



Currents Subject Review

The following questions are based on information from the Tutorial on Currents (<http://oceanservice.noaa.gov/education/kits/currents/welcome.html>).

1. The _____ of currents includes speed and direction components.
2. Three factors that drive ocean currents are _____.
3. When a coastal tidal current _____ it moves toward the land and away from the sea. When a coastal tidal current _____ it moves toward the sea away from the land.
4. As a coastal tidal current moves from ebbing to flooding (and vice versa), there is a period during which there is no current velocity. This period is called _____.
5. Tidal currents are most strongly influenced by motions of the _____.
6. When the moon is at full or new phases, the tidal current velocities are _____ and are called _____. When the moon is at first or third quarter phases, tidal current velocities are _____ and are called _____.
7. “_____ currents” occur when the moon and Earth are closest to each other. “_____ currents occur when the moon and Earth are farthest from each other.
8. Wave height is affected by wind _____, wind _____, and _____.
9. Breaking waves are caused by _____.
10. When a wave reaches a beach or coastline, it releases a burst of energy that generates a current, which runs parallel to the shoreline. This type of current is called a _____.

11. Water flowing in a longshore current can transport beach sediment and cause significant beach erosion through a process known as _____.
12. A localized current that flows toward the ocean, perpendicular or nearly perpendicular to the shoreline is called a _____.
13. Swimmers caught in a rip current can escape by _____.
14. A long offshore deposit of sand situated parallel to the coast is called a _____.
15. _____ occurs when winds blowing across the ocean's surface push water away from an area, causing subsurface water to come up from beneath the surface to replace the diverging surface water. Areas where this occurs are often good for _____, because _____.
16. Earth's rotation causes air circulating in the atmosphere to deflect toward the right in the Northern Hemisphere and toward the left in the Southern Hemisphere. This deflection is called _____.
17. Between 5 degrees North latitude and about 25 degrees North latitude, surface winds generally blow from the northeast to the southwest, and are known as the _____.
18. Between 5 degrees North and 5 degrees South latitude, where the winds are generally sporadic and have little or no velocity. This region is called _____.
19. Between about 35 degrees North latitude and about 55 degrees North latitude, surface winds generally blow from the west, and are known as _____.
20. Global winds drag on the ocean's surface, causing the water to move in the direction that the wind is blowing and thus create surface ocean currents. Deflection of these currents by Earth's rotation produces spiral currents called _____.

21. Each of the major ocean-wide gyres is flanked by a strong and narrow “western boundary current,” and a weak and broad “eastern boundary current.” The western boundary current of the North Atlantic gyre is called _____, and the eastern boundary current of this gyre is known as _____.
22. When surface water molecules move by the force of the wind, friction with water molecules below them causes movement of deeper water layers. Deeper layers move more slowly than shallower layers, however, and all layers are deflected by Earth’s rotation (to the right in the Northern Hemisphere and to the left in the Southern Hemisphere). These forces create a spiral effect called _____.
23. Deep-ocean currents below 100 meters are driven by _____, in a process known as _____.
24. The global-scale system of deep-ocean currents is sometimes called the _____.
25. Global ocean circulation resulting from deep-ocean currents is vital to the world’s food chain because _____.
26. Global ocean circulation resulting from deep-ocean currents could be disrupted by global warming if _____.
27. Ocean and coastal current velocities are typically are measured in _____, which is equal to about _____ standard (or “statute”) miles per hour or about _____ kilometers per hour.
28. Current measurements made with drifters are termed “_____ measurements,” while measurements of the speed and direction of a fluid at a single point are termed “_____ measurements.”

