ESS 101 Midterm Spring 2005 **Name**

Student #: **VERSION D**

Provide the **best** answer for the following multiple choice questions. There are 49 regular test questions and five bonus questions. The bonus questions can only help your score. Circle the correct answer on your test paper and hand it in along with your scantron form.

1-3 Match the magma type with the appropriate tectonic setting where it likely forms.

1. Cascade Mountains **c**
2. plutons under the Himilaya Mountains **b**
3. Japan **c**

a. basalt
b. granite
c. andesite
d. peridotite
e. andalucite

4. The aesthenosphere is composed of rock rich in:
a. quartz and olivine
b. gabbro
c. peridotite (>90% olivine) **correct answer**
d. basalt
e. amphibole and pyroxene

5. As a granitic magma (wet melt) rises toward the surface:
a. its melting temperature will increase.
b. its melting temperature will decrease
c. it will tend to crystallize before it reaches the surface
d. answers a and c are both correct **correct answer**
e. answers b and c are both correct

6. A partial melt of the asthenosphere will tend to rise toward the surface because _____.
a. because of centrifugel forces
b. earth's magnetic field
c. convection cells in the outer core
d. of gas bubbles within the magma
e. the melt is less dense than the surrounding rock **correct answer**

7. Pillow basalts form _____.
a. when basalt is extuded through a narrow opening.
b. when a basalt flow is blocked and the flow piles up in pillow structures.
c. when the basalt flow is erupted onto land and chilled quickly
d. when the basalt flow is erupted into water **correct answer**
e. none of the above are correct

8. When two ocean plates converge _____.
a. the younger plate will be subducted
b. the older plate will be subducted **correct answer**
c. the plate closest to ocean water will be subducted
d. a collision mountain belt will form
e. none of the above are correct

9. The most widely accepted explanation for the earth's magnetic field is _____.
a. movement of electrons in the molten iron of its outer core **correct answer**
b. movement of electrons in the molten iron of its inner core
c. small magnetic mineral present in its crust
d. the earth does not have a magnetic field
e. none of the above are correct

10. What kind of plate margin existed when the Appalachian Mountains formed during the Paleozoic Era?
a. divergent margin
b. convergent margin (ocean-continental collision)
c. convergent margin (ocean-ocean collision)
d. transform margin
e. collision margin (continent-continent) **correct answer**

11. What type of volcanic rock would incorporate lithic fragments during the eruption.
a. andestite
b. pumice
c. granite
d. obsidian
e. volcanic breccia **correct answer**

12. Why does quartz develop six cleavage planes?
a. this mineral does not cleave. **correct answer**
b. this mineral cleaves between the covalent bonds of shared oxygen atoms.
c. the mineral cleaves between ionic bonds separating sheet pairs
d. the mineral cleaves between covalent bonds separating sheet pairs
e. none of the above are correct

13. Why are andesitic rocks usually porphyritic?
a. some minerals naturally grow larger crystals compared to other minerals
b. the heat flow beneath the earth is variable causing two mineral sizes
c. two staged cooling history for andesitic magmas **correct answer**
d. all of the above
e. none of the above

14. Magnetic minerals that crystallize from an igneous melt today will _____.
a. all point to a common magnetic pole
b. all have a similar polarity
c. not point to the same common magnetic pole 100 million years from today
d. all of the above answers are correct
e. only answers a and b are correct

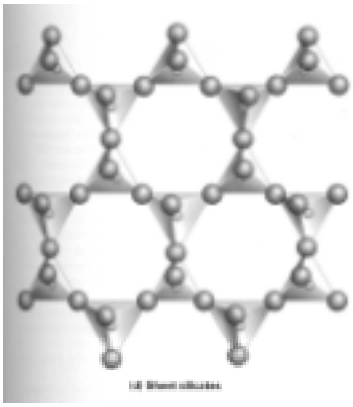
15. Diamond is harder than graphite because:
a. diamonds have covalent bonds between atoms while graphite has metallic bonds between its atoms.
b. diamonds and graphite have the same bonds, but diamonds are composed of a harder element than graphite.
c. diamonds have covalent bonds between its constituent atoms while graphite has vanderwahl bonds. **correct answer**
d. diamond and graphite have the same hardness except graphite is composed of a powdered form.
e. none of the above answers are correct

