

## 08 BIO-PROCESS LAB SAMPLE TOURNAMENT

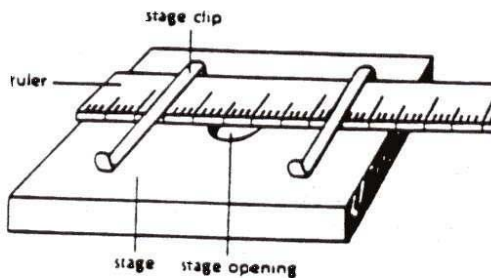
### Station A: Using a Microscope

1. What is the range of magnification (lowest to highest) for this microscope?
2. A slide with the letters "P" is positioned in the normal reading position on the stage. Show how the "P" will appear when viewed. Use the slide with the "P" to help you if you wish.

Place the transparent ruler on the stage, hold it down with the stage clips and focus on the metric scale with the low (10X) power objective.

Hint: Applying gentle pressure to the free end of the ruler will help to adjust for the thickness of the ruler and allow better focus. (See the diagram)

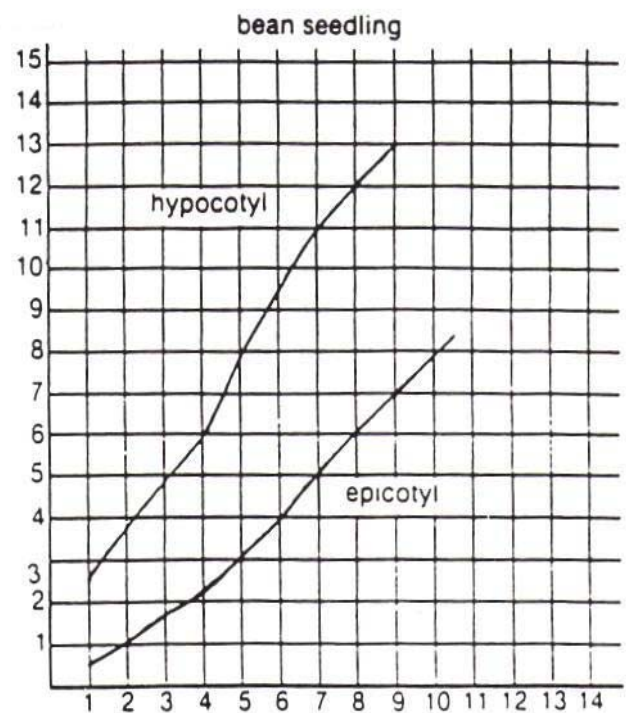
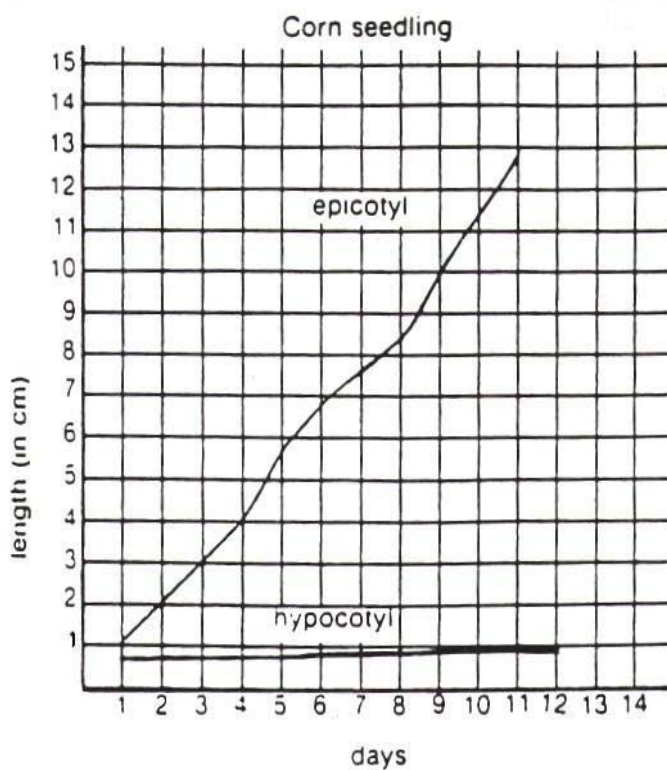
3. What is the diameter of the low (10X) power field of this microscope in millimeters ? in micrometers?
4. Assuming this algae photo was taken using the low power field of this microscope, what is the length in micrometers of the cell that is labeled "one cell" ?
5. A slide of red blood cells is viewed under high power (10X ocular and 40X objective). Ten evenly distributed cells are visible across the field of view. How many cells should be visible across the low (10X) power field of view?



