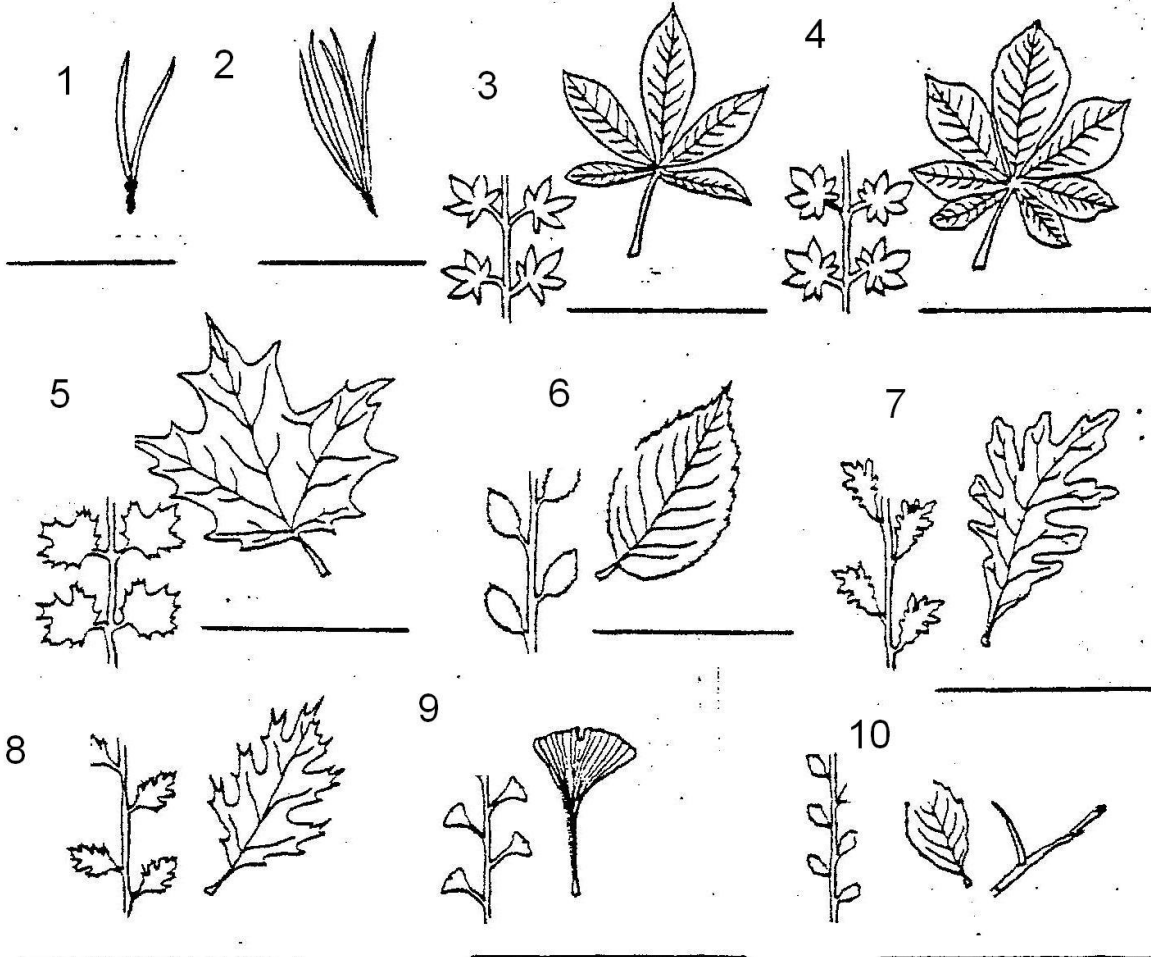


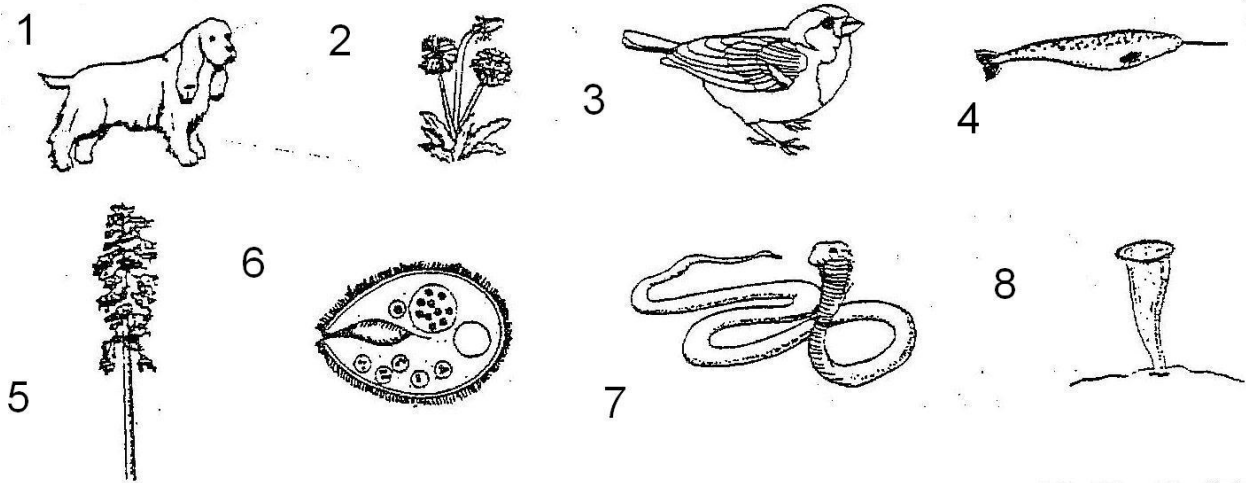
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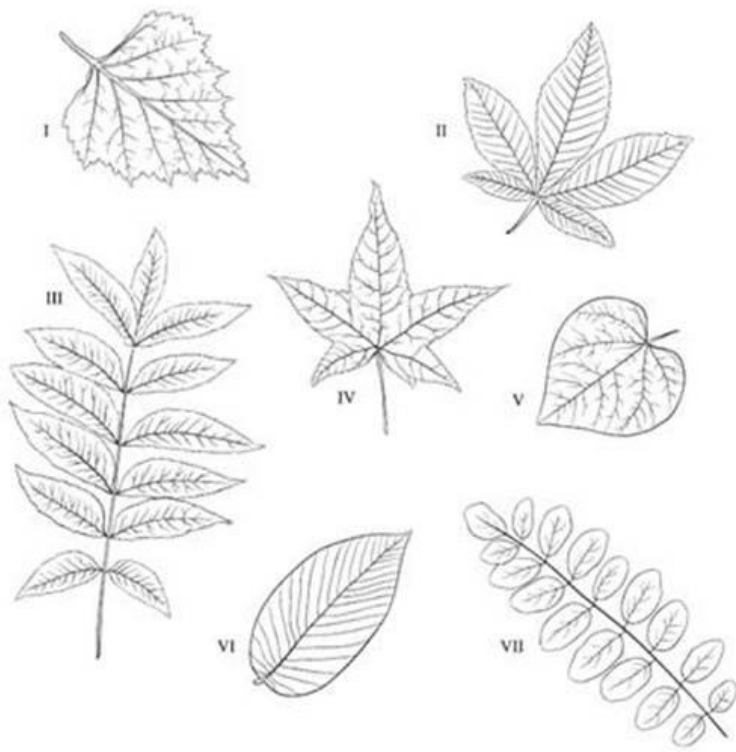


Below is one possible dichotomous key for the trees shown in this lab:

- 1a. Trees with leaves modified as needles — Go to 2
- 1b. Trees with broad-bladed leaves — Go to 3
- 2a. Two needles in bundle . . . Jack pine
- 2b. Five needles in bundle . . . White pine
- 3a. Leaves compound — Go to 4
- 3b. Leaves simple — Go to 5
- 4a. Leaf composed of five leaflets . . . Buckeye
- 4b. Leaf composed of seven leaflets . . . Horse chestnut
- 5a. Leaves opposite . . . Maple
- 5b. Leaves alternate — Go to 6
- 6a. Three with thorns . . . Hawthorn
- 6b. Tree without thorns — Go to 7
- 7a. Leaf blade shaped like a fan . . . Ginkgo
- 7b. Leaf blade not shaped like a fan — Go to 8
- 8a. Leaf blade oval, toothed but not lobed . . . Elm
- 8b. Leaf blade lobed — Go to 9
- 9a. Leaf blade with rounded lobes . . . White oak
- 9b. Leaf blade with pointed lobes . . . Pin oak

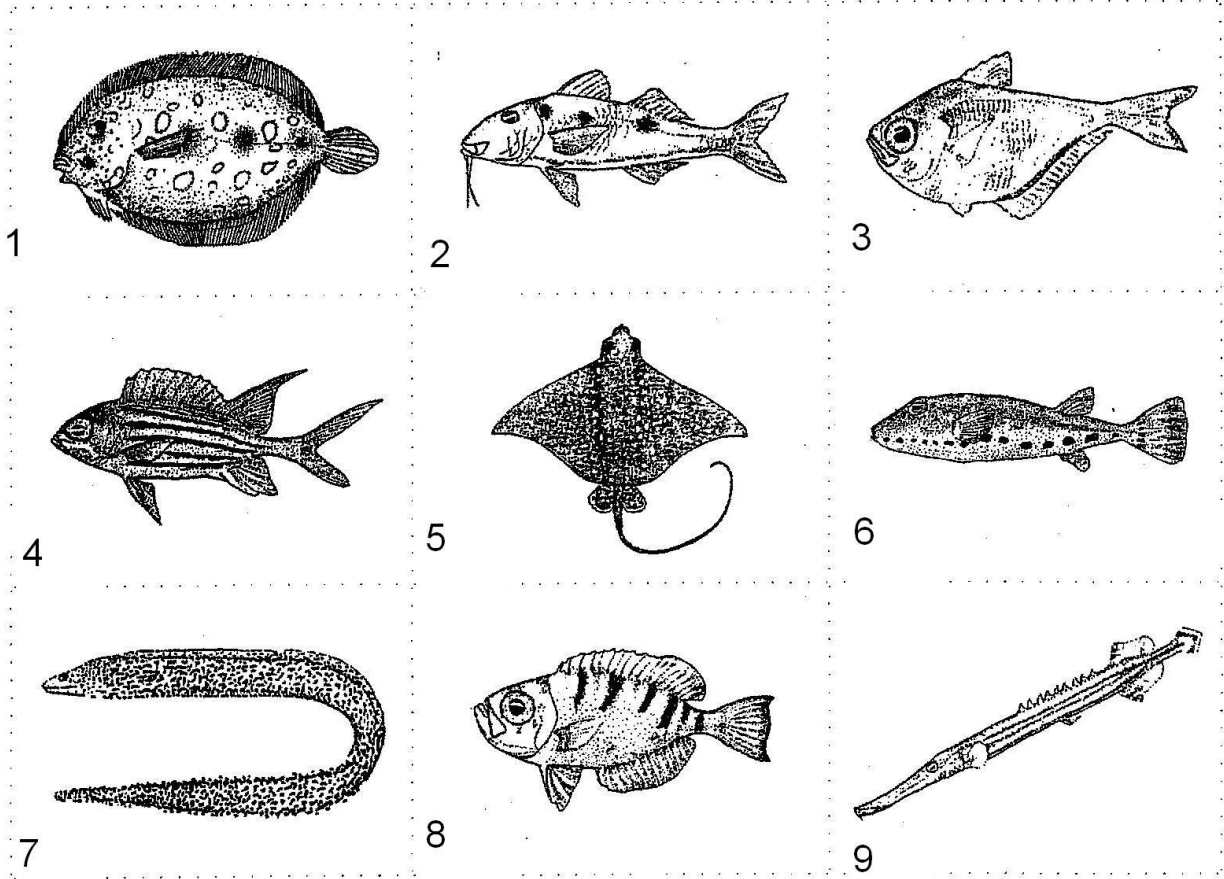


- 1a. organism with two or four functional legs . . . go to 2
 1b. organism without two or four legs go to 3
- 2a. organism without wings *Canis familiaris* dog
 2b. organism with wings *Passer domesticus* house sparrow
- 3a. organism is unicellular go to 4
 3b. organism is multicellular go to 5
- 4a. organism swims freely in water *Balantidium* sp. balantidium
 4b. organism anchored to substrate *Stentor* sp. stentor
- 5a. organism is heterotrophic go to 6
 5b. organism is autotrophic go to 7
- 6a. organism lives in oceans *Monodon monoceros* narwhal
 6b. organism lives on land *Ophiophagus hannah* king cobra
- 7a. organism is a tree *Pinus ponderosa* ponderosa pine
 7b. organism is an herb *Taraxicum officinale* dandelion



Dichotomous Key for Leaves

1. Compound or simple leaf
 - 1a) Compound leaf (leaf divided into leaflets)go to step 2
 - 1b) Simple leaf (leaf not divided into leaflets)go to step 4
2. Arrangement of leaflets
 - 2a) Palmate arrangement of leaflets (leaflets all attached at one central point)*Aesculus* (buckeye)
 - 2b) Pinnate arrangement of leaflets (leaflets attached at several points)go to step 3
3. Leaflet shape
 - 3a) Leaflets taper to pointed tips*Carya* (pecan)
 - 3b) Oval leaflets with rounded tips*Robinia* (locust)
4. Arrangement of leaf veins
 - 4a) Veins branch out from one central pointgo to step 5
 - 4b) Veins branch off main vein in the middle of the leafgo to step 6
5. Overall shape of leaf
 - 5a) Leaf is heart-shaped*Cercis* (redbud)
 - 5b) Leaf is star-shaped*Liquidambar* (sweet gum)
6. Appearance of leaf edge
 - 6a) Leaf has toothed (jagged) edge*Betula* (birch)
 - 6b) Leaf has untoothed (smooth) edge*Magnolia* (magnolia)



Fish key

Step 1

- A** If fish shape is long and skinny...
then go to Step 2
- B** If fish shape is not long and skinny...
then go to step 3

Step 2

- A** If the fish has pointed fins, it is a trumpet fish
- B** If the fish has smooth fins, it is a spotted moray eel

