Name _____ **Period** _____

Living Environment / Biology **Date** _____

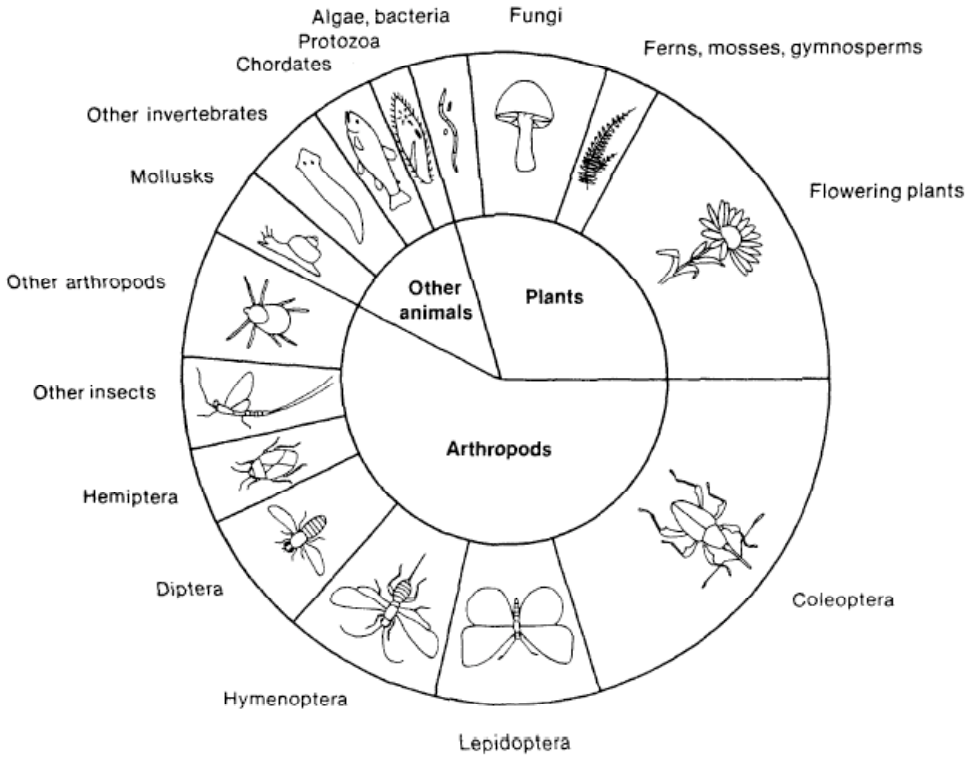
LAB ____. CLASSIFICATION & DICHOTOMOUS KEYS

As we have discussed in class, with the help of Carolus Linnaeus, scientists have developed a hierarchical organizing and naming system for all organisms — from **Kingdom** all the way down to **Genus** and **Species**. They have also detailed the characteristics by which organisms are clustered into those groups. For example, all organisms which are warm-blooded, have hair, give birth to live young, and produce milk are considered **Mammals**.

Now that we have this organized system, we can classify all living creatures into these groups. And we also can use the characteristics and groups to identify unknown specimens. Like "What bird is that?" or "What kind of bug is that

How does one go about identifying the species, genus, etc., of a specimen whose identity is unknown (to the person who wishes to identify the specimen)? The most useful tool for such identifications is the **dichotomous classification key**. A dichotomous key contains information useful in identifying unknown organisms, and is arranged in a way that allows the information to be used quickly. It is the most widely used type of key in biological sciences.

In a dichotomous key, the user is presented with a sequence of choices between paired statements based on characteristics of the organism. By always taking the correct choice the identity of the organism will eventually be revealed. Let's begin with a brief exercise to illustrate this.



Adapted from a lab originally developed by Michael Comet, South Lewis High School, Turin, NY

FRUIT IDENTIFICATION

We will practice using a dichotomous key with some items we are familiar with: fruit.

