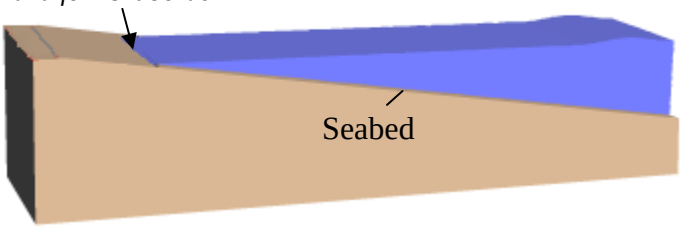
Oceans – Practice Questions and Answers

Revised August 2008

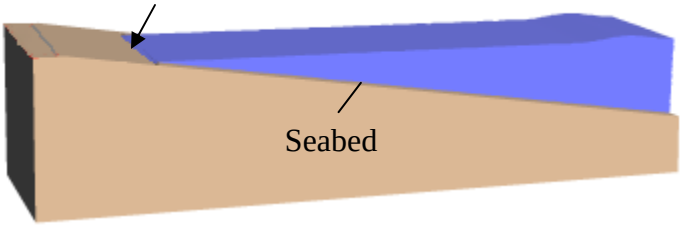
1. In the following illustration what do you call the land that borders the oceans?

All of the landmass to the left of this line lies adjacent to the ocean and forms it border

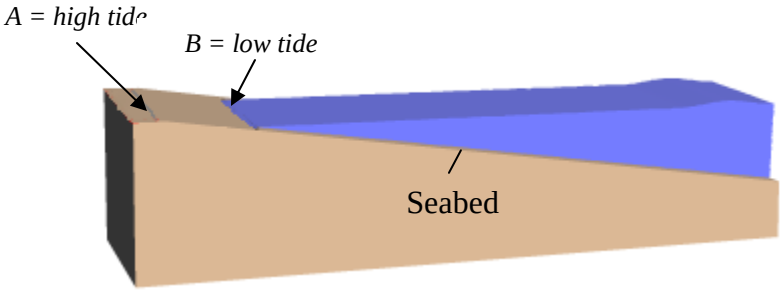


2. In the following illustration what is the name of the line separating the shore from the ocean?

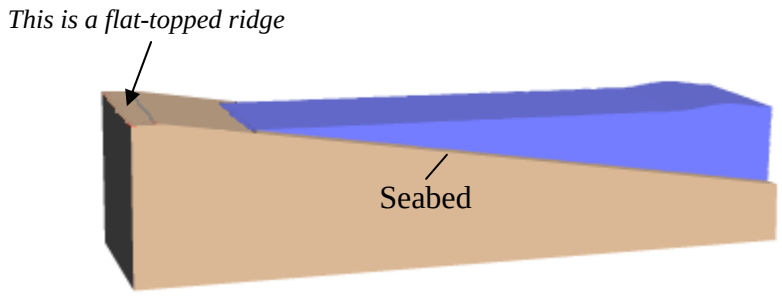
This line separates the shore from the ocean, i.e., it represents the contact between water and land



3. As shown in the following illustration, what do you call the strip of land lying between low and high tide?

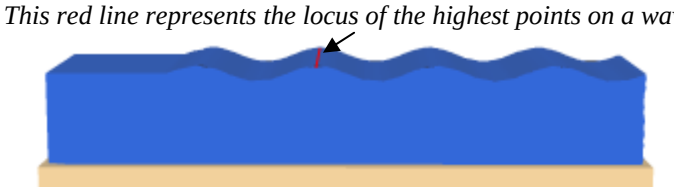


4. What do call the flat-topped ridge illustrated in the following image? Note that sand or gravel is only deposited there during high tide.

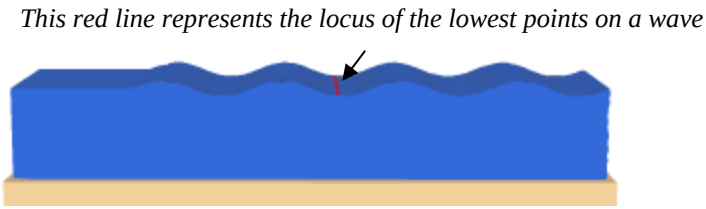


5. What is the name of the feature that is defined as the area along the shore extending from the seaward position where sand particles are moved by waves to the landward edge of the permanent coast?

