking, grazing, swimming, and flying reptiles that lived in the Cretaceous Period.
 - b) two orders of Reptilia that tended toward large size during the mid- to late Mesozoic era.
 - c) such things as Brontosaurus, Mosasaurus, and Mammut.
 - d) early varieties of birds.

e) None of the above is correct.

31. When did the Gulf of Mexico start to form and what environment did this represent?

- a) South America started pulling apart from North America in the Jurassic.
- b) Africa started pulling apart from North America in the Triassic.
- c) Africa started pulling apart from South America in the Cretaceous.
- d) South America started pulling apart from North America in the Cretaceous.
- e) Africa started pulling apart from Europe in the Jurassic.

32. The initial deposits of a pull-apart basin filled by an evaporating seaway forms what type of deposit?

- a) sandstone.
- b) shale.
- c) salt.
- d) basalt.
- e) granite.

33. What was the environment like in Arizona during the Early Jurassic?

- a) shallow seas with deltaic deposits.
- b) coastal sand dunes with sandstone deposits.
- c) volcanoes with interfingering sandstone deposits.
- d) all of the above.
- e) none of the above.

34. What were some of the famous dinosaurs of the Jurassic?

- a) Allosaurus.
- b) Triceratops.
- c) Tyrannosaurus.
- d) Iguanodon.
- e) Hadrosaurus.

35. What rocks of Jurassic age occur near Tucson?

- a) Recreation Redbeds in the Tucson Mountains.
- b) Chinle Formation in Petrified Forest.
- c) Cat Mountain Rhyolite in Tucson Mountains.
- d) Wilderness Granite in Catalina Mountains.
- e) Amole Granite in Tucson Mountains.

36. What major porphyry copper deposit is of Jurassic age in Arizona?

- a) Mission.
- b) Morenci.
- c) Bisbee.
- d) Superior.
- e) San Manuel.

37. Characteristic paleogeography of the Middle Cretaceous in the central and western U.S. produced what type of rock, which is a resource of what?
- volcanoes produced veins of copper, used for electric wire and pipe.
 - abundant floodplains produced clay deposits, used for ceramics and brick.
 - abundant sand dunes produced pure silica sand, used in making glass.
 - shallow seas produced limestone, used to make cement.
 - shallow lakes produced phosphate, used to make fertilizer.
38. What are some Cretaceous rhyolite flows near Tucson and what type of environment do they represent?
- Cat Mountain Rhyolite, an explosive ash fall like Mt. Pinatubo.
 - Sierra Nevada granite, a deep batholith.
 - A Mountain basaltic andesite, a slow moving lava flow like Hawaiian volcanoes.
 - Picacho Peak, a series of lava flows and conglomerates near the volcano.
 - Willcox Playa flows, creating a dry lake.
39. Dinosaurs became extinct because of:
- climatic changes.
 - "overkill" by early humans.
 - cosmic ray increases.
 - all of the above.
 - factors not yet completely agreed upon, but currently leaning heavily toward the after effects of a great meteorite impact that probably took place on the coast of Yucatan near the end of Cretaceous time.
40. What major mountain range was formed at about 43 million years ago and what continental collisions caused it?
- Appalachians, caused by the collision of the continents of Europe and North America.
 - Himalayas, caused by the collision of the continents of India and Asia.
 - Rocky Mountains, caused by the collision of continents of North America and Wrangellia.
 - Andes, caused by the collision of the continent of South America with the Pacific plate.
 - Cascades, caused by the collision of the continent of North America with the Juan de Fuca plate.
42. What was the Early Tertiary paleogeography?
- shallow seas throughout the mid-continent.
 - continental areas with large lakes in Wyoming.
 - mountain building in the Appalachian Mountains.
 - glaciers throughout the northern U.S. and Canada.
 - large sand seas of coastal sand dunes.

43. High-crowned teeth are a selective advantage to grazing, hoofed mammals because:

- a) it enables them to see farther over the tall grasses of the tundra.
- b) high-crowned teeth are made of replaceable forms of protein.
- c) only high-crowned teeth are able to scrape algae off the rocks of the littoral life zone.
- d) their continuous growth compensates for severe wear experienced through silica abrasion incidental to grazing.
- e) The statement itself is incorrect; high-crowned teeth are a selective DISadvantage to grazing mammals.

44. The evolution of the modern horse from a three-toed, dog-sized, browsing animal:

- a) took place mostly during the Mesozoic era.
- b) occurred in Asia.
- c) has recently been wholly discredited.
- d) took place in North America during the Tertiary period.
- e) is a very good example of what is meant by "Pleistocene overkill".

45. Vast areas of Pleistocene continental glaciation in what is now northern United States resulted in:

- a) deposition of banded iron formations.
- b) Lakes Lahontan and Bonneville.
- c) the Great Lakes.
- d) the extinction of the dinosaurs and ammonites.
- e) "nuclear winter".