16. The silicate tetrahedron $(SiO_4)^?$ has a net charge of _____.
a. +4
b. -4 **correct answer**
c. -3
d. +2
e. 0 (it is balanced)

17. How does the silicate tetrahedron achieve charge balance?
a. it will share electrons between oxygen atoms
b. it will form ionic bonds with available cations
c. it will form metallic bonds with available cations
d. all of the above are correct **correct answer**
e. none of the above are correct

18. Why do the terrestrial planets have so little molecular (gaseous) hydrogen?
a. Hydrogen was a very rare component of the primordial dust from which the planets formed.
b. The terrestrial planets have a large component of molecular hydrogen in their interiors.
c. The terrestrial planets are close to the sun and the low density hydrogen was lost to space. **correct answer**
d. Hydrogen is only present as water in all planets.
e. none of the above are correct

19-21. Using the diagram and chemical formula of Muscovite shown below, answer questions 19-21.



Muscovite Mica: $K_2Al_4(Si_6Al_2O_{20})(OH,F)_2$

19. How many oxygen atoms are being shared between the silicate tetrahedral muscovite sheets?
a. one
b. two
c. three **correct answer**
d. four
e. two and three

20. Why does muscovite cleave between its silicate sheets?
a. the bonds are weaker within the silicate sheets compared to between the silicate sheets
b. the bonds are stronger within the silicate sheets compared to between the silicate sheets **correct answer**
c. the valencies of the silicon atoms remain unfilled
d. the valencies of the oxygen atoms remain unfilled
e. it does not cleave

21. What is the significance of (OH) in the muscovite crystal structure?
a. it is due to alcohol being degassed from the primitive mantle
b. it is water likely formed in the primitive mantle
c. it is water likely incorporated during the subduction process **correct answer**
d. it is water resulting from asteroid impacts
e. it is alcohol stashed during prohibition

22. Why does the topographic expression of the Hawaiian Island become progressively lower from the Big Island to the island lying northwest?
a. the topographic expression of all the Hawaiian Islands is the same
b. the ocean lithosphere is less dense to the northwest and it floats higher
c. there is a subduction zone to the northwest drawing the ocean crust downward
d. the Big Island has a segment of continental crust within its interior
e. the ocean lithosphere is lighter over the hotspot and it floats higher **correct answer**

23. Arrange the compositional zones of the earth according to their respective density (densest to lightest).
a. mantle, outer core, inner core, continental crust, ocean crust
b. inner core, outer core, mantle, continental crust, ocean crust
c. inner core, outer core, mantle, continental crust, ocean crust
d. outer core, mantle, ocean crust, continental crust, inner core
e. inner core, outer core, mantle, ocean crust, continental crust **correct answer**

24. What kind of plate margin is represented by the Andes Mountains?
a. divergent margin
b. convergent margin (ocean-continental subduction) **correct answer**
c. convergent margin (ocean-ocean subduction)
d. transform margin
e. collision margin (continent-continent)

25. Meteorites are thought to be composed of _____?
a. materials mainly comprising the sun
b. materials very different from the original material comprising the Earth
c. materials that are similar in composition to those found in the solid earth **correct answer**
d. mainly organic components
e. mainly materials found only in continental crust

26. Which zone of the earth is also described as the "low velocity zone?"
a. outer core
b. inner core
c. asthenosphere **correct answer**
d. lithosphere
e. mesosphere

27. The melting temperature of _____ must be reached in order for the earth to become compositionally zone:
a. silicon
b. Fe-Mg silicate minerals
c. Metallic Fe and Ni **correct answer**
d. water
e. crustal rocks

28. Why will the Juan de Fuca spreading ridge eventually be subducted under the North American plate?
a. the rate of sea floor spreading exceeds the rate of subduction at the convergent margin
b. the rate of sea floor spreading is less than the rate of subduction at the convergent margin **correct answer**
c. sea floor spreading will cease because the asthenosphere convection will shut down
d the Juan de Fuca spreading ridge will not be subducted under the North American plate
e. none of the above answers are correct because the Juan de Fuca spreading ridge is off the coast of Africa.

