Name _____ Date _____

Bottled Water

Part 1: Taste Test

While tasting the samples provided by your teacher, record your observations below.

Sample #	Taste (1=worst, 10=best)	Odors, other observations
1		
2		
3		
4		
5		

Which sample received the highest score from the class? _____

What did this activity teach you about the difference in taste between bottled and regular water?

_____

_____

_____

Part 2: Water Treatment Reports

Your teacher will provide you with copies of your local water treatment report. First, use the chart below to answer some questions.

Water Type	Disinfection Required?	Confirmed *E. Coli* & Fecal Coliform Banned?	Testing Frequency for Bacteria?	Must Filter to Remove Pathogens, or Have Strictly Protected Source?	Must Test for *Cryptosporidium, Giardia,* Viruses?	Testing Frequency for Most Synthetic Organic Chemicals?	Must Use Certified Labs to Do Testing?	Must Report Violations to State, Feds?	Consumer Right to Know About Contamination?
Bottled Water	No	No	1/week	No	No	1/year	No	No	No
Carbonated and/or Seltzer Water	No	No	None	No	No	None	No	No	No
Big City Tap Water (using surface water)	Yes	Yes	Hundreds/ month	Yes	Yes	1/quarter (limited waivers available if clean source)	Yes	Yes	Yes
Small Town Tap Water (using a well)	No (though new rule in 2002 will require if needed)	Yes	20/month	No (unless subject to surface contamination)	No	1/quarter (waivers available if clean source)	Yes	Yes	Yes

Table 1. Key Differences between PWS and Bottled Water Rules Source:Olsen, NRDC, 1999

1. Which water type is tested more frequently for different viruses and bacteria?
   _____
2. Which water type must report the results to the government and consumers?
   _____
3. Based on this chart only, which type of water has the most safeguards?
   _____

Use the chart below and your local water quality report to answer the following questions.

Table 2. ComparisonTest Results Table

	Analytical Tests								
Sample	Cl2 mg/L	HPC cfu/1mL	TTHM ug/L	Bromide ug/L	Bromate ug/L	Lead mg/l	Copper mg/l	Bottle size and cost	Cost/ gallon
MCL	0.02 4.0	500	80		10.0 ug/l	0.015 mg/l	1.3 mg/l		
1A	2.17	0/0	A 2.07 B 0.11	15.3	< 5	<RL	0.0107	$412.77 90,000 gal.	$0.0046 0.46 cent
1B	1.07	17/27	A 0.62	8.2	< 5	<RL	0.0044	$25.45 Initial $5.46 Replace 40 gal.	$0.64 $0.14
1C	0.30	0/0	None detected	14	< 5	<RL	<RL	$41.17 Initial $15.41 Replace 100 gal.	$0.41 $0.15
2A	2.9	0/0	A 2.65 B 0.16	15.1	< 5	<RL	0.020	$396.01 90,000 gal.	$0.0044 0.44 cent
2B	1.10	59/72	A 1.05	11.2	< 5	<RL	0.0133	$25.43 Initial $5.44 Replace 40 gal.	$0.64 $0.14
2C	0.42	0/0	None detected	14.4	< 5	<RL	<RL	$41.15 Initial $15.39Replace 100 gal.	$0.41 $0.15
3	<0.02	>500/>500	C 0.13	>50 Br=82.5	< 5 BrO_3=2.48	<RL	<RL	$0.50/ gal	$0.50
4	<0.02	>500/>500	None detected	41.5	< 5	<RL	<RL	$0.80/ gal	$0.80
5	<0.02	>500/>500	None detected	33.1	< 5	<RL	<RL	$1.79/ 1.5 L	$4.52
6	<0.02	0/1	None detected	1.89	< 5	<RL	<RL	$0.42/ 1 pint of 12	$3.36
7	0.02	0/1	A 17.37 B 6.08 D 1.17	2.28	< 5	<RL	<RL	$0.75/ 1 L	$2.84
8	0.03	2/0	A 1.38 B 0.21	3.44	< 5	<RL	<RL	$0.56/ 1.5 pint of 6	$2.99
9	<0.02	6/0	None detected	5.52	< 5	<RL	<RL	$0.99/ gal	$0.99
10	<0.02	>500/>500	None detected	6.93	< 5	<RL	<RL	$1.49/1 L	$5.64

