**GeoLogic Mapping C - GeoLogic Mapping - Rickards Invitational Div. C - 12-05-2020**

Hello there! Welcome to the Rickards Invitational. You have 50 minutes to complete the following test, good luck!

**Section 1: Multiple Choice and Fill in the Blank**

Answer the following questions below. The question format will be either multiple choice (A-E) or fill in the blank. For the fill in the blank questions, please capitalize every word in you answer.

Good Luck!

**1. (1.00 pts)** What is the supercontinent that formed after the breakup of the Columbia supercontinent?

- A) Gondwana
- B) Pannotia
- C) Pangaea
- D) Vaalbara
- E) Rodinia

**2. (1.00 pts)** True or False: Seismic waves pass slowly through the asthenosphere

- A) True
- B) False

**3. (1.00 pts)** The splitting of what mineral marks the boundary between the asthenosphere and the mesosphere?

- A) Peridotite
- B) Obsidian
- C) Ringwoodite
- D) Granite
- E) Mica

**4. (1.00 pts)** The discontinuity between the outer and inner core is known as what?

- A) Moho
- B) Repetti
- C) Lehmann
- D) Guttenberg
- E) Conrad

**5. (1.00 pts)** Who formed the idea that earthquakes spread as waves through the Earth?

A) John Mitchell
B) Nicolas Steno
C) Charles Lyell
D) James Hutton
E) Johann Gottlob Lehmann

**6. (1.00 pts)** Who first grasped the idea of mantle convection?

A) Alfred Wegener
B) Abraham Gottlob Werner
C) Arthur Holmes
D) Nicolas Steno
E) James Hutton

**7. (1.00 pts)** Which type of lagoon is marked by its only connection to the main body of water being a thin, narrow strait?

A) Restricted
B) Choked
C) Leaky
D) Segmented
E) Pinched

**8. (1.00 pts)** Which type of estuaries are formed when a lagoon is separated from the ocean by a barrier island?

A) Tide Dominated
B) Wave Dominated
C) Coastal Plain
D) Bar-built
E) Fjord

**9. (1.00 pts)** Which type of depositional movement is marked by a gradient of sedimentary rock that is fining upwards?

A) Progradational
B) Retrogradational
C) Regressional
D) Transgressional
E) Aggradational

**10. (1.00 pts)** Which type of parasequence is marked by a seaward migration of the contact between deeper and shallower facies upwards along the sequence?

A) Aggradational
B) Progradational

C) Regressional
D) Transgressional
E) Retrogradational

**11. (1.00 pts)** Which type of map projection map the prime meridians as a straight line, other meridians as complex curves, and the parallels as circular arcs?

A) Conical
B) Azimuthal
C) Pseudoconical
D) Pseudoazimuthal
E) Cylindrical

**12. (1.00 pts)** Which two map properties cannot exist everywhere on the map separately?

A) Area and Distance
B) Shape and Distance
C) Distance and Direction
D) Area and Shape
E) Shape and Direction

**13. (1.00 pts)**

Which map projection is the image above showing?

A) Eckert II
B) Eckert III
C) Eckert IV
D) Eckert V
E) Eckert VI

**14. (1.00 pts)** What type of map projection was described in the question above?

A) Cylindrical
B) Azimuthal
C) Conical
D) Pseudoconical
E) Pseudocylindrical

**15. (1.00 pts)** The United States exists between what two latitude numbers on the UTC map (including Alaska)?

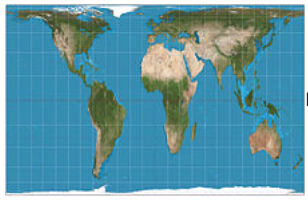
A) 1 and 19
B) 2 and 20
C) 10 and 18
D) 6 and 24
E) 31 and 40

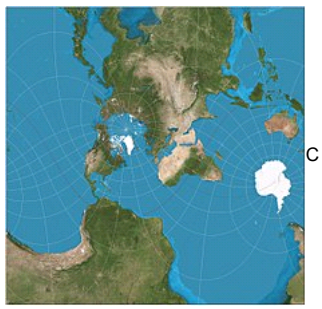
**16. (1.00 pts)** What is the degree area that the United States takes up on the UTC map(including Alaska)?

