Exam IV: Sierra Nevada

1) On the diagram above, where is the Arc-Trench Gap?
   a. 1 and 3
   b. 4
   c. 7 and 8
   d. 6
   e. 5 and 10

2) On the diagram above, where is the subduction zone Franciscan Formation?
   a. 4
   b. 3
   c. 1
   d. 10
   e. 7 and 8

3) On the diagram above, where is the Sierra Nevada Magmatic Arc?
   a. 7 and 8
   b. 7
   c. 8
   d. 10
   e. 6

4) On the diagram above, where is the Farallon Plate?
   a. 1
   b. 3
   c. 2
   d. 10
   e. 5

5) On the diagram above, where is the trench?
   a. 3
   b. 1
   c. 10
   d. 6
   e. 7

6) On the diagram above, where is the present position of the Great Valley?
   a. 6
   b. 4
   c. 7
   d. 8
   e. 9

7) On the diagram above, where is the Coast Range Ophiolite?
   a. 10
   b. 4
   c. 2
   d. 5
   e. 1
8) On the diagram above, where is the batholith?
   a. 7  
   b. 10  
   c. 3  
   d. 4  
   e. 8

9) On the diagram above, where is the present Coast Ranges?
   a. 7 and 8  
   b. 9  
   c. 4  
   d. 5  
   e. 2

10) On the diagram above, where is the Paleozoic, Foothills subduction zone?
    a. 7  
    b. 10  
    c. 8  
    d. 3  
    e. 5

11) On the diagram above, where are the Mesozoic magmatic arc volcanoes or the Sierran Arc?
    a. 7  
    b. 8  
    c. 7 and 8  
    d. 10  
    e. 6

12) Why is the Sierra Nevada is asymmetrical?
    a. range front faulting in Basin and Range  
    b. San Andreas Transform Tectonics  
    c. mantle upwelling in Basin and Range  
    d. convergent margin tectonics during the Mesozoic  
    e. both a and c

13) Approximately when was the Sierra Nevada uplifted?
    a. 16 million years ago  
    b. 10 to 16 million years ago  
    c. 5 to 8 million years ago  
    d. 4 million years ago  
    e. 20 to 25 million years ago

14) What evidence do we have that the Sierra Nevada uplift is young?
    a. seafloor magnetic anomalies  
    b. table mountains and Tertiary gravels  
    c. lode deposits in Sierra  
    d. roof pendants in high Sierra

15) The source area for the Table Mountain lavas was ___________.
    a. west of the present Sierran crest  
    b. north of the present Sierran crest  
    c. east of the present Sierran crest  
    d. the Great Valley  
    e. the Cascade Range

16) What are the two major divisions of rocks in the Sierra Nevada?
    a. subjacent series and accreted terranes series  
    b. superjacent series and auriferous gravels series  
    c. subjacent series and batholith series  
    d. subjacent series and superjacent series  
    e. accreted series and exotic series

17) The Sierra Nevada Batholith is an example of the ______________ series.
    a. subjacent  
    b. superjacent

18) The Calaveras Complex is an example of the __________ series.
    a. subjacent  
    b. superjacent

19) The metamorphic roof pendants are examples of the ___________ series.
    a. subjacent  
    b. superjacent

20) The table mountain lavas are examples of the __________ series.
    a. subjacent  
    b. superjacent

21) The Northern Sierra Terrane is an example of the ___________ series.
    a. subjacent  
    b. superjacent

22) The auriferous gravels are examples of the __________ series.
    a. subjacent  
    b. superjacent

23) What fault zone in the Foothills Metamorphic Belt represents the Paleozoic to Early Mesozoic subduction zone?
    a. Golconda Allochthon fault zone  
    b. Robert’s Mountain Allochthon fault zone  
    c. Yuba Fault zone  
    d. Melones Fault zone  
    e. Pine Flat Fault zone
24) The Minarets and Ritter Range in the Sierra Nevada are _______ in age.
   a. Paleozoic  
   b. Cenozoic  
   c. Mesozoic  
   d. Precambrian  
   e. Archean

25) The geological structure formed by the Minarets and Ritter Range is a ______.
   a. graben  
   b. caldera  
   c. horst  
   d. shield volcano  
   e. lava dome