Step 3

- A** If fish has both eyes on top of the head...
then go to step 4
- B** If fish has one eye on each side of the head...
then go to step 5

Step 4

- A** If the fish has long whip-like tail, it is a spotted eagle ray
- B** If the fish has short, blunt tail, it is a peacock flounder

Step 5

- A** If fish has spots...
then go to step 6
- B** If fish does not have spots...
then go to step 7

Step 6

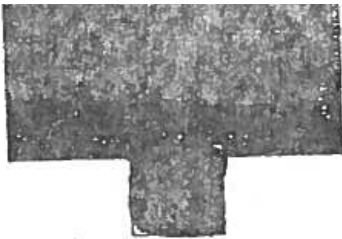
- A** If fish has chin "whiskers," it is a spotted goat fish
- B** If fish does not have chin "whiskers," it is a band-tail puffer

Step 7

- A** If fish has stripes...
then go to step 8
- B** If fish does not have stripes, it is a glassy sweeper

Step 8

- A** If fish has a v-shaped tail, it is a squirrel fish
- B** If fish has a blunt tail, it is a glass-eye snapper



Name _____
Class _____ Date _____

Classification

Extending Science Concepts

Classifying Insects

Almost one million species of insects have been identified. More than one-hundred thousand species can be found in North America. Scientists hypothesize that many more species exist but are yet to be discovered.

All insects are characterized by three body segments and six jointed legs. Most adult insects have two pairs of wings, but some are wingless and others, such as ants and termites, lose their wings after mating. The classification of insects is a very complex process and is based on such characteristics as presence and number of wings, shape of wings, shape of legs, type of mouth parts, and so on.

A dichotomous, or branched, key is a device useful in classifying. *Dichotomous* (dy KAHT uh muhs) comes from the Greek word meaning "in two." In a dichotomous key, two opposite characteristics are compared. As you use the key for classifying insects, start with numbers 1a and 1b. If the characteristic described in 1a fits the insect you are "keying," go on to the numbered step indicated at the end of the line. Continue keying the insect until you find its name.

