



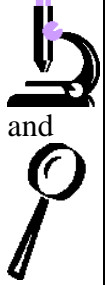
















Question #	The question	The answer	Bugs to use	Fact or ID sheets needed	Magnify needed	? Difficulty
A	Identify this aquatic macroinvertebrate.	Common Stonefly Nymph Order: Plecoptera Family: Perlidae	UNlabeled specimen (labeled X in unidentified reference collection) or live specimen	Key / illustration sheet (easier) or none (harder)		Easy
B	Here is a mount of a common insect's life cycle. a. Identify this insect. b. Review the life cycle mount and determine if it is complete or incomplete metamorphosis. c. List the stages in order of this life cycle	Mosquito Order: Diptera Family: Culcidae  Complete metamorphosis  Egg, larva, pupa, adult.	Use the mosquito (Culex) life history mount (a small, 2.5 in. long, plastic, clear block)	None		Easy
C	This organism's eating category is filtering collector. So what does it eat? What body adaptation does it have to assist with collecting food?	This is Brushlegged Mayfly nymph that eats fine particulate organic matter (FPOM). It has brushes on its front legs to help screen out the FPOM. Then it eats out of these brushes.	Use <u>UN-IDENTIFIED</u> Brushlegged Mayfly Specimen (Labeled F in the unidentified collection)	None		Difficult
D	Identify this aquatic macroinvertebrate.	Black Fly Larva Order: Diptera Family: Simuliidae	UNlabeled specimen (labeled E in unidentified reference collection) or live specimen	Key / illustration sheet (easier) or none (harder)		Moderate



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E	Here are two water bugs (hemiptera) commonly found in ponds swimming along the bottom and rising to the surface occasionally to obtain air – a backswimmer and a water boatman. Note that one side of their body (either top or bottom) is light and the other side is dark. Why do these bugs have this coloration? What benefit does it provide when on the pond bottom? Near the pond surface?	Camouflage and protection. When on the bottom, the dark side blends in with the muddy dark bottom. When at the surface, the light side blends in with the light sky. Because the backswimmer swims on its back, the light side is on its “topside.”	The labeled back-swimmer and water boatman specimens.	Maybe use the back-swimmer and water boatman fact sheets.	None	Moderate
F	If you only found a 5 or 10 of each of these aquatic organisms in your stream, would you conclude the stream is healthy or unhealthy? Why?	This is not good biodiversity. These creatures are also all from the Group 3 – pollution tolerant group. They can be found in polluted waters.	Labeled Midge larva, leech, aquatic worm specimens.	Need “Aquatic Macroinvertebrates Grouped by Pollution Tolerance” Sheet	None	Easy
G	Examine these aquatic insects. What do you think they eat? What body evidence suggests this?	These insects are predators. The giant water bug and water strider have modified front legs to grasp prey. The fishfly larva has prominent chewing mouthparts.	Labeled Giant Water Bug, Water Strider, Fishly Larva specimens.	None	 and	Moderate


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<b>H</b>	Identify this aquatic macroinvertebrate.	Hellgrammite or dobsonfly larva	UNlabeled specimen (Labeled AA in the unidentified collection)	None		Difficult
<b>I</b>	Is this a fishfly larva or a dobsonfly larva (hellgrammite)? What is the main difference between the two?	Dobsonfly larva (hellgrammite). A dobsonfly larva has gill tufts under the filaments (fake legs) on the abdomen.	UNlabeled specimen (Labeled AA in the unidentified collection)	None		Moderate
<b>J</b>	Here is a whirligig beetle adult. List 4 body or behavioral adaptations that this creature uses to elude being captured and eaten.	2 sets of eyes – above and below the water; unpalatable (from a secretion); live in colony so survival in numbers; swim on surface irregular patterns; hind legs have effective swimming hairs for locomotion.	Labeled whirligig beetle adult specimen.	Include the whirligig beetle fact sheet.		Moderate
<b>K</b>	Identify this aquatic macroinvertebrate.	Common Netspinner Caddisfly Larva Order: Trichoptera Family: Hydropsychidae	UNlabeled specimen (labeled K in unidentified reference collection) or live specimen (easier)	Key / illustration sheet (easier) or none (harder)		Easy