To use a dichotomous key, one begins with the first couplet of paired statements, deciding which statement is true for a specimen. The key may then tell you what organism or group you have, or it may direct you to another couplet. Choose the fruits at your lab bench one at a time and follow the key until you have arrived at an identification for each.

1a. Fruits occur singly ..... Go to 3

1b. Fruits occur in clusters of two or more ..... Go to 2

2a. Fruits are round ..... Grapes

2b. Fruits are elongate .....Bananas

3a. Thick skin that separates easily from flesh ..... Oranges

3b. Thin skin that adheres to flesh ..... Go to 4

4a. More than one seed per fruit .....Apples

4b. One seed per fruit ..... Go to 5

5a. Skin covered with velvety hairs ..... Peaches

5b. Skin smooth, without hairs .....Plums

Note that the overall organization of the key is very important. One cannot simply read through a key to find characteristics that apply to a specimen. For example, statement 3a above (*thick skin that separates easily from meat*) is true of both oranges and bananas. Correct identification of bananas depends on couplet number 1, which separates clustering vs. non-clustering fruits. You must walk through a dichotomous key step-by-step and not jump around until the key tells you to.

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PROCEDURE

1. Closely examine one of the drawings of a fish shown in your packet of fish diagrams. A labeled diagram has been provided to help you become familiar with fish anatomy and the terms that describe fish anatomy. Please review it and refer to it throughout this lab.

2. Pick a fish to identify in your packet of fish diagrams and then begin using the classification key by reading both statements listed under number 1.

3. One of these statements should describe the fish you have chosen; the other should not.

4. Refer to the number after the statement that fits your fish and look for that number lower down in the classification key.

5. Again select the statement that describes the fish you picked. Continue through the key until you come to a name after one statement. This should be the name of the fish you picked.

6. Use the key to identify the fish in your Fish Identification Packet.

FOLLOW THIS EXAMPLE:

Suppose you want to find the name of Fish 2. Look at the Classification Key on the next page. Note that each numbered item presents two possibilities. We see that our fish has no scales, or at least we cannot see any. So we choose item #1b. This refers us to number 12. So we skip down the page to number 12. Our fish is not elongated or snakelike (item 12b), so this choice directs us to go to number 13 of the key. The fish we are classifying has barbels (see the Fish Anatomy Diagram supplied with your Fish Identification Packet) growing from its lips and the top of its head (item 13a), so this choice directs us to go to number 14 of the key. Since our fish has a caudal fin that is rounded, and a blunt head, this choice directs us to the **Bullhead Catfish**. That becomes our identification.

