Method:

By taking applying computational thinking we can decompose the problem. Light is absorbed by pollution in water. The more pollution the less light can pass through the water. Using a standard light source(laser), light-dependent resistor (LDR) and a standard quantity of water, we can use a micro:bit to measure how much light passes through the water sample and falls on the LDR. The lower the light level, the more polluted the water is. You will need to find a default value by calibrating the system.

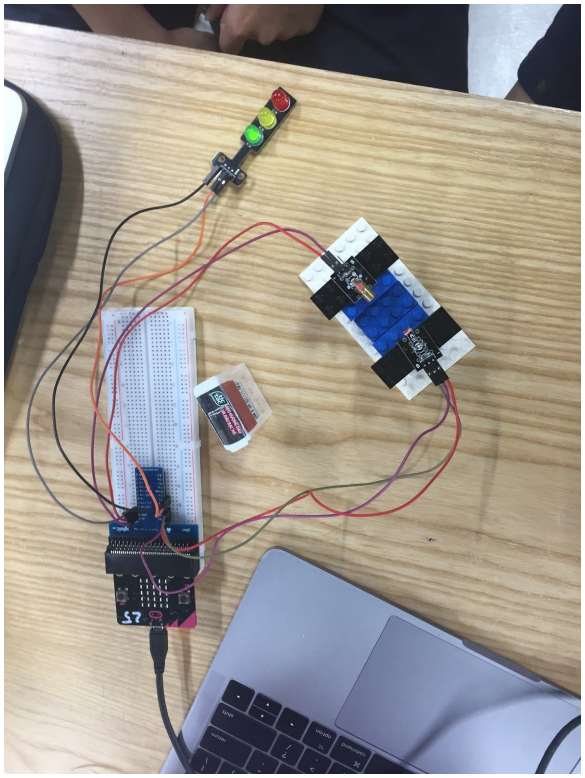
Q1. How will this give an indication of the number of algae in the water sample?

Because the more algae there is the less light will shine through the water and into the LDR

Q2: Why is the calibration needed? How often is calibration needed?

Because there may be variations between light intensity from the laser.

Q3. Document your apparatus setup (video and/or photo). Explain why you made specific connections



Q3. What event(s)will you use to trigger the calibration? The reading?

When the button is pressed. When the button is not pressed

Q4. Document your pseudocode/flowchart for what will happen when these events are triggered.

```
cleanValue = 2
error = 5
If button = pressed
        cleanValue = LDR + error
If button = not  pressed
        If LDR > = cleanValue
                Turn on green light
        Else:
                Turn on red light
```

Q5. How would you edit the program script if you wanted the filter to keep the pond water even cleaner in the future?

I would lower either the starting cleanValue or the error value to make sure that the program's sensor would have a larger range of dirty water and a smaller range of clean water.

Q6. What is the difference between an analog sensor and a digital sensor? What type of sensor are you using and how will it impact your code?

An analog sensor has a variety of values while a digital sensor only has 2 states: on or off, 1 or 0. We used an analog sensor as it gives a more precise value as to what is the clean water than just super clean and super dirty.

Q7. Provide a screenshot of your working code and explain the programming techniques you utilized in the code.

```
let ERROR = 3
let clearValue = 15

basic.forever(function () {
    let currentValue = pins.analogReadPin(AnalogPin.P0)
    if (currentValue > clearValue) {
        pins.digitalWritePin(DigitalPin.P8, 1)
        pins.digitalWritePin(DigitalPin.P4, 0)
        basic.showIcon(IconNames.Angry)
    } else {
        pins.digitalWritePin(DigitalPin.P8, 0)
        pins.digitalWritePin(DigitalPin.P4, 1)
        basic.showIcon(IconNames.Happy)
    }
})

input.onButtonPressed(Button.A, function () {
    clearValue = pins.analogReadPin(AnalogPin.P0) + ERROR
})
```

We used conditional statements in the form of one if/else statement. In addition, an infinite loop was used so that the system will always work. Variable definitions were also used

Q8. Explain what a control system is and why this pond filtration system is a control system.

A control system is any system that regulates or controls the behavior of other devices and systems to achieve the desired result. The pond filtration system receives data from the LDR sensor and either turn red light or green light on by comparing this input with another calibrated input.

Q9. Define “sensor”. What sensor(s) did you use in this control system? Explain how additional sensor(s) could be used in this control system.

Sensor, an electrical component that takes in changes from the outside environment and sends it to the system for it to respond. LDR sensor; another sensor that could be used is

Q10. Define “actuator”. Explain how actuator(s) could be used in this control system.

An actuator is a component of a machine responsible for controlling a mechanism or a system. In this system, the actuator is the micro: bit, which uses signals from the sensor to indicate which light should turn on,

Q11. Explain the relationship between the sensors, microprocessors, and actuators/indicators in this control system.

The sensor senses stuff, transmit the signal to the microprocessor, which serves as the actuator (indicates which light should be turned on.

Q12. Would this control system be considered an “open-loop” control system, or a “closed-loop” control system? Explain the difference between these types of control systems in your answer.

This is an open-loop control system because we do not alter the output to achieve our desired result. Rather, the output is solely dependent on the input signals from the sensors. A closed-loop system would instead consider the output, and based on the need would modify it. This system doesn’t encounter any disturbances, while our open-loop system considers only the input, so we are prone to changes in the input due to external disturbances.

Q13. Discuss the social impacts and ethical considerations associated with the use of this control system.

Regarding the social aspect of this humble project, I wholeheartedly believe that there is a myriad of social impacts and ethical considerations concerning this project; this includes: raising awareness of people on clean water, make sure there is clean water, and so on and so forth.

Q14. What were the sensors and actuators used in the automatic watering control systems video?

Actuator: pump

Sensor: Soil moisture sensor

Team Contribution: