Water Chemistry Activity and Testing

Today's Date:	List the members of your team:
Date water sample was collected:	
Where the water sample was collected:	
Weather during past two days:	
Which chemical or water property are you testing?	
TEST RESULT (include units):	

1. PICK-the-POLLUTANT-ACTIVITY

A. Pick a reader to read the information card about the property you are testing.
As a team, select pictures that show human or natural activities that can changes to this chemical or property in a water body.
   - Below list possible the sources of pollution that would change this chemical attribute, using the information from the cards, pictures, and the presentation.

B. Describe the land uses and land covering around the stream where the water sample was collected. (Here's an example answer: more than half the area is urban and covered with streets and houses; about a fourth is covered with trees and parks, and about a fourth are industrial areas.)

C. Look at your selected pictures, and *pick pollution sources that are most likely to affect your chemical property in the sampled stream.* Keep the pictures separate to share with the class.
   - List the possible sources of this type of pollution in the sampled stream.

D. Based on your previous answers, do you predict that the levels of this chemical property in your stream will be safe for aquatic life or detrimental to it? Please explain your answer.

2. WATER CHEMISTRY TEST

Safety First: Pick someone to be a reader, someone to handle the test tube, someone to pour the chemicals, and someone to take notes. Those handling chemicals must use safety goggles and gloves. Everyone helps put the supplies away when done.

Before starting the test, read the directions out loud, and find the correct supplies as you do so. Once you are clear about what needs to be done, do the test.

QUESTIONS to complete after finishing the test.

E. What was your test result? _____

F. Look at your pollutant graph. Mark the graph to show your results. You will share the graph with the class.

G. Do you think this pollutant is presently harming the stream ecosystem? Why or why not? Be prepared to share this information with the class.

Dissolved Oxygen

Dissolved oxygen is the measure of oxygen that is dissolved in the water. Almost all aquatic organisms need to breathe oxygen in order to survive. Submerged Aquatic Vegetation (SAV) produces oxygen, and turbulent water contributes to dissolved oxygen levels. Turbidity and temperature can negatively affect the concentration of dissolved oxygen.

Significant levels:

- 1-2 ppm (parts per million), or mg/L will not support fish.
- <3 ppm, or mg/L, is stressful to most aquatic organisms.
- 5-6 ppm, or mg/L, is usually required for growth spawning.

Turbidity

Turbidity is the measure of the cloudiness of water. The cloudier the water, the greater the turbidity. Sources such as soil erosion and runoff can cause an increase in cloudiness. High turbidity results in lower amounts of sunlight reaching underwater plants called Submerged Aquatic Vegetation (SAV). With less sunlight, there is less plant growth, and because plants produce oxygen, this can cause a decrease in dissolved oxygen concentrations, which is essential to aquatic life.

Significant levels:

- >1 meter Secchi depth: growth of SAV favorable
- <1 meter Secchi depth: turbidity can clog gills and interfere with fish finding food

Phosphates

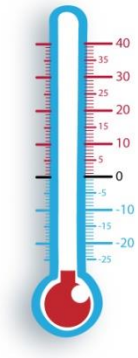
Phosphate is an essential nutrient for plant life. However, too much phosphate in the water increases the growth of algae, and this leads to a reduction in the amount of dissolved oxygen in the water. Conditions of low dissolved oxygen concentrations cause the death of many fish and invertebrates.

Most elevated levels of phosphates are introduced through human activities. These activities include washing detergents, waste water treatment plants, industrial wastes, and runoff from fertilized croplands and lawns.

Significant levels:

- >0.1 ppm or mg/L contributes to increased plant growth.
- >7 ppm or mg/L is considered unsafe for drinking water.

Temperature



Water temperature directly affects aquatic animals and plants, as well as the chemical properties of stream water. It controls the rate of metabolic and reproductive activities of fish, even determining which fish species can survive. Photosynthesis of plants increases with higher temperatures. Temperature also affects the concentration of dissolved oxygen and can influence the activity of bacteria and toxic chemicals in the water.

Significant levels:

- >32°C or 90°F is unhealthy for swimming and aquatic life.
- Average temperatures vary with the time of year and size of the body of water.