Answers:

- (1) The *velocity* of currents includes speed and direction components.
- (2) Three factors that drive ocean currents are *tidal motion, wind, and differences in water temperature and salinity in different parts of the ocean (thermohaline circulation)*.
- (3) When a coastal tidal current *floods*, it moves toward the land and away from the sea. When a coastal tidal current *ebbs*, it moves toward the sea away from the land.
- (4) As a coastal tidal current moves from ebbing to flooding (and vice versa), there is a period during which there is no current velocity. This period is called *slack water*.
- (5) Tidal currents are most strongly influenced by motions of the *moon*.
- (6) When the moon is at full or new phases, the tidal current velocities are *strong* and are called *spring currents*. When the moon is at first or third quarter phases, tidal current velocities are *weak* and are called *neap currents*.
- (7) *Perigean currents* occur when the moon and Earth are closest to each other. *Apogean currents* occur when the moon and Earth are farthest from each other.
- (8) Wave height is affected by wind *speed*, wind *duration*, and *fetch (the distance over water that the wind blows in a single direction)*.
- (9) Breaking waves are caused by *friction between the seafloor and the water*.
- (10) When a wave reaches a beach or coastline, it releases a burst of energy that generates a current, which runs parallel to the shoreline. This type of current is called a *longshore current*.
- (11) Water flowing in a longshore current can transport beach sediment and cause significant beach erosion through a process known as *longshore drift*.

- (12) A localized current that flows toward the ocean, perpendicular or nearly perpendicular to the shoreline is called a *rip current*.
- (13) Swimmers caught in a rip current can escape by *swimming parallel to the shore instead of towards it, or by letting the current carry them out to sea until the force weakens*.
- (14) A long offshore deposit of sand situated parallel to the coast is called a *barrier island*.
- (15) *Upwelling* occurs when winds blowing across the ocean's surface push water away from an area, causing subsurface water to come up from beneath the surface to replace the diverging surface water. Areas where this occurs are often good for *fishing*, because *subsurface water is typically rich in nutrients, which support the growth of marine algae that provide food for other species*.
- (16) Earth's rotation causes air circulating in the atmosphere to deflect toward the right in the Northern Hemisphere and toward the left in the Southern Hemisphere. This deflection is called *the Coriolis effect*.
- (17) Between 5 degrees North latitude and about 25 degrees North latitude, surface winds generally blow from the northeast to the southwest, and are known as the *trade winds*.
- (18) Between 5 degrees North and 5 degrees South latitude, where the winds are generally sporadic and have little or no velocity. This region is called *the doldrums*.
- (19) Between about 35 degrees North latitude and about 55 degrees North latitude, surface winds generally blow from the west, and are known as *westerlies*.
- (20) Global winds drag on the ocean's surface, causing the water to move in the direction that the wind is blowing and thus create surface ocean currents. Deflection of these currents by Earth's rotation produces spiral currents called *gyres*.

- (21) Each of the major ocean-wide gyres is flanked by a strong and narrow “western boundary current,” and a weak and broad “eastern boundary current.” The western boundary current of the North Atlantic gyre is called *the Gulf Stream*, and the eastern boundary current of this gyre is known as *the Canary Current*.
- (22) When surface water molecules move by the force of the wind, friction with water molecules below them causes movement of deeper water layers. Deeper layers move more slowly than shallower layers, however, and all layers are deflected by Earth’s rotation (to the right in the Northern Hemisphere and to the left in the Southern Hemisphere). These forces create a spiral effect called the *Ekman spiral*.
- (23) Deep-ocean currents below 100 meters are driven by *differences in the water’s density*, in a process known as *thermohaline circulation*.
- (24) The global-scale system of deep-ocean currents is sometimes called the *global conveyor belt*.
- (25) Global ocean circulation resulting from deep-ocean currents is vital to the world’s food chain because *warm surface waters that have been depleted of nutrients by biological activity are enriched with these nutrients as they circulate as deep- or bottom-water layers*.
- (26) Global ocean circulation resulting from deep-ocean currents could be disrupted by global warming if *increased rainfall in the North Atlantic and melting of glaciers and sea ice reduced the sinking of cold, salty water*.
- (27) Ocean and coastal current velocities are typically measured in *knots*, which is equal to about *1.15* standard (or “statute”) miles per hour or about *1.85* kilometers per hour.
- (28) Current measurements made with drifters are termed *Lagrangian* measurements, while measurements of the speed and direction of a fluid at a single point are termed *Eulerian* measurements.