29. Transform plate boundaries are typically associated with _____.
a. convergent margins where the descending plates slows down during subduction
b. convergent margins where the descending plates speeds up during subduction
c. divergent margins where the rate of spreading is different along segments of the spreading ridge **correct answer**
d. divergent margins where the rate of spreading is the same along segments of the spreading ridge
e. none of the above answers are correct.

30. The cause of volcanism observed at Yellowstone National Park is similar to that of _____.
a. Japan
b. the Phillipines
c. the Columbia Plateau
d. the Cascades
e. the Hawaiian Islands **correct answer**

31. A shield volcano has a lower slope angle than a strato (composite) volcano because _____.
a. its basaltic lava flows have higher viscosities than the andesitic flows of strato volcanoes
b. its basaltic lava flows have lower viscosities than the andesitic flows of strato volcanoes **correct answer**
c. the shield volcano is smaller than the strato volcano and cannot achieve the same slope angle
d. it has more water content which lowers the melting temperature
e. answers b and d are both correct

32. What is the significance of the change in direction of the Hawaiian Island chain and the Emperor Seamount chain?
a. the tectonic plate on which both island chains sit changed directions **correct answer**
b. each island chain formed from two different hot spots.
c. a single hot spot moved beneath the tectonic plate
d. the Hawaiian Islands formed over a hot spot volcanism while Emperor Seamounts are part of a mid-ocean spreading ridge
e. none of the above answers are correct

33. Which tectonic margin would tend to have **deep and shallow focused** earthquakes?
a. divergent
b. transform
c. convergent **correct answer**
d. all of the above answers are correct
e. only answers a and b are correct

34. Basaltic composition magma can form _____.
a. at sea floor spreading zones
b. at continental rift zones
c. above hotspots
d. back arc spreading basins
e. all of the above tectonic settings **correct answer**

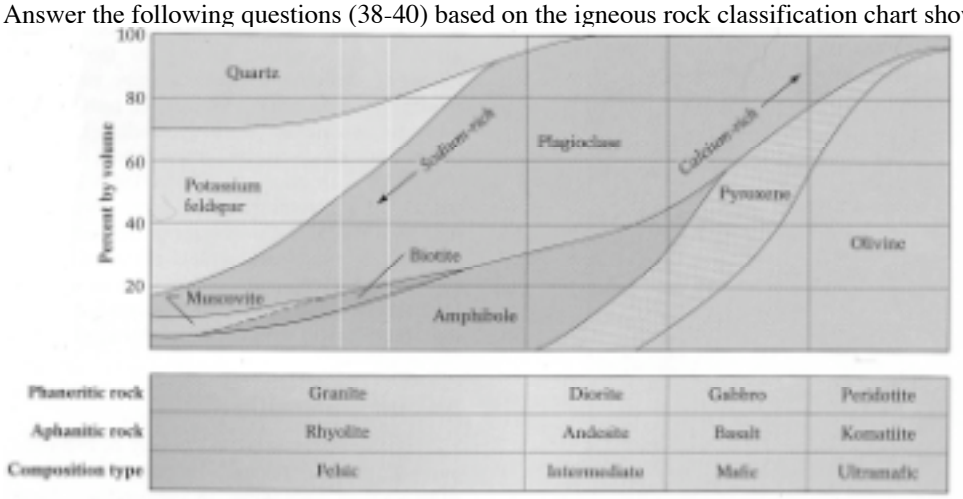
35. S-waves _____ as they travel through the outer core.
a. are absorbed **correct answer**
b. decelerate
c. accelerate
d. reverse
e. rebound

Questions 36. and 37. We know from seismic wave data that the outer core is liquid and the inner core is solid; yet the actual temperature of the outer core is lower than the inner core's actual temperature.

36. How can we best explain the fact that the inner and outer cores are both composed of metallic iron and nickel yet the outer core is liquid and the inner core solid?
a. the melting temperature for iron-nickel is lower than the geothermal gradient temperature in the outer core. **correct answer**
b. the melting temperature for iron-nickel is greater than the geothermal gradient temperature in the outer core
c. the melting temperature for iron-nickel is the same as the geothermal gradient emperature in the outer core.
d. the outer core is solid and the inner core is solid
e. the actual temperature of the outer core is greater than the inner core's actual temperature.