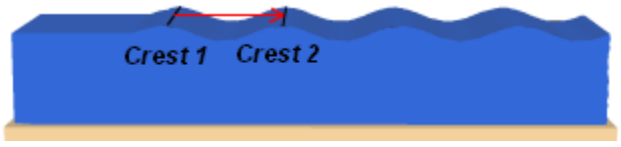
6. What is the name of the feature illustrated below?



7. What is the name of the feature illustrated below?



8. What is the name of the feature illustrated by the length of the red arrow below?

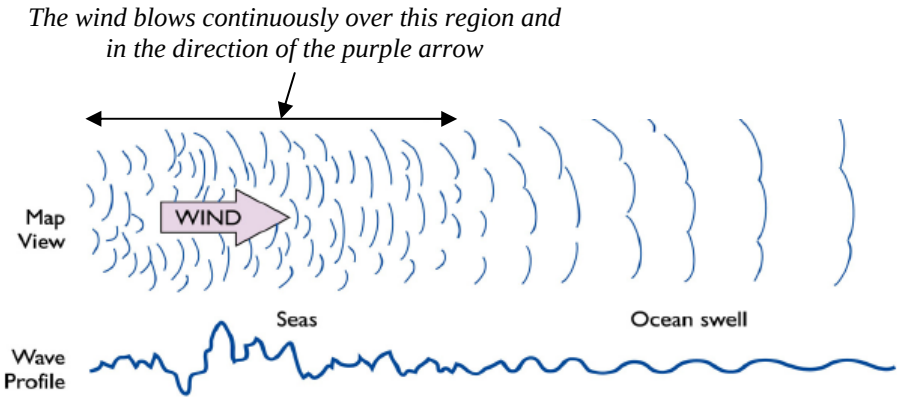


9. What is the period of an ocean wave?

10. What do you call the vertical distance from trough to crest?

11. If a typical wave had a wavelength of say 40 meters, and a period of 8 seconds, then what is its speed?

12. In the following illustration what do you call the region over which wind blows continuously?



13. Please review the wave profile shown in the illustration for question 12. As waves generated within a storm move outward away from the storm center and begin their travels to distant shorelines what happens to their crest lines?

14. The range of the period of common swell is ____ to ____ seconds.

15. The range of the wavelengths of common swell varies from____ to _____ meters

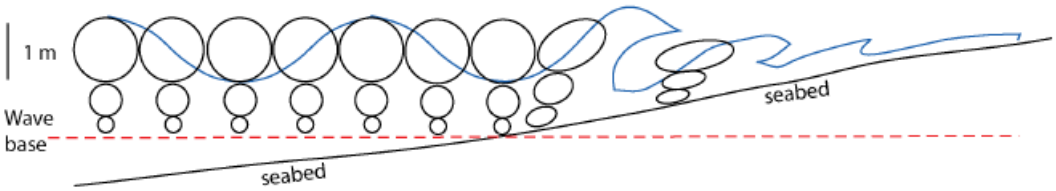
16. There is a mathematical relationship between wavelength and wave base for deep water ocean waves. What is that relationship?

17. Particles lying above wave base follow what kinds of paths as swell pass through a given volume of seawater?

18. Does the diameter of the circular path followed by particles above wave base increase or decrease with depth?

19. If you were in a submarine approaching a swell with a wavelength of 800 meters, then at what depth would you have to dive to in order to escape the effects of the oncoming swell?

20. Please review the following illustration, and then describe the condition under which a deep-water wave becomes a shallow-water wave?



21. What happens to wavelength as deep water waves become shallow water waves?

22. What happens to wave height as deep water waves become shallow water waves?

23. What happens to wave period as deep water waves become shallow water waves?

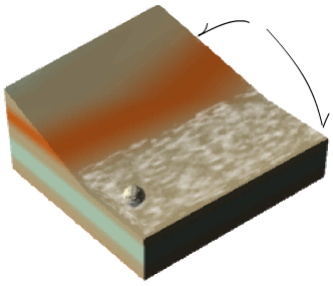
24. When the water depth is one-half the wavelength of a deep-water wave, water particles just above the bottom follow what kind of a path?