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CLASSIFICATION KEY FOR COMMON FRESHWATER FISH OF NEW YORK STATE

Questions	Identify/Go To
1a. Body noticeably covered with scales	2
1b. Scales not covering body or too small to be seen	12
2a. Dorsal fin single	3
2b. Dorsal fins two or more, joined or separated	6
3a. Body more than four times as long as broad (top to bottom): front edge of dorsal fin far back on body; mouth large, hinge back of eye	4
3b. Body less than four times as long as broad: front edge of dorsal fin about midway between head and tail; mouth not large, hinge in front of eye	5
4a. Dark lines forming netted design on body: fins not spotted	Pickerel
4b. Body covered with yellow spots; fins spotted	Northern Pike
5a. Mouth turned downward: barbels absent; dorsal fin not elongated	White Sucker
5b. Mouth not turned downward: barbels present; dorsal fin elongated	Carp
6a. Two dorsal fins separated, the anterior spiny and the posterior soft	7
6b. Two dorsal fins united, forming an anterior spiny portion and a posterior soft portion	8
7a. Top of head concave, forming a hump in front of dorsal fin; dark vertical bars on body	Yellow Perch
7b. Top of head not concave, body sloping to dorsal fin and not forming a hump; dark blotches on body	Walleye
8a. Body more than three times as long as broad	9
8b. Body less than three times as long as broad	10
9a. Hinge of jaws behind the eye: notch between spiny and soft dorsal fin deep and nearly separating into two fins	Large Mouthed Bass
9b. Hinge of jaws below the eye; notch between spiny and soft dorsal fin not nearly separating into two fins	Small Mouthed Bass
10a. Mouth large, hinge below or behind eye	11
10b. Mouth small, hinge in front of eye	Bluegill
11a. Five to seven spines in dorsal fin; dark spots forming broad vertical bars on sides, Red/orange earspot on gill covering	Pumpkinseed
11b. Ten or more spines in dorsal fin: sides flecked with dark spots	Rock Bass
12a. Body much elongated and snakelike: dorsal, caudal, and anal fins continuous	American Eel
12b. Body not elongated and snakelike: dorsal, caudal, and anal fins separate; adipose fin present	13
13a. Barbels growing from lips arid top of head; head large and broad	14
13b. Barbels lacking; head not large and broad	16
14a. Caudal fin deeply forked; head tapering	15
14b. Caudal fin rounded or slightly indented but not forked: head blunt	Bullhead
15a. Dorsal fin rounded at top: body silvery, speckled with black markings	Channel Catfish
15b. Dorsal fin long and pointed at too: body bluish-gray without speckles	Blue Catfish
16a. Caudal fin deeply forked: back not mottled and with few spots	Atlantic Salmon
16b. Caudal fin square or slightly indented; back mottled or spotted	17
17a. Back and caudal fin spotted: broad horizontal band along sides	Rainbow Trout
17b. Back mottled with dark lines: caudal fin not spotted; fins edged with white	Brook Trout

Data: The following data were collected during this activity:

Fish #	Identified as	**Identification pathway** (list numbers & letters separated by commas)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		

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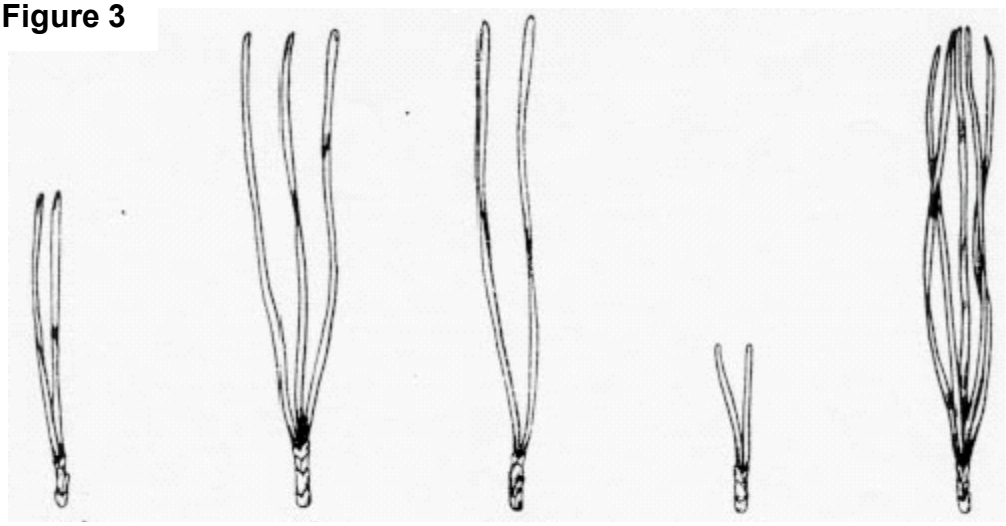
1. Prepare your own key for the pine tree sample in the figure below. Use the same format as the dichotomous keys you have seen in this lab page. These leaves (needles) in Figure 3 (below) are all from different pine trees and are drawn life size. Note that each bundle contains different numbers and lengths of leaves. Design a key which will classify each tree. You may use a ruler if necessary.

Figure 3



Scotch **Pitch** **Austrian** **Jack** **White**

1A _____

1B _____

2A _____

2B _____

3A _____

3B _____

4A _____

4B _____

5A _____

5B _____

6A _____

6B _____

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