What was the tectonic setting for the volcanic rocks of the Minarets and Ritter Range?
   a. island arc  
   b. hot spot  
   c. divergent  
   d. passive margin  
   e. magmatic arc

26) How old are the volcanic rocks found in the Minarets and Ritter Range?
   a. 100 Ma  
   b. 175 Ma  
   c. 60 Ma  
   d. 25 Ma  
   e. 350 Ma

27) Orogeny means ____________?
   a. basin development  
   b. rifting  
   c. mountain building  
   d. Basin and Range extension

28) How many orogenies affected California before the formation of the Sierra Nevada Batholith?
   a. three  
   b. four  
   c. five  
   d. one

29) These orogenies were characterized by __.
   a. magmatic arc development  
   b. island arc accretion  
   c. continent-continent collision  
   d. rifting and passive margin setting

30) The first of these orogenies was the ______.
   a. Sonoma  
   b. Antler  
   c. Sierran  
   d. Antler

31) The second of these orogenies was the ____.
   a. Sonoma  
   b. Antler  
   c. Sierran  
   d. Nevadan

32) The last of these exotic terrane accretion orogenies was the ______.
   a. Sonoma  
   b. Antler  
   c. Sierran  
   d. Nevadan

33) During the oldest or first orogeny, what terrane or terranes were accreted to California?
   a. Shoo Fly Complex and Sonoma Arcs  
   b. Nevadan Arcs and Foothills terrane  
   c. Sonoma Arcs and Calaveras Complex  
   d. Northern Sierra Terrane and Shoo Fly Complex  
   e. Nevadan Arcs and Calaveras Complex

34) During the second orogeny, what terrane or terranes were accreted to California?
   a. Shoo Fly Complex and Sonoma Arcs  
   b. Nevadan Arcs and Foothills terrane  
   c. Sonoma Arcs and Calaveras Complex  
   d. Northern Sierra Terrane and Shoo Fly Complex  
   e. Nevadan Arcs and Calaveras Complex

35) During the last terrane accretion orogeny, what terrane or terranes were accreted to California?
   a. Shoo Fly Complex and Sonoma Arcs  
   b. Nevadan Arcs and Foothills terrane  
   c. Sonoma Arcs and Calaveras Complex  
   d. Northern Sierra Terrane and Shoo Fly Complex  
   e. Nevadan Arcs and Calaveras Complex

36) During the late Precambrian and early Paleozoic, the tectonic setting of California was ______.
   a. active margin  
   b. passive margin  
   c. transform margin

37) Nevadan cleavage is a pervasive foliation affecting Sierra Nevada rocks older than __.
   a. Triassic, 208 Ma  
   b. Cretaceous, 65 Ma  
   c. Jurassic, 150 Ma  
   d. Cretaceous, 80 Ma

38) Nevadan cleavage developed due to the ____.
   a. Sonoma Orogeny  
   b. Antler Orogeny  
   c. Sierran Orogeny  
   d. Nevadan Orogeny
39) Foothills examples of Nevada cleavage are the ____________.
   a. Table Mountains
   b. Tombstone Slates
   c. Auriferous Gravels
   d. Serpentine Bodies

40) Inverted valleys are characterized by ____.
   a. capping basalt lava flows
   b. soft, gravels overlain by lava flows
   c. higher, elevated above modern stream
   d. all of the above

41) Approximately at what depth and temperatures did the Sierra Nevada Batholith form?
   a. 100 to 500 meters; 1000°C
   b. 10 to 15 km; 850°C to 900°C
   c. 5 to 10 km; 750°C to 800°C
   d. 20 to 25 km; 900°C to 1200°C

42) To locate the epicenters of earthquakes, a total of ________ seismic stations are needed.
   a) two
   b) one
   c) three
   d) none

43) The elastic rebound theory goes as follows:
   a) rocks experience rupture, then are strained, then seismic waves are released
   b) rocks experience strain, then seismic waves are released, then rock rupture
   c) seismic waves are released, rocks are strained, rocks rupture
   d) rocks experience strain, then rupture occurs, then seismic waves are released