A) 108
B) 18
C) 22
D) 132
E) 48

**17. (1.00 pts)**


A


B


C


D

In terms of projection types, which map projection of the images above does not belong?

A) A
B) B
C) C
D) D

E) None of the above (all of them belong)

**18. (1.00 pts)** Which map projection is used to minimize distortion when displaying all 50 states?

A) Mercator
B) Mollweide
C) GS50
D) Dymaxion
E) Armadillo

**19. (1.00 pts)** What process does Bowen's Reaction Series show?

A) Pyroclastic rock formation
B) Fractional crystallization
C) Flux melting
D) Outgassing
E) Exsolution

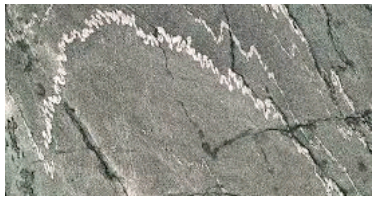
**20. (1.00 pts)** Which two minerals from Bowen's Reaction Series are most likely to be found together?

A) Olivine and Pyroxene
B) Pyroxene and Quartz
C) Amphibole and Quartz
D) Biotite Mica and Olivine
E) Plagioclase Feldspar and Olivine

**21. (1.00 pts)** When the dip isogons are parallel, what class of dip isogon is this showing?

A) Class 1a
B) Class 1b
C) Class 2
D) Class 1c
E) Class 3

**22. (1.00 pts)**



What fold is the image above showing?

A) Chevron
B) Parasitic

C) Monocline
D) Homocline
E) Kink

**23. (1.00 pts)** What is the upthrown block between two normal faults called?

**24. (1.00 pts)** What are faults that occur around calderas called?

A) Listric
B) Synthetic
C) Antithetic
D) Ring
E) Rotational

**25. (1.00 pts)** What is the deepest layer of an ophiolite sequence made out of?

**26. (1.00 pts)** What is the third deepest layer of an ophiolite sequence made out of?

**27. (1.00 pts)** What is the relationship between the speeds between P, S, Rayleigh (R), and Love (L) waves?

A) L < R < P < S
B) R < L < S < P
C) L < R < S < P
D) S < R < P < L
E) P < S < R < L

**28. (1.00 pts)** What is the zone of seismicity corresponding with the down sliding slab in the subduction zone?

A) Flinn-Engdahl Regions
B) Wadati-Benioff Zone
C) Anderson's Zone of Faulting
D) Subductive Seismic Zone
E) Stoneley Zone

**29. (1.00 pts)** Which drainage pattern is most likely to occur in areas where there has been a lot of geologic disruption?

**30. (1.00 pts)** Which drainage pattern is most likely to occur down a volcano?

**31. (1.00 pts)** What is Death Valley an example of?

- A) Shield
- B) Horst
- C) Graben
- D) Fault
- E) Basin

**32. (1.00 pts)** Which physiographic province does Tallahassee exist in?

**33. (1.00 pts)** What kind of earthquake occurs along a thrust fault that does not show signs of fracturing on the surface?

**34. (1.00 pts)** What is the most abundant silicate in the Earth's crust?

- A) Quartz
- B) Pyroxenes
- C) Feldspar
- D) Amphiboles
- E) Micas

**35. (3.00 pts)** Which are folding mechanisms? (choose all that apply)

(Mark **ALL** correct answers)

- A) Tension
- B) Flexural Slip
- C) Slab Pull
- D) Buckling
- E) Antiformal Molding
- F) Mass Displacement

**36. (1.00 pts)** What is produced when there is erosion or normal faulting on a thrust fault?

- A) Shield
- B) Horst
- C) Graben
- D) Fenster
- E) Fault Scarp

**37. (1.00 pts)** Which field of folding corresponds with a low mean ductility?

- A) Passive
- B) Flexural Flow
- C) Flexural Slip
- D) Quasi-Flexural
- E) Active

**38. (1.00 pts)** What fold structure represents the connection of many hinges in a folded stack?

- A) Axial Plane
- B) Fold Limb
- C) Crest
- D) Trough
- E) Hinge Stack

**39. (1.00 pts)** What is the vergence of a fold axial plane that has a strike of N 25° E and a dip at angle of 30° SE?

- A) SE
- B) NE
- C) SW
- D) NW
- E) N

**40. (1.00 pts)** Which foreland basin depositional zone sits on the moving thrust sheet and contains all the sediments from the active thrust wedge?