## Station B: Experimental Design and Graphing

Examine the graph provided and answer the following questions.

6. What is the independent variable for this study?
7. What is the dependent variable for this study?
8. Which seedlings were studied for their germination patterns?
9. What should be the height in centimeters of the bean epicotyl at day 11?
10. Based upon the data, one might conclude that
  - (A) The corn seedling is dead.
  - (B) Bean seedlings grow slower than corn seedlings.
  - (C) The hypocotyl of bean seedlings grow taller than the hypocotyl of corn seedlings during the first week.
  - (D) Corn grows better in sandy soil than beans do.



### Station C: Hypothesis

Using the information provided and the following key, decide which is the appropriate response for statements 11 - 14.

Key:

- A. A logical hypothesis according to the data.
- B. Illogical hypothesis or contrary to the data.
- C. Not a hypothesis, but a restatement of data.
- D. Reasonable hypothesis, but not based on this data

- 11. The flies respond only to a visual stimulus.
- 12. The flies can detect color.
- 13. The flies assembled over plates I, III, and V.
- 14. Flies respond positively to the odor of fermenting grapes.
- 15. Movement of the flies was random until they encountered Plate I where they began to feed.

The following questions are based on the illustrated investigation. Fermenting grapes were placed in each of the plates shown in the diagram. 20 fruit flies were released 20 feet away. 30 seconds later flies were clustered around the plates as shown.



### Station D: Balances

Use the balances to determine the requested information.

Be sure to include units with all answers.

16. What is the most specific graduation or increment on either balance?
17. What is the capacity of the electronic balance?
18. What is the capacity of the triple beam balance as it is equipped with these two auxiliary weights in grams?  
in kilograms?
19. What is the actual combined weight in grams of the two auxiliary weights supplied with the triple beam balance.
20. Place object X on the appropriate balance and determine it's weight. What is it's weight in grams?

**PLEASE** - Place all slides on the balance back at zero!!

MATERIALS: Electronic balance – 0.1 g X 300 g, triple beam balance with 1 – 500 g and 1 - 1000g auxillary weights.

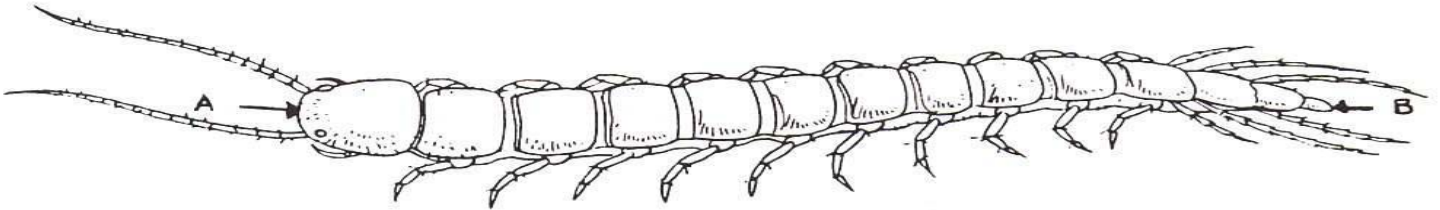
Object X is a bottle filled with water to equal 750 g.

NOTE: The auxillary weights have an actual mass of 147.5 g and 295 g.

## Station E: Measurement

Using the instruments provided, obtain the requested information.

