Hydrosphere

How much of the Earth’s surface is covered by water? ________

Earth’s water is collectively called the _______________ and is stored in a number of so-called _______________ as follows:

1. _______________  2. _______________  3. _______________
4. _______________  5. _______________  6. _______________
7. _______________

Most of the world’s water is in the oceans (i.e. most water is salty). How much? ________

The second largest accumulation of water, about 2.1%, is stored in _______________

In other words, about 74% of the world’s fresh water supply is _______________
Out of all the liquid fresh water we have, about 99% of it is stored _______________

Although very little of the Earth’s water flows through rivers, running water is the most important geologic process for modifying the Earth’s land surface. Huge volumes of water move through Earth’s rivers each year.

The constant shifting or recycling of water from the oceans, to the atmosphere, to the continents, and back to the oceans is called the ______________________.

On a local scale there may be sudden fluctuations, such as floods or droughts. Individual reservoirs may also have prolonged changes due to global climate changes.

The processes by which water travels between the reservoirs include:

• _______________ : water changes from a liquid to a gas, driven by the Sun’s energy
• _______________ : water taken up by plant roots then moves into the atmosphere
• _______________ : atmospheric water vapor changes into a solid or liquid
• _______________ : condensed water that falls to the ground (rain, snow or hail)
• _______________ : water that is transported across the land surface (e.g. in rivers)
• _______________ : water that seeps into the ground

The amount of time that water molecules spend in any reservoir is called the: _______________________

What is the residence time in the following reservoirs?

Oceans and ice sheets: ______________________
Rivers and Channel Flow

When water falls onto the land, it will either be absorbed into the soil, which is a process called ________________, or it will flow down-slope.

How much water is absorbed into the soil depends on the soil’s ________________.

Which of the following soils are good at absorbing water?

1) loosely packed, dry soils  YES / NO
2) tightly packed or wet soils  YES / NO
3) hard, dry baked soil and rock surfaces  YES / NO

Water that does not infiltrate flows down-slope over the surface as ________________. Initially, the water forms a thin film or sheet of water across the surface, called ________________ or ________________. This may result in a type of erosion called ________________, which removes crucial topsoil in agricultural areas.

After travelling a short distance, sheet flow becomes more confined into discrete channels, and is then called ________________. Any body of water that flows in a channel is called a stream or a river.

These channels can vary from the tiniest trickle to the largest rivers like the Amazon in South America, which is longer than the width of the USA, up to 1.5 mi wide and up to 300 ft deep.

What are the six main controls on the nature of channel flow?

1) ________________ = vertical drop/horizontal distance (variable along stream).
   Where is the channel gradient usually the greatest? ________________

2) ________________ = width x depth

3) ________________ - distance traveled divided by time taken (m/s). Slower along the bed and banks due to friction. Varies with channel shape.
   What are the two types of flow? ________________ and ________________
4) ____________________ - amount of water per unit time (m³/s). Varies with the amount of precipitation.

What river has the world's highest discharge? __________________

5) ____________________ - boulders and gravel increase the frictional resistance to flow, but clay creates a smooth surface for water to flow over.

6) ____________________ - amount of sediment carried by the water.

What are the 3 types of stream load?  
1. ___________________________  
2. ___________________________  
3. ___________________________

Channel Types

Stream channels are variable in terms of their width, depth, and surface appearance.

Some channels appear straight, but don't stay straight for very long. Even when the channel appears straight, the path of the deepest and fastest flow may wind its way back and forth across the channel. This is called a ________________ channel. It snakes its way towards the ocean along the steepest gradient. There are two different types of stream channels: **meandering** and **braided**.

**Meandering Channels**

When the gradient is low, the channel tends to become so sinuous that it develops a series of looping curves, called ________________, thus forming a meandering channel.

Meanders have a steep bank on the outer part of a bend, called a ________________, but have a gently sloping surface on the inside of a bend, called ________________. As the river meanders downstream, point bars and cut banks alternate from one side of the channel to the other.

The water is deepest and the velocity is greatest on the outside of the bend but on the inside of the bend, water velocity is very low.

What process dominates on the outside/inside of the bend?

<table>
<thead>
<tr>
<th>Inside (point bar)</th>
<th>EROSION or DEPOSITION</th>
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<tr>
<td>Outside (cut bank)</td>
<td>EROSION or DEPOSITION</td>
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So what side of the meander should you not build a house? __________________

Erosion of the cut bank causes the channel to migrate laterally into the bank, perpendicular to the flow direction. The channel meanders thus get wider and point bars grow outwards across the old path of the channel through a process called: ____________________
Sometimes, the meanders get so pronounced that two cut banks in adjacent meanders cut through to each other. This allows the river to cut off the meander, straightening the river course. The cut off meander will eventually form a horseshoe shaped lake called an _______________________.

**Braided Channels**

A **braided channel** forms when a channel is unable to carry the large load of sediment it has eroded, so it deposits it within the stream channel as a number of almond shaped mounds of sand or gravel called ____________.

Bars form temporary islands in the channel that migrate through time as the channel redistributes the sediment.

When the water level is high, the bars get covered over by the water, but they reappear when the water level drops. Then the water flows around the bars, repeatedly dividing and rejoining.

What word describes this type of flow pattern? ______________________

In what type of environment are braided streams most common?

_________________________________________

**Stream Deposits**

Sediment deposited by rivers or streams is called _________________.

The material gets deposited when the stream's energy decreases and it loses its ability to carry the sediment load. This may happen when the stream enters a standing body of water such as a lake or the ocean. Sediment also gets deposited along the channel margins and at the edges of mountain ranges.

What are the four main types of stream deposits?

1. ________________________            2. ________________________
3. ________________________            4. ________________________

**Floodplains**

What is a **floodplain**? _____________________________

Most of the time, a river is confined to a channel, but during a flood, the river overflows its banks and covers the floodplain.

As the water overflows the river bank, the velocity decreases and the water loses its ability to carry sediment. The coarser sediment then gets deposited along the top of the river bank, forming a mound called a _________________.


Over the river banks, the finer sediment settles out of the water forming a broad flat area of fertile land that is good for agriculture. This sediment gets replenished during every flood, building up layers of sediment through a process called ________________.

Deltas

When rivers flow into a standing body of water like the ocean, the sediment gets deposited at the river mouth as a delta. It gets its name from the Greek letter delta, Δ, which is a common shape of the deposited sediment when viewed from above.

Much of the delta may be above sea level. The main river channel often divides up into a number of smaller channels called ________________ that flow across the delta surface.

The three typical styles of deltas are:

1) ________________ : distributaries build out into the sea, forming long finger-like channels.  
   Also called a ________________ delta. e.g. ___________________

2) ________________ : waves push the sediment back across the shoreline, forming a classic delta shape. e.g. ___________________

3) ________________ : elongate sand bodies line up with the direction of the tides.  
   e.g. __________________________

Alluvial Fans

Alluvial fans form where mountain streams that flow rapidly through confined channels suddenly exit the mountains and spew into a valley. The river loses its ability to carry sediment and dumps it at the edge of the mountains as a ________________ deposit.

Sometimes a number of alluvial fans along the edge of a mountain range will coalesce to form an almost continuous line of fans along range front called a ________________.

**FINAL QUESTION:**

Alluvial fans are common in desert environments, such as:  
________________________