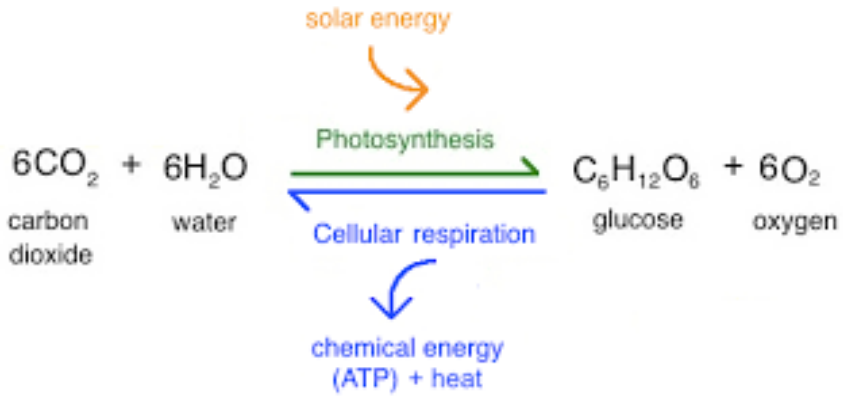
Partner names: _____

Biological Oxygen Demand (BOD) Investigation

Background information:

Biological oxygen demand (BOD) is the measure of the amount of dissolved oxygen (DO) required to break down the organic material in a given volume of water through respiration. BOD is used to indirectly measure the amount of organic matter in a sample.

This is because bacteria (and other living things) use up oxygen when carrying out respiration. The more bacteria, the more respiration, the more oxygen will be used up. This means the BOD (oxygen demand) increases (i.e. oxygen is being used up by the bacteria). Remember the formula for respiration and photosynthesis:



Too much organic matter is one common type of pollution. It can come from runoff from agriculture or residential streets (ie. dog waste). It can also come from a sewage treatment plant. Eutrophication is when there are so many excess nutrients (nitrogen, phosphorus), that there is a bloom of algae that then dies off and removes all the oxygen from the water when it decomposes (which is respiration), causing a dead zone.

A high BOD (demand of oxygen is high) is associated with water polluted with organic waste. A low BOD is associated with water with little organic pollution.

We can measure the biochemical oxygen demand by carrying out a simple experiment. Note that it is important to keep temperature a controlled variable (same for all trials) because cold water can hold more dissolved oxygen than warm water and could affect results.

Materials:

Water collected at a stream, DO measurement device, at least 2 water sample tubes (with caps) per group

Procedure:

1. Take two samples of water from a water source.
2. Measure the dissolved oxygen (DO) level (how much oxygen is dissolved in the water) using the DO measurement device. The units will be milligrams per liter (mg/L).
3. Place one of the samples in the dark at 20°C in an airtight container for five days (lack of light means no photosynthesis, therefore no additional oxygen produced). This is the BOD sample. Leave the other sample in the light. This is the control sample.
4. After five days measure DO again in both samples using the DO measurement device.
5. BOD is the difference between two measurements of the BOD sample left in the dark (the amount of DO used up by respiration in the bottle).

Pre-lab analysis questions:

1. What is happening to the DO in the BOD sample (the one in the dark) during the five days?

2. Why is it important to keep the BOD sample in the dark during the five days?

3. What do you expect your results to be for the control sample exposed to light during the five days?

4. Why is it important to keep both samples exposed to the same temperature?

5. Is it important to keep both samples exposed to a constant temperature around 20°C?

6. What does a small BOD result indicate?

7. What does a large BOD result indicate?

Results:

Initial water temperature: _____

Table 1. Dissolved oxygen levels in water sample

	Initial DO (mg/L)	Final DO (mg/L)	BOD
BOD sample (in dark)			
Control sample (in light)			n/a

Post-lab analysis questions:

1. Did your findings match your prediction? Why or why not?

2. Where else can you collect samples to improve this investigation?

3. What time of day do you think has the highest DO readings? Why?

4. What time of day do you think has the lowest DO readings? Why?

5. How many samples should you collect from each water body if you were going to do this experiment? Why?