21. Measure the length of the critter from A to B.  
What is its length in millimeters? in centimeters?
22. What is the value of the numbered and unnumbered increments or graduations of the actual thermometer taped to the counter.
23. What is the temperature recorded on the diagram of a thermometer?
24. What is the value of the numbered and unnumbered increments or graduations of the actual graduated cylinder on the counter?
25. What is the volume present in the pipet that is diagrammed?



## Station F: Observations

Use the specimens, diagrams and data provided to answer the following questions.

26. Using the diagrams provided and your knowledge of the bones in a vertebrate skeleton, name bone C .
27. Skull B is from what animal?
28. On average, how many animal skeletons are found per owl pellet?
29. How many of the animals consumed by this owl should be rodents?
30. From the organisms represented in the food web, list a food chain that would be the most common source of energy for the owl whose pellets were analyzed and represented on the data table.

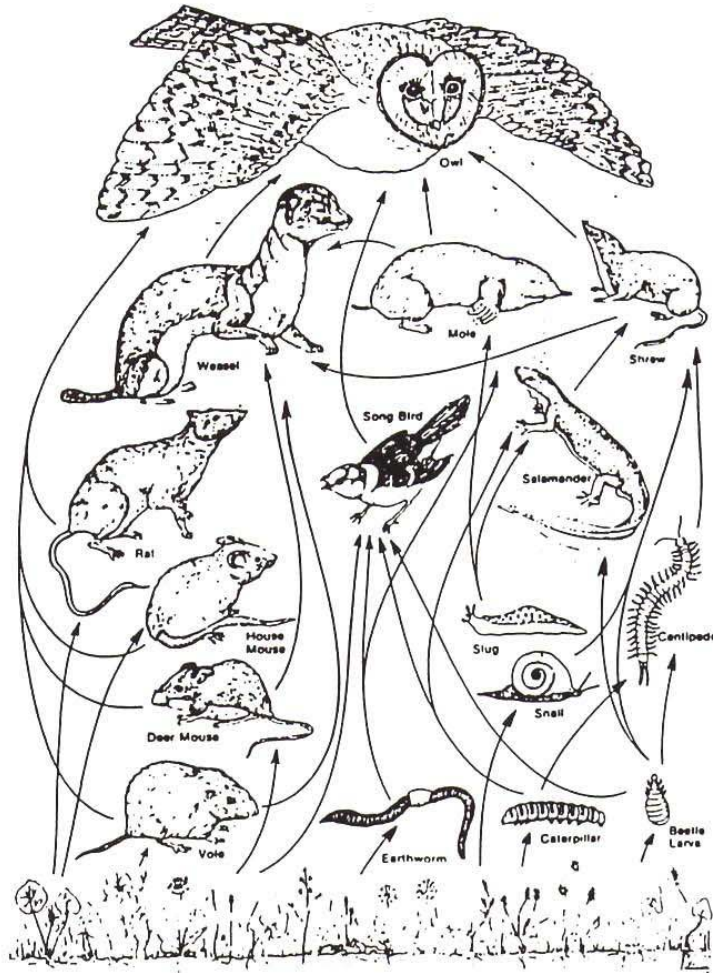
# Analyzing Owl Pellets

## BACKGROUND

Barn owls often nest in farm buildings and feed in open fields.

One way biologists learn about a community is by studying feeding patterns of members of that community. You can begin to learn about a field community by studying the feeding patterns of one member, the barn owl. The barn owl usually eats small mammals, such as rodents, shrews, and moles. These prey animals are swallowed whole. The prey animal's soft parts dissolve in the owl's stomach. The owl regurgitates the indigestible parts, such as bones, hair, teeth, and feathers, in a mass called an *owl pellet*. An owl pellet usually contains the entire skeleton of the prey animals the owl consumed the previous day. In this laboratory you will examine owl pellets to learn about feeding patterns of the owl and to find out about other animals in the owl's community.

