Islip Invitational Tournament December 10, 2016

DYNAMIC PLANET

This test consists of 100 questions. Please write your names on your Scantron answer sheets and your question papers.

YOU MUST HAVE A CLIPBOARD FOR THIS EVENT. NO PENS, PLEASE, IN THE AUDITORIUM.

SCHOOL NAME: ____________________________________________________________

TEAM NUMBER: _________________  TEAM COLOR/LETTER: ______________________

PLACE ALL OF YOUR ANSWERS ON THE SEPARATE SCANTRON ANSWER SHEET.
1. Alfred Wegener’s Pangaea was surrounded by the
   a. Panthalassic Ocean
   b. Tethys Sea
   c. Black sea
   d. Paleo-Mediterranean Ocean

2. Pangaea began to disintegrate approximately
   a. 140 million years BP
   b. 220 million years BP
   c. 175 million years BP
   d. 275 million years BP

3. You can see in the attached image that the northern and southern halves of this most recent supercontinent were separated by a sea that intruded from the east. This intrusion of the world ocean is known as
   a. Rhodian Sea
   b. Ionian Sea
   c. Rhodesian Sea
   d. Tethys Sea

4. At one time the mountains of eastern North America, NW Africa, the British Isles, and Scandinavia, combined formed one continuous mountain range. What event formed the Appalachian Mountains during this time frame?
   a. Taconic Orogeny
   b. Atlas Orogeny
   c. Permian Super-Orogeny
   d. Alleghanian Orogeny

5. Which of the following statements is most accurate about the Wilson Cycle?
   a. According to the Wilson Cycle, only one supercontinent has formed and that will be the only one.
   b. According to the Wilson Cycle, periods of orogenic activity are punctuated by episodes of extreme volcanism destroying those orogenic belts.
   c. According to the Wilson Cycle, periods of crust thinning, rifting, and opening new ocean basins are separated by episodes of convergence and mountain building.
   d. According to the Wilson Cycle, there is no link between volcanism, rifting, and ocean basin development.

6. About how long is one Wilson Cycle thought to last?
   a. approximately 750 million - 1 billion years
   b. approximately 300 million - 500 million years
   c. approximately 100 million - 200 million years
   d. approximately 200 million - 300 million years
7. How would our current climate be described, according to the Wilson Cycle?
   a. a greenhouse Earth
   b. an mini-icehouse Earth during a greenhouse period
   c. a mini-greenhouse Earth during an icehouse period
   d. an icehouse Earth

8. What arrangement/orientation of continents results in the greatest diversity and isolation of species?
   a. north-south
   b. east-west

9. John Tu zo Wilson is also credited with developing the ideas behind which of the following phenomena?
   a. the divergent plate boundary
   b. that the Hawaiian Islands were formed by a lithospheric plate riding toward the northwest over a stationary hot spot, creating a nematath
   c. that transform faults are actually right-rotated thrust faults
   d. J. T. Wilson is credited with each of the discoveries above.

10. Which of the following portions of the world ocean are very young, geologically, and could become the next major ocean basins, according to Wilson? **CHOOSE ALL THAT APPLY. YOU CAN FILL IN MORE THAN ONE ANSWER ON YOUR SCANTRON, IF NECESSARY.**
    a. the Gulf of Mexico
    b. the Gulf of California
    c. the Red Sea
    d. the Sea of Okhotsk

11. The attached image shows the North American Basin and Range Province, including the Great Basin. What tectonic forces led to the creation of this geologic province?
    a. crustal uplift, extension, and fracturing
    b. rapid crustal formation
    c. crustal downwarping during the formation of the most recent supercontinent
    d. steep-angle subduction of the Farallon Plate

12. Which of the current current lithospheric plates were once part of the larger Farallon Plate that have not yet subducted beneath North America? **CHOOSE ALL THAT APPLY.**
    a. Juan de Fuca Plate
    b. Cocos Plate
    c. Nazca Plate
    d. Caribbean Plate

13. The Farallon Plate carried many crustal fragments toward western North America. It is accepted that the western ¼ of North America consists of this foreign geologic material. What are these blocks, these fragments, of foreign lithosphere known as?
    a. microcontinents
    b. meso continents
    c. LIP’s
    d. terranes

