Plants and Permits Worksheet

Name:_____

Read the following scenario and complete the problems below.

> A Wastewater Treatment Plant (WWTP) has been instructed that their permit limits will become more restrictive, due to changes in the receiving waterbody's acceptance capacity. In order to meet these new limitations, the WWTP will have to undergo plant upgrades to more effectively remove pollution. Below are three possible upgrade options and information on calculating the parameters for each option.

- Three Possible Upgrade Options and Cost
  - Option 1 Description: This option will upgrade the bar screening to remove smaller particles and will increase the aerobic tank size to increase removal of organic matter. This will result in a **50% removal of salinity and turbidity** and a **DO concentration of 1.8 mg/L and a pH of 5.0 SU**. Cost: $150,000.00
  - Option 2 Description: This option will upgrade bar screening to remove smaller particles and will use a series of aerobic tanks to increase removal of organic matter and increase DO concentration. This will result in a **70% removal of salinity and turbidity** and **DO concentration of 2.0 mg/L and a pH of 5.5 SU**. Cost: $275,000.00
  - Option 3 Description: This option will use the same screening as Option 1 but will use a series of aerobic tanks operating different processes to increase removal of organic matter and increase DO concentration. This will result in an **80% removal of salinity and turbidity** and a **DO concentration of 2.5 mg/L and a pH of 6.0 SU**. Cost: $400,000.00

- Calculate all the permit parameters for all 3 options using the equations provided. The influent wastewater has the following characteristics:

  Influent: DO = 1.0 mg/L; pH = 4.5 SU, Salinity = 100 g/L, and Turbidity = 50 NTU

  To calculate new parameter concentration, use the following equation:

$$[Influent] \times \frac{100 - \%\,Removal}{100} = [NewConcentration]$$

  - Option 1

  - Option 2

  - Option 3

Plants and Permits Worksheet

Write the calculated parameters for all three options below. Use these to answer the following questions.

	New Limits	Option 1	Option 2	Option 3
DO	> 2.0 mg/L	_____	_____	_____
pH	> 5.0 SU	_____	_____	_____
Salinity	< 30 g/L	_____	_____	_____
Turbidity	< 15 NTU	_____	_____	_____
Upgrade Cost		$150,000	$275,000	$400,000

Q1. Given the new permit limits, which option(s) will meet the new limitations?

_____

_____

_____

Q2. What are the differences between the options you selected above?

_____

_____

_____

Q3. With your knowledge of treatment processes, which of the options is the best solution? Please explain your decision and be prepared to discuss.

_____

_____

_____

_____

_____

_____