46. The major plate boundary in the southwestern United States today is generally considered to be:

- a) a transform fault.
- b) the San Andreas Fault.
- c) a slide-past plate boundary.
- d) all of the above.
- e) none of the above.

47. The PRESENT-DAY geography of Nevada is due most directly to:

- a) the deposition of limestone in Mississippian seas.
- b) Basin-and-Range tensional tectonics during the Cenozoic era.
- c) extensive sedimentation in Precambrian time.
- d) Mesozoic subduction along the west coast.
- e) the San Andreas fault.

48. The continental collision in the Paleogene that created very high mountains caused a major reorganization of plate motions and resulted in what climates all over the world?

- a) cooler, starting the slide into the ice ages.
 - b) warmer, beginning the global warming.
 - c) wetter, resulting in flooding.
 - d) drier, resulting in world wide drought.
 - e) none of the above.
49. The major food crops of most human beings are:
- a) gymnosperms.
 - b) all derived from cycads and/or their very close plant relatives.
 - c) seeds of grasses.
 - d) from woody plants.
 - e) from plants that have been around since early Paleozoic times.
50. A large volume of the mountains around Tucson (the Galiuros, White Mountains, Chiricahuas, Superstitions, N. Tucson Mts.) resulted from what types of volcanic eruptions and when?
- a) explosive rhyolite flows in the mid-Tertiary.
 - b) porphyritic andesite dikes in the Cretaceous.
 - c) gentle basalt flows in the late Tertiary.
 - d) explosive rhyolite flows in the Triassic.
 - e) gentle basalt flows in the late Cretaceous.
51. When is the most recent time when glaciers become very prominent?
- a) Cretaceous.
 - b) Pleistocene.
 - c) Recent.
 - d) Paleogene.
 - e) Ordovician.
52. The five Great Lakes of the eastern north-central U.S.:
- a) were formed by volcanism.
 - b) developed mainly due to Silurian geosynclinal subsidence.
 - c) were a result of Pleistocene continental glaciation.
 - d) were wholly unrelated to Quaternary glaciation.
 - e) became extinct due to wholly unknown causes.
53. When much of the northeastern U.S. was covered by late Cenozoic continental glaciers:
- a) no ice existed anywhere at all in the western U.S.
 - b) many valleys of the western U.S. contained large fresh water lakes.
 - c) dinosaurs became extinct.
 - d) evolution stopped.
 - e) all of the above occurred.
54. What happened to the vegetation zones/climate zones during the glacial advances compared to the present?

- a) the vegetation zones were farther north.
- b) the vegetation zones were farther south.
- c) the vegetation zones were farther east.
- d) the vegetation zones were farther west.
- e) there was no change.

55. When have the major periods of glaciation occurred in the last 2.5 billion years and what plate tectonic/orogenic events are common to these occurrences?

- a) every 1 million years due to fluctuations and a decrease in the solar radiation.
- b) every 26 million years when the dark star passes near the Ort cloud and sends comets and meteorites toward the Earth.
- c) every 250 million years when there are major continental assembly events, decreased sea floor spreading, and increased volcanism.
- d) every 50,000 years when the precession of the equinoxes or wobble in the Earth's axis points to a different North Star.
- e) none of the above.

56. How has the amount of carbon dioxide in the atmosphere changed since 100 million years ago? What was the climate like then?

- a) 10 times as much now, so it is hotter and drier now
- b) 10 times less now, so it is cooler now.
- c) 100 times more now, so it is much hotter due to global warming.
- d) 100 times less now, so it is so much cooler that we are in an ice age.
- e) it is the same now as it was 100 million years ago.

57. During the last 2 million years in the U.S. there were 4 major advances and retreats of glaciers. What is the name of the last North American glacial stage? What type of stage are we in now?

- a) Illinoian, interglacial.
- b) Nebraskan, glacial.
- c) Wisconsinian, interglacial.
- d) Kansan, glacial.
- e) Wurm, interglacial.

58. When were the Little Ice Ages and what effect has this had on civilizations?

- a) 1540 – 1890, causing loss of crops, famine, and warfare.
- b) 1240 – 1650, causing exploration, expansion of empires, settling of Greenland.
- c) 650 – 1240, causing barbarian advances and overthrow of civilized empires.
- d) 300 – 650, causing expansion of empires, Renaissance in thoughts, prosperity.
- e) 50-300, causing overthrow of Roman Empire, barbarian hordes migrating.

59. Milankovitch first proposed that variations in Earth's climate may be caused by _____.

- a) changes in the angle that Earth's axis makes with its orbital plane

- b) wobbling of Earth's axis
 - c) variations in the shape of Earth's orbit
 - d) all of the above.
 - e) none of the above
60. During an glacial epoch, global sea level is
- a) higher during glacial epochs because of reduced evaporation
 - b) higher because the continents are depressed by the weight of ice
 - c) lower because water is stored as ice on the continents
 - d) lower because evaporation rate increases
 - e) unchanged