14. Foreign blocks of lithosphere are added to a continent through the process of
    a. accretion
    b. obduction
    c. overhead subduction
    d. reverse faulting
15. The attached diagram illustrates a cross-section of the Basin and Range Province. What type of faulting is illustrated?
   a. thrust faulting
   b. normal faulting
   c. reverse faulting
   d. right-thrust transform fault

16. In the same diagram as in #15, the higher areas created by the faulting are known as
   a. horsts
   b. grabens
   c. foreland basins
   d. tectonic ranges

17. Geologists estimate that this section of the North American Craton (same as #15 and #16) has been stretched by rifting up to ___ of its original width.
   a. 10%
   b. 25%
   c. 55%
   d. 100%

18. The attached attempts to show geologists’ best explanation regarding the origin of the Rocky Mountains. How is the subduction taking place here different from a “typical” subduction boundary?
   a. The subduction is the same.
   b. The subduction angle here is much shallower than usual.
   c. The subduction taking place here is much slower than usual.
   d. Too little information is provided in the diagram to answer the question accurately.

19. The image below illustrates some important information regarding the Yellowstone hot spot.
    Which of the statements below is accurate regarding that hotspot?
    a. The north American plate is moving toward the west/southwest in this area.
    b. The hot spot is moving toward the northeast.
    c. The hot spot has recently been producing massive basaltic lava flows.
    d. The hot spot has been in “hyperactive” mode for the past 500,000 years.
20. What is probably the single largest volcanic feature in the continental United States lies to the east-northeast of this region (same as in #19). It was also created by the Yellowstone hot spot. What feature is this?
   a. Columbia River Basin/Plateau
   b. Mt. Rainier
   c. Newberry Volcano
   d. Mt. St. Helens

21. The North American craton consists largely of the ancient continent
   a. Gondwana
   b. Rodinia
   c. Hesperian Terrane Complex
   d. Laurentia

22. What does the term 'epicratonic' mean?
   a. ‘in the craton’
   b. ‘below the craton’
   c. ‘on the craton’
   d. ‘during the Cretaceous’

23. For the most part, the North American craton is not exposed at the surface in the United States, while it is in Canada. Where can you go to see the rocks of the craton exposed at the surface?
   a. the Adirondacks of New York State
   b. the Ozarks of Arkansas
   c. Black Hills of South Dakota
   d. North American Cordillera

24. What is a stable platform, also known as an interior platform, when applied to continental geology?
   a. an area where the craton is covered by younger sedimentary rocks
   b. an area where the craton is exposed at the surface and is being actively weathered and eroded
   c. an area where the craton consists of metamorphic rock
   d. an area where the craton was once joined to other sections of the craton that have since separated from the main continent

25. Who is known as the 'father of geochronology'?
   a. Matthew Fontaine Maury
   b. Arthur Holmes
   c. Alexander Agassiz
   d. Beno Gutenberg

26. What is Beno Gutenberg credited with?
   a. working with Charles Richter and developing the Richter Scale
   b. devising a method for predicting the probability distribution for earthquakes of a given energy
   c. working to discover the core-mantle boundary
   d. Gutenberg researched all three of these ideas.

27. Who advanced the theory that the movement of the tectonic plates was driven by convection movements within the mantle?
   a. Arthur Francis Buddington
   b. John Tuzo Wilson
   c. Harry Hammond Hess
   d. Ronald Oxburgh
   e.
28. When the Earth is analyzed chemically, how many layers can be identified?
   a. 3
   b. 5
   c. 7

**Use the diagram below #31 to answer #29 - 37.**

29. Identify #5 in the diagram below, showing a cross-section of the earth.
   a. inner core
   b. mesosphere
   c. asthenosphere
   d. lithosphere

30. Identify #1 in the diagram below, showing a cross-section of the earth.
   a. oceanic crust/lithosphere
   b. exosphere
   c. asthenosphere
   d. mesosphere

31. Identify #9 in the diagram below, showing a cross-section of the earth.
   a. outer core
   b. mesosphere
   c. asthenosphere
   d. continental crust

32. Layer #9 is known to be solid through the study of seismic waves. If the temperatures there are high enough to melt that material, why is it solid?
   a. The temperatures are actually not high enough to melt that material.
   b. The increased pressures prevent the material in layer #9 from melting.
   c. The rapid rotation of #9 within #8 prevents it from melting.
   d. None of these answers is accurate.
33. Using the diagram above showing a cross section of the Earth, identify the layer where the convection movements driving plate tectonics occur.
   a. #2
   b. #3
   c. #6
   d. #7

