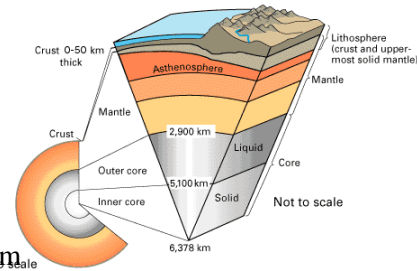


8) When the Earth was a Molten mass, it's elements and compounds separated from each other according to their?

- A) density
- B) magnetism
- C) radioactivity
- D) specific heat



9) Mantle convection is

- A) The magnetic reversal of the poles
- B) Materials rising from the mantle spread out sideways and pull continents with them.
- C) Earth's crust being divided into plates that move independently
- D) All of the above

10) What is the composition and density of Continental crust and Oceanic crust?

- A) Continental crust - Granite $\sim 2.7 \text{ g cm}^{-3}$; Oceanic crust - Basalt $\sim 3 \text{ g cm}^{-3}$
- B) Continental crust - Basalt $\sim 2.7 \text{ g cm}^{-3}$; Oceanic crust - Granite $\sim 3 \text{ g cm}^{-3}$
- C) Continental crust - Granite $\sim 3 \text{ g cm}^{-3}$; Oceanic crust - Basalt $\sim 2.7 \text{ g cm}^{-3}$
- D) Continental crust - Basalt $\sim 3 \text{ g cm}^{-3}$; Oceanic crust - Granite $\sim 2.7 \text{ g cm}^{-3}$

11) Which of the following does NOT occur at a plate boundary?

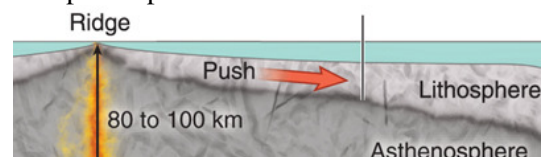
- A) Zone of Convergence
- B) Hot Spot
- C) Zone of Divergence
- D) Transform fault

12) How can Rigid lithospheric plates move about on a sphere?

- A) Because of the existence of transform faults
- B) Because of the existence of subduction zones
- C) Because heat is readily transferred from continental crust to oceanic crust
- D) Because of the magnetic reversal of the poles

13) The Major model(s) that explain(s) the driving force behind lithospheric plate movement is?

- A) The Ridge push - slab pull Model
- B) The Convection currents Model
- C) Both A and C
- D) None of the above



14) Based on the current movements of the Earth's tectonic Plates, which Ocean basin is getting smaller and will eventually disappear?

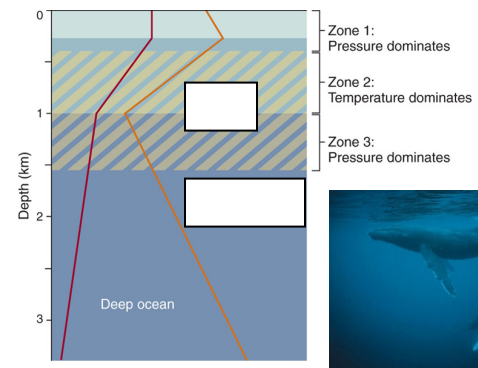
- A) Indian
- B) Atlantic
- C) Southern
- D) N. Pacific

15) How fast does sound travel in miles per hours (MPH) in AIR versus in the Oceans?

- A) AIR- 786 mph, Oceans -3,840 mph
- B) AIR- 786 mph, Oceans -2,840 mph
- C) AIR- 1786 mph, Oceans - 840 mph
- D) AIR- 786 mph, Oceans - 640 mph

16) At which depth range in kilometers (km) is there diminished sound travel and why?

- A) 0.0 - 0.5 km (warmer temperatures)
- B) 0.6 - 1.0 km (rapid temperature change- thermocline)
- C) 1.0 - 1.5 km (rapid pressure changes)
- D) 1.5 - 3.5 km (colder temperatures)



17) Which of the following is not found at the site of a Passive (e.g. Atlantic) margin?

- A) Continental slope
- B) Continental shelf
- C) Trench
- D) Submarine canyon

18) A characteristic feature of an Active margin is

- A) a wide shelf (margin)
- B) lots of sediment accumulation
- C) a plate boundary
- D) none of the above

19) Identify the exchange point(s) of Oceanic water with the Mediterranean Sea?

- A) The Gulf of Suez
- B) The Straits of Gibraltar
- C) The Black Sea
- D) Both A and B



20) Deep Ocean basins contain which of the following?