- A) Forearc
- B) Fore Deep
- C) Wedge Top
- D) Forebulge
- E) Backbulge

**41. (1.00 pts)**
You come across a certain depositional sequence and notice significant cross-bedding. You also notice that the sediment contained within the beds ranges from 1-10 cm. Which depositional environment could this sequence have come from?

- A) Glacial
- B) Aeolian

C) Fluvial
D) Lacustrine
E) Deep Marine

**42. (1.00 pts)** If the dip of an axial surface and the plunge of the hinge line are both between 30° and 60°, what can the fold be classified as?

A) Upright
B) Recumbent
C) Vertical
D) Horizontal
E) Reclined

**43. (1.00 pts)** Which unconformity is defined as being between layers of sedimentary rock and either igneous or metamorphic rock?

A) Paraconformity
B) Nonconformity
C) Discontinuity
D) Buttress Unconformity
E) Blended Unconformity

**44. (1.00 pts)** What is the angle between a line (or feature) and the strike line of the plane in which it is found called?

**45. (1.00 pts)**

You come across the fold outlined in the image above. What type of fold is this?

A) Isoclinal
B) Recumbent
C) Homocline
D) Similar
E) Anticline

**46. (1.00 pts)** What is the fold structure created when an anticline's limbs are further folded into anticlines themselves?

A) Antiformal Anticline
B) Synformal Anticline

C) Anticlinorium
D) Synclinorium
E) Plunging Anticline

**47. (1.00 pts)** Which group of clastic sedimentary rock is defined by >75% silt and clay?

A) Breccia
B) Sandstone
C) Conglomerate
D) Mudstone
E) Coal

**48. (1.00 pts)**
The grade of metamorphism changes as temperature and pressure changes. If a specific rock exists at 200°F and 800 MPa, what grade of metamorphism does it exist in?

A) Contact
B) Diagenesis
C) High
D) Intermediate
E) Low

**49. (1.00 pts)** If a certain fold has an interlimb angle of 28°, what category does the fold fall into in terms of its tightness?

A) Gentle
B) Open
C) Closed
D) Tight
E) Isoclinal

**50. (1.00 pts)** What are the topographical barriers that separate drainage basins?

**Section 2: Free Response**

The following questions are all free response. Make sure to answer every part of the question. Partial credit will be given.

Good Luck!

**51. (1.00 pts)** What is the shape of the Earth?

**52. (6.00 pts)** Describe the three main mechanisms that drive plate tectonics.

**53. (2.00 pts)** Describe what defines the Conrad and the Moho discontinuities.

**54. (3.00 pts)** Describe at least 3 different types of ripple sedimentary structures.

**55. (4.00 pts)** Name the four system tracts in the depositional system tract model.

**56. (4.00 pts)** What are Type 1 and Type 2 depositional sequence boundaries?

**57. (2.00 pts)** In a geological cross section, how would someone differentiate a retrogradational parasequence?

**58. (2.00 pts)** In a geological cross section, how would someone differentiate a degradational parasequence?

**59. (2.00 pts)** What is the difference between azimuth bearings and quadrant bearings?

**60. (2.00 pts)** Describe the characteristics of a strombolian volcanic eruption.

**61. (2.00 pts)** Describe the characteristics of a pelean volcanic eruption.

**62. (2.00 pts)** What is an ophiolite sequence? At what kind of plate boundary is this structure likely to be found?

**63. (2.00 pts)** What is a clinometer? What is it used for?

**64. (4.00 pts)** Describe how S-wave and P-wave velocities change when traveling through the Earth.

**65. (2.00 pts)** What is a Rayleigh wave? How is it created?

**66. (4.00 pts)**
Let's say that for a given earthquake, it takes 7 minutes from the rupture of the fault for the P-waves to reach a certain seismometer. Using this information, approximately how far away is the epicenter of this earthquake?