25. Because water particles in a shallow-water wave follow a back-and-forth elliptical path it takes longer for water particles to complete their circuits than do water particles higher in the water column. As a result the seabed is said to exert what on the advancing wave?

26. When does an advancing shallow-water wave become unstable and start to break?

27. What is the name of the feature shown in the following illustration?

Within this zone surf runs up and then down this surface

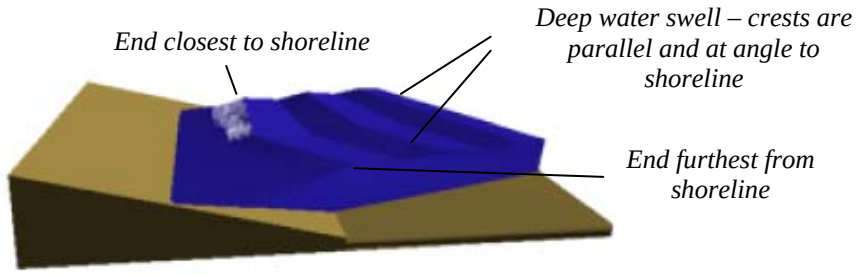


28. What is the name given to surf rushing up the shore face?

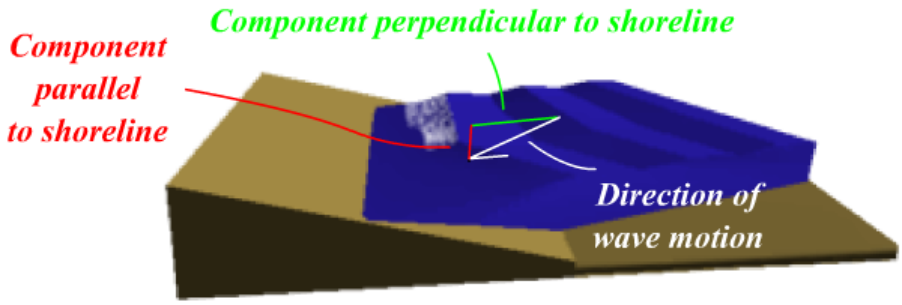
29. What is the name given to surf running back down the shoreface?

30. Grains of sand caught in the swash zone will be dragged, pushed, and carried up the shore face in the direction of the swash, and then will be dragged, pushed, and carried down the shore face by the backwash acting under the influence of gravity. This process results in grains of sand being slowly translated down the beach. What is this overall process called?

31. Please review the following illustration. Note that as the swell approaches the shore the crests are even and parallel but at an angle to the shoreline. When this geometry occurs, the end of the approaching wave that is closest to the shoreline will feel the drag created by the seabed before the deeper water end does. Hence, it slows down and eventually breaks while the end furthest from the shoreline maintains its deep-water form and speed. As shown in the illustration what is the ultimate result of this overall process?



32. The velocity of a wave is a vector as it has both magnitude and direction. In the following illustration the general vector showing the direction and magnitude of the approaching swell is broken down into components that are perpendicular and parallel to the shoreline. Which of these two components is responsible for long shore currents?



33. Along a coast line long shore currents traveling in opposite directions commonly meet. When this happens they turn and flow back out to sea. What are these seaward flowing currents called?

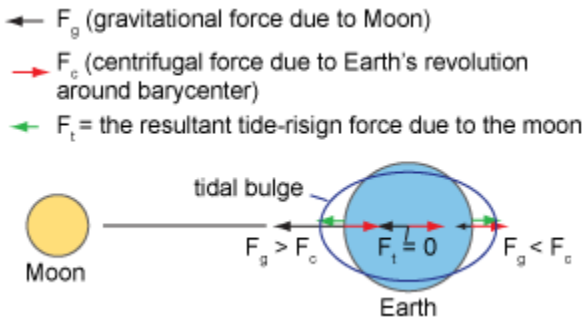
34. How many tides occur in every 24 hour day?

35. What is the common center of mass of the Earth-Moon pair called?

36. Where is the common center of mass of the Earth-Moon pair located?

The following 5 questions (37 – 41) relate to the illustration shown below

Force vectors have both direction and magnitude.
The lengths of the force vectors (the arrows) shown below are proportional to magnitude.
The points of the arrows indicate the direction of the force.



37. Inertial forces acting within the Earth-Moon pair are sometimes referred to as "outward" or "center" fleeing or “centrifugal” forces. After reviewing the above illustration are they everywhere the same on and within the Earth?