- A) Abyssal plains
- B) Trenchs
- C) Unique and yet to be discovered new organisms
- D) All of the above

20) Using plankton (foraminifera) shells, what elemental ratio is used to measure cold vs warmer sea water temperatures over time?

- A) delta ^{13}C vs ^{12}C
- B) delat ^{16}O vs ^{13}C
- C) delta ^{18}O vs ^{16}O
- D) delta ^{238}U vs ^{235}U



21) What are Heinrich Events and how many have occurred in the last 750,000 years?

- A) Rapid changes in Earth's global temperature within decades/centuries, 6
- B) Variations in the eccentric distance of the Earth's Orbit around the sun, 7.5
- C) Variations in the Obliquity of the Earth's Orbit around the sun, 18.3
- D) Variations in the Precession of the Earth's Orbit around the sun, 32.6

22) The factor(s) that most influence(s) the solubility (dissolution) of calcite shells is

- A) lower temperature
- B) higher pressure
- C) acidity (lower pH)
- D) All of the above

- 23) The depth where the existence of Calcite shells = their dissolving rate (1:1 ratio) is known as
- A) the Lysocline
 - B) the Calcite Compensation Depth (CCD)
 - C) Both A and B
 - D) None of the above



Shell of Calcite (CaCO_3)

- 24) What organisms produce the most Air (O_2) to the atmosphere, and by how much?
- A) Terrestrial Plants, 60%
 - B) Chemosynthetic bacteria, 70%
 - C) Zooplankton, 60%
 - D) Algae (phytoplankton), 70%

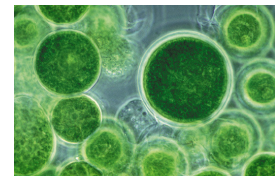
- 25) Why does the N. Pacific **NOT** have the same visible Calcite deposition as the N. Atlantic?
- A) Biological production (phytoplankton blooms) are more abundant in the N. Pacific
 - B) There is no Mid Ocean ridge in the N. Pacific available for accumulation
 - C) The N. Pacific is older
 - D) None of the above

- 27) Which of the following is **NOT** a major constituent (component) of Seawater?
- A) Sodium (Na^+)
 - B) Magnesium (Mg^{2+})
 - C) Potassium (K)
 - D) Chloride (Cl^-)
 - E) Calcium (Ca^{2+})

- 28) Zones of the Water column with No dissolved Oxygen (O_2) are known as _____ regions
- A) Thermocline
 - B) Hypoxic
 - C) Anoxic
 - D) Aerobic

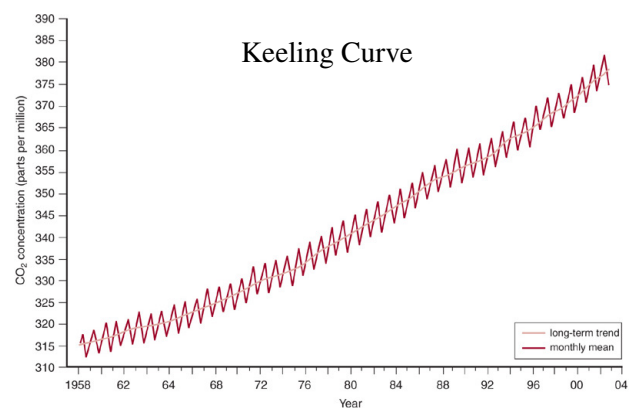
- 29) The Macronutrients (large scale) and Micronutrients (small scale) required for phytoplankton (algae) blooms are:

- A) Macro: Iron (Fe), Silicon (Si); Micro: Nitrogen (N), Phosphorous (P)
- B) Macro: Nitrogen (N), Phosphorous (P); Micro: Sodium (Na), Silicon (Si)
- C) Macro: Iron (Fe), Silicon (Si); Micro: Nitrogen (N), Calcium (Ca)
- D) Macro: Nitrogen (N), Phosphorous (P); Micro: Iron (Fe), Silicon (Si)

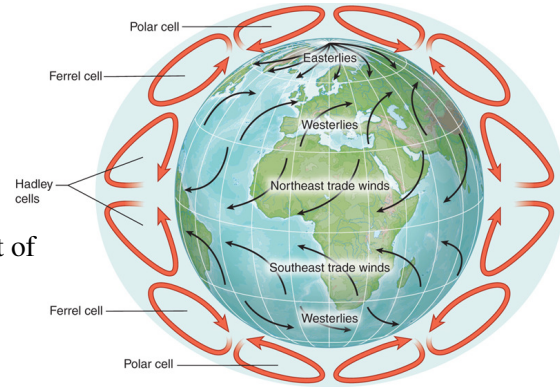


- 30) The Keeling Curve is representative of which Carbon cycle?
- A) The Short Term Organic Carbon cycle
 - B) The Long Term Organic Carbon cycle
 - C) The Long Term InOrganic Carbon Cycle
 - D) All of the Above

