

Name: \_\_\_\_\_

# Scientific Method Unit Review :

## Dichot. Keys

Base your answers to questions 47 through 49 on the information below and on your knowledge of biology.

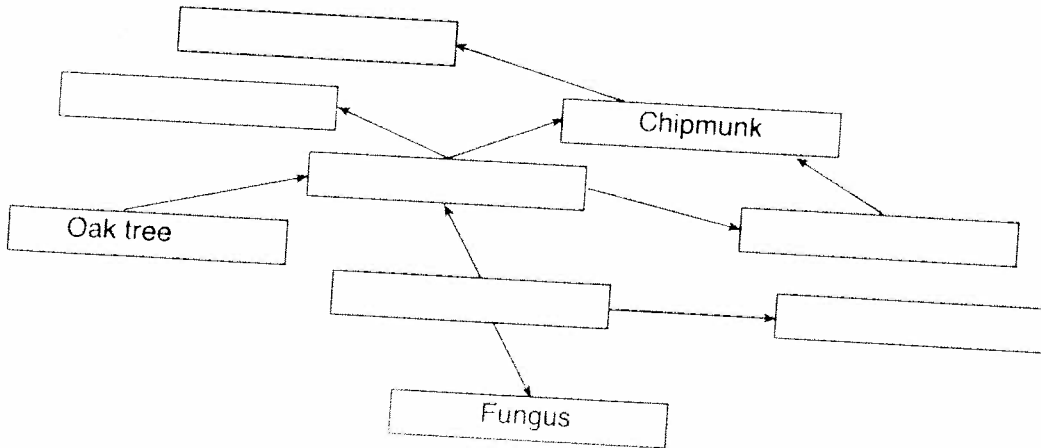
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An ecologist made some observations in a forest ecosystem over a period of several days. Some of the data collected are shown in the table below.

Observations in a Forest Environment

| Date | Observed Feeding Relationships   | Ecosystem Observations  |
|------|--|---|
| 6/2  | <ul style="list-style-type: none"> <li>white-tailed deer feeding on maple tree leaves</li> <li>woodpecker feeding on insects</li> <li>salamander feeding on insects</li> </ul> | <ul style="list-style-type: none"> <li>2 cm of rain in 24 hours</li> </ul>                            |
| 6/5  | <ul style="list-style-type: none"> <li>fungus growing on a maple tree</li> <li>insects feeding on oak trees</li> </ul>   | <ul style="list-style-type: none"> <li>several types of sedimentary rock are in the forest</li> </ul> |
| 6/8  | <ul style="list-style-type: none"> <li>woodpecker feeding on insects</li> <li>red-tailed hawk feeding on chipmunk</li> </ul>   | <ul style="list-style-type: none"> <li>air contains 20.9% oxygen</li> </ul>                           |
| 6/11 | <ul style="list-style-type: none"> <li>chipmunk feeding on insects</li> <li>insect feeding on maple tree leaves</li> <li>chipmunk feeding on a small salamander</li> </ul>     | <ul style="list-style-type: none"> <li>soil contains phosphorous</li> </ul>                           |

47 On the diagram below, complete the food web by placing the names of *all* the organisms in the correct locations. [1]



47

48 Identify *one* producer recorded by the ecologist in the data table. [1]

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48

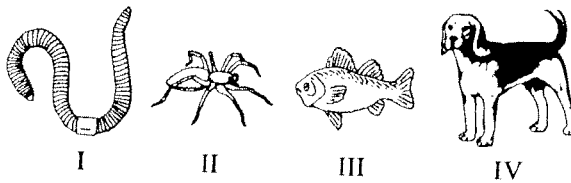
49 Which statement describes how one biotic factor of the forest uses one of the abiotic factors listed in the data table?

- (1) Trees absorb water as a raw material for photosynthesis.
- (2) Insects eat and digest the leaves of trees.
- (3) Erosion of sedimentary rock adds phosphorous to the soil.
- (4) Fungi release oxygen from the trees back into the air.