44) The Mw scale is “better” than the Ml scale because it accurately measures the ___ of an earthquake.
   a) energy released
   b) vibrations
   c) ground shaking
   d) damage

45) Sources of seismic waves are ________.
   a) earthquakes
   b) nuclear detonations
   c) chemical phase transitions
   d) all of the above

46) The P wave is the ___ wave and is known as the _____ wave.
   a. body, point
   b. fastest, primary
   c. fastest, point
   d. slowest, primary

47) The S wave is known as the _____ wave.
   a. secondary
   b. source
   c. shear
   d. seismic

48) Both P and S waves are _____ waves.
   a. body
   b. surface
   c. rolling
   d. zig-zag

49) What is stress?
   a. force/area
   b. force/meters
   c. force/inches
   d. force/strain

50) Does the San Andreas have all three types of stress?
   a. yes
   b. no

51) What is strain?
   a. force/strain
   b. the way the rocks behave to stress
   c. the way stress behaves to strain

52) Which of the following is NOT a strain.
   a. elastic
   b. brittle
   c. tensile
   d. ductile

53) Where is strain energy stored?
   a. faults
   b. rocks/minerals
   c. scars

54) What is the tectonic setting of the Franciscan Formation?
   a. subduction zone
   b. arc-trench gap
   c. magmatic arc
   d. island arc

55) What is mélange?
   a. forearc basin
   b. arc trench gap
   c. accretionary wedge
   d. magmatic arc
56) When was the initial contact between the Pacific Plate (East Pacific Rise) and the North American Plate?
   a. 45 Ma
   b. 28 Ma
   c. 10 Ma
   d. 2 Ma

57) What is the distinction between the San Andreas Fault and the San Andreas Transform?
   a. transform is stationary in time
   b. transform migrates through time

58) What does the Salinian Block represent in terms of tectonic setting?
   a. subduction zone
   b. arc-trench gap
   c. magmatic arc
   d. island arc

59) In the word batholith, what does the Greek word *bathos* mean?
   a. rock
   b. flat
   c. deep
   d. basin

60) The oldest plutonic rocks in the Sierra Nevada batholith are about _____ and the youngest are about _____.
   a. 310 Ma, 100 Ma
   b. 410 Ma, 300 Ma
   c. 60 Ma, 24 Ma
   d. 210 Ma, 80 Ma

61) The majority of the plutons in the Sierran batholith are granitic (granite, granodiorite, and tonalite) in composition. Which type is the single most abundant?
   a. granite
   b. granodiorite
   c. tonalite

62) Geologists refer to the depth at which magma solidifies within the surrounding rocks as _____.
   a. emplacement depth
   b. crystallization depth
   c. plutonic depth
   d. batholith depth

63) This depth varies between __ km and __ km.
   a. 5 and 15
   b. 10 and 50
   c. 20 and 60
   d. 25 and 100

64) Geologists agree that batholiths throughout the world are formed at plate margins where
   a. two oceanic plates converge at a subduction zone boundaries
   b. an oceanic plates slides by a continental plate
   c. oceanic and continental plates converge at subduction zone boundaries
   d. two oceanic plates diverge from each other

65) Geologists believe that the origin of granitic batholiths is fueled by water. Water trapped in the subducting oceanic plate is driven off as the plate descends. This water “leaks” into the mantle. How does water explain the origin of magmas under volcanic arcs?
   a. melts the oceanic, subducting plate
   b. lowers the melting point of the mantle
   c. causes higher temperatures in the mantle
   d. reduces friction and facilitates melting

66) What is a tectonic stratigraphic terrane?
   a. exotic block
   b. originated in a different area than where found
   c. tectonically transported
   d. all of the above

67) Which unit is characterized by high pressure and low temperature metamorphism?
   a. Salinian Block
   b. Franciscan Formation

68) Which of the following best describes a marine terrace?
   a. old beach sands and gravels
   b. ancient sea floor that sits above sea level
   c. current, nearly flat surface actively being cut by surf action
   d. current sea cliff

69) Which of the following best describes a wave-cut platform?
   a. old beach sands and gravels
   b. ancient sea floor that sits above sea level
   c. current, nearly flat surface actively being cut by surf action
   d. current sea cliff