Animal	Number found	% in diet
Rodent		73%
Shrew	11	21%
Mole	2	4%
Other: BIRD	1	2%
Total number of animals	51	
Total number of pellets	17	



**Station G: Genetics**

For questions 31 - 33, refer to the pedigree on Huntington's chorea.

**Background:** Assume that all couples are married.  
 Genotype is the gene combination and phenotype is the appearance of a trait.  
 Huntington's is caused by a dominant allele. Capitals letters indicate dominant genes and lower case indicate recessive genes. Remember that circles are females and squares are males.

- 31. What is the probable genotype of individual D?
- 32. What is the relationship of individuals D and E?
- 33. What is the probability that individual M will not have Huntington's chorea?

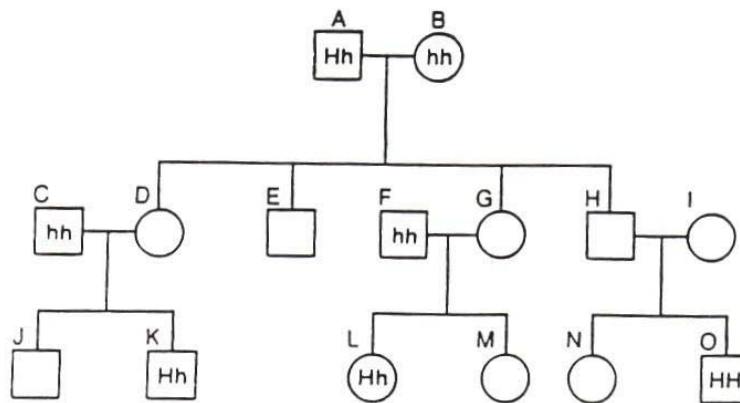
For questions 34 & 35, refer to the karyotypes provided?

Background: A karyotype is an arrangement of chromosomes with the autosomes arranged longest to shortest and the sex chromosomes are placed at the end. Remember normal males have an X and Y and normal females have 2 X chromosomes.

- 34. Which individual(s) are male?
- 35. How many chromosomes are present in a somatic (body) cell of individual B?

**Pedigree – Huntington's Disease**

Huntington's is a disease of the nervous system caused by a dominant gene. The normal gene is recessive.

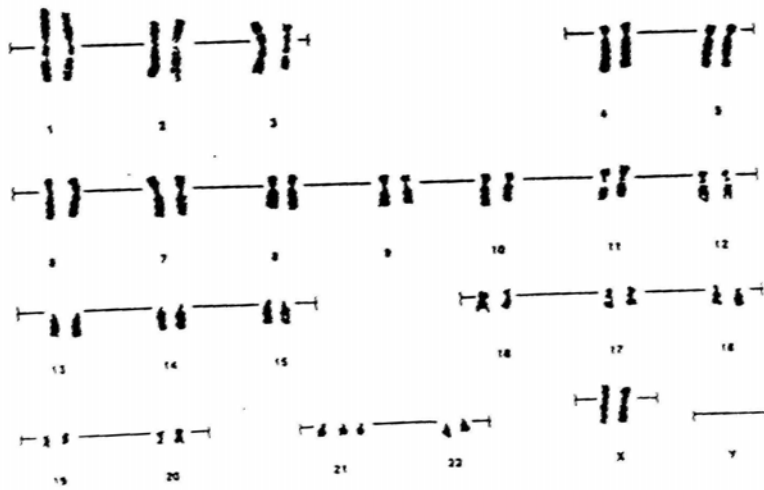




A



B



C

**Station H: Nutrition & Bioenergy**

Examine the food label on the food provided.

- 36. Food must provide a source of energy, raw materials, vitamins, and minerals. What unit on the food label gives the amount of stored energy for this food and how much is there in one serving?
- 37. The raw materials listed on the food label are protein, carbohydrates and fat. How many grams of total carbohydrate are present per serving? What % of the USDA does it provide?
- 38. What is the most abundant vitamin in this food? What % USDA does it provide?
- 39. What is the most abundant ingredient in this food and what is the least abundant ingredient?
- 40. What % of a single serving of this food is protein? Show how you calculated it.