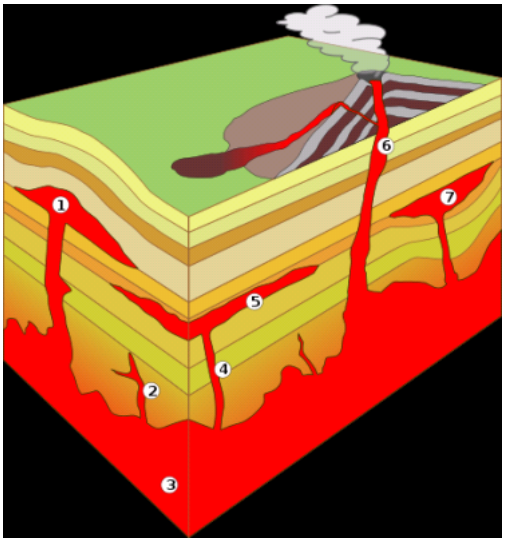
**67. (4.00 pts)**
Let's say that for another unrelated earthquake, it takes 18 minutes and 40 seconds from the rupture of the fault for the S-waves to reach a certain seismometer. Using this information, approximately how far away is the epicenter of this earthquake?

**68. (6.00 pts)** Describe at least three factors that affect deformation

**69. (3.00 pts)** What are the three stages of deformation?

**70. (2.00 pts)** What is the Alvarez hypothesis?

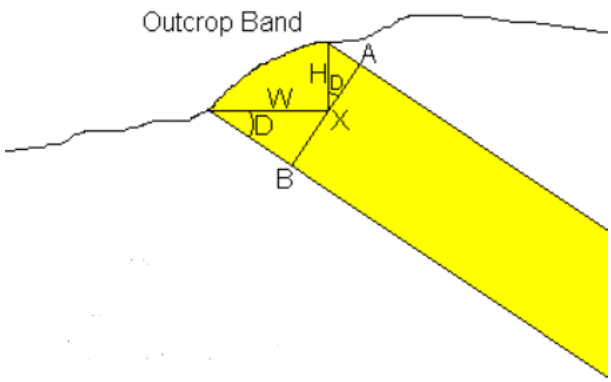
**71. (3.50 pts)**




Look at the image above. Name the igneous intrusions 1-7.

**72. (2.00 pts)** What is the relationship between the grain size of sediment found in a depositional sequence and the amount of energy in the system?

**73. (3.00 pts)**




What is the true thickness of the diagram above if D = 30° W = 2 and H = 5?

**74. (3.00 pts)** Given the true dip as 48° and the apparent dip as 67° what is the angle between the apparent and true dips?

**75. (3.00 pts)** A bed outcrop has a width of 7.5m and a height of 2m. If the bed's dip angle is 70°, what is its true thickness?

**76. (1.50 pts)** What is the length of the slope of a fault if the vertical throw of the fault is 70m, and the dip angle of the fault is 80°?

**77. (4.50 pts)**
Let's say that you want to find the dip of a bed on a geologic map where the scale is 1 in = 100 m. You draw your strike lines at 650m and 750m on the contact lines of the bed such that they are 2.4 in apart. What is the dip angle of this particular bed according to the procedure shown?

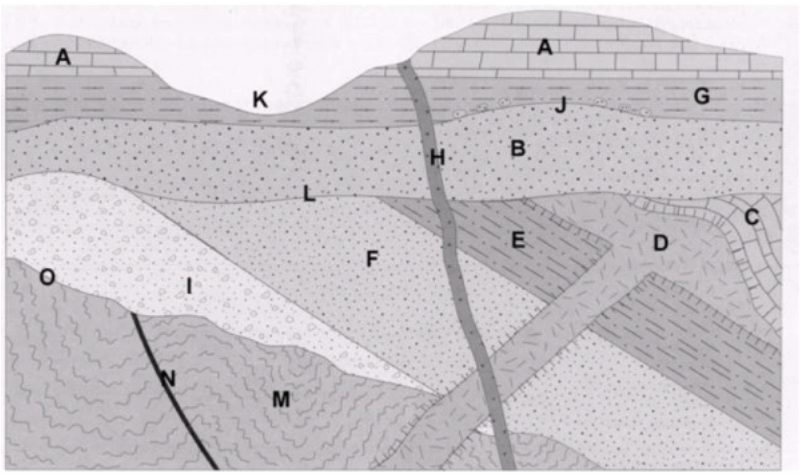
**78. (2.00 pts)**
A triple junction is a place where three plates come together. All triple junctions are stable, except for two. Name the types of plates that come together to form the two unstable triple junction.

**79. (4.00 pts)** Briefly explain Walther's Law, and how it relates to vertical facies changes.

**80. (3.00 pts)**

Identify the depositional environment relating to the image above.