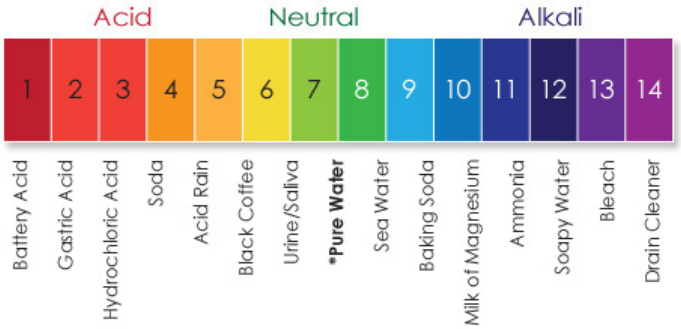
Nitrogen (Nitrates/Nitrites)

Nitrogen is an essential nutrient for plant life. However, too much nitrogen (*in the form of nitrates*) is harmful to people and causes algae blooms, which leads to a reduction in dissolved oxygen. Nitrates come from fertilizers in agricultural runoff, animal waste, human sewage, and decomposing plants.

Significant levels:

- <1 ppm, or mg/L is considered unpolluted water.
- >10 ppm, or mg/L is considered unsafe for drinking water.

pH



pH is a measure of the acid (or base) content of the water. It is measured in pH units on a scale of zero to 14. A pH of 7 is neutral, greater than 7 is basic, and less than 7 is acidic. Acidity of water can be increased by natural processes, industrial emissions (acid rain), and mining (acid mine drainage). Acidic water is harmful to aquatic communities, particularly since it can leach toxic substances, such as aluminum, from the soil.

Significant levels:

- A pH range of 6.5-8.2 is considered optimal for most organisms.

Alkalinity

The amount of buffering materials in the water is termed the “alkalinity” of the water. Buffering materials reflect the types of soils, minerals, and rocks in the area around a stream, lake, or pond. The presence of these buffering materials helps to neutralize acids. If a body of water has an abundance of buffering materials (high alkalinity), it is more stable and resistant to changes in pH. On the other hand, if a body of water has very little buffering material (low alkalinity), it is very susceptible to changes in pH.

Significant levels:

- A total alkalinity of 100 to 200 ppm will stabilize the pH level in a stream.

Animal Waste 1


http://www.trbimg.com/img-55b027ec/turbine/bs-md-livestock-stream-pollution-20150722,
http://www.onegreenplanet.org/wp-content/uploads/2010/10/2015/01/800px-Chicken_Farm_034.jpg

Car Exhaust 2

https://images.iacpublishinglabs.com/reference-production-images/question/aq/700px-394px/why-does-my-car-exhaust-smell-like-sulphur_9d4aca08-1375-4067-b4ec-0b72302f739a.jpg

Road Salt 3

http://www-tc.pbs.org/prod-media/newshour/photos/2011/01/18/4322613107_dbacff474f_o_slideshow.jpg

Sediment and Waste from Construction 4

http://www.munciesanitary.org/clientuploads/Stormwater/construction-stormwater.jpg

Fertilizer and Pesticides from Agricultural Fields | 5

http://www.earthinstitute.columbia.edu/sitefiles/image/press_room/press_releases/2016/bauer-fertilizer_300.jpg

Chemicals in Household Cleaners and Products | 6

http://1077thejewel.com/wp-content/uploads/household-floor-cleaning-products.png

Industrial Emissions 7

http://www.c3medianet.com/JMG/wp-content/uploads/2015/04/Paper-Factory-000001803681_Large-570x370.jpg

Lawn Fertilizer 8

https://mobileimages.lowes.com/product/converted/021496/021496017662.jpg,
https://static1.squarespace.com/static/549da7f9e4b0bcb26c2084e8/t/56153bcfe4b065d1f3705633/1444232144136/?format=300w

Mining 9

http://www.arabianbusiness.com/sites/default/files/styles/full_img/public/images/2013/07/16/Mining.jpg

