Name _____

Hour _____

SCIENCE 9

How We Use Water – Background Information

Reading for Content Questions – (RFC's)

1. According to the United States Geological Survey (USGS), how much water on average does a person directly use in a day?

2. What is meant by the term indirect water use?

3. Who is/are the largest users of water in the US?

4. How does daily indirect water use in the US and Europe compare to Asia?

5. What are the five main user categories of water in Michigan?

6. What are some recreational activities in Michigan that rely on water?

7. What kind of industries in Michigan depend on reliable sources of fresh water? (Be thorough in your answer) Use back of sheet.

Background Information (Student Reading)

Michigan's rivers, streams, lakes, and groundwater provide water for drinking, household use, recreation, farming, industry, habitat for wildlife, and other activities that contribute to Michigan's economy and our quality of life. When people think of using water, they usually think of **direct water uses** in the home (drinking, brushing teeth, taking a shower or bath, flushing the toilet, cooking, cleaning, watering the garden, or washing the car). According to the United States Geological Survey (http://ga.water.usgs.gov/edu/qahome.html#HDR3) on average, **a person *directly* uses 80-100 gallons of water per day.**

The water used to produce a product is termed **indirect water use**. Most people do not realize that they are also using water when they eat a hamburger, drive a car, use a computer, read a book, or put on a pair of jeans. According to the U.S. Geological Survey, **nearly every manufactured product uses water during some part of the production process**. The industries that produce our metals, wood and paper products, chemicals, gasoline, clothing, and pharmaceuticals (medicines) are major users of water. Food production, which includes irrigation of crops, watering livestock, food processing, and packaging, accounts for nearly 70% of all water used, not including thermoelectric power generation. Agriculture, industry, and power generation are society's largest water users. It is our indirect use of water that results in U.S. citizens being the greatest consumers of water. In Asia, a person indirectly uses an average of 364 gallons per day. In Europe and North America, **a person *indirectly* uses an average of 1,040 gallons to 1,700 gallons of water each day.**

Water Use in Michigan

According to the Michigan Department of Environmental Quality's *Water Use Reporting Program*, a total of 10,946 million gallons per day were used in Michigan in 2004 (up from 10,633 million gallons per day in 2001) by five major water user categories:

Major Water User Category	Amount of Water Used (MGD*) in 2004
Golf Course Irrigation	33 million gallons (.003%)
Irrigation (agriculture)	256 million gallons (2%)
Industry (self-supplied)	628 million gallons (6%)
Public Water Supply (includes residential, public, commercial, industrial)	1,144 million gallons (10%)
Electrical Power Generation (heating and cooling)	8,885 million gallons (81%)
Total	10,946 million gallons per day

*MGD = millions of gallons per day

Source: *Water Withdrawals for Major Water Users in Michigan*. (2004). Lansing, MI: Michigan Department of Environmental Quality. http://www.deq.state.mi.us/documents/deq-wd-wurp-report.pdf.

The Great Lakes are the source of 91% of the water used, followed by 4.8% from groundwater and 4.2% from inland surface waters. Only 5-10% is considered consumptive uses, with 90-95% of the water used being returned to its source, primarily after being used as a cooling medium in thermoelectric power generation. We can see that maintaining an adequate supply of clean freshwater is essential to Michigan's economy.

Quality of Life in Michigan Depends on Water

Not only is water used to make the products that we use, it also can add to our enjoyment of living in Michigan. When you think of scenery or recreation in Michigan, you most likely think of something related to water—lighthouses, swimming beaches, boating, camping, wildlife watching, hunting, fishing, skiing, snowboarding, and snowmobiling. Water adds a lot to our enjoyment of living in Michigan!

While there may seem to be an unlimited supply of water available to Michigan residents, using water efficiently helps to reduce the costs of water treatment to make water safe to drink and of wastewater treatment to clean water after it is used.

Efficient water use also reduces the energy needed to pump, transport, and heat water. All water users are encouraged to practice water conservation—the care, preservation, protection, and wise use of water.