Use the dichotomous key to classify the insects shown. Choose one insect and follow the key until you have named the insect. Put the insect's name on the line provided. Repeat the keying procedure for all of the insects.

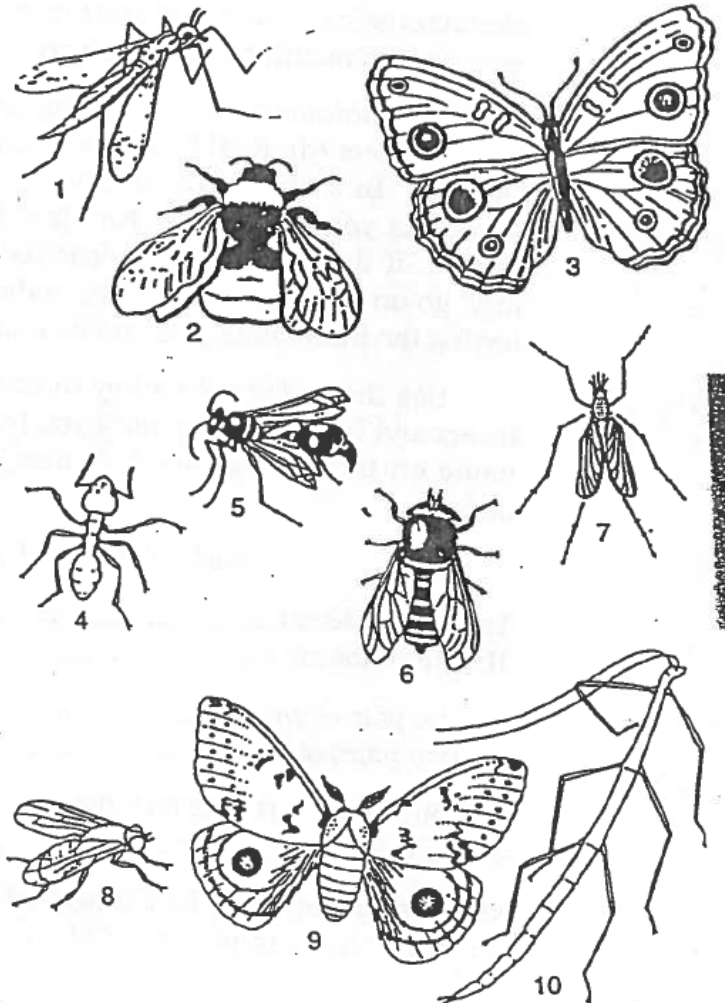
KEY TO INSECT CLASSIFICATION

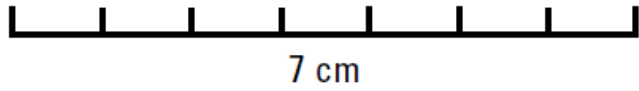
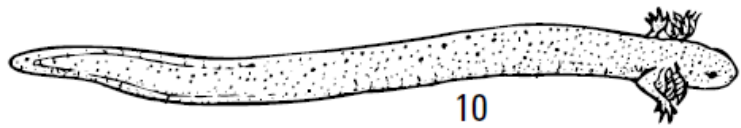
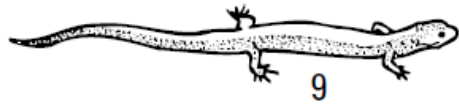
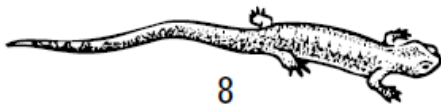
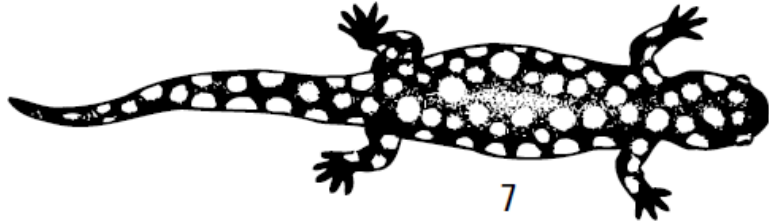
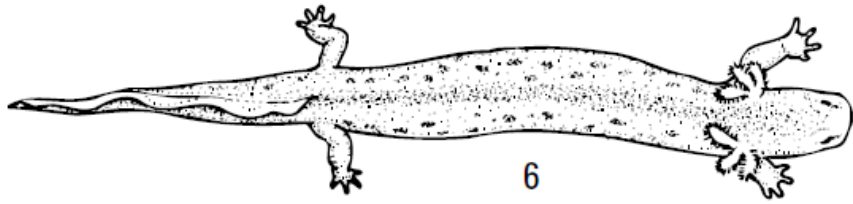
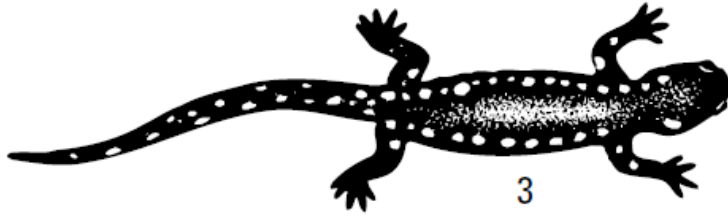
- 1a Wings presentgo to 2
- 1b Wings absentgo to 9
- 2a One pair of wingsgo to 3
- 2b Two pairs of wingsgo to 6
- 3a Long body, legs long and slendergo to 4
- 3b Rounded body, short legsgo to 5
- 4a Wings transparent, lie flat against body when at restmosquito
- 4b Wings transparent, extended up and away from bodycrane fly

Classification (continued)

- 5a Wings longer than body, rounded at endsfruit fly
 5b Wings almost the same length as body, slightly tapered at endshorse fly
 6a Wings broad and flat, covered with scalesgo to 7
 6b Wings transparent and narrowgo to 8
 7a Antennae long and thin, expanded at tipbutterfly
 7b Antennae feathery, pointed at tipmoth
 8a Abdomen broad and rounded, many bristlesbumblebee
 8b Abdomen slender, pointed at endwasp
 9a Twiglike body, long slender legswalking stick
 9b Large head, narrow "waist," rounded abdomen with pointed end ant

Number	Name
1	_____
2	_____
3	_____
4	_____
5	_____
6	_____
7	_____
8	_____
9	_____
10	_____





1	a Hind limbs absent	<i>Siren intermedia</i> , siren
	b Hind limbs present	Go to 2
2	a External gills present in adults	<i>Necturus maculosus</i> , mud puppy
	b External gills absent in adults	Go to 3