37. What makes the asthenosphere unique relative to the lowermost lithosphere and the uppermost mesosphere (upper mantle)?
a. its composition is vastly different from the lowermost lithosphere and uppermost mesosphere.
b. the asthenosphere is not unique relative to the other two structural units.
c. the asthenosphere is at the pressure melting temperature for the upper mantle composition. **correct answer**
d. all of the above are correct
e. none of the above answers are correct

38-40. Use the rock-composition diagram shown below to answer questions 38-40.
Answer the following questions (38-40) based on the igneous rock classification chart shown below:



Phaneritic rock	Granite	Diorite	Gabbro	Peridotite
Aphanitic rock	Rhyolite	Andesite	Basalt	Komatiite
Composition type	Felsic	Intermediate	Mafic	Ultramafic

38. A phaneritic (plutonic) rock composed of 5% quartz, 55% plagioclase, 25% amphibole and 5% pyroxene would be classified as _____.
a. basalt
b. diorite
c. andesite
d. rhyolite
e. granite **correct answer**

39. A plutonic rock composed of predominantly calcium-rich plagioclase and pyroxene would be classified as _____.
a. basalt
b. diorite
c. gabbro **correct answer**
d. rhyolite
e. granite

40. Granite contains _____olivine.
a. 0% **correct answer**
b. 10-20%
c. 30-40%
d. less than 50%
e. 70-90%

41-43. Magma is being erupted from a hotspot.
41. What type of magma is produced at this setting?
a. rhyolite
b. obsidian
c. andesite
d. pumice
e. basalt **correct answer**

42. This type of tectonic setting can be found _____?
a. only beneath ocean basins
b. only beneath continents
c. along the San Andreas Fault
d. beneath ocean basins and continents **correct answer**
e. none of the above answers are correct

43. What is the main source of the erupted lava?
a. partial melt of the asthenosphere **correct answer**
b. partial melting of the subducting ocean crust and marine sediment
c. partial melting of the continental crust
d. mantle plumes
e. none of the above are correct

44. Magmas are divided into three compositional ranges based mainly on _____ content.
a. mafic content
b. silica content **correct answer**
c. iron content
d. water content
e. gas content

45. Why is there a low velocity zone for seismic waves entering the asthenosphere?
a. the asthenosphere is considerably less dense than the overlying continental crust
b. the asthenosphere is considerably more dense than the underlying continental crust.
c. there is not a low velocity zone in the asthenosphere
d. the asthenosphere is a partial melt and seismic wave decelerate as they enter the phase change **correct answer**
e. none of the above are the correct answer

Lab Questions

46. In the geologic techniques lab each group completed a topographic cross-section of Yosemite Valley. What profile shape was indicative of a glaciated valley?
a. V-shaped
b. Y-shaped
c. U-shaped **correct answer**
d. depends exclusively on the bedrock lithology
e. none of the above answers are correct

47. In the plate tectonics lab we observed that the magnetic polarity stripes south of Alaska were uni-directional. How could you explain the fact that half of the magnetic stripes were missing?
a. the spreading ridge that created the stripes was subducted under Washington
b. the Hawaiian Islands moved off the hotspot
c. the magnetic stripes were transform faulted south towards California
d. the spreading ridge that created the stripes was subducted under Alaska **correct answer**
e. none of the above answers are correct

48. In the minerals lab the main diagnostic criteria for identifying the metallic mineral hematite was _____.
a. its density
b. its metallic luster
c. its reddish-brown streak **correct answer**
d. its magnetic properties
e. none of the above answers are correct

49. In the igneous rock lab we observed two volcanic rocks at the front of the lab. They were collected from ____.
a. Mt. Rainier and Mt. Vesuvius
b. Yellowstone Park and Mount St. Helens
c. Hawaii and Japan
d. Phillipines and Andes Mountains
e. Hawaii and Mount St. Helens **correct answer**

Bonus Questions (Answers to bonus questions are provided to the class during a specific lectures. Varies each quarter).

