Name _____ Date _____

A Yeast Population Study

75

A population study of living organisms may be difficult in the laboratory for several reasons. Reproductive cycles of some organisms can take months or years. Proper maintenance and growth of a population under ideal conditions may be difficult. Also, accurate counting of actual numbers of a population often requires elaborate equipment or sampling techniques. Study of a population in a laboratory is artificial compared to an actual population in nature. Many environmental factors which are interrelated in nature cannot be duplicated in a laboratory.

Biologists often study population trends using microorganisms such as yeast. The problems listed above are lessened somewhat when dealing with this type of organism. Yeasts can be maintained easily in test tubes, they reproduce rapidly under ideal conditions, and a simple sampling technique can be used to count a yeast population.

In this investigation, you will

(a) use a sampling technique to determine density changes in a yeast population.
(b) compare the number of cells present at the start of a yeast population with the number present during later time intervals.
(c) calculate and graph the actual number of cells present in the yeast population.
(d) apply the principles responsible for changes in the yeast population to the human population.

Procedure

Figure 75-1 represents population samples taken from a test tube yeast population. The samples are on special glass slides with lines etched on them. Each figure represents the view as seen through a microscope.

- Count the total number of yeast cells (small circles) in each of the three samples for 0 hours.

As an aid in counting, the areas are divided into 16 small squares. You may wish to place a pencil dot inside those cells counted so that you do not count any twice.

- Record in Table 75-1 the number of cells counted in each of the three areas for 0 hours of growth.

- Determine and record in the proper column of Table 75-1 the total number of cells for 0 hours.

- Compute the average number of yeast cells per area to one decimal place. Record the average in Table 75-1.

- Repeat the four previous steps for yeast samples at 24, 48, 72, 96, and 120 hours.

All cells in the test tube population were not counted on the glass slides. Only a small sample was counted. Thus, this method of determining population is called a sampling technique. Multiplying all average yeast cell counts in Table 75-1 by 1000 will give an estimate of the number of cells in the entire population. A volume equal to only 1/1000 the original yeast population was placed on the counting slides.

- Record in the row "Entire Population" of Table 75-1 the total number of yeast cells in the population.

- In Figure 75-2, construct a graph of your data. Use values representing the total number of yeast cells (entire population) present during 0, 24, 48, 72, 96, and 120 hours.

