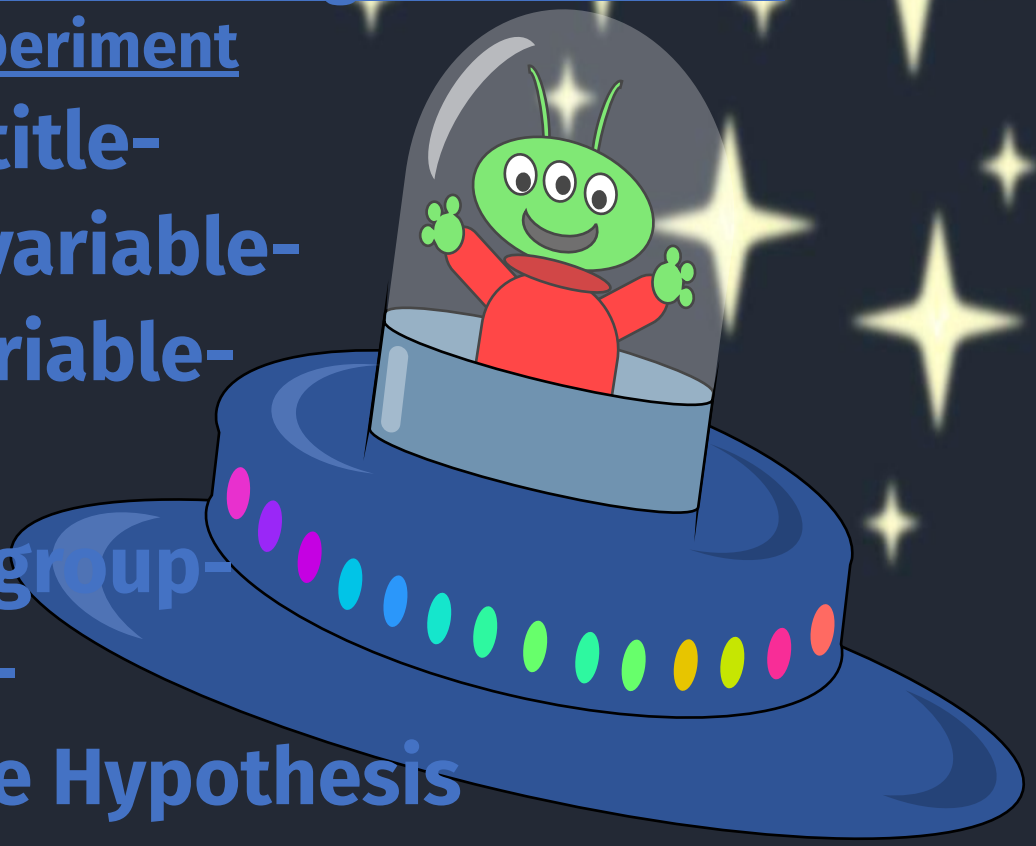
Experimental Design Practice

Determine the following for the experiments shown:

Type your answer on the following slide after the experiment

1. A descriptive title-
2. Independent variable-
3. Dependent variable-
4. Constants-
5. Experimental group-
6. Control group-
7. An appropriate Hypothesis



Problem #1

Some boys collected 10 crickets in separate identical boxes. Over the next five days they recorded the temperature at 8pm and counted the number of chirps per minute for each cricket. They calculated the average number of chirps per minute and recorded that as well. Below is the group's data collected during their study.

Temperature (Degrees Celsius)	Chirps per Minute (#)
20	18
23	22
24	25
27	30
28	35

1. A descriptive title-
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Sam read that the level of SPF in sunscreen could increase the time a person could spend in the sun before burning the skin. He decided to test this by applying various SPFs to his forearms and laying in the sun, noting the time until he became sunburned. He applied 20mL of SPF 15, 30 and 50 to 3 cm^2 patches on BOTH of his forearms. He also measured out a patch to which he applied no sunscreen.

Problem #2

1. A descriptive title-
2. Independent variable-
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Problem #3

A group of students collected four jars of water samples from the same pond out in the sunlight. They wrapped each jar with different types of insulation; cotton , wool, nylon, and one with nothing. Then they recorded the temperature at 6pm for the next 5 days and wanted to figure out if temperature of the water in the jars will increase by different amounts.

1. A descriptive title-
2. Independent variable-
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Problem #4

A fitness instructor wants to test the effectiveness of a performance-enhancing herbal supplement on students in her exercise class. To create experimental groups that are similar at the beginning of the study, the students are assigned into two groups at random (they can not choose which group they are in). Students in both groups are given a pill to take every day, but they do not know whether the pill is a placebo (sugar pill) or the herbal supplement. The instructor gives Group A the herbal supplement and Group B receives the placebo (sugar pill). The students' fitness level is compared before and after six weeks of consuming the supplement or the sugar pill.

1. A descriptive title-
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Problem #5

Kay hypothesized that plants will grow taller when miracle grow is applied. Plant A and B are both given the same amount of light, water, and stored at the same temperature. Only Plant A was given miracle grow. Kay collected data every 3 days.

Date	Plant A	Plant B
8/1/2014	10	7
8/4/2014	25	15
8/7/2014	45	20
8/10/2014	60	35
8/13/2014	68	45

1. A descriptive title-
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Problem #6

Coach Thompson read that Gatorade will enhance an athlete's performance. To test this, Coach T had her athletes perform the 1 mile run over a 6 week period. Her JV athletes drank bottles filled with Gatorade before and after the run, while the varsity athletes drank water from the bottles before and after the run. Below is the data that Coach Thompson collected.

Week	JV ATHLETES (avg in minutes)	VARSITY ATHLETES (avg in minutes)
1	9:36	9:15
2	9:26	9:10
3	9:00	9:00
4	8:20	8:45
5	8:00	8:30
6	7:30	8:35

1. A descriptive title-
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Problem #7

Daphnia (water fleas) are sensitive to many changes in pond ecosystems. An experiment was designed to determine the toxicity of different salt solutions on cultures of daphnia. Five fish tanks were each filled with the same amount of water containing different concentrations of salt. Ten daphnia were placed into each tank. After 48 hours, the number of daphnia that had survived and the number of daphnia that had died in each tank were recorded and the percent mortality was calculated. The results of the experiment are shown in the data table below. Note that normal salt concentrations are approximately 2.5 g/L in environment that Daphnia are normally found.

Salt Concentration (g/L)	Number that Survived	Number that Died	Mortality (%)
0.63	8	2	20
1.25	7	3	30
2.5	10	0	0
5.0	3	7	70
10.0	0	10	100

1. A descriptive title-
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Problem #8

Different plant species require different amounts of direct sunlight in order to flower. A student designed an experiment to determine the length of exposure to direct sunlight necessary for a specific plant species to produce flowers. The student collected the data below.

- 0 hours, 0% with flowers
- 9 hours, 0% with flowers
- 1 hour, 0% with flowers
- 5 hours, 90% with flowers
- 3 hours, 80% with flowers
- 7 hours, 10% with flowers