Pet Waste 10

http://www.doodycalls.com/wp-content/uploads/2014/06/DPC-cleanup-sign.jpg

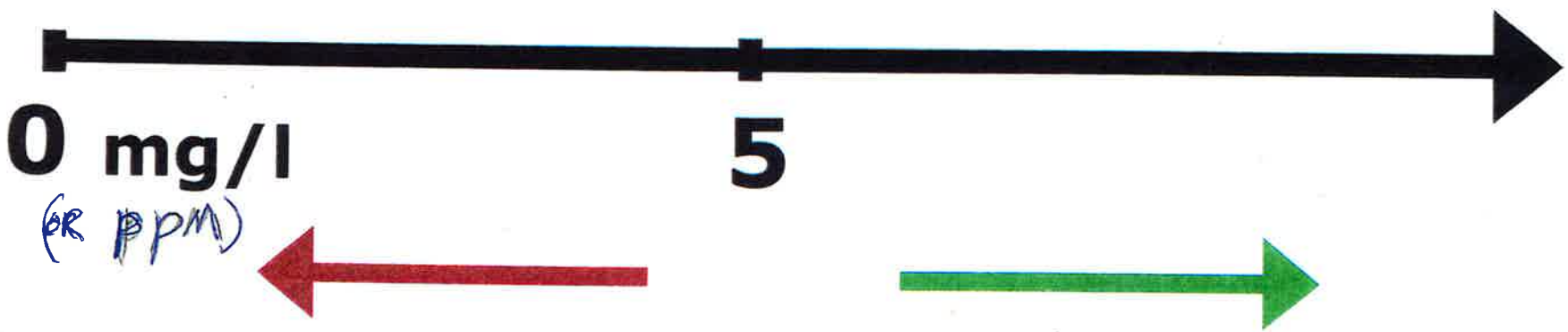
Waste Water Treatment Plant 11

https://www.estormwater.com/sites/estormwater.com/files/wastewatertreatmentplant.jpg?1421940715