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49

50 Fill in all of the blanks in parts 2 and 3 of the dichotomous key below, so that it contains information that could be used to identify the four animals shown below. [2]



**Dichotomous Key**

- 1. a. Legs present..... Go to 2
- b. Legs not present..... Go to 3

**Characteristic**

**Organism**

- 2. a. \_\_\_\_\_
- b. \_\_\_\_\_
- 3. a. \_\_\_\_\_
- b. \_\_\_\_\_

50

Base your answers to questions 46 through 49 on the information and data table below and on your knowledge of biology.

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Birds colliding with aircraft either on the ground or in the air create problems for the Air Force. An organization known as BASH (Bird Aircraft Strike Hazard) studied the impact of birds colliding with aircraft. In 2001, there were 3854 bird collisions reported at a total cost to the Air Force of over 31 million dollars in damage—approximately eight thousand dollars per collision. August, September, and October were the busiest months with 1442 collisions. Nearly 50% of all these collisions occurred in the airfield environment, an environment that can most easily be controlled.

The top five species of birds involved in these collisions are listed in the data table below.

**Top Five Bird Species Involved in Collisions in 2001**

| Type of Bird                       | Number of Collisions |
|------------------------------------|----------------------|
| American mourning dove (species A) | 123                  |
| horned lark (species B)            | 100                  |
| barn swallow (species C)           | 83                   |
| American cliff swallow (species D) | 55                   |
| American robin (species E)         | 55                   |

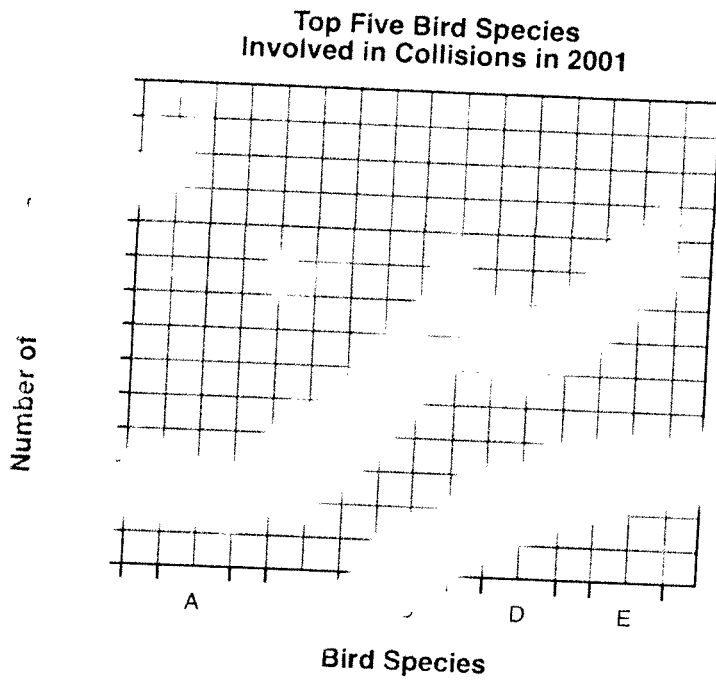
Source of data: Bird Aircraft Strike Hazard by Matt Granger, <http://www.find.articles.com>

Directions (46–47): Using the information in the data table, construct a bar graph on the grid, following the directions below.

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46 Mark an appropriate scale on the axis labeled "Number of Collisions." [1]

47 Construct vertical bars to represent the data. Shade in each bar. [1]



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48 Is the problem with birds and aircraft limited to your area? Using information from your research, write a message to your group.

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49 State one possible reason that the greatest number of bird collisions occurs during August, September, and October. [1]

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Part B-2

Answer all questions in this part. [10]

Directions (46-55): For those questions that are followed by four choices, circle the *number* preceding the choice that, of those given, best completes the statement or answers the question. For all other questions in this part, follow the directions given in the question and record your answers in the spaces provided.

