

1. The primary force or forces causing tides in the ocean are
  - a) undersea earthquakes and landslides.
  - b) wind and storms.
  - c) the gravitational attraction of Mars and Venus.
  - d) the gravitational attraction of the moon and the sun.
  - e) rotation of the moon on its axis.
  
2. The tides at any particular time and location are a result of the interaction of
  - a) sun, moon, and Earth.
  - b) the elliptical orbits of the moon and Earth.
  - c) rotation of Earth.
  - d) size, shape, and depth of the ocean basin.
  - e) all of the above.
  
3. The side of Earth facing the moon experiences a high tide. At the same time, according to the equilibrium theory of tides, the side opposite the moon will experience
  - a) a low tide.
  - b) a high tide.
  - c) a medium tide.
  - d) no tide.
  - e) a tide that can't be predicted until you have local wind data.
  
4. According to the equilibrium theory of tides,
  - a) the ocean bulges both under the moon and opposite the moon, and the earth turns under the bulges.
  - b) the tide is a wave which goes sweeping around the world at 16,000 km per hour.
  - c) the tide is a wave that goes around the earth in the same direction as earth's rotation, but twice as fast.
  - d) the tide rotates around each ocean basin in a circle centered on an androgynous point.
  
5. The moon orbits the earth with a period of about 27 days in an orbital plane angled  $28.5^\circ$  from Earth's equatorial plane. According to the equilibrium theory of tides these two facts combine to produce
  - a) A high tide every 12 hours and 25 minutes whose height may be very different from that of the previous high tide.
  - b) A high tide every 12 hours whose height may be very different from that of the previous high tide.
  - c) A high tide every 12 hours and 25 minutes whose height is approximately the same as that of the previous high tide.
  - d) A high tide every 12 hours whose height is approximately the same as that of the previous high tide.
  
6. The solar tide is \_\_\_\_\_ than the lunar tide because the sun is much \_\_\_\_\_ than the moon.
  - a) larger ... larger
  - b) larger ... closer
  - c) larger ... farther away
  - d) smaller ... closer
  - e) smaller ... farther away
  
7. During a new moon
  - a) tides are at their minimum.
  - b) high tides are highest and low tides are lowest.
  - c) the gravitational attraction of the moon is reduced.
  - d) high tides are delayed.

8. Differences between the equilibrium theory of tides and the dynamic theory of tides include which of the following?
- The equilibrium theory does not account for continents whereas the dynamic theory does.
  - The equilibrium theory accounts for true ocean depth whereas the dynamic theory assumes ocean depth is 22 km.
  - The equilibrium theory does not account for the shape of ocean basins whereas the dynamic theory does.
  - a) and b) above
  - a) and c) above.
9. A tide pattern of one high and one low tide each day describes a(n)
- diurnal tide.
  - mixed tide.
  - semidiurnal tide.
  - amphidromic tide.
  - reversing tide.
10. The tide patterns characteristic of San Diego are
- diurnal tides.
  - mixed tides.
  - semidiurnal tides.
  - amphidromic tides.
  - reversing tides.
11. According to the dynamic theory of tides, the tidal pattern in a Northern Hemisphere basin might be characterized by
- a tidal crest that moves clockwise along the edges of the basin around a “no tide point” called the *amphidromic point*.
  - a tidal crest that moves counterclockwise along the edges of the basin around a “no tide point” called the *amphidromic point*.
  - a tidal crest that moves clockwise along the edges of the basin around a “high-tide point” called the *amphidromic point*.
  - a tidal crest that moves counterclockwise along the edges of the basin around a “high tide point” called the *amphidromic point*.
12. In San Diego tidal height is measured relative to a \_\_\_\_\_ which is given by \_\_\_\_\_
- tidal datum ... mean sea level.
  - tidal datum ... mean lower low water (MLLW).
  - tidal datum ... mean low water (MLW).
  - tidal range ... mean sea level.
  - tidal range ... mean low water (MLW).
13. A *tidal bore* is
- an open ocean wave produced by the tide crest running around an amphidromic point.
  - a wave produced in a narrow inlet or river by the incoming tide.
  - any shallow-water wave focused by refraction onto a point of land.
  - the refractive focusing of the tide crest onto a point of land.
  - a person who can name all 140 tide-generating forces used to predict the magnitude and timing of tides.
14. The tidal current flowing into Mission Bay will have maximum velocity
- at high tide.
  - about 6 hours and 12 minutes before high tide.
  - about 6 hours and 12 minutes after high tide.
  - about 3 hours and 6 minutes before high tide.
  - about 3 hours and 6 minutes after high tide.

15. Tidal friction causes which of the following?
- a) A gradual increase in the length of the day.
  - b) A gradual increase in the length of the year.
  - c) A gradual decrease in the length of the day.
  - d) A gradual decrease in the length of the year.
  - e) no change in either the length of the day or of the year.
16. Sketch a cross-section of Earth showing the shape of the lunar tides according to the equilibrium theory of tides.
17. Sketch the position of the sun and moon during a) a full moon, b) a new moon, c) a quarter moon. Use the sketches to show why we get spring tides with a full moon and a new moon, and neap tides with a quarter moon.
18. Sketch a typical amphidromic tidal system in an ocean basin. Show the amphidromic point and the position of the tide crest as a function of time.
19. Explain to your grandmother how the tides work. Include in your explanation the role of the moon and sun, why the tides rise and fall in wave-like fashion, and why we San Diego experiences a high tide before Los Angeles does.