Experimental Design Diagrams

Name: _____

Directions: Read each of the following descriptions of experiments. Identify the independent variable, dependent variable, control, and constants. Fill in the information on the experimental design diagram.

Scenario #_1

Amy's lab assignment was to determine how members of a species are affected by intraspecific competition (competition by members within the same species). She used radish seeds and plated them in small pots. She put the same amount of dirt in each pot. In the first five pots she planted one seed. In the second five pots she planted 10 seeds and in the third five pots she planted 20 seeds. She placed them in well lighted areas and watered her plants whenever the soil surface was dry. At the end of 3 weeks she removed the plants from each plot including the roots and determined the biomass from each pot. From this she was able to determine the average biomass.

Independent Variable: number of radish seeds

Levels of IV	(control) 1 seed	10 seeds	20 seeds	
# of Trials	5 pots	5 pots	5 pots	

Dependent Variable: biomass

Constants:
- size + type of pot
- amount of soil
- amount of water
- time allowed for growth
- amount of sunlight
- type of seed (radish)

Scenario #_2

Anne read that there had been a sewage spill in one of the local creeks that runs into the local river that is used for recreation, electric power, and drinking water. She also read that the fact which causes fish kills in water seems to be a lower of the dissolved oxygen (DO). She also learned that the microorganisms in the sewage were using up the oxygen and if the water remained cool the DO level would probably remain acceptable. She collected samples of water from the creek, took them back to the lab and put them into several containers of the same size into which she put the same amount of water. She varied the temperatures of each container from 15°C, 20°C (room temperature), 25°C, and 30°C, but kept each at a constant temperature. Each day she performed a dissolved oxygen test on the samples and recorded her data. At the end of 5 days she was able to draw conclusions from her experiment.

Independent Variable: temperature of water

Levels of IV	(control) 20°C	15°C	25°C	30°C
# of Trials	1	1	1	1

Dependent Variable: amount of dissolved oxygen (DO)

Constants:
- size/type of container
- amount of water
- temp. kept constant
- samples collected from same location
- time before measured (5 days)

should do 5 trials

Scenario # 3

Bob's lab in Environmental Science class was to measure the effect of toxic materials on brine shrimp and determine the lethal dose at which 50% of the population dies (LD 50). His group was assigned to determine the LD 50 of copper sulfate ($CuSO_4$). They used two petri dishes per concentration. In two petri dishes they put a 10% solution of $CuSO_4$. In the next set a 1% solution, in the next a 0.1%, in the next 0.01%, and in the last they used 0% copper sulfate. They put 10 brine shrimp in each petri dish and they examined them at the end of 24 and 48 hours. From this they were able to determine the approximate concentration at which 50% of the brine shrimp died within 48 hours.

Independent Variable: different concentrations of copper sulfate

Levels of IV	(control) 0%	0.01%	0.1%	1%	10%
# of Trials	2	2	2	2	2

Dependent Variable: number of brine shrimp alive

Constants:
- same chemical ($CuSO_4$)
- same # shrimp per petri dish
- same volume of $CuSO_4$

Scenario # 4

In his science class, Allen determined the effectiveness of various metals in releasing hydrogen gas from hydrochloric acid. Several weeks later, Allen read that a utilities company was burying lead next to iron pipes to prevent rusting. Allen hypothesized that less rusting would occur with more active metals. He placed the following into separate beakers of water: a) 1 iron nail, b) 1 iron nail wrapped with an aluminum strip, c) 1 iron nail wrapped with a magnesium strip, d) 1 iron nail wrapped with a lead strip. He used the same amount of water, equal amounts (masses) of the metals, and the same type and size of iron nails. At the end of 5 days, he rated the amount of rusting as small, moderate, or large by analyzing the color of the water.

Independent Variable: type of metal

Levels of IV	(control) Iron	Iron + Al	Iron + Mg	Iron + Pb
# of Trials	1	1	1	1

Dependent Variable: amount of rust / color of the water

Constants:
- same amount of water
- equal mass of metals
- same type/size of iron nail
- 5 days of exposure
- size of beaker

Should have done at least 3 trials