Volcano 12

http://abcnews.go.com/images/International/EPA_volcano_ml_160307.jpg

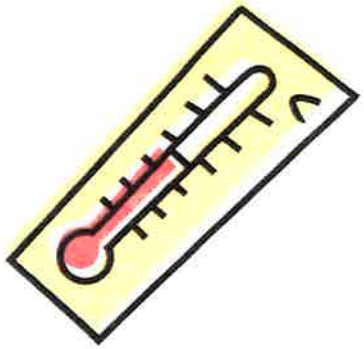
DISSOLVED OXYGEN



Stress

Supports Aquatic Life

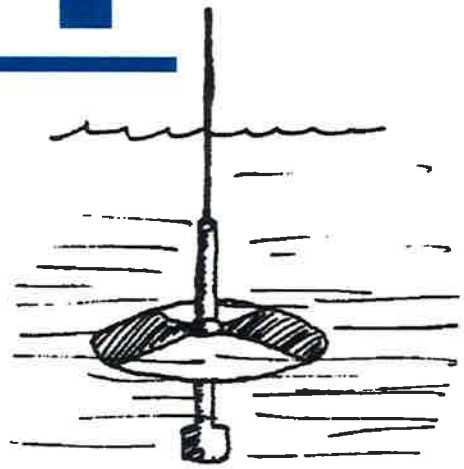
TEMPERATURE

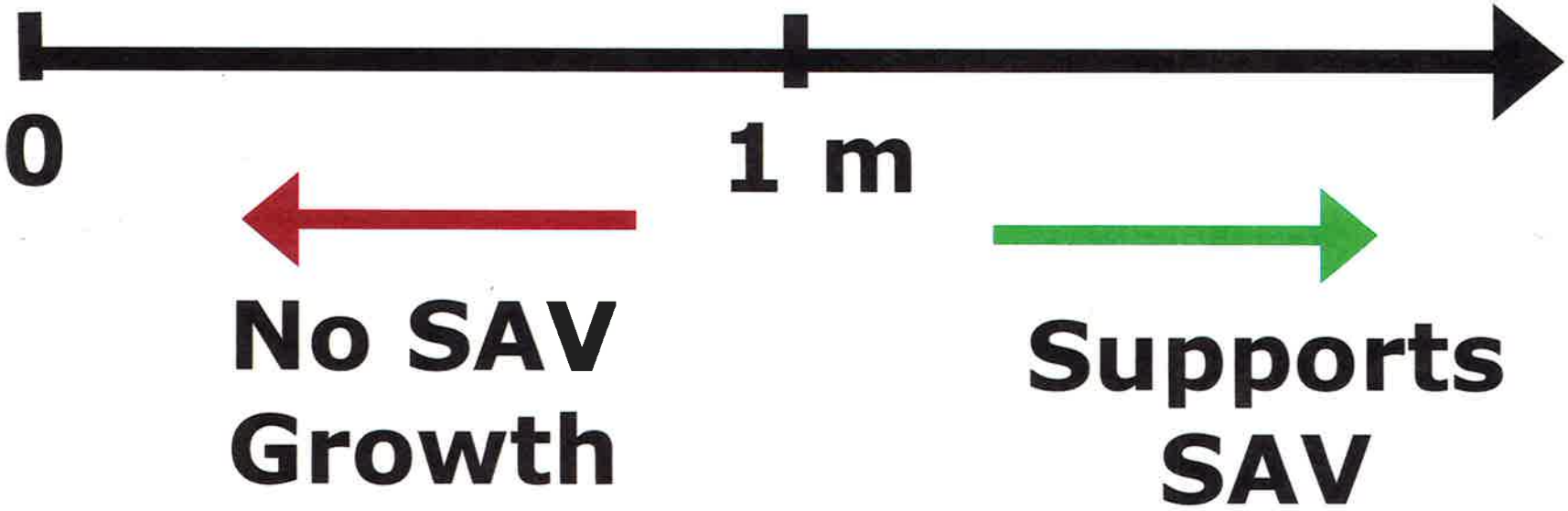


0 ° C
32 ° F

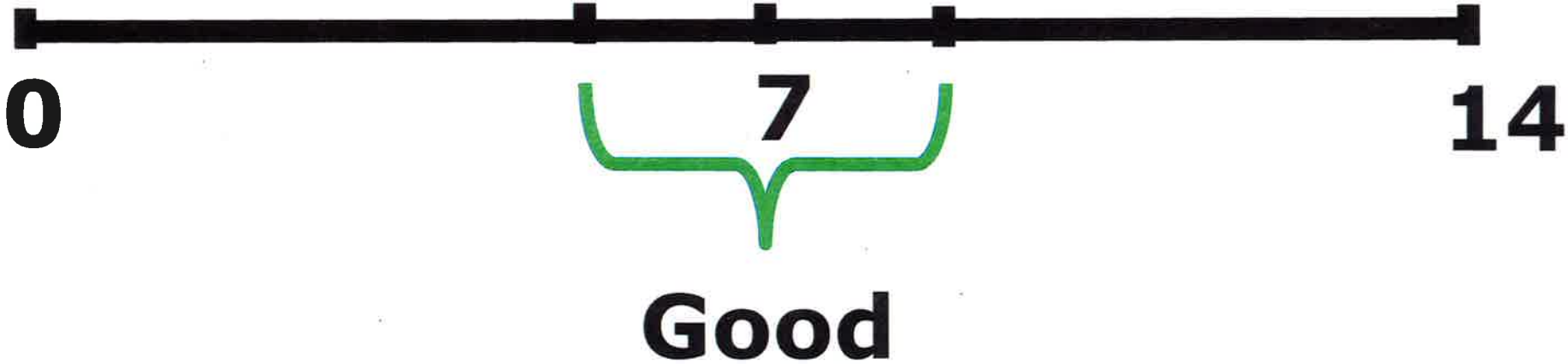
30 ° C
86 ° F

TURBIDITY

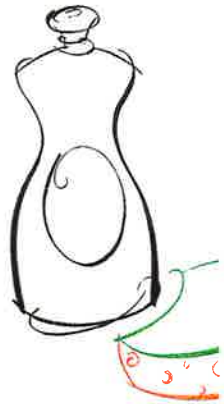


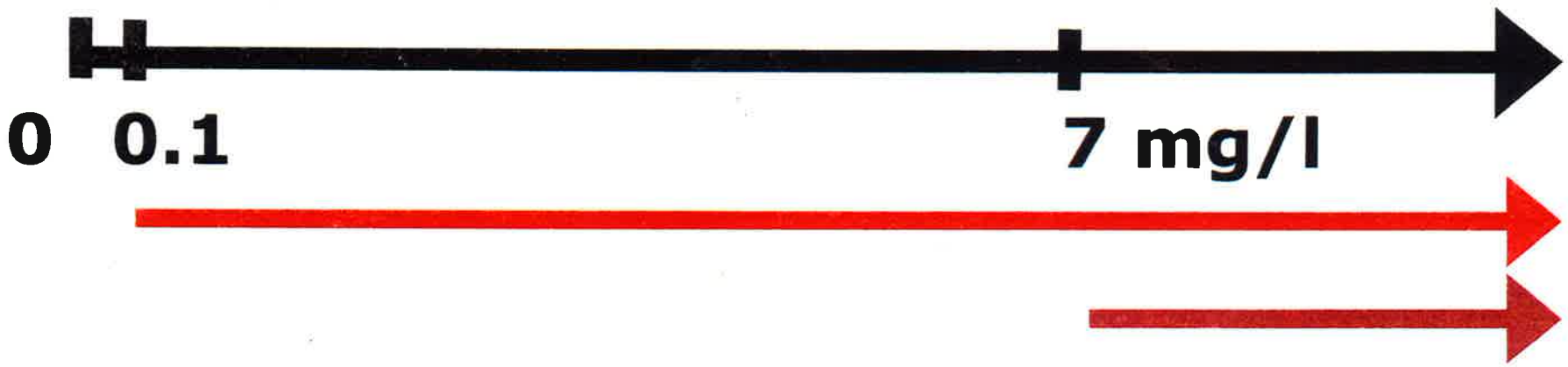


pH



PHOSPHATES





Contributes to Increased Plant Growth

Unsafe to Drink

NITRATES

Unpolluted

Unsafe to Drink