Name _____ Hour _____
Biology I Date _____

Population Density Problems

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Several factors affect population density. The main factors are birthrate, mortality, immigration and emigration. Other limiting factors may come from the environment. Biotic factors like predators, available food, competitors and disease may affect the population size. Abiotic factors like temperature, weather, living space and available water can affect it as well.

Remember that *population density* is determined with this formula:

$$\text{Population Density} = \frac{\text{Population (\#of individuals)}}{\text{Area}}$$

1. On October 15, 1984 at the beginning of the squirrel-hunting season, biologists counted 95 gray squirrels in a 20-acre forest. On December 15, 1984, 42 gray were counted in the forest.

   a. What was the density of the gray squirrel population on October 15, 1984? (1 pt)

   b. What was the density of the gray squirrel population on December 15, 1984? (1 pt)

   c. List the many factors that ***could have affected*** the density of the population. (½ pt)

   d. What factor ***must*** have affected the density the most? (½ pt)

2. In a certain city an 8-block area, 300 old/rundown houses contained 1530 humans and an estimated population of 1800 rats. Then the Urban Renewal Commission razed the houses in the area and constructed 8 large apartment buildings. Following this development, 2880 humans and an estimated population of 200 rats occupied the area.

   a. Calculate the population density per block for <u>rats</u> ***before*** and ***after*** the development. (2 pts)

   b. What is the change in rat population density? (1 pt)

   c. What factors were probably most important in causing this change in the density of rats? (½ pt)

d. Calculate the population density per block for humans ***before*** and ***after*** the development. (2 pts)

e. What is the change in human population density? (1 pt)

f. What factors were probably most important in causing this change in the density of humans? (½ pt)

3. On a range of 375 acres are a total of 1450 jackrabbits. During the following year studies indicate the rates for this population:

Birthrate – 3625/yr	Immigration – 190/yr
Mortality – 2320/yr	Emigration – 845/yr

a. Is the population of jackrabbits increasing or decreasing? (½ pt) _____

b. Calculate the rate at which the population is changing (**+** or **–** number of jackrabbits/yr). (1 pt)

c. Predict the population size at the end of four years. (1 pt)

d. What is likely to happen to the population of producers in this area during the four years? (½ pt)
(Remember: Jackrabbits are herbivores.)

4. In a cornfield the population of weeds (all plants other than corn) is estimated at 47 weeds per square meter. Half the field is treated with chemical A and the other half is treated with chemical B.

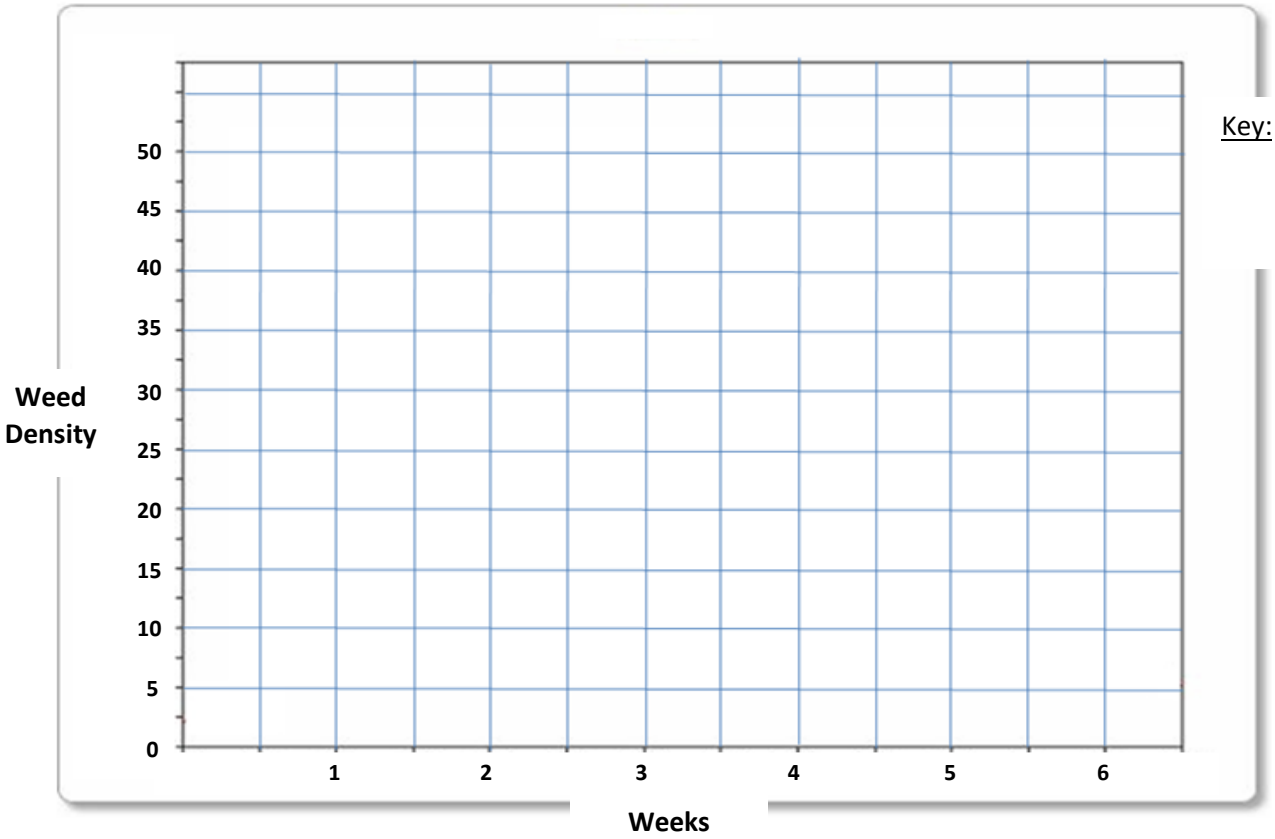
The density of weeds treated by **Chemical A** is as follows:

Chemical A	
Week 1	29/m^2
Week 2	20/m^2
Week 3	15/m^2
Week 4	14/m^2
Week 5	13/m^2

The density of weeds treated by **Chemical B** is as follows:

Chemical B	
Week 1	39/m^2
Week 2	25/m^2
Week 3	17/m^2
Week 4	12/m^2
Week 5	9/m^2

Use the data from tables A & B and graph the data on the next page and answer the following questions based on that data.



3 pts

a. Which chemical would you recommend to a corn farmer to control the weed population density in the cornfields? Why? (1 pt)

b. How many weeds/m^2 did the 1st half of the field start out with? (½ pt)_____

How many weeds/m^2 did the 2nd half of the field start out with? (½ pt)_____

c. At what point in time did the 2 chemical have the same amount of weeds/m^2 left in their part of the fields? (½ pt)

d. What happened over time with chemical A? (½ pt)

e. Which chemical killed more weeds faster? (between week 1-2) Back it up with data. (2 pts)