50. On April 22nd the prof was wearing a _____ shirt.
a. blue
b. grey
c. black
d. yellow
e. green

51. Dolomite is a rock similar to limestone except it has more _____ present.
a. calcium
b. iron
c. silica
d. aluminum
e. magnesium

52. What evidence exists that suggests that the Cascade Range was lower in elevation during the Miocene epoch?
a. metamorphic minerals within Cascade rocks indicate paleobarometry
b. petrified wood from the Columbia Plateau indicates that moisture-loving plants grew east of the Cascades
c. river deposits suggest major floods occurred during the Miocene epoch
d. all of the above answers are correct
e. the Cascade Range was actually higher in elevation during the Miocene epoch

53. How many lectures has the prof missed this quarter?
a. one because of a family emergency
b. two because of geological meetings
c. none
d. more than two
e. I do not know because I never come to lecture

54. Who was one of the lone survivors from the St. Pierre Nuee ardente?
a. Raoul Sarteret
b. Greg La Monde
c. Guy LaFleur
d. Jean Beliveau
e. Guy Carboneau

Geology 101 Final (Spring Quarter 2005) **VERSION A:**
Name: _____ Student # _____

Please read through the exam and answer the questions as instructed. Please give the best answer to the question. Each question has only one correct answer.

1. Where do earthquakes occur in the Pacific Northwest?
a. near the surface within the North American plate
b. deep within the Juna de Fuca plate
c. at the Cascadia subduction zone
d. all of the above are correct **correct answer**
e. only answers a and c are correct

2. The recurrence interval of large Cascadia subduction zone earthquakes is _____.
a. ~30 years
b. ~100 years
c. ~500 years **correct answer**
d. ~1000 years
e. ~5000 years

3. How did geologists determine the **exact day** of offset on the Cascadia subduction zone in 1700 AD?
   a. they counted tree rings of dead cedar trees
   b. they used radiocarbon dating of buried peat
   c. they had accurate tsunami logs from Japan that recorded this event **correct answer**
   d. they had accurate tsunami logs from native Americans that recorded this event
   e. there were no records of this event

4. Where is isostatic recovery from ice loading still occurring today in North America?
   a. northern Great Lakes
   b. southern Great Lakes
   c. Hudson Bay, Canada
   d. All of the above answers are correct
   e. only answers a and c are correct **correct answer**

5. An overturned fold will often evolve into a _____ with continued compressive stress.
a. normal fault
b. hinge fault
c. thrust fault **correct answer**
d. strike-slip fault
e. transform fault

6. Which mineral group accounts for most of our extractable iron ore deposits in the world?
a. carbonates
b. sulfides
c. sulfates
d. oxides **correct answer**
e. silicates

7. Chert generally precipitates _____.
a. in desert playas
b. in shallow ocean waters
c. in deep ocean water **correct answer**
d. in fast moving streams
e. high saline embayments

8. Joints facilitate weathering because _____.
a. they increase the acidity of the water
b. permit water and other chemical agents to penetrate below the surface
c. provide more surface area for the weathering front to attack
d. none of the above answers are correct
e. only answers b and c are correct **correct answer**

9. Why is olivine the dominant mineral in most beach sands?
a. olivine is the most common mineral in surface rocks
b. olivine is not the dominant mineral in beach sands **correct answer**
c. olivine is most resistant to chemical weathering processes
d. olivine weathers easily from felsic igneous dikes
e. none of the above are correct

10. Which rock type will tend to produce sink holes in Florida from solution weathering?
a. granite
b. gneiss
c. quartzite
d. limestone **correct answer**
e. none of the above rock types are susceptible to solution weathering

11. Frost wedging would be most prominent in:
a. polar regions where temperatures remain well below freezing (0°C) throughout the year.
b. sub-polar latitudes where temperature fluctuate around the freezing temperature during certain seasons.
correct answer
c. low latitude rainforests where abundant moisture enters cracks and pores in the rocks.
d. arid regions where temperature fluctuate diurnally (daily).
e. all of the above are correct

12. Which soil horizon contains the highest organic content?
a. A horizon **correct answer**
b. B horizon
c. C horizon
d. R horizon
e. none of the above are correct as soils only contain inorganic minerals