34. Identify the layer consisting of molten nickel and iron.
   a. #6
   b. #7
   c. #9
   d. #5

35. Which layer can undergo ductile deformation?
   a. #7
   b. #4
   c. #1
   d. #3

36. Which layer contains substantial amounts of the rocks peridotite, dunite, and eclogite?
   a. #2
   b. #3
   c. #4
   d. #5

37. Which layers are thought to generate the Earth’s magnetosphere?
   a. #7 and #9
   b. #1 and #2
   c. #5 and #6
   d. #3, #4, and #5

38. What could have started the Earth’s electrical dynamo? Choose all that apply.
   a. electrical currents in the lithosphere
   b. electrical currents along the core-mantle boundary
   c. a strong external magnetic field, as when the sun was its T-Tauri phase
   d. the sun’s present solar wind

39. Who first suggested that the rocks forming on the mid-ocean ridges record, preserve, the Earth’s current magnetic field and strength?
   a. Alexander Agassiz
   b. Fred Vine and Drummond Matthews
   c. Mercalli
   d. Beno Gutenberg

40. The most recent magnetic field reversal is the
   a. Cobb Mountain versal
   b. Mammoth reversal
   c. Sidityufjall reversal
   d. Brunhes-Matuyama reversal

41. What is a good average length for a typical magnetic chron?
   a. 200,000 years
   b. 50,000 years
   c. 485,000 years
   d. 780,000 years
42. Where do the magnetic vectors of oceanic crust plunge at the steepest angles?
   a. near the poles
   b. near the equator
   c. at about 30° latitude
   d. at about 60° latitude

43. Where can you see an extensive exposure of mantle rock in North America?
   a. Green and White Mountains of Vermont
   b. the Ozarks in Arkansas
   c. Newfoundland and Labrador in Canada
   d. the Kerguelen Islands

44. Which chemical elements (their radioactive isotopes) are thought to significantly drive convection in the mantle?
   a. uranium, thorium, and potassium
   b. oxygen, silicon, and, and magnesium
   c. uranium, oxygen, and magnesium
   d. oxygen, iron, and calcium

45. Some subducting slabs of rock reach the lower mantle while in other areas this sinking is impeded, stopped. What is thought to prevent the further sinking of subducted rock?
   a. a thermal gradient
   b. a chemical transition from spinel to perovskite and magnesiowustite
   c. whole-mantle convection currents
   d. electromagnetic currents within the mantle

46. Geologists are still debating whether mantle plumes are shallow upper mantle phenomena or whether the originate in the lower mantle. Scientists involved in this debate look particularly at the ratio of
   a. Si-28/Si-29
   b. H-2/H-3
   c. He-3/He-4
   d. Fe-55/Fe-56

47. What is the estimated average speed of mantle convection?
   a. 20 mm/year
   b. 40 mm/year
   c. 20 m/year
   d. 1 m/year

48. What happens to seismic waves as they attempt to travel through the asthenosphere?
   a. They accelerate.
   b. They decelerate.
   c. They continue at the same velocity.
   d. They are absorbed.

49. What is the Earth’s geothermal gradient in the upper crust?
   a. 10°C/km
   b. 14°C/km
   c. 25°C/km
   d. 28°C/km

50. The geothermal gradient decreases quickly between the depths of
   a. 10-20 km
   b. 50-100 km
   c. 150-300 km
   d. 100-150 mk
51. Why does melting take place at progressively higher temperatures with increased depth?
   a. due to increasing pressure
   b. due to compositional changes
   c. due to the Earth’s electromagnetic dynamo
   d. due to strong convection currents

52. ____ plays a major role in the formation of magma at divergent plate boundaries.
   a. Partial melting
   b. Fractional melting
   c. Convection melting
   d. Decompression melting

53. ____ rock melts at ____ temperatures than ____ rock.
   a. dry / lower / wet
   b. dry / lower / felsic
   c. wet / higher / dry
   d. wet / lower / dry

54. Crustal rocks cannot be melted by underlying basaltic magma generated by subduction.
   a. True
   b. False

55. The magmas along divergent plate boundaries can be best described as
   a. felsic
   b. mafic
   c. ultramafic
   d. carbonatite