Many Michigan Industries Depend on a Reliable Source of Freshwater

Michigan is home to many thriving industries across the state, producing everything from automobiles to cereals, chemicals to pharmaceuticals, and machine tools to plastics.

The production of autos, trucks, and parts is a $106.2 billion industry in Michigan. Detroit is the home to GM, Ford, and Daimler-Chrysler, as well as auto suppliers such as Lear Corporation of Southfield, a global leader in interior design systems, and Delphi Corporation of Troy, a world leader in mobile electronics, transportation components, and systems technology for today's vehicles. Manufacturing all of the parts of a car, including the tires, is estimated to require 65,000 gallons of water.

Michigan ranks fourth in the United States with employment in the plastics industry and ranks fifth in the nation for plastics shipments. The plastics industry impacts our lives in many ways, from the automotive industry to large global companies such as Huhtamaki, which produces thermoform food containers for packaging fragile items like eggs, soft fruit, and tomatoes. Plastipak Packaging is a multinational corporation, which manufactures the recyclable plastic containers that we use on a daily basis for milk, bottled water, soft drinks, and other beverages. Manufacturing one ton of plastics requires 140,000 gallons of water.

Michigan has a strong forestry and wood products industry (see table of *Made in Michigan Wood Products*). Pulp- and paper-making require large amounts of water in the production process. Efforts are being made to reduce water requirements. In 2004, approximately 10,600 gallons were needed to produce a ton of paper.

Michigan leads the nation in the production of nine crops and ranks fifth or higher in 28 crops (see table of *Grown in Michigan* products). Michigan's food and agriculture industry adds $37 billion to the state's economy annually and is the leading growth industry in our state. Michigan produces more than 125 raw commodities commercially, second in diversity only to California. The value of these raw agricultural products is increased tenfold with further processing, agriculture tourism, and marketing. Fremont is the home of Gerber (baby food) Company. Battle Creek is home to Kellogg's and Post Cereals, and the Bay City area is home to the Michigan Sugar Company and the Monitor Sugar Company, producing Big Chief and Pioneer sugar used in baking. Midland is home to Dow Chemical's global operations, which include chemicals to plastics, and adhesives to sealants—all requiring large amounts of water as evidenced in the significant amount of wastewater that is discharged.

Source: Michigan Economic Development Corporation. (n.d.). *Key Industries.* Lansing, MI: MEDC. Retrieved August 18, 2005, from http://medc.michigan.org/greatlocation/industries/.

What Is Your Household Water Use?

Individual Direct Uses of Water	Amount Used (gallons)
Brush Teeth	1 (3 gallons if water running)
Wash Hands	4 gallons/minute
Shower (low flow showerhead)	2 gallons/minute (multiply by minutes in shower)
Shower	5 gallons/minute (multiply by minutes in shower))
Bath	25
Drinking	0.5
Flush Toilet	7 (2 gal/flush if low volume toilet)
Shaving	4 gallons/minute (if water running)

Family Water Uses	Amount Used (gallons)
Wash Clothes (1 load—top loader)	40
Wash Clothes (1 load in a front loader—*Energy Star**)	20
Wash Dishes (by hand)	20
Wash Dishes (1 dishwasher load)	15
Wash Dishes (1 dishwasher load—*Energy Star**)	7
Clean House	7
Wash Car	25
Leaking Faucets	25-50/day
Water Lawn and Garden	10 gal/min x 60 minutes

**Energy Star* is a program of the U.S. Environmental Protection Agency to assess the water and energy used by household appliances and to recommend those products that meet minimum requirements for energy conservation.

Source: Tampa Water Department. *Water Education and Conservation.* Tampa, FL: City of Tampa. Retrieved July 9, 2005, from http://www.tampagov.net/dept_water/conservation_education/.