Base your answers to questions 46 through 50 on the data table below and on your knowledge of biology. The data table shows the concentrations of oxygen in parts per million (ppm) present in freshwater and seawater at various temperatures.

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Concentration of Oxygen in Water

| Temperature (°C) | Oxygen Concentration in Freshwater (ppm) | Oxygen Concentration in Seawater (ppm) |
|------------------|--|--|
| 1                | 14.0                                     | 11.0                                   |
| 10               | 11.5                                     | 9.0                                    |
| 15               | 10.0                                     | 8.0                                    |
| 20               | 9.0                                      | 7.5                                    |
| 25               | 8.0                                      | 7.0                                    |
| 30               | 7.5                                      | 6.0                                    |

Directions (46-48): Using the information in the data table, construct a line graph on the grid on the next page, following the directions below.

46 Mark an appropriate scale on each labeled axis. [1]

47 Plot the data for freshwater oxygen concentration on the grid. Surround each point with a small circle and connect the points. [1]

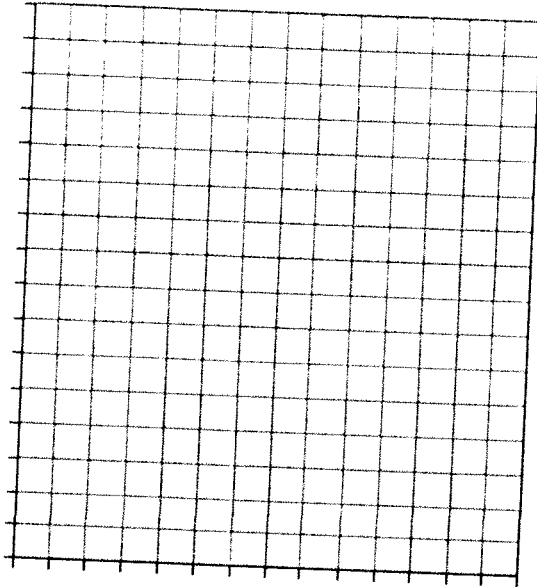


48 Plot the data for seawater oxygen concentration on the grid. Surround each point with a small triangle and connect the points. [1]



### Concentration of Oxygen in Water

Oxygen Concentration (ppm)



Temperature (°C)

| Key |                      |
|-----|----------------------|
| ●   | Oxygen in freshwater |
| ▲   | Oxygen in seawater   |

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49. Oxygen concentration in freshwater at 35°C. [1]

\_\_\_\_\_ ppm

50. State one \_\_\_\_\_ temperature and dissolved oxygen concentration in \_\_\_\_\_  
w: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

6

Base your answers to questions 52 through 55 on the information and data table below and on your knowledge of biology.

An investigation was carried out over a five-year period to measure the effect of color on the survival of trout in a stream. The stream contained many brightly colored stones and food was plentiful. At the start of the investigation (year 0), 100 bright-colored trout and 100 drab-colored trout were placed into a section of the stream that had been blocked with netting. Investigators monitored the trout populations for five years and recorded the water condition each time a count was done. The data collected are shown in the table below.

**Trout Population Over Five Years**

| Year | Bright-Colored Trout | Drab-Colored Trout | Condition of Water |
|------|----------------------|--------------------|--------------------|
| 0    | 100                  | 100                | clear              |
| 1    | 64                   | 36                 | clear              |
| 2    | 86                   | 25                 | clear              |
| 3    | 25                   | 77                 | cloudy             |
| 4    | 14                   | 86                 | cloudy             |
| 5    | 90                   | 9                  | clear              |

*Directions (52-54):* Using the information in the data table, construct a line graph on the grid on the following page, following the directions below.

