|  |  |
| --- | --- |
| Quiz(14pts) |  |
| Filter Grade(10pts) |  |
| **GRADE:** |  |

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ APES

Mr. Crisci

**Lab: WATER REPORT AND TREATMENT** Date: **\_\_\_\_\_\_\_\_\_**

**PART I:**

 **GOOGLE:** [**SCWA water quality report**](http://www.scwa.com/about/wq_reports/)**:** [**http://www.scwa.com/about/wq\_reports/**](http://www.scwa.com/about/wq_reports/)

 **Click on Suffolk County Water Authority Link**

 **On bottom left hand side of home page click link titled “Water Quality Reports”**

 **Click link titled “2015 Annual Water Quality Report”**

 **Click BLUE box on right labeled “Click to view water quality report for your community”**

1. After you find the correct link for the town click on it and search contaminants:

Using this link <http://s1091480.instanturl.net/dwqr2016/2016_DWQR_FINAL_5-31-16.pdf>

Go to page 22 of the document and **DEFINE:**

MCL –

MCLG –

1. Looking at your distribution area list:
	1. List at least three of the Synthetic Organic Compounds found in your water:
		1. Contaminant: MCL: High Value:

* + 1. Contaminant: MCL: High Value:
		2. Contaminant: MCL: High Value:
	1. List at least three of the Volatile Organic Compounds found in your water:
		1. Contaminant: MCL: High Value:

* + 1. Contaminant: MCL: High Value:
		2. Contaminant: MCL: High Value:
	1. List at least three of the Disinfectants found in your water:
		1. Contaminant: MCL: High Value:

* + 1. Contaminant: MCL: High Value:

* + 1. Contaminant: MCL: High Value:

**Pick one chemical from each part found in your water, Google it & describe what it can do to your body**

**GOOGLE:** [EPA National Primary Drinking Water Regulations table of contaminants](http://www.epa.gov/your-drinking-water/table-regulated-drinking-water-contaminants) **(click on link) Write** **answers below:**

1. **Disinfectants**
	1. Contaminant:
	2. Potential Health Effects:
	3. Source of Contaminant**:**
2. **Volatile Organic Compounds**
	1. Contaminant:
	2. Potential Health Effects:

* 1. Source of Contaminant:
1. **Synthetic Organic Chemicals**
	1. Contaminant:
	2. Potential Health Effects:
	3. Source of Contaminant:

Lastly, look up how much Methyl‐Tert‐Butyl Ether under Volatile Organic Compounds and record how much is in your water here:

Get informed about [MTBE](http://www.freedrinkingwater.com/water-contamination/mtbe-contaminants-removal-water.htm), google it:

* 1. Source of Contaminant:
	2. What can you do to remove MTBE from your water?

**PART II:**

**Primary Waste Water Treatment Competition**

Your team is invited to compete in the Primary Waste Water Treatment Competition. You will be given a quantity of “waste water” which may contain some or all of the following elements: potting soil, plastic, leaves, dried beans, oatmeal, tea, coffee and/or other organic material. The wastewater used will *not* contain any bacteria-laden materials or other pathogens. Your team will have time to design, “purchase” the parts, and construct a primary wastewater treatment device (PWWTD). **The final competition will begin at the designated time when everyone will receive 250 ml of the Teacher’s Waste Water. 50 ml MUST be brought up for judging.**

The competition will be scored on the following criteria: design and cost of the device, clarity and color of water, and rate of purification. Extra credit will be given for 1st place for the “cleanest” water. See the rubric on next page for details.

**INSTRUCTIONS FOR THE WASTE WATER TREATMENT COMPETITION:**

This lab will span across 2 periods:

Step 1: Designing & Purchasing Materials

1. Break into lab groups and design your primary wastewater treatment device (PWWTD).
	1. You are limited by the components listed on the order form below.
2. When your team has finalized a design, draw your PWWTD on the competition form where indicated.
3. You will be given a small window of time to share ideas with the other groups if you so choose to.
4. Using your final design, fill out the order form below to “purchase” the components for the PWWTD.
	1. To make a “purchase” you must hand the form to me, the “clerk of the store.” I MUST SIGN YOUR FORM BEFORE YOU LEAVE THE STORE TO VERIFY THE COST. Any time more materials need to be purchased, you must bring this form with you.
5. Begin constructing your PWWTD.