13. H+ ions utilized in hydrolysis weathering reactions come from _____.
a. primordial water emitted directly from volcanic eruptions
b. hydrogen sulfide gas
c. carbonic acid **correct answer**
d. hydrogen gas from the atmosphere
e. none of the above

14. Spheroidal weathering occurs because:
a. rock joints start out being rounded
b. rounding occurs because the corners and edges of a rock are less stable than its interior
c. mineral grains within the rock have rounded corners
d. rounding occurs because the edges and corners of the rock surface offer more points of attack to chemical weathering processes than its planar surface **correct answer**
e. none of the above are correct

15. Which of the following transport agents generally results in current (asymmetric) ripples?
a. wind
b. ocean waves
c. rivers
d. glaciers
e. answers a and c are both correct **correct answer**

16. What test would **conclusively** tell you that marble and limestone are both composed from the mineral calcite?
a. color
b. taste
c. hardness
d. reaction with HCl acid **correct answer**
e. the number of cleavage planes

17. The zig zag pattern of rock units that can be observed while flying over Pennsylvania is due to _____.
a. migrating stream deposits
b. erosion of monoclines
c. erosion of symmetric anticlines and synclines
d. erosion of plunging (tilted) anticlines and synclines **correct answer**
e. erosion of horizontal strata by meandering streams

18. Oolites form from _____.
a. precipitation of silica around sand grains oscillated by waves
b. precipitation of calcite around sand grains oscillated by waves **correct answer**
c. iron oxide mottles in the B horizon of a soil
d. O-worms burrowing tubes
e. none of the above answers are correct

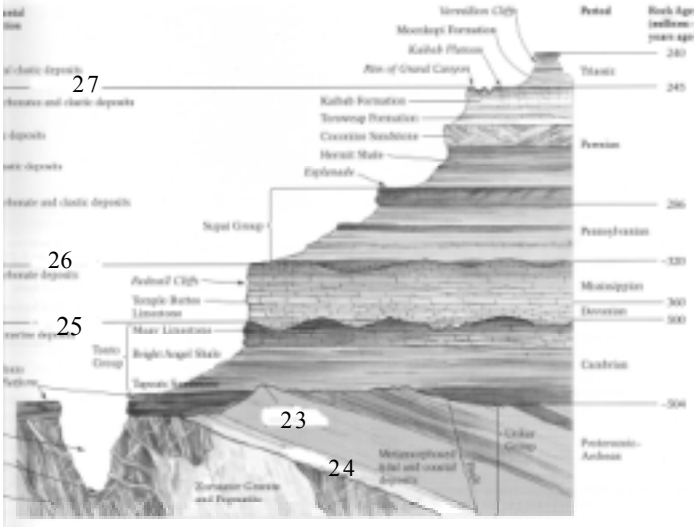
19. Why do geochronologists not use the ratio of $^{14}C/^{14}N$ to determine the age of organic matter?
a. Nitrogen (^{14}N) is not the decay product of radiocarbon (^{14}C).
b. The ratio of $^{14}C/^{14}N$ could not be measured because ^{14}N is too rare in the natural environment.
c. Most of the ^{14}N found in organic matter is naturally occurring and not the result of ^{14}C decay. **correct answer**
d. Radiocarbon cannot be used to date organic matter.
e. Nitrogen does not exist in organic matter because it rapidly decays as well.

20. If a horizontal layer of volcanic tephra lies between two horizontal sedimentary strata, the principle by which the relative ages of each of these layers could be determined is:
a. the principle of original horizontality
b. the principle of superposition **correct answer**
c. the principle of cross-cutting relationships
d. the principle of inclusions
e. the principle of exclusions

21. According to the principle of inclusions**:**
a. a xenolith will be older than the plutonic body in which it is emplaced.
b. a xenolith will be younger than the plutonic body in which it is emplaced.
c. clasts within a conglomerate will be older than the rock itself.
d. answers a and c are both correct. **correct answer**
e. answers b and c are both correct.

