Exam 1: California’s Natural Provinces, Plate Tectonics
(Multiple choice questions worth 2 points each)

1) Which of the following is a famous valley in the Basin and Range?
   A) San Joaquin Valley
   B) Death Valley
   C) Shasta Valley
   D) Santa Clara Valley

2) Why is the Basin and Range arid?
   a) rain shadow
   b) Horse Latitudes
   c) Westerlies
   d) Easterlies

3) What was the tectonic setting of Mesozoic California and the Sierra Nevada?
   a) Transform margin
   b) Divergent margin
   c) Continent-continent
   d) Convergent margin

4) What two major factors have played a role in the 1980 Mammoth Lakes earthquake swarm?
   a) tree kill, hot springs
   b) magma movement, faulting on Sierra fault
   c) magma movement, tree kill

5) Pleistocene lakes in the California deserts resulted from glacial run off. Strandlines are one line of evidence for high lake levels, what is the second?
   a) tufa towers
   b) lake sediment
   c) plant species
   d) historical evidence

6) The Colorado Desert province is the on-land extension of what major geologic structure?
   A) Sierra Nevada Fault
   B) Cocos Plate
   C) Trans Mexican Volcanic Belt
   D) East Pacific Rise
   E) None of the above

7) What faults border the NE and SW boundaries of the Salton Trough?
   A) Calaveras, Hayward
   B) Elsinor, San Jacinto
   C) San Andreas, Garlock
   D) San Andreas, San Jacinto

8) What was the tectonic setting of Mesozoic California and the Sierran Batholith?
   A) island arc
   B) transform fault
   C) fracture zone
   D) magmatic arc
   E) basin and range

9) When was the largest historical earthquake in California?
   A) 1857
   B) 1971
   C) 1906
   D) 1868

10) What province did this historic quake occur in?
    A) Basin and Range
    B) Sierra Nevada
    C) Transverse
    D) Coast Ranges

11) What is the tectonic setting of the Cascade Range?
    A) Divergent boundary
    B) Convergent boundary
    C) Transform boundary
    D) Fracture zone

12) The Big Bend in the San Andreas transform results in uplift of the Transverse Ranges. The Big Bend forms a __________.
    A) restraining bend
    B) releasing bend
    C) seismic bend
    D) aseismic bend

13) What faults define the NW and SW boundaries of the Mojave Desert?
    A) Transverse Ranges, Sierra Nevada
    B) Garlock Fault, San Andreas Fault
    C) Whittier Fault, Garlock Fault
    D) San Jacinto Fault, San Andreas Fault
    E) Elsinor Fault, San Gabriel Fault

14) The three basic concepts of plate tectonics are ______, ______, and ________.
    A) Convergent, Divergent, Transform
    B) Ocean-Ocean, Ocean-Cont., Cont.-Cont.
    C) Rigid plates, Plates move, Deformation at plate boundaries
    D) East Pacific Rise, Ocean Trenches, Hot Spots
15) What is the difference between island arc and continental magmatic arc?
A) Island arcs occur in ocean-continent tectonic settings whereas continental arcs occur in ocean-ocean tectonic settings.
B) Island arcs occur in divergent boundaries whereas continental arcs occur in convergent boundaries.
C) Island arcs and continental arcs are the same.
D) Island arcs occur in ocean-ocean tectonic settings whereas continental arcs occur in ocean-continent tectonic settings.

16) The California Cascade volcanoes are a result of the subduction of what oceanic plate?
A) Gorda Plate
B) Juan de Fuca Plate
C) Farallon Plate
D) Pacific Plate
E) Cocos Plate

17) The San Andreas Transform is a __ between the Pacific and North American plate.
A) divergent boundary
B) convergent boundary
C) transform boundary
D) fracture zone boundary

18) The San Andreas is a plate boundary between which two tectonic plates?
A) Pacific plate, Juan de Fuca plate
B) Farallon plate, North American plate
C) Nazca plate, Pacific plate
D) Pacific plate, North American plate

19) What are the three types of plate tectonic boundaries?
A) ocean-ocean, ocean-cont., cont.-cont.
B) asthenosphere, lithosphere, mantle
C) transform, divergent, convergent
D) crust, mantle, core

20) The three compositional layers of Earth are
A) lithosphere, asthenosphere, crust
B) core, mantle, crust
C) crust, asthenosphere, outer core
D) crust, upper mantle, asthenosphere

21) Alfred Wegner proposed continental drift, and he named the supercontinent that formed at the end of the Paleozoic __.
A) Gondwanaland
B) Eurasia
C) Laurentia
D) Pangea

22) The lithosphere is composed of __ and __.
A) outer core, asthenosphere
B) inner core, mantle
C) crust, uppermost mantle
D) crust, asthenosphere

23) The weak sphere of Earth is called the
A) asthenosphere
B) lithosphere
C) upper mantle
D) outer core

24) The definition of plate tectonics is ____.
A) isostatic adjustment of Earth’s crust
B) the separation of mantle and core
C) the movement and deformation of Earth’s crust
D) thickness of the asthenosphere

25) What is a batholith? Name one batholith in California.
A) basaltic lava flows, Modoc Plateau
B) igneous plutonic rock in magmatic arcs, Sierra Nevada
C) one stock, Sierra Nevada
D) igneous plutonic rock in island arcs, Sierra Nevada

26) The boundary between crust and mantle is called __.
A) Moho
B) Low velocity zone
C) Lithosphere
D) asthenosphere

27) Peridotite is rock that composes the upper mantle. The upper mantle is also called __.
A) crust
B) mantle
C) crust lithosphere
D) mantle lithosphere

28) What is the Benioff zone?
a. zone of earthquakes in subduction zone
b. zone of earthquakes in transform fault
c. zone of earthquakes in divergent margins
d. zone of earthquakes in San Andreas Fault

29) What provides the lubrication for plate tectonics?
A) lithosphere
B) liquid outer core
C) asthenosphere
D) ocean seawater
30) What causes the mantle to melt at subduction zones (~100 km to 150 km depth) to form arc volcanoes?
   A) higher temperature
   B) dewatering of ocean lithosphere
   C) mantle plumes

31) Island arcs occur in ____ tectonic settings.
   A) ocean-ocean convergent
   B) ocean-continent convergent
   C) transform
   D) divergent

32) The San Andreas is ____ transform fault.
   A) right-lateral
   B) left-lateral
   C) fracture zone
   D) thrusting

33) The Hawaiian Islands are a volcanic chain formed in ____ tectonic setting.
   A) Convergent
   B) Transform
   C) Hot Spot
   D) Divergent

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

35) On the diagram below, label the Benioff zone, accretionary wedge (mélange), batholith, continental magmatic arc, arc-trench gap, and ocean trench (6 pts).

36) On the following, label the natural provinces.