TTHMs: A Chloroform; B Bromodochloromethane; C Bromoform; D Dibromochloromethane

Sample # / Water Source Product

1A MWRA Tap, Somerville, no filtration
1B MWRA Tap, Somerville, Filter A
1C MWRA Tap, Somerville, Filter B
2A MWRA Tap, DITP, no filtration
2B MWRA Tap, DITP, Filter A
2C MWRA Tap, DITP, Filter B
3 Market Basket "Natural Spring Water";bottled at the source by S.H.E.D. Ward Hill, MA
4 Shaw's "Spring Water"; Spring water source: Brentwood Springs, Brentwood, NH
5 Fiji "From the Islands of FIJI, Natural Artesian Water"; source Yagara, Viti Levu, Fiji Islands
6 Nestle "Pure Life"
7 Dasani "Purified Water, reverse osmosis;
8 Aquafina "Purified Drinking Water", bottled at the source P.W.S. , Ayer MA, uses reverse osmosis
9 Poland Spring "Natural Spring Water"; sources: one of five springs listed, div. of Nestle Waters North America, Inc.
10 Evian "Natural Spring Water"; bottled at Evian, France; "Evian is naturally filtered in the French Alps for over 15 years

Source: Whittier, J. 2007. The Value of Tap Water. Massachusetts Water Resources Authority.
Samples #1A-2C are all taken from the Massachusetts Water Resources Authority drinking water sources.

Key:

MCL	Maximum Contaminant Level allowed by law
Chlorine (CL_2)	Chlorine is used to disinfect the water, killing bacteria. It does have some side effects, however, and high levels of chlorine are associated with stomach problems and irritation in the eyes and nose.
HPC: Heterotrophic Plate Count	Used to count non-specific bacteria in the water. It tells you how effective the chlorination process was at removing bacteria.
TTHM: Trihalomethanes	A by-product of chlorination in drinking water, this is a suspected carcinogen. All municipal facilities must now reduce these levels.
Bromide/Bromate	Bromate occurs when water is disinfected with ozone, which reactes with bromide ions. Also a suspected carcinogen.
Lead	Lead in drinking water can cause severe neurological damage, especially in young children or fetuses. Lead usually enters the drinking water supply through lead pipes (old homes), the lead solder that is used in brass pipes (new homes), or contact with brass which contains some lead. However, lead in drinking water is suspected of contributing only 10-20% of total lead exposure in young children. Lead paint and leaded gasoline (now outlawed) are the main ways children absorb lead.
Copper	Copper is naturally occurring in the environment, although these are very low levels. Higher levels occur when water comes in contact with copper plumbing, especially if the water is corrosive. However, copper is necessary for good health, and everyone eats or drinks about 1,000 mg of copper per day.

4. Based on the chart, which water samples had the highest levels of
   HPC? _____
   TTHM? _____
   bromide? _____
   of copper? _____
5. Which sample is the most economical?
   _____
6. Now, compare your municipal water quality report with the bottled water quality information. You may not be able to compare everything, but you should compare copper, lead, TTHMs, and chlorine. Remember that the units in the provided chart and your water quality report may be different. (For instance, since 1 mg/L = 1000 µg/L, 0.015 mg/L of lead = 15 µg/L .) Based on your comparison, explain which water source you think is better for your health.
   _____
   _____
   _____
7. Finally, think about everything you have learned about bottled water and tap water, including the number of times each is tested, who regulates the water, the social, environmental, and economic impacts, and the possible contaminants. Considering all of these factors, what type of water will you drink? Why?
   _____
   _____
   _____
   _____
   _____
   _____