22. According to the principle of cross-cutting relationships, if a fault is found cutting across sedimentary strata, the reasonable conclusion would be that:
a. the fault is younger than the strata **correct answer**
b. the fault is older than the strata
c. the fault and strata are the same age
d. it cannot be determined whether the fault or strata is older
e. none of the above are correct

23-27. What type of unconformity is shown by each number on the diagram below?



a. euconformity
b. disconformity (25, 25, 27)
c. nonconformity (24)
d. aconformity
e. angular unconformity (23)

28. The strike-slip fault shown below is _____.

a. right lateral
b. left lateral **correct answer**
c. cannot tell from the diagram
d. right or left lateral depending upon which side of the fault you stand
e. none of the above

29. The half-life of a radioactive isotope refers to:
a. one-half of the total life span of a parent isotope.
b. the time it takes for the ratio of parent to daughter isotopes to be 1:2.
c. the time it takes for the ratio of parent to daughter isotopes to be 2:1.
d. the time it takes for half of the existing parent isotopes to decay to daughter isotopes **correct answer**
e. none of the above are correct

30. A nonfoliated metamorphic rock would likely form _____.
a. from contact of pre-existing country rock with an igneous pluton **correct answer**
b. deep within the lithosphere of a subducting plate
c. in the accretionaly wedge above the subducting plate where pressure is high
d. where both temperature and pressure are high
e. where temperature is low and pressure high

31. A minimum of _____ seismic stations are necessary to determine the focus of an earthquake.
a. 3 **correct answer**
b. 10
c. 1
d. 300
e. 5

32. If an earthquake occurs, the _____ waves are the **second waves** to arrive at the seismic station.
a. surface
b. compression
c. S **correct answer**
d. P

e. all of the seismic waves travel at the same velocity.

33. In order to relieve **stress buildup** that would cause a Richter magnitude 6 earthquake, approximately how many magnitude 5 earthquakes would have to occur?
a. 3
b. 30 **correct answer**
c. 300
d. 900
e. 27,000

34. High confining pressure is conducive to _____ deformation in rock.
a. brittle fracture
b. elastic
c. ductile **correct answer**
d. all of the above are correct
e. none of the above are correct as confining pressure has no impact on the type of deformation rocks will undergo.

35. A high strain rate is conducive to _____ deformation in rock.
a. brittle fracture **correct answer**
b. elastic
c. ductile
d. all of the above are correct
e. none of the above are correct as strain rate has no impact on the type of deformation a rocks will undergo

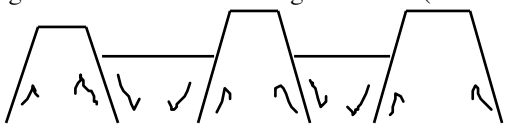
36. According to the national earthquake hazard map, the Puget Lowland is a ____ risk region in the U.S.
a. low
b. moderate
c. high **correct answer**
d. no
e. indeterminate

37. An eroding anticline (upwarped fold) will have the _____ rocks exposed along its axis.
a. youngest
b. oldest **correct answer**
c. densest
d. lightest
e. answers b and c are both correct

38. A reverse fault _____.
a. can have repeating strata exposed in a vertical cross-section
b. can result in older rock units overlying younger units in a vertical cross-section
c. results primarily from compressive stresses.
d. all of the above are correct **correct answer**
e. none of the above are correct

39. _____ is an example of elastic deformation.
a. oblique faulting
b. subsidence related to the filling of a reservoir
c. isostatic unloading of the earth's lithosphere following deglaciation
d. liquifaction
e. answers b and c are both correct **correct answer**

From the diagram of the Basin and Range Province (Nevada and Utah) shown below answer questions 40-43.



40. What kind of faults bound mountains and valleys of the Basin and Range province in Nevada and Utah?
a. reverse faults
b. normal faults **correct answer**
c. strike-slip faults
d. transform faults
e. oblique faults

41. What kind of stress would you expect to cause this type of faulting?
a. shear
b. tensile (extension) **correct answer**
c. compressional
d. rotational
e. lateral

42. At what kind of plate margin would you expect to find this type of fault?
a. divergent **correct answer**
b. convergent
c. transform
d. subduction
e. none of the above