**Spaghetti with Meat Sauce**

<b>Nutritional Facts:</b>	<b>Amount/serving</b>	<b>% DV*</b>
Serving size: 1pkg (326 g)	<b>Total Fat</b> 40 g	6%
Servings per container 1	saturated fat 1g	5%
<b>Calories 300</b>	polyunsaturated fat 1g	
Fat Calories 35	monounsaturated fat 1.5 g	
	<b>Cholesterol</b> 15 mg	4%
	<b>Sodium</b> 510 mg	20%
	<b>Total Carbohydrates</b> 51 g	17%
	Dietary fiber 5g	20%
	Sugars 9g	
	<b>Protein</b> 13g	

Vitamin A – 15%\*    Vitamin C – 4%\*    Calcium – 6%\*    Iron – 10%\*

Ingredients: Cooked spaghetti, tomatoes, water, beef, mushrooms, onions, bleached flour, salt, parmesan cheese, beef flavor, soy sauce, pepper

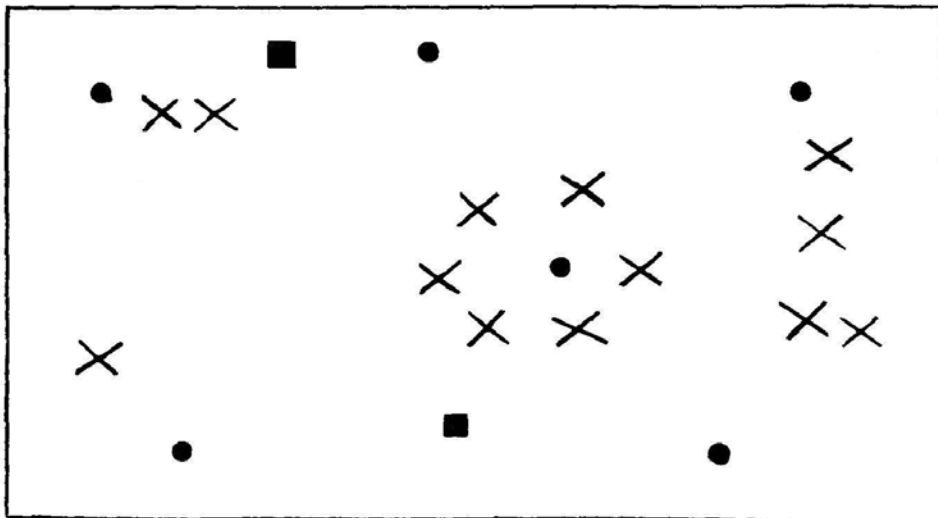
\* Percent Daily Values (DV) are based upon a 2000 calorie diet

**Station I: Ecology & Sample Analysis**

Use the metric ruler, chart and food web to assist you in analyzing this population sample.

- 41. What is the length and width of the clear plastic box in **meters**?
- 42. What is the area of the clear plastic box in **square meters**?
- 43. How many specimens are present in the clear plastic box and which symbol on the diagram of the sample area does this sample represent? (Is it the "[ ]", the "O" , or the "X" )
- 44. If this sample in the clear plastic box represents a typical sample for this population, how many **individuals** would there be **per square meter**?
- 45. Examine the food chain and the diagram of the sample area with symbols representing the populations present. Which organism on the food web is represented by the specimens in the clear plastic box?

PLANTS ———> MICE ———> SNAKES



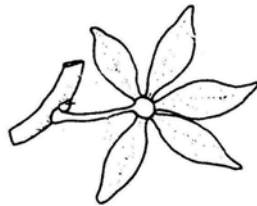
**Station J: Dichotomous key**

Use the specimens and the dichotomous key to identify the requested specimen.