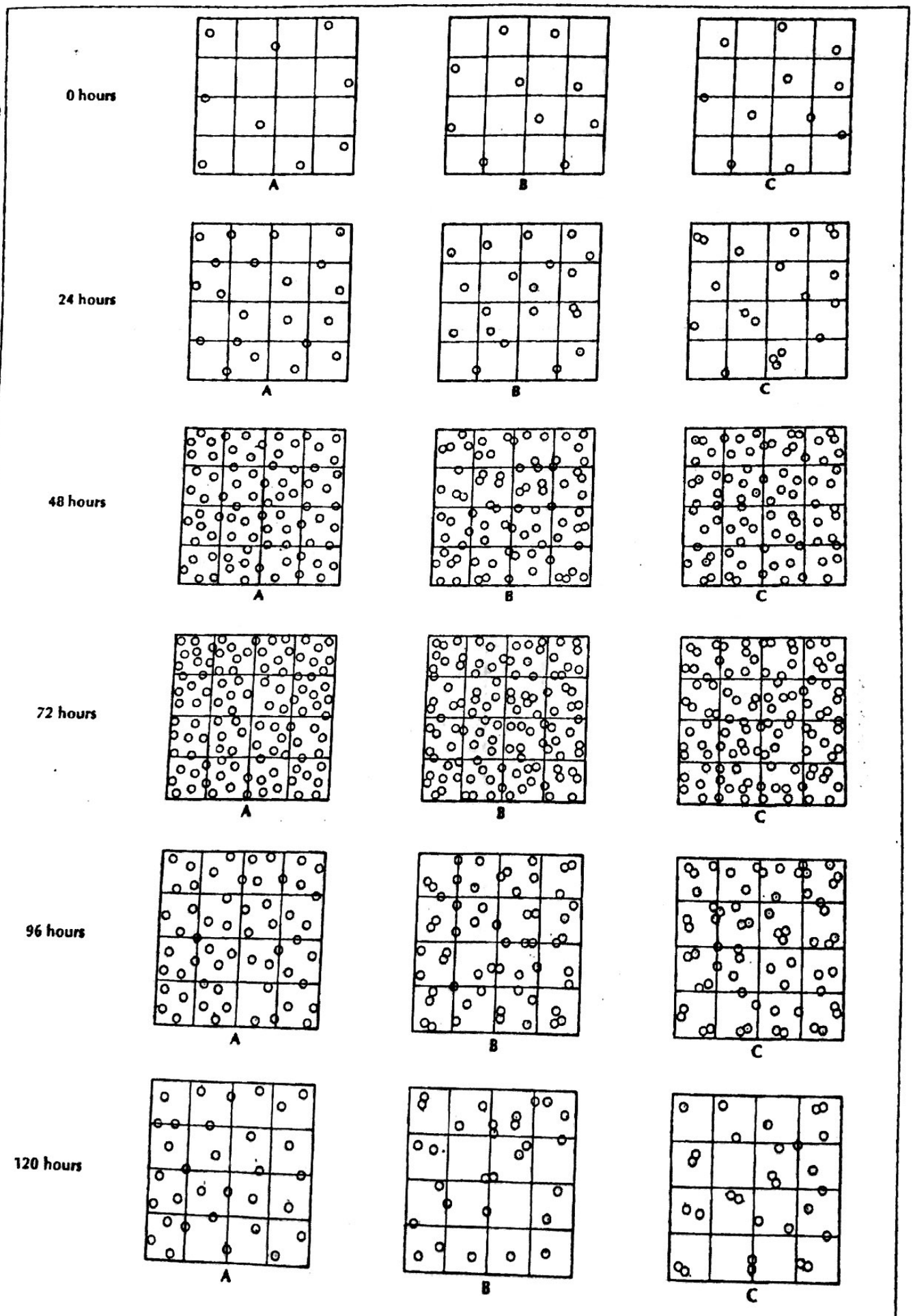
0 hours
A
B
C
24 hours
A
B
C
48 hours
A
B
C
72 hours
A
B
C
96 hours
A
B
C
120 hours
A
B
C

FIGURE 75-1

Name _____ Date _____

TABLE 75-1. SAMPLES OF YEAST POPULATION						
	NUMBER OF CELLS					
HOURS →	0	24	48	72	96	120
Area A						
Area B						
Area C						
Total						
Average						
Entire population (Average × 1000)						