- 31) The Sawtooth pattern seen on the Keeling Curve is due to?
- A) Plants consuming CO_2 (level drops)
 - B) Seasonal Temperature changes in the N. Hemisphere
 - C) Animals producing CO_2 (level rises)
 - D) All of the Above

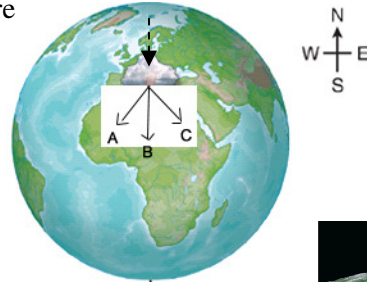


- 32) What is the Study of Climatology?
 A) Study of atmospheric weather and related phenomena
 B) Prediction of weather at any given time and location
 C) Study of LONG term weather or atmospheric patterns
 D) The accumulated weather statistics over defined period of time

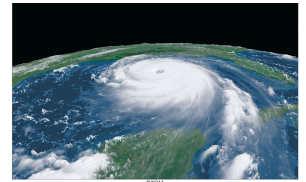


- 33) The paths of the Trade Winds depicted (**black arrows**) are a product of
 A) High and Low Pressure Cells
 B) The Coriolis Effect
 C) Both A and B
 D) None of the Above

- 34) On Earth, as clouds migrate from N to S in the N. Hemisphere they will follow the path(s) of
 A) A
 B) B
 C) C
 D) A or C only



- 35) A Hurricane Forms from
 A) Warmer sea surface water temperatures
 B) The evaporation of seawater into the atmosphere
 C) The condensation of warm water in cold air forming rain at higher altitudes
 D) All of the Above



- 36) What is an *El Nino* Southern Oscillation (ENSO) event a result of?
 A) A relaxing of the Trade winds
 B) The slosh back of Warm H₂O from the Eastern Pacific to the Western Pacific
 C) Both A and B
 D) None of the Above

- 37) Based on Ekman transport what phenomenon(s) occur(s) to the surface currents as you go deeper in depth layers?
 A) They decrease in intensity (velocity)
 B) They deflect more to the right (N. Hemisphere) or left (S. Hemisphere)
 C) Both A and B
 D) None of the Above

- 38) The Pycnocline, which influences the layering of the oceans water masses, is an area of
 A) a rapid change in salinity exclusively
 B) a rapid change in density exclusively
 C) a rapid change in pressure exclusively
 D) a rapid change in temperature exclusively

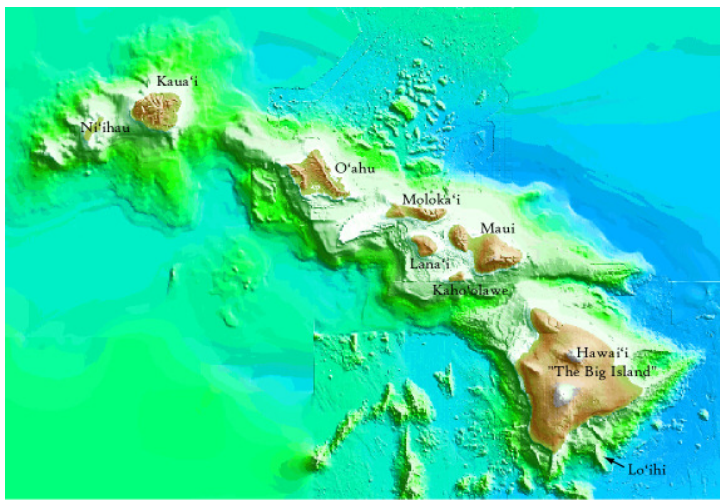
- 39) Which of the following physical properties are involved in facilitating Deep Ocean Water Circulation?
 A) Equatorial (divergence) upwelling
 B) Downward flux - sinking of cold/salty (more dense) water
 C) Coastal upwelling
 D) All of the above