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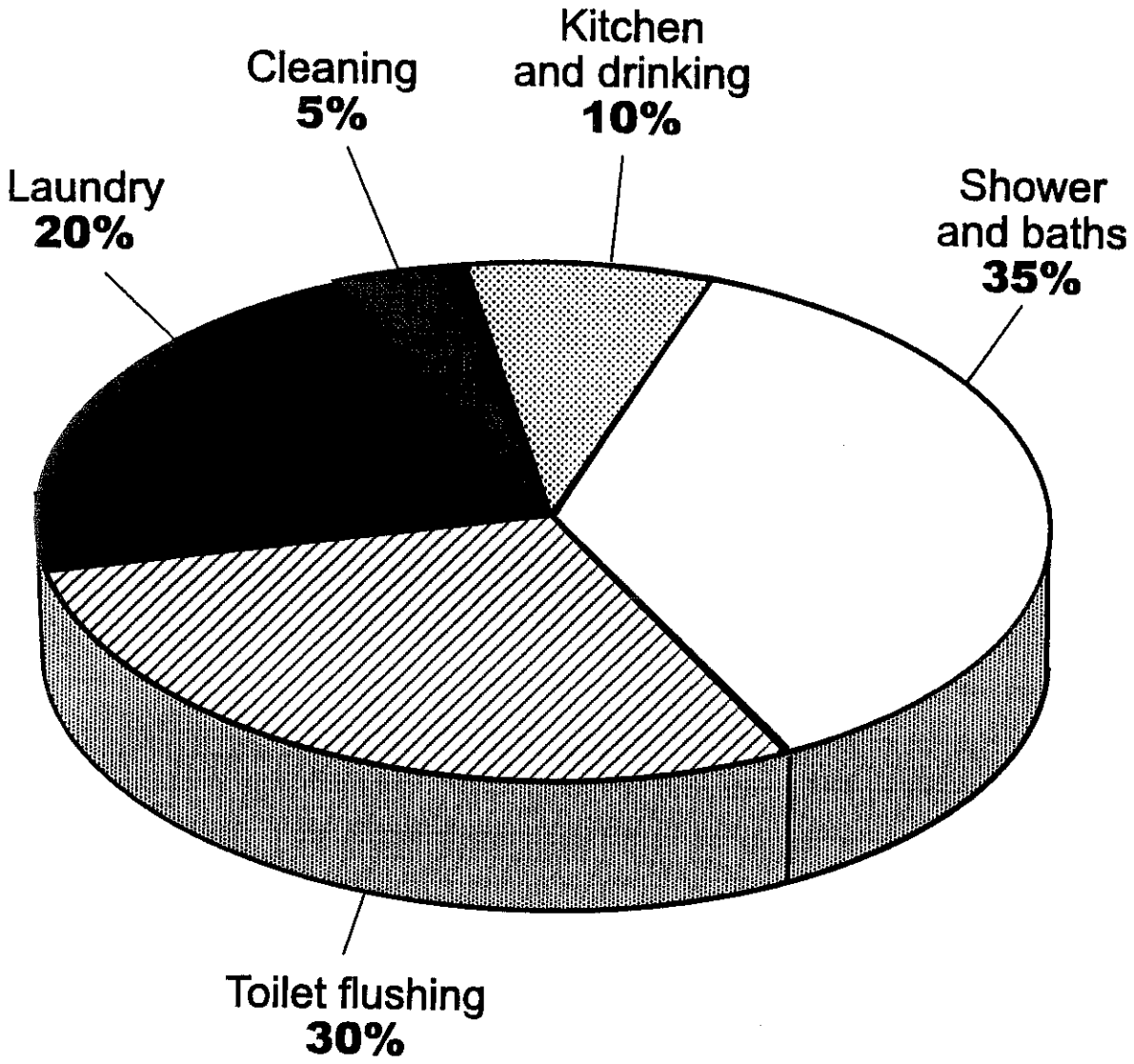
Percent Water Use in the Home by Activity



Environment Canada. *Clean Water.* Retrieved July 8, 2005 from http://www.ec.gc.ca/water_e.html http://www.ec.gc.ca/water/images/manage/effic/a6f7e.htm

United States Environmental Protection Agency. *Water Supply and Demand.* Looks at world water distribution, total U.S. water use, agricultural and industrial water use, and household water usage. Retrieved July 9, 2005 from http://www.epa.gov/seahome/groundwater/src/supply.htm#supply