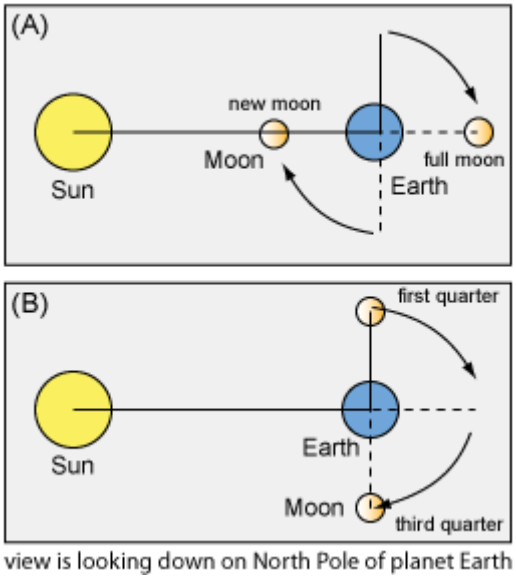
38. According to Sir Issac Newton, the gravitational pull of the Moon on any point on the Earth will vary inversely as the second power of the distance of that point from the Moon. After reviewing the above illustration is the gravitational attraction of the Moon everywhere the same on the Earth?

39. After reviewing the above illustration is the gravitational force of the Moon on the surface of the Earth facing the Moon greater or less than the inertial force?

40. After reviewing the above illustration is the gravitational force of the Moon on the surface of the Earth facing away from the Moon greater or less than the inertial force?

41. What effect do your answers to the two previous questions imply about the world’s oceans or hydrosphere?

The last set of questions relate to the following illustration.



view is looking down on North Pole of planet Earth

42. Please review the above illustration. As shown in (A) twice a month the centers of the Sun, Moon, and Earth are aligned in a straight line? During these events the gravitational field of the Sun works in concert with the gravity field of the Moon resulting in a tidal range higher than normal. What are these tides called?

43. As shown in (B) twice a month the centers of the Moon and Earth are aligned in a straight line at a right angle to the center of the Sun. During these events the gravity field of the Sun counteracts that of the Moon resulting in tidal ranges that are less than normal. What are these tides called?

Answers

1. The shore is the land bordering the oceans.
2. shoreline
3. The beach or shore face.
4. berm
5. This is the technical definition of a beach.
6. crest or crest line
7. trough or trough line
8. wavelength
9. The period is the time it takes successive crests or troughs to pass a stationary point
10. wave height
11. The magnitude of the velocity or speed is wavelength divided by time; hence, the velocity is 40 meters/8 seconds or 5 meters/sec.
12. Fetch is the maximum distance over which a given wind blows.
13. They become lower, more rounded, symmetrical, and sinusoidal in form.
14. 6, 16
15. 56, 400
16. Wave base is the limiting depth of particle motion as swell passes through a volume of seawater. It is equal to ½ the wavelength, i.e., wave base = (1/2) * λ, where λ is wavelength.
17. They follow a circular path.
18. The diameter decreases with depth.
19. The answer is 800 meters/2 = 400 meters
20. When the seabed rises above wave base, then a deep water wave becomes a shallow water wave.
21. Wavelength decreases
22. Wave height increases
23. Wave period remains unchanged
24. They begin to follow an elliptical rather than circular path.
25. traction or resistance to forward movement
26. When the water depth reaches about 1.3 times its height it will break.
27. swash zone
28. swash
29. backwash
30. long shore drift
31. wave refraction – the bending of crestlines into parallelism with the shore line
32. The component of wave motion that is parallel to the shoreline.
33. rip currents
34. 4 – 2 high and 2 low
35. barycenter
36. The barycenter lies along a line connecting the centers of the Earth and Moon, at a point about 1707 km (~1068 miles) below the surface of the Earth that faces the moon.

37. yes
38. no
39. The gravitation force is greater than the inertial or centrifugal force.

40. The gravitation force is less than the inertial or centrifugal force.
41. The hydrosphere (e.g., oceans) bulges toward the moon on the side of the Earth facing the moon, and away from the moon on the side of the Earth facing away from the moon. The Earth spins beneath these bulges resulting in two low and two high tides every 24 hours.
42. Spring
43. Neap