43. What hypothesis did we discuss to explain Basin and Range tectonics (i.e., to explain why a divergent margin might be forming under Nevada and Utah)?
a. delayed reaction due to the separation of Pangaea
b. the spreading ridge was subducted under California and is now positioned under Nevada and Utah. **correct answer**
c. bolide (meteorite) impact
d. compressive stresses linked to microterrane collisions of the coast of Washington
e. all of the above

44. What type of faulting would you expect to dominate the Canadian Rockies or Appalachian Mountains?
a. thrust faults **correct answer**
b. normal faults
c. strike-slip faults
d. transform faults
e. oblique faults

45. _____ is an example of elastic deformation.
a. oblique faulting
b. tectonic uplift
c. isostatic unloading of the earth's lithosphere following deglaciation **correct answer**
d. liquifaction
e. monoclinal folding

Laboratory Questions
46. In the geologic time lab we studied _____ fossil assemblages that we used as biostratigraphic indicators?
a. one
b. two
c. three **correct answer**
d. four
e. none of the above answers are correct, as the fossils were lost in the move from Johnson Hall to Condon.

47. In metamorphic rocks with foliation, the texture develops as a result of:
a. the alignment of platy (flat) minerals perpendicular to the maximum pressure on the body of rock.
correct answer
b. the rock mass melting and then solidifying.
c. factors unrelated to metamorphic processes.
d. lithostatic pressure.
e. all of the above are correct.

48. In the sedimentary rock lab which chemical precipitate **did we not** observe in the laboratory?
a. halite
b. gypsum
c. bauxite **correct answer**
d. calcite
e. chert

49. In laboratory you used the first arrival time of P-waves to determine the distance between a seismic station and the focus of the Nisqually earthquake. What is the most likely reason that the three arcs not intersect at location one point, assuming your measurements were accurate?
a. the seismographs may not have recorded the exact arrival time of the P-waves.
b. the seismographs may have measured two earthquakes that occurred close in time to one another.
c. seismic waves traveled at different velocities to each seismic station.
d. the computer alogarithm was not programmed correctly to determine seismic wave velicities in the crust.
e. the Nisqually earthquake focus was 50 km below the surface and the arcs would not intersect at the surface. **correct answer**

Bonus Questions: (Answers provided during specific lectures to the class).

50. How will the drainage pattern change as the northern Great Lakes isostatically rebound?
a. the water will begin to flow south through the Mississippi drainage system.
b. the water will begin to flow north to the Hudson Bay
c. the St. Lawrence River drainage will be diverted to the Hudson River drainage.
d. the Great Lakes will increase in size due to greater impoundment of water.
e. none of the above is correct as the Great Lakes region is fully isostatically compensated.

51. Why did Terry switch **slide** projectors at the start of one of his lectures in May?
a. the bulb burned out of the right-hand side projector.
b. the automatic focus kept changing the focus of the right-hand side projector during lecture
c. a spotlight was shining on the right-hand side screen.
d. he changed slide projectors so he could come up with a new bonus question for spring quarter.
e. none of the above answers are correct, as he never changed projectors during lecture.

52. Terry missed _____ lectures because _____.
a. 0, because he rarely gets sick
b. 1, he attended a geologic conference in Idaho
c. 1, he attended the wedding of his youngest brother in Canada
d. 2, he attended a geologic conference in San Francisco
e. 2, he had to attend jury duty in Island County, Washington

53. The last slide shown on the last day of lecture was _____.
a. an artistic rendition of a collapsed Space Needle following a magnitude 9 earthquake.
b. a Japanese tsunami record of the Cascadia subduction zone earthquake of 1701.
c. an ancient native American petroglyph of a tsunami generated from the 1701 earthquake.
d. a photograph of Terry and his dog Wilson T. Spuddle Duddle.
e. none of the above slides were shown on the last day.

54. How can the radiocarbon isotope system be used to catch smugglers importing illegally obtained ivory and whale bones?
a. the radiocarbon content of the atmosphere has increase 100 times since the 1950's because of nuclear testing in the atmosphere
b. the radiocarbon content of the atmosphere has increased 100 times since 1850 because of the increased use of fossil fuels
c. the ivory and whale bones can be dated to within days using the radiocarbon system for young samples
d. none of the above answers are correct
e. all of the above answers are correct