

Name:		Date:
Natural and Urban "Stormwater" Water Cycles Handout Instructions: Before the teacher's presentation begins, complete the left column by writing in your known answers or best guesses. During the presentation, complete the right column. After the presentation, compare the answers in your two columns.		
Slide #	Your Predictions	From the Presentation
Slide 1	<ul style="list-style-type: none"> Our planet is covered by water, an astonishing _____ percent! If the world was uniform all the way around, water would cover the planet to a depth of _____ km, (_____ miles). 	<ul style="list-style-type: none"> Our planet is covered by water, an astonishing _____ percent! If the world was uniform all the way around, water would cover the planet to a depth of _____ km, (_____ miles).
Slide 2	<ul style="list-style-type: none"> It would take _____ years for that volume of water to go over the Niagara Falls. Our planet is _____ years old. It takes the average American _____ years to use the amount of water that flows over Niagara Falls every second. 	<ul style="list-style-type: none"> It would take _____ years for that volume of water to go over the Niagara Falls. Our planet is _____ years old. It takes the average American _____ years to use the amount of water that flows over Niagara Falls every second.
Slide 3	<ul style="list-style-type: none"> _____ % of the water on our planet is considered fresh water. _____ % trapped as polar ice, _____ % fresh groundwater, and _____ % in the planet's surface and atmosphere. That means ~ _____ gallons are available per person per day. 	<ul style="list-style-type: none"> _____ % of the water on our planet is considered fresh water. _____ % trapped as polar ice, _____ % fresh groundwater, and _____ % in the planet's surface and atmosphere. That means ~ _____ gallons are available per person per day.
Slide 4	<ul style="list-style-type: none"> Civil and environmental engineers design systems to pump water from _____ and _____ sources to water treatment facilities and then to our homes. It is their job to provide _____ drinking water and a sufficient _____ of water. 	<ul style="list-style-type: none"> Civil and environmental engineers design systems to pump water from _____ and _____ sources to water treatment facilities and then to our homes. It is their job to provide _____ drinking water and a sufficient _____ of water.
Slide 5	<ul style="list-style-type: none"> Civil and environmental engineers use the _____ of _____ to design treatment systems and must understand the _____ occurring as a result of the reaction, in order to provide water that is safe to drink and release back into nature. 	<ul style="list-style-type: none"> Civil and environmental engineers use the _____ of _____ to design treatment systems and must understand the _____ occurring as a result of the reaction, in order to provide water that is safe to drink and release back into nature.
Slide 6	<ul style="list-style-type: none"> These engineers must have an -depth knowledge of the water cycle. List the different components of the water cycle: _____ _____ _____ _____ 	<ul style="list-style-type: none"> These engineers must have an -depth knowledge of the water cycle. List the different components of the water cycle: _____ _____ _____ _____