3	a Large size (over 7 cm long in Figure 1)	Go to 4
	b Small size (under 7 cm long in Figure 1)	Go to 5
4	a Body background black, large white spots variable in size completely covering body and tail	<i>Ambystoma tigrinum</i> , tiger salamander
	b Body background black, small round white spots in a row along each side from eye to tip of tail	<i>Ambystoma maculatum</i> , spotted salamander
5	a Body background black with white spots	Go to 6
	b Body background light color with dark spots and/or lines on body	Go to 7
6	a Small white spots on black background in a row along each side from head to tip of tail	<i>Ambystoma jeffersonianum</i> , Jefferson salamander
	b Small white spots scattered throughout a black background from head to tip of tail	<i>Plethodon glutinosus</i> , slimy salamander
7	a Large irregular white spots on a black background extending from head to tip of tail	<i>Ambystoma opacum</i> , marbled salamander
	b No large irregular black spots on a light background	Go to 8
8	a Round spots scattered along back and sides of body, tail flattened like a tadpole	<i>Triturus viridescens</i> , newt
	b Without round spots and tail not flattened like a tadpole	Go to 9
9	a Two dark lines bordering a broad light middorsal stripe with a narrow median dark line extending from the head onto the tail	<i>Eurycea bislineata</i> , two-lined salamander
	b Without two dark lines running the length of the body	Go to 10
10	a A light stripe running the length of the body and bordered by dark pigment extending downward on the sides	<i>Plethodon cinereus</i> , red-backed salamander
	b A light stripe extending the length of the body without dark pigment on the sides	<i>Hemidactylium scutatum</i> , four-toed salamander