52 Mark an appropriate scale on each labeled axis. [1]

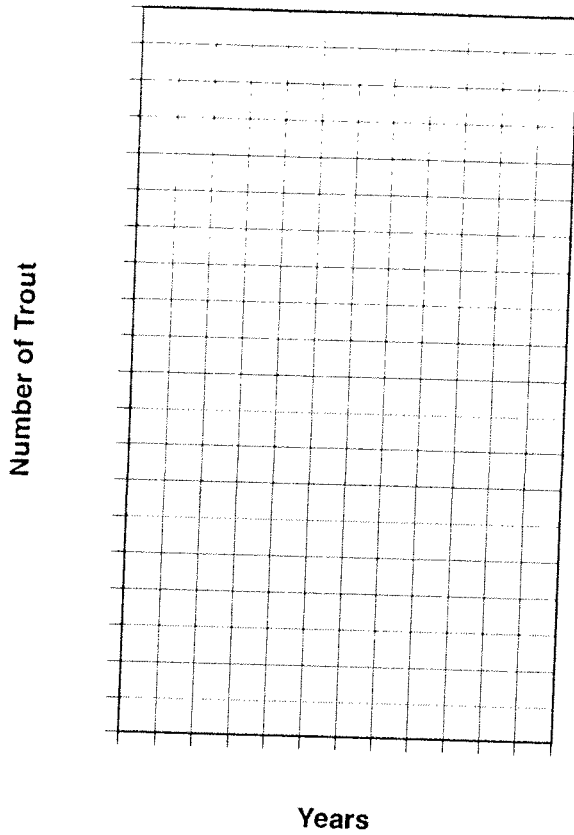
53 Plot the data for the bright-colored trout on the grid. Surround each point with a small circle and connect the points. [1]



54 Plot the data for the drab-colored trout on the grid. Surround each point with a small triangle and connect the points. [1]



### Trout Population Over Five Years



| Key |                      |
|-----|----------------------|
| ⊙   | Bright-colored trout |
| △   | Drab-colored trout   |

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55 Explain how trout survival is related to the color of trout and the environmental condition of the stream. [1]

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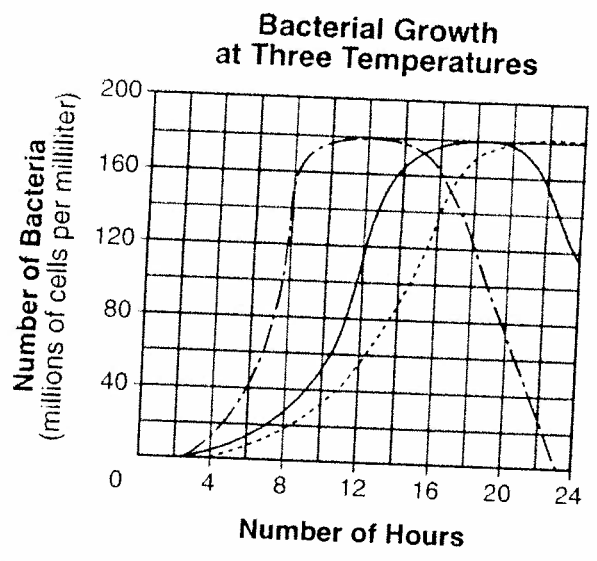


Part B-I

Answer all questions in this part. [13]

Directions (31-43): For each statement or question, write on the separate answer sheet the number of the word or expression that, of those given, best completes the statement or answers the question.

31 The graph below represents the growth of bacteria cultured at three different temperatures over a period of 24 hours.



| Key   |                     |
|-------|---------------------|
| ---   | Growth rate at 37°C |
| —     | Growth rate at 25°C |
| ..... | Growth rate at 18°C |

Which statement concerning the rate of cell division in the bacteria culture is correct?

- (1) Cell division is most rapid at 37°C between 6 and 8 hours after it began.
- (2) Cell division is most rapid at 25°C between 20 and 24 hours after it began.
- (3) Cell division is most rapid at 18°C between 4 and 8 hours after it began.
- (4) Cell division occurs at the same rate no matter what the temperature.

