**Oceans and Shorelines II**

(p. 614-635)

**Deposition Along Shorelines**

Waves that strike a shoreline obliquely set in motion a longshore current parallel to the shoreline. The longshore current transports eroded sediment along the coastline.

The transportation of this sediment occurs by waves washing up the beach obliquely then returning directly to the sea. The swash and sediment therefore zig-zags along the beach in a process called ____________________.

Even large pebbles can get moved by several hundred meters a day by longshore drift.

What are the three categories of depositional features produced by the deposition of sediment carried by longshore currents?

1. ____________________
2. ____________________
3. ____________________

**Beaches**

A **beach** consists of unconsolidated sandy sediment (i.e., it hasn't turned into rock yet).

What are the boundaries or limits of a beach? ____________________

__________________________________________________________

Beaches are constantly changing, with sediment being added and removed. In calm weather, beaches receive more sediment that they lose and get wider. During storms, beaches may lose a lot of sediment to erosion so they get thinner. Beaches may be long and continuous of they may occur as small, isolated beaches between rocky outcroppings, in which case they are called ____________________.

What are the two components of a typical beach?

- ____________________
- ____________________

The backshore is usually dry, only being covered by water during storms or very high tides. Platforms of sand deposited by waves on the backshore are called ____________.
What is the foreshore?

The sloping region on the foreshore that faces the sea and is exposed to wave swash is called the ________________.

What can be built along a shoreline to catch the sand being carried away by longshore drift and protect the beach from being eroded away? ________________

What are the main components of beach sand?

__________________________________________________________________

Spits

Longshore drift carries sediment along the coastline until it reaches some sort of obstruction. For example, where a river flows into the ocean.

How does a spit then form? ________________________________

You can tell the direction of the longshore current by looking at a spit because the spit will jut across a river mouth or bay in what direction?

__________________________________________________________________

If the spit completely covers the river mouth, it is called a _________________.

During periods of heavy river discharge or at high tide, the river may be open to the ocean through the spit, but is closed to the ocean at low tide or during low discharge periods.

The end of a spit sometimes gets curved or hooked as result of wave refraction, in which case it is called a _________________.

Sometimes, an island just offshore can get connected to the mainland by an arm of sediment deposited by longshore drift. This is called a _________________.

Barrier Islands

Barrier islands are long lines of sandy offshore islands, parallel to the coastline but separated from the shoreline by a lagoon or bay that is several km or 10s of km wide.

Example of a barrier island location: ________________________________
Barrier islands form as a result of longshore drift. They probably start out as spits that get reworked by the action of waves. Usually a chain of barrier islands forms along the coastline. The highest points on these islands are sand dunes.

Which side of the barrier island is smooth? ________________

Which side of the barrier island is irregular? ________________

Barrier islands also tend to move around as sediment gets redistributed. Because sea level is currently rising due to global warming, wave action is pushing barrier islands closer to the continents.

Example: ____________________________ (moved _____ m landward in 70 yrs)

Another example of migrating barrier islands on the east coast: ____________________________

This is a problem for communities that have developed on barrier islands because their homes are sitting on sand that is eventually going to be reclaimed by the sea.

**Erosion Along Shorelines**

Along some coastlines, the predominant process is erosion rather than deposition. In such cases, beaches are usually absent or poorly developed, and ________________ typically develop.

These cliffs are constantly being eroded by the force of the waves pounding against them. What are the three processes by which sea cliffs get eroded by the ocean?

1) ____________________________ (the force of the waves pounding against the cliff)

2) ____________________________ (sand and pebbles grind away at the rocks)

3) ____________________________ (chemical reactions by seawater erode the cliffs)

**Wave-Cut Platforms**

Erosion of sea cliffs causes them to retreat in towards land. As the cliff retreats, it leaves behind a flat or gently sloping surface underneath shallow water. This is called a ________________. Material that is eroded off of the cliff is transported across the platform and deposited at its edge, forming a ________________.
The main cause of sea cliff retreat is hydraulic action and abrasion at the base of the cliff, causing the front edge to collapse into the waves. The rate at which the sea cliff retreats varies with the rock type and the frequency of storms, which is when erosion is most effective.

What rock type is most prone to erosion? ____________________

Example: ____________________ are retreating at ~ _____ m per century.

Sometimes, wave-cut platforms are lifted out of the water by tectonic forces and become flat areas immediately along the shoreline, called ____________________. This also happens when sea level drops relative to the land (e.g. during ice ages).

In general, erosion of sea cliffs is not uniform along the coastline because some rocks may be more resistant to erosion than others. This results in promontories being left behind, jutting out into the ocean. These are called ____________________ and are separated from each other by ____________________ which may contain pocket beaches.

Wave refraction around headlands causes waves to attack at both sides of the headland. This may result in the development of ________________ along the sides of the headland.

If two caves on opposite sides of a headland join together, this forms a ________________ through the headland. If the roof then collapses, this leaves behind an island at the end of the old headland and is called a ________________.

Because wave action is concentrated on the headlands, they are more susceptible to erosion, whereas the embayments between them are more susceptible to deposition. This causes the headlands to be eroded back, while pocket beaches in the embayments build outwards. The overall effect is to _____________________.

**Types of Coastlines**

The dominant processes along coastlines are either erosion or deposition, and some coastlines may be dominated by one of these processes.

Depositional coastlines have plenty of sediment supply and form wide, sandy beaches, deltas, and barrier islands.

Example: ____________________

Erosional coastlines are steep and irregular with few well developed beaches, and lots of sea cliffs, wave-cut platforms, and sea stacks.

Example: ____________________
We can also consider coastlines in relationship to changes that are occurring in sea level with respect to the land.

The two types of coasts are ____________________ and ____________________.

**Submergent Coasts**

If sea level rises with respect to the land or the land subsides, coastal regions get flooded and are called submergent or drowned.

When sea level dropped by 130 m during the last ice age, rivers along the east coast of North America eroded new canyons into the exposed shelf. When sea level rose again after the ice age, the canyons got submerged, forming an irregular coastline.

The drowned river valleys formed large ______________, which are the seaward ends of river valleys where freshwater and seawater start to mix.

Example: ______________________________

**Emergent Coasts**

Emergent coasts form where the land has risen with respect to sea level, due either to a drop in sea level during ice ages or uplift of the land.

Uplift of the land can be produced by tectonic forces or due to the land bouncing back up after an ice age because the weight of the glaciers was removed. This effect is called ____________________.

It is still occurring today, especially in places that were once heavily glaciated such as NE Canada and Scandinavia. Such coastlines tend to be very irregular because they were heavily eroded during glaciation.

Uplift by tectonic forces tends to produce smoother coastlines because the smooth seafloor topography is getting exposed (e.g., west coasts of North and South America). ______________ are a common feature in such locations. Tectonic uplift may occur in steps, separated by periods of no uplift during which time new wave-cut platforms form. Then, when uplift continues, the new wave-cut platform also becomes a marine terrace. This forms a stair-step effect with multiple marine terraces.

**FINAL QUESTION:**

What is the height above sea level of marine terraces along the coast of California?

______________________________