Step 2: Constructing the PWWTD

1. Begin or continue working on your PWWTD. You will have access to one of “waste water” while constructing your device. You should aim to complete construction by end of the period.

Step 3: Competition Time!

1. Take 10-15 minutes to finalize construction.
2. You may want to saturate the entire filter before you pour in the “waste water”
3. Begin competition: Each team will receive 250 mL of “waste water.” Remember, *at least* 50 mL of water must be brought up for judging.
4. Assign one group member to be the “timer”. He/she is to record the time it took for 50 mL of wastewater to be purified.
5. We will observe each other’s PWWTD in action.

**Order form**

|  |  |  |  |
| --- | --- | --- | --- |
| FILTER COMPONENTS | COST PER | QUANTITY ORDERED | TOTAL COST |
| Plastic water bottle (totaling a full bottle) | $100 |  |  |
| Cup of sand **(rinse before use!)** | $10 |  |  |
| Cup of marble gravel **(rinse before use!)** | $10 |  |  |
| Small cup of granular activated carbon (GAC) | $20 |  |  |
| Coffee filter, each | $5 |  |  |
| 10 cm x 10 cm square of screen | $15 |  |  |
| 10 cm x 10 cm square of newspaper | $5 |  |  |
| Duct tape, 10 cm | $10 |  |  |
| Rubber band, each | $2 |  |  |
| Paper clip, each | $2  |  |  |
| Cotton Ball, each | $2 |  |  |
|  |  |

**Teacher’s signature for received items**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**COMPETITION FORM**

**1. Names of team members:**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2. PWWTD design: Please sketch your design in the space below. Your sketch must include the following: (5 pts)**

1. Identification of all components (ex: 8 oz plastic bottle, plastic screen, sand etc)
2. Brief identification of the purpose for each component…why did you choose to use the components you did and why did you choose the set up you choose?
3. For your PWWTD design, correlate its structure and function with its associated part in an actual wastewater treatment plant. (ex. preliminary treatment removes all the large solids…etc)

**Competition Results:**

Total time for purification (include minutes and seconds):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Scoring:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 5 pts | 4 pts | 3 pts | 2 pts | 1 pts | TOTAL pts |
| pH | 7 (neutral) | 6 | 5 | 4 | 3 or lower |  |
| COST | $100 to $150 | $151 to $200 | $201 to $250 | more than $250 |  |  |
| MINUTES FOR PURIFICATION | 50 ml in less than 2 minutes | 50 ml in 2 to 4 minutes | 50 ml in 4 to 10 minutes | 50 ml in10 to 16 minutes | took more than 16 minutes |  |
| COLOR of water post-treatment | colorless | pale | cloudy colored | colorful | dark-brown |  |
| Total Dissolved Solids (TDS)**using digital reader** | Lowest number(clear) | Low number(slight turbidity; no debris) | Medium number (cloudy, very little debris) | High number(cloudy with debris other than sand) | Highest number (flashflood turbidity) |  |

TOTAL SCORE OUT OF 25 POINTS \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Conclusion Questions:**

1. Identify 2 wastes/items that should **NOT** be flushed down the toilet or discarded down your sink. Describe why each of those items should not be discarded in this manner.
2. If we were to continue this experience, what would you include in the future design to address secondary wastewater treatment and why.
3. If you splurged and used the granular activated carbon (GAC) in your filter, identify what stage of the sewage treatment process this would relate to (preliminary, primary, secondary, and/or tertiary) and explain why you selected this stage: (what does the activated carbon remove that the other treatment methods cannot?)
4. Summarize the stages of wastewater treatment (preliminary, primary, secondary, tertiary treatment).

|  |  |
| --- | --- |
| **Stage** | **What is being removed?** |
| **Preliminary Treatment** |  |
| **Primary Treatment** |  |
| **Secondary Treatment** |  |
| **Tertiary Treatment** |  |

1. In the space below diagram each stage of the sewage treatment process: (Use your notes if you need help).