68 A student conducted an experiment to determine if listening to different types of music would affect pulse rate. She thought that pulse rate would change with different types of music. Each person participating in her experiment listened to seven different selections of music for 30 seconds each. The pulse rates were taken after each 30-second interval of music. Based on her experiment, the student concluded that a person's pulse rate changed when listening to different types of music.

The component missing from this experiment is a

- (1) prediction
- (2) hypothesis
- (3) control group
- (4) research plan

68

69 An experiment was carried out to determine whether drinking caffeinated soda increases pulse rate. The pulse rates of two groups of people at rest were measured. Group A was then given caffeinated soda and group B was given caffeine-free soda. One hour after drinking the soda, the pulse rates were measured. The participants in the experiment were all the same age, and they were all given the same amount of soda.

The dependent variable in this experiment is the

- (1) type of soda given to each group
- (2) amount of soda given to each group
- (3) pulse rate of each group
- (4) age of participants in each group

69

Base your answer to question 70 on the information below and on your knowledge of biology.

A student states that exercise will affect the number of times a person can squeeze a clothespin in a certain amount of time. An experiment is carried out to test this hypothesis. One group of ten students sits quietly before squeezing a clothespin as many times as possible during a one-minute interval. A second group of ten students does 25 jumping jacks before squeezing a clothespin as many times as possible during a one-minute interval.

70 State *one* way the experiment could be improved in order to increase the validity of the results. [1]

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

70

Answer all questions in this part. [17]

Directions (56–64): Record your answers in the spaces provided in this examination booklet.

Base your answer to question 56 on the information below and on your knowledge of biology.

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Help for Aging Memories

As aging occurs, the ability to form memories begins to decrease. Research has shown that an increase in the production of a certain molecule, BDNF, seems to restore the processes involved in storing memories. BDNF is found in the central nervous system and seems to be important in maintaining nerve cell health. Researchers are testing a new drug that seems to increase the production of BDNF.

56 Design an experiment to test the effectiveness of the new drug to increase the production of BDNF in the brains of rats. In your answer, be sure to:

- state the hypothesis your experiment will test [1]
- describe how the control group will be treated differently from the experimental group [1]
- identify two factors that must be kept the same in both the experimental and control groups [1]
- identify the dependent variable in your experiment [1]

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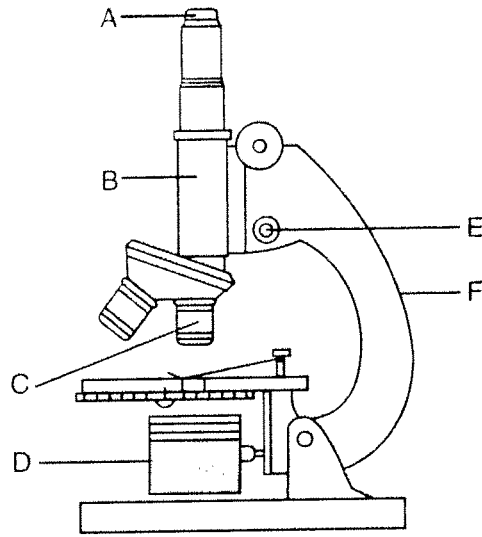
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Base your answers to questions 76 through 78 on the diagram of a microscope below and on your knowledge of biology.

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76 Information about which *two* lettered parts is needed in order to determine the total magnification of an object viewed with the microscope in the position shown? [1]

\_\_\_\_\_ and \_\_\_\_\_

76

77 Which lettered part should be used to focus the image while using high power? [1]

\_\_\_\_\_

77

78 State *two* ways the image seen through the microscope differs from the actual specimen being observed. [1]

\_\_\_\_\_ and \_\_\_\_\_  
\_\_\_\_\_

78