Slide 7	<ul style="list-style-type: none"> • _____: When water changes from a liquid to gas or vapor. • Phase change: Heat from the sun creates energy that _____ the bonds holding water molecules together. 	<ul style="list-style-type: none"> • _____: When water changes from a liquid to gas or vapor. • Phase change: Heat from the sun creates energy that _____ the bonds holding water molecules together.
Slide 8	<ul style="list-style-type: none"> • _____: When water vapor changes from gaseous state (vapor) to the liquid phase. • Phase change: Evaporated water vapor condenses in the atmosphere due to _____ temperatures resulting from _____ atmospheric pressure. • Rate: On average, the residence time for moisture in the atmosphere is _____ days • A large cumulonimbus cloud can weigh as much as a 747 jumbo jet. So why does it not come crashing down to the ground? Answer: The rising air responsible for the cloud formation keeps the cloud _____ in the air because the air below the cloud is _____ than the cloud. 	<ul style="list-style-type: none"> • _____: When water vapor changes from gaseous state (vapor) to the liquid phase. • Phase change: Evaporated water vapor condenses in the atmosphere due to _____ temperatures resulting from _____ atmospheric pressure. • Rate: On average, the residence time for moisture in the atmosphere is _____ days • A large cumulonimbus cloud can weigh as much as a 747 jumbo jet. So why does it not come crashing down to the ground? Answer: The rising air responsible for the cloud formation keeps the cloud _____ in the air because the air below the cloud is _____ than the cloud.
Slide 9	<ul style="list-style-type: none"> • _____: Condensed water vapor that falls to Earth as rain, snow or hail. • Phase change: Water molecules combine with tiny _____ particles that act as a nucleus to form cloud droplets. _____ of collisions occur with other droplets until the mass of the droplet creates a fall velocity that is _____ than the cloud updraft speed, resulting in rain, snow or hail. 	<ul style="list-style-type: none"> • _____: Condensed water vapor that falls to Earth as rain, snow or hail. • Phase change: Water molecules combine with tiny _____ particles that act as a nucleus to form cloud droplets. _____ of collisions occur with other droplets until the mass of the droplet creates a fall velocity that is _____ than the cloud updraft speed, resulting in rain, snow or hail.
Slide 10	<ul style="list-style-type: none"> • _____: Movement of water into the media layer. • _____: Movement of water within the media layer. • _____: The combination of inorganic and/or organic earth materials (for example, sand, soil, mulch, compost, limestone, granite, gravel). 	<ul style="list-style-type: none"> • _____: Movement of water into the media layer. • _____: Movement of water within the media layer. • _____: The combination of inorganic and/or organic earth materials (for example, sand, soil, mulch, compost, limestone, granite, gravel).
Slide 11	<ul style="list-style-type: none"> • _____: The flow of rainwater that occurs as a result of the precipitation rate exceeding the soil infiltration and percolation rate or as a result of impervious surfaces. • Also generated from _____ such as roofs, roads, and sidewalks. 	<ul style="list-style-type: none"> • _____: The flow of rainwater that occurs as a result of the precipitation rate exceeding the soil infiltration and percolation rate or as a result of impervious surfaces. • Also generated from _____ such as roofs, roads, and sidewalks.

Slide 12	<ul style="list-style-type: none"> • Collects _____, _____, and _____, as it travels down the street and into the storm sewer. • _____: The lateral or horizontal flow of water beneath the ground surface. • Groundwater levels are typically the surface level at which you can see water in a _____ or the level of a _____. • Storm water replenishes the groundwater table and underground aquifer through _____ and _____ of water, which then flows to streams, lakes and wells. 	<ul style="list-style-type: none"> • Collects _____, _____, and _____, as it travels down the street and into the storm sewer. • _____: The lateral or horizontal flow of water beneath the ground surface. • Groundwater levels are typically the surface level at which you can see water in a _____ or the level of a _____. • Storm water replenishes the groundwater table and underground aquifer through _____ and _____ of water, which then flows to streams, lakes and wells.
Slide 13	<ul style="list-style-type: none"> • _____: The process of plants absorbing water and nutrients from roots in order to grow. • Phase change: Plants use the energy from the sun (_____) and _____ to draw up water and nutrients and transform inorganic nutrients into organic above-ground and below-ground biomass. 	<ul style="list-style-type: none"> • _____: The process of plants absorbing water and nutrients from roots in order to grow. • Phase change: Plants use the energy from the sun (_____) and _____ to draw up water and nutrients and transform inorganic nutrients into organic above-ground and below-ground biomass.
Slide 14	<ul style="list-style-type: none"> • _____: The process by which plants release water into the air. • In the fall, trees typically drop their leaves in order to _____ • As a result of transpiration, an acre of corn can give off _____ gallons of water per day. • As a result of transpiration, a large oak tree can give off _____ gallons of water per year. 	<ul style="list-style-type: none"> • _____: The process by which plants release water into the air. • In the fall, trees typically drop their leaves in order to _____ • As a result of transpiration, an acre of corn can give off _____ gallons of water per day. • As a result of transpiration, a large oak tree can give off _____ gallons of water per year.

Additional notes and questions:

Urban "Stormwater" Water Cycle — Vocabulary and Definitions	
Slide 15	surface water
	impervious surface
	pervious surface
	wastewater
	storm sewer
	sanitary sewer
	combined sewer
	urban infrastructure
Slide 16	<p>Your RAFT Assignment: Take on the role of a journalist to describe the journey through the urban water cycle—from a water droplet’s point of view.</p> <ul style="list-style-type: none"> • You are a travel magazine journalist for <i>Urban Environment Weekly</i>. • Your assignment this week is to follow the life of a drop of water as it makes its way through the urban environment. • In your article, include all the descriptive details about whom the drop met and what it encountered along the way.