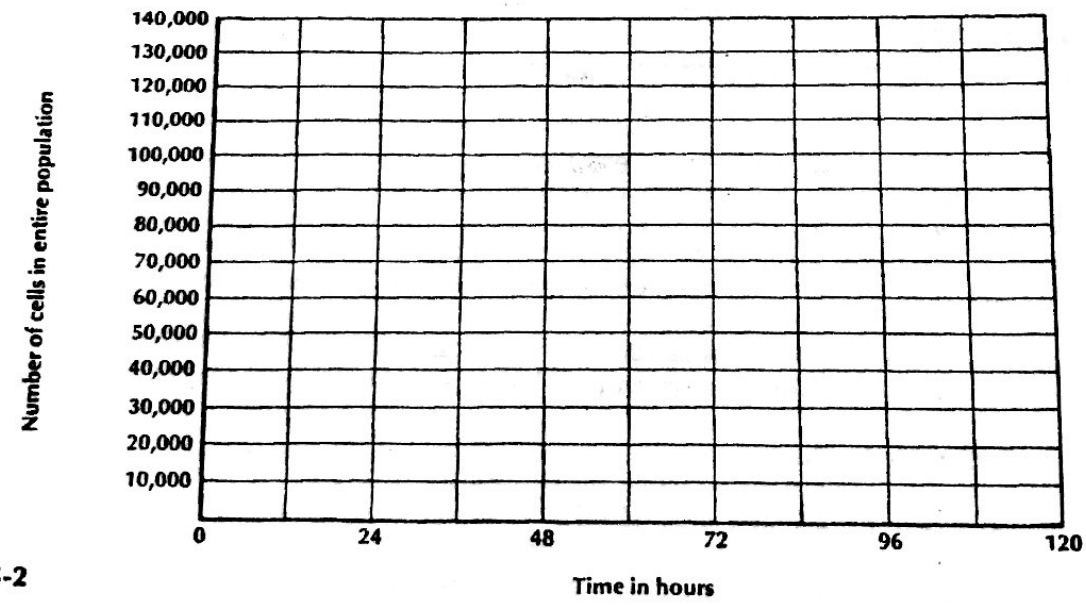

FIGURE 75-2

Analysis

1. From the graph, determine the change in population size between

   (a) 0 and 24 hours._____

   (b) 24 and 48 hours._____

   (c) 48 and 72 hours._____

   (d) 0 and 72 hours._____

2. During which time interval (0-24, 24-48, and so on) is growth most rapid?_____

3. During which time interval (0-24, 24-48, and so on) is growth slowest?_____

4. When did this yeast population reach a peak (no further increase in growth occurred)?_____

5. What happened to this yeast population after it reached its peak (maximum)?_____

6. After reaching a peak, the yeast population began to decline. What may have caused this?_____

_____

7. From the graph in Figure 75-3, determine the changes in the human population occurring between

(a) 1700 and 1800._____

(b) 1800 and 1900._____

(c) 1900 and 2000._____

NOTE: The dashed portion of the graph line is an estimate of the population in future years based on the current rate of increase.

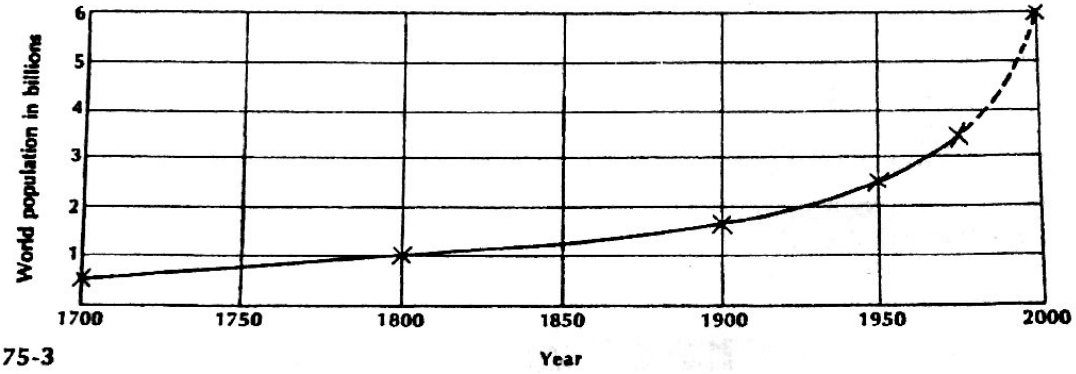

FIGURE 75-3

8. It took 125 years (1800-1925) for the human population to increase in size by 1 billion.

(a) How many years were needed to increase by another 1 billion (from 2 to 3 billion)?_____

(b) How many years is it expected to take for the next 1 billion increase (from 3 to 4 billion)?_____

_____

(c) What trend is occurring within the human population as far as the amount of time needed to increase population by 1 billion._____

9. Has the human population reached a peak similar to the yeast population?_____

10. What do you think may happen to the human population if it continues to increase?_____

_____

11. Explain how each of these factors may be important in influencing human population growth.

(a) crowding or available space_____

_____

(b) food availability_____

_____

(c) chemicals produced as "waste products"_____

_____