56. Andesitic magma would be most common in which of the following geologic settings?
   a. collision boundary and orogeny
   b. oceanic-oceanic subduction boundary
   c. oceanic-continental subduction boundary
   d. divergent boundary

57. Very hot basaltic magmas generated by partial melting can, in turn, generate ____ magma.
   a. felsic
   b. carbonatite
   c. peridotite
   d. dunite

58. Which choice below best describes most volcanic eruptions at divergent plate boundaries?
   a. effusive
   b. pyroclastic
   c. phreatic
   d. dome-building

59. The eruption of Iceland’s Holuhraun lava field in 2014 was the largest lava flow in Iceland since
   a. 1888
   b. 1815
   c. 1883
   d. 1783

60. Iceland is thought by many geologists to be a(n) ____ in the process of forming.
   a. LIP
   b. LVP
   c. MORB
   d. nematath
61. Stratovolcanoes in island arcs tend to be ___ as their counterparts in continental arcs.
   a. less explosive
   b. more explosive
   c. about as explosive

62. Of the five most powerful recorded earthquakes, which one occurred most recently?
   a. Japan
   b. Chile
   c. Alaska
   d. Indonesia
   e. Kamchatka

63. Of the five most powerful recorded earthquakes, which one caused the most fatalities?
   a. Japan
   b. Chile
   c. Alaska
   d. Indonesia
   e. Kamchatka

64. Study the tsunami time travel graph from the Valdivia Earthquake in Chile. What was the average speed of the tsunami as it crossed the Pacific Ocean?

   a. 450 km/h
   b. 778 km/h
   c. 680 km/h
   d. 840 km/h
65. Tsunamis can now be detected out in the open ocean. What instrument is used for this?
   a. DART buoy
   b. C-man buoy
   c. discus buoy
   d. radar altimeter

66. What agency issues and coordinates tsunami watches and warnings for the United States and its possessions?
   a. PTWC
   b. JTWC
   c. NWS
   d. NASCAR

67. The most powerful (estimated) earthquake to have occurred in or near the United States (or its territories) was generated in the
   a. Cascadia Subduction Zone
   b. Mid-Atlantic Ridge
   c. Puerto Rico Trench
   d. Middle-America Trench

68. What type of stress in the crust can cause faulting?
   a. compressional
   b. tensiona
   c. shear
   d. All three types of stress can cause crustal faulting.

69. What type of stress deforms the shape of rocks while maintaining a consistent density?
   a. compressional
   b. tensiona
   c. shear
   d. All three types of stress can deform shape without altering density.

70. The image below is of a
   a. monocline
   b. plunging anticline
   c. plunging syncline
   d. backarc basin
71. What is a foreland basin?
   a. Foreland basins are formed by the downwarping of lithosphere due to a large geologic and topographic load, usually an orogenic belt.
   b. Foreland basins are formed by the downwarping of lithosphere due to lava accumulation.
   c. Foreland basins are formed by the downwarping of lithosphere due to reverse faulting.
   d. Foreland basins are formed by the downwarping of lithosphere due to sediment accumulation.

72. What is the source of most of the migrating fluids in a foreland basin?
   a. the sediments accumulated within the basin
   b. the ocean
   c. geothermal systems
   d. magma

73. If hydrocarbons are present in the sediments of a foreland basin, they tend to
   a. migrate away from the orogenic belt
   b. evaporate
   c. migrate toward the ocean
   d. migrate toward the orogenic belt

74. What feature would be most closely associated with a forearc basin, usually found in conjunction with a back arc basin?
   a. a rift
   b. an accretionary wedge
   c. a deep-ocean trench
   d. a shield volcanic front

75. Most forearc and backarc basins are currently located
   a. in the eastern Indian Ocean
   b. in the eastern Pacific Ocean
   c. in the western Pacific Ocean
   d. in the Arctic Ocean

BEST OF LUCK TODAY IN ALL YOUR EVENTS!!!!!
Answer Key.
1. A
2. C
3. D
4. D
5. C
6. B
7. B
8. A
9. B
10. A, C
11. A
12. A, B, C
13. D
14. A
15. B
16. A
17. D
18. B
19. A
20. A
21. D
22. C
23. A
24. A
25. B
26. D
27. C
28. A
29. B
30. A
31. A
32. B
33. B
34. B
35. D
36. B
37. A
38. B, C
39. B
40. D
41. C
42. A