**Section 3: Mapping**




Use the image above to answer the following questions.

**81. (15.00 pts)** State these rock layers from oldest to youngest.

**82. (1.00 pts)** What law/principle is rock layer H enacting?

A) Law of superposition
B) Law of original horizontality
C) Cross Cutting relationships
D) Principle of faunal succession

**83. (1.00 pts)** What is the more accurate name of the rock layer D?

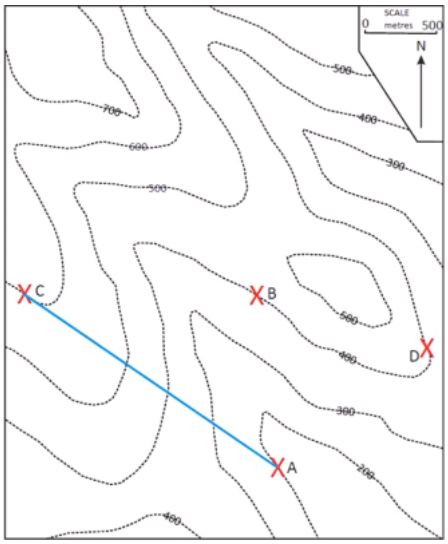
A) Dike
B) Laccolith
C) Sill
D) Batholith

**84. (1.00 pts)** Why is rock layer L just a line?

A) It is a discontinuity
B) It is a very thin layer
C) It was the folds of the previous rock layers
D) It is a igneous intrusion

**85. (1.00 pts)** What law/principle is the cause for both parts of rock Layer A to not have different letters?

A) Law of superposition
B) Law of original horizontality
C) Law of lateral continuity
D) Walther's law




Directions: Use the image above to solve the questions below. Use points A,B,C in your 3-point problem; disregard D.

Disregard the scale; the distance between points C and A is 2140m. Round to the nearest tenth. Assume this is an outcrop of a coal seam.

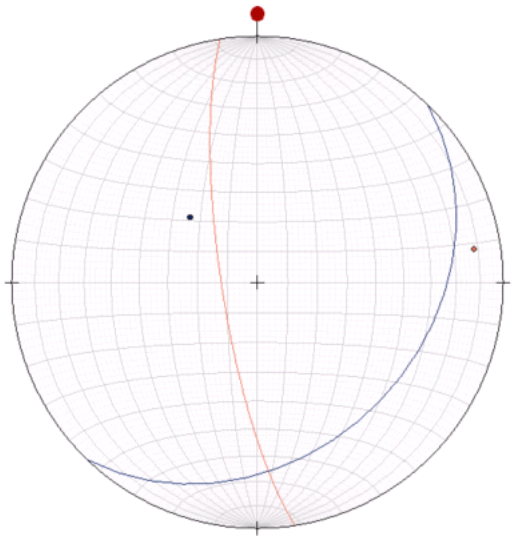
**86. (9.00 pts)** What is the apparent dip of a bed outcropping at points A, B, and C?

**87. (7.00 pts)** What is the true dip of the bed outcropping at points A, B, and C if the length of the line that joins the line between A and C and the strike line is 780m?

**88. (1.50 pts)** What is the contour interval?

**89. (1.50 pts)** After drawing structure contours, what is the depth at which coal will be encountered at borehole D?

**90. (5.00 pts)**
Let's say a stream exists that goes through points A and B on the map. Toward which point would this stream be flowing, and if the distance between A and B is 4.34 in on the map, what is the stream gradient? Use the scale for this question (2.5 in = 500m).



For the following questions use the image above. (Strike and Trend acceptable range within +/- 15, Dip and Plunge acceptable range within +/- 5)

**91. (8.00 pts)** What is the strike and dip of orange and blue planes?

**92. (8.00 pts)** What is the trend and plunge of the orange and blue lines?

**93. (4.00 pts)** What is the trend and plunge of the intersection of the planes?

**94. (4.00 pts)** What is the strike and dip of the plane defined by the given two lines?

**95. (2.00 pts)** What is the angle between the two given lines?

**96. (1.50 pts)** What is a great circle?

**97. (1.50 pts)** What is a pole of a plane?

Congratulations on finishing! Don't forget to check your answers. Once you do, feel free to submit. Good luck on your other events!