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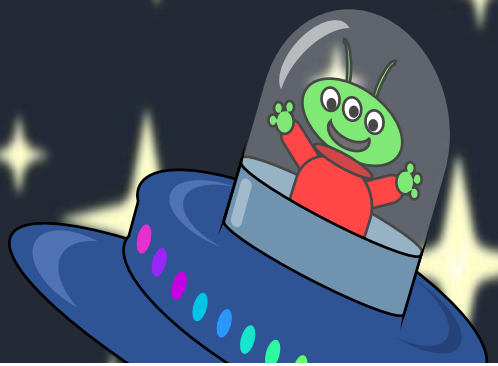
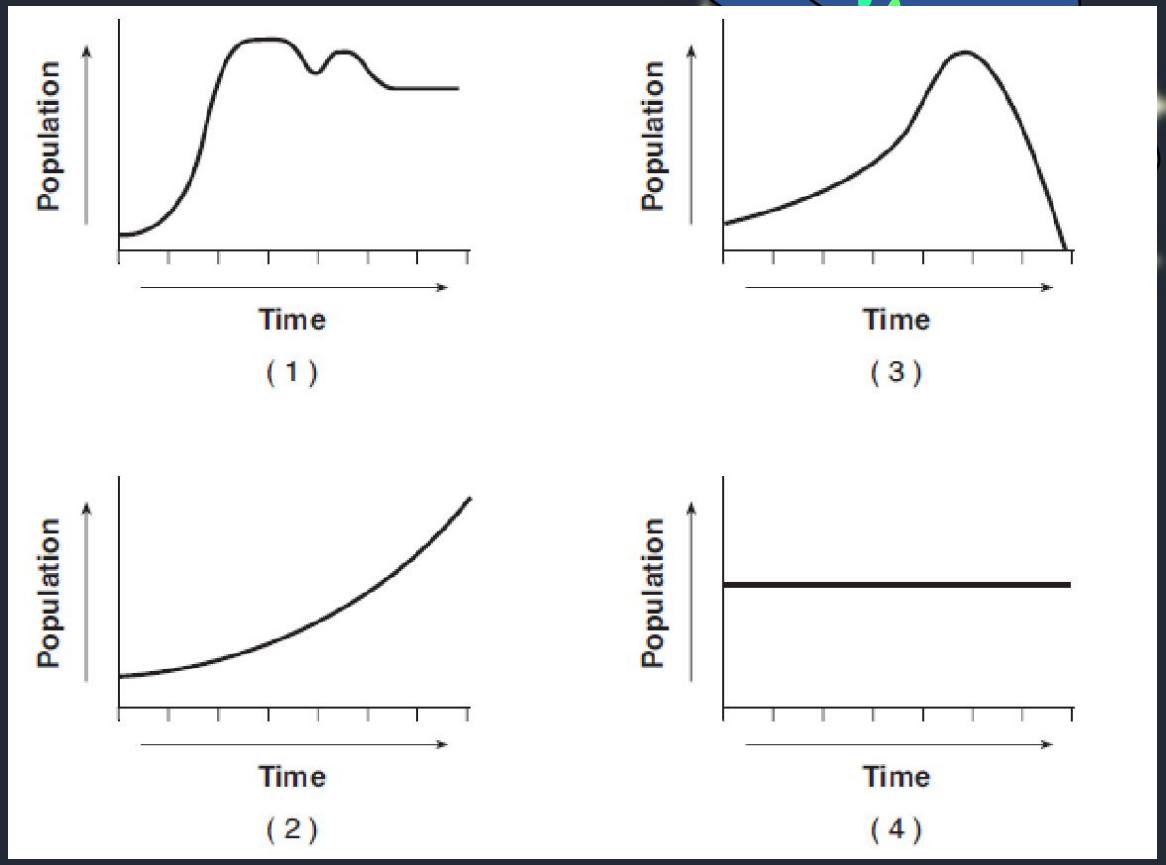
Bonus Problem #1