- 40) _____ is Not an Area of Deep water formation that facilitates major Ocean circulation
- A) Antarctic Bottom Water (AABW)
 - B) North Pacific Deep Water (NPDW)
 - C) North Atlantic Deep Water (NADW)
 - D) None of the Above

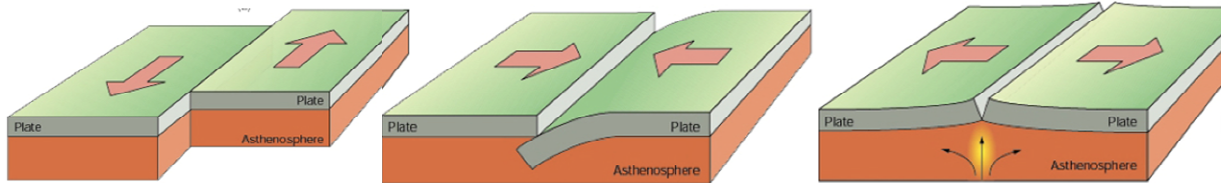
SHORT ANSWER Questions

1. Plate Tectonics & Marine Geology (10 pts)

- a) Draw an Arrow showing the direction of the Pacific Plate movement. (2 pts)
- b) Mark a Circle in the general Vicinity of where the HOT SPOT exists. (4 pts)
- c) Label which Island in the Hawaiian Chain is the Youngest and the Oldest. (4 pts)

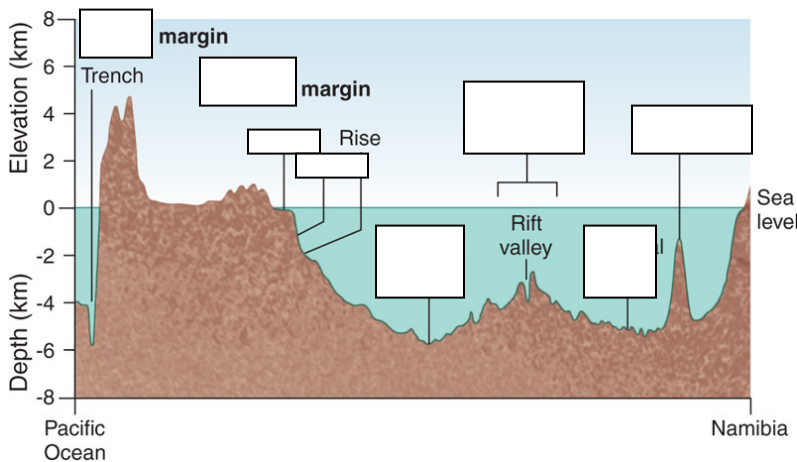


2a. Name the following types of Plate Boundaries: (3 pts)



A. _____ B. _____ C. _____

2b. Fill in the following Boxes below with the proper designations:



- A. Passive Margin
- B. Abyssal Plain
- C. Transform Fault
- D. Seamount
- E. Active Margin
- F. Slope
- G. Mid Ocean Ridge
- H. Shelf
- I. Subduction Zone
- J. Bark Arc basin

3. Winds Patterns - Fill in the Blanks. (10 pts)

- a) Coastal upwelling can only occur on our (West) coast if the wind is blowing from the _____. (2 pts)
- b) If the wind were blowing from the West, the net transport of water should be to the _____. (2 pts)
- c) This effect of water movement relative to wind direction is called _____, and is fundamentally a result of _____. (2 pts)
- d) If, on the other hand, the wind blows from the South for a prolonged period of time on our coast, the process that will occur is _____? (2 pts)
- e) A wind blowing from the direction below is called a _____ wind. (2 pts)



4. Global Atmospheric Circulation. (10 pts)

- a) Label the High and Low pressure Cell(s) below. (4 pts)
- b) Specify which is composed of more dense air, and which is composed of less dense air. (2 pts)
- c) Specify which is composed of Cold air and which composed of Warm Air. (2pts)
- d) Circle which one(s) are involved in the formation of Hurricanes. (2pts)



5. Ocean Circulation. (10 pts)

a) On the World Map below - Identify and name the 4 major Gyre systems. (2 pts)

b) Draw circular arrows to indicate which direction they are circulating (clockwise or counterclockwise). (4 pts)

c) Name two Western Boundary Currents, one in each Hemisphere and draw an arrow to indicate the direction(s). (4 pts)



Extra Credit: **Movie** _ An Inconvenient Truth. (4 pts)

The Name of the Famous Mountain Glacier projected to be gone in the next decade is? (2pts)

The Warmest Year on Record for Temperature measurements according to the Movie is? (2pts)