- |                                  |   |
|----------------------------------|---|
| 46. Specimen A is a <u>  ?</u> . | <i>Materials:</i> Specimen A = white pine needles |
| 47. Specimen B is a <u>  ?</u> . | Specimen B = maple leaf                           |
| 48. Specimen C is a <u>  ?</u> . | Specimen C = horse chestnut leaf                  |
| 49. Specimen D is a <u>  ?</u> . | Specimen D = ash leaf                             |
| 50. Specimen E is a <u>  ?</u> . | Specimen E = elm leaf                             |

**Background: Leaf Anatomy Diagram**

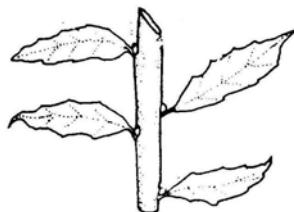
Palmately compound



Pinnately compound



Alternate



Opposite



- |  |                       |
|--|-----------------------|
| 1. Leaves needle-like . . . . .                        | 2                     |
| 1. Leaves are broad and flat . . . . .                 | 3                     |
| 2. Needles in bundles of 5 . . . . .                   | <b>Pinus strobus</b>  |
| 2. Needles in bundles of 2 . . . . .                   | <b>Pinus resinosa</b> |
| 3. Leaves compound . . . . .                           | 4                     |
| 3. Leaves simple . . . . .                             | 5                     |
| 4. Leaves palmately compound . . . . .                 | <b>Aesculus sp.</b>   |
| 4. Leaves pinnately compound . . . . .                 | <b>Fraxinus sp.</b>   |
| 5. Leaves arranged opposite on stem . . . . .          | 6                     |
| 5. Leaves arranged alternate on stem . . . . .         | 7                     |
| 6. Leaves lobed star-like . . . . .                    | <b>Acer sp.</b>       |
| 6. Leaves not lobed, large heart-shaped . . . . .      | <b>Catalpa sp.</b>    |
| 7. Leaves with uneven base, longer than wide . . . . . | <b>Ulmus sp.</b>      |
| 7. Leaves with even base, longer than wide . . . . .   | <b>Betula sp.</b>     |

**ANSWER KEY: SAMPLE TOURNAMENT  
BIO-PROCESS LAB**

SCHOOL NUMBER \_\_\_\_\_  
SCHOOL \_\_\_\_\_  
STATE \_\_\_\_\_

STUDENT NAMES: (PLEASE PRINT)

1. \_\_\_\_\_  
2. \_\_\_\_\_

RAW SCORE \_\_\_\_\_  
RANK \_\_\_\_\_  
POINTS \_\_\_\_\_

BE SURE TO INCLUDE APPROPRIATE UNITS WITH ALL ANSWERS!!!

**STATION A:**

1. 50X to 450 X  
2. d  
3. 1.5 mm            1500 mcm  
4. 300 mcm  
5. 40 cells

**STATION B:**

6. Days  
7. Length in cm  
8. corn & bean  
9. 9 cm  
10. C

**STATION C:**

11. B  
12. D  
13. C  
14. A  
15. B

**STATION D:**

16. 0.1 g  
17. 300 g  
18. 2110 g  
19. 442.5 g  
20. 750.0 g

**STATION E:**

21. 138.0 mm        13.80 cm  
22. n = 10° C    un = 1° C  
23. 28.5° C  
24. n = 10 mL    un = 1 mL  
25. 620.0 mL

**STATION F:**

26. femur  
27. shrew  
28. ~ 3  
29. 37  
30. plant → rodent → owl

**STATION G:**

31. H h  
32. sister and brother  
33. 50 %  
34. Individual B  
35. 47

**STATION H:**

36. calories            300 calories  
37. 51 g                    17%  
38. vitamin A            15%  
39. spaghetti            pepper  
40. 13 g / 326 g X 100% = 4%

**STATION I:**

41. .175 m X .125 m  
42. .02 m<sup>2</sup>  
43. 13  
44. 650 individuals/ m<sup>2</sup>  
45. plants

**STATION J:**

46. Pinus strobus  
47. Acer  
48. Aesculus  
49. Fraxinus  
50. Ulmus