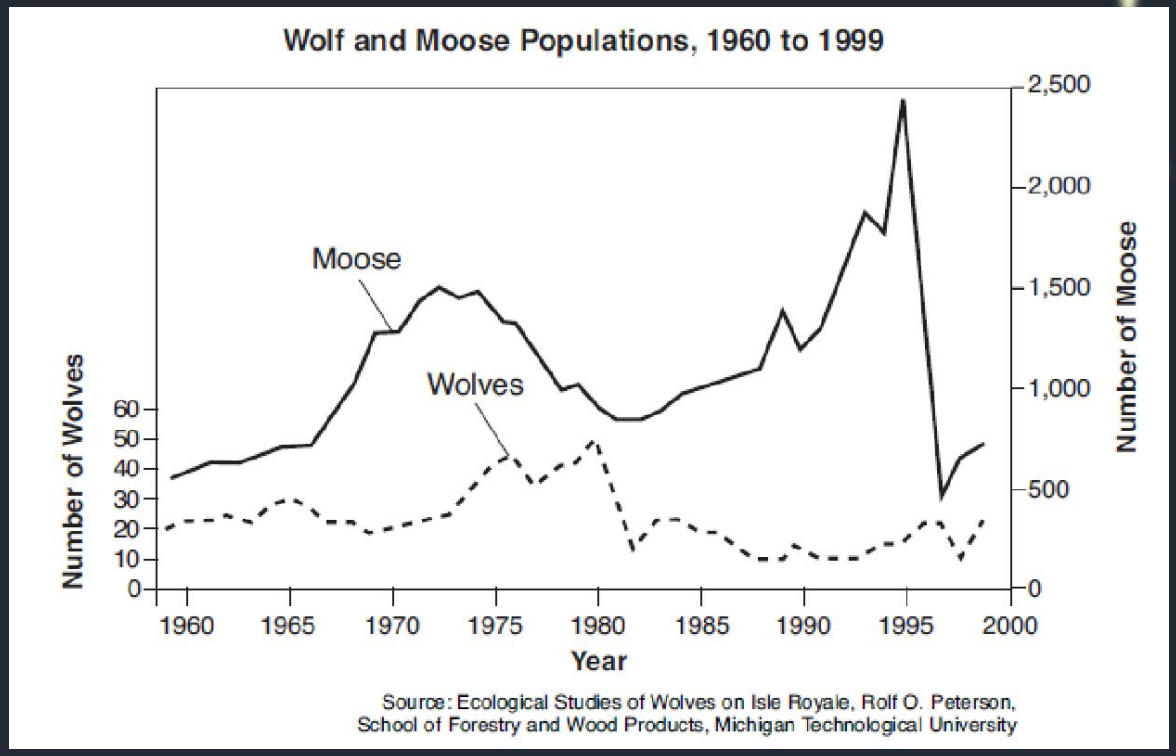


Which graph best shows changes in a population of yeast that develops in a test tube and completely consumes a limited supply of food?



1. Answer -

Bonus Problem #2



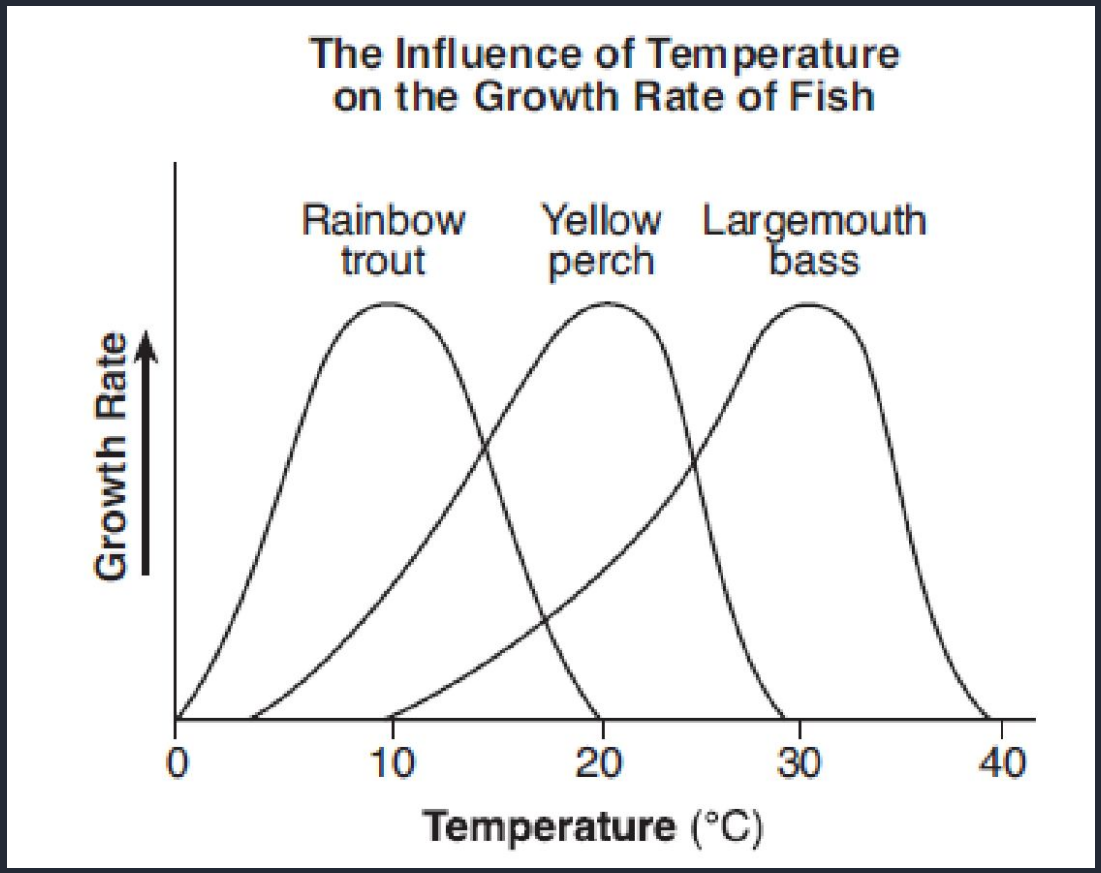
What was the population of wolves in 1980?

What can you deduce happened to the moose population in 1994?

1. Answer -

Bonus Problem #3

At what temperature range could all three fish species survive?



1. Answer -