Question #	The question	The answer	Bugs to use	Fact or ID sheets needed	Magnify needed	? Difficulty
L	How does this aquatic macroinvertebrate breathe? What section of the body is its breathing structures/apparatus found?	Gills, and stoneflies often do push ups to increase the flow of water over their gills, especially in low oxygen conditions. The gills are located on the thorax, undersides, next to the legs – in the “leg pits.”	Labeled Common Stonefly and Giant Stonefly preserved specimen	None	 or 	Moderate
M	Identify this aquatic macroinvertebrate.	Brushlegged Mayfly Nymph Order: Ephemeroptera Family: Oligoneuriidae	UNlabeled specimen (labeled F in unidentified reference collection) or live specimen	Key / illustration sheet (easier) or none (harder)		Moderate
N	Here is a case-building caddisfly larva. Why does a case-building caddisfly larva build a case?	Because caddisflies live on stream and pond bottoms, the cases serve as protection and camouflage. The caddisfly also seals up the case and uses it as a safe place to pupate.	Labeled Northern Case Maker or Longhorned Case Maker Caddisfly Larva	None	None	Easy
O	Locate the gills on these mayfly nymphs. What body section are the gills located? Upon close examination under magnification, draw what the gills look like for each specimen.	There are numerous gills per insect located on the abdomen for all mayflies. Some gills are plate-like, some feathery, some leaf-like.	Use labeled Flathead Mayfly, Common Burrower Mayfly, Brush-legged Mayfly Nymphs.	None		Easy




Question #	The question	The answer	Bugs to use	Fact or ID sheets needed	Magnify needed	? Difficulty
P	What pollution tolerance group do these aquatic insects belong to?	Group 2 – Moderate Pollution Tolerance.	Labeled alderfly larva, scud (side-swimmer), damselfly nymph specimens.	Need “Aquatic Macroinvertebrates Grouped by Pollution Tolerance” Sheet		Easy
Q	What pollution tolerance group do these aquatic insects belong to?	Group 2 – Moderate Pollution Tolerance.	UNlabeled alderfly larva (labeled A in collection), scud (side-swimmer) (labeled BB), damselfly nymph (M) specimens.	Need “Aquatic Macroinvertebrates Grouped by Pollution Tolerance” Sheet		Hard
R	Identify this aquatic macroinvertebrate.	Water Boatman Order: Hemiptera Family: Corixidae	UNlabeled specimen (labeled B in unidentified reference collection) or live specimen (easier)	Key / illustration sheet (easier) or none (harder)		Difficult
S	This is a water penny. Based on the shape of its body, where exactly will it usually be found in the stream? Based on the shape of its body, how does it eat and what does it eat?	The water penny’s body acts like a suction cup attaching it to rocks. It is a grazer or scraper, eating periphyton (algae on rocks).	Labeled Water Penny specimen	None		Moderate






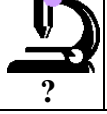
Question #	The question	The answer	Bugs to use	Fact or ID sheets needed	Magnify needed	? Difficulty
T	In what type of waterway would these aquatic creatures typically be found – a small stream in the forest or a large river with sandy bottom? Why?	These aquatic organisms are all shredders that eat and break down coarse particulate organic matter (CPOM) like leaves. They would be found in a small, forested stream, where CPOM would be readily available.	Labeled Crane fly Larva, Slender Winter Stonefly or Roach-like Stonefly Nymph, Aquatic sowbug specimens.	Include the fact sheets for each of the aquatic insects you put out if you want to make the question easier.		Easy or Difficult
U	Assume that you found 15-20 of each of these different aquatic insects when kicknetting in your stream. Would you conclude that the stream is healthy or unhealthy based on these results? Why?	The stream is pretty healthy because there is a decent amount of biodiversity of aquatic insects from all three pollution tolerance groups.	Use at least 8 of the following: dobsonfly larva; primitive minnow mayfly; hacklegill mayfly nymph; crayfish; blackfly larva; any beetle larva; planarian; fingernail clam; any snail; broadwinged damselfly nymph; fishfly larva; whirligig beetle larva.	Need “Aquatic Macroinvertebrates Grouped by Pollution Tolerance” Sheet	None	Easy
V	Identify this aquatic macroinvertebrate.	Giant Water Bug Order: Hemiptera Family: Belostomatidae	UNlabeled specimen (labeled W in unidentified reference collection) or live specimen	Key / illustration sheet (easier) or none (harder)		Moderate

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W	Why does the black fly larva have brushes around its mouth? Would this creature prefer to live in a small, headwater stream OR a mid-sized, rocky bottom stream OR a large sandy bottom river? Why?	<p>The blackfly larva is a filtering collector that uses the brushes to collect fine particulate organic matter (FPOM) from the flowing water.</p> <p>It would prefer the mid-sized rocky bottom stream because it attaches itself to rocks (not sand) and this stream would have more FPOM than a headwater, smaller stream.</p>	None	Include the black fly larva fact sheet.	None	Difficult
X	This is a dragonfly life cycle (there are no eggs shown however). Is it complete or incomplete metamorphosis? Identify the stages in order of this life cycle.	<p>Incomplete metamorphosis.</p> <p>Egg, Larva or Nymph, Adult</p>	Dragonfly life cycle mount (2.5" x 2.5" square, clear, plastic block.	None	None	Moderate
Y	Identify this aquatic macroinvertebrate.	Narrowwinged Damselfly Nymph Order: Odonata Family: Coenagrionidae	UNlabeled specimen (labeled M in unidentified reference collection) or live specimen	Key / illustration sheet (easier) or none (harder)	 or 	Moderate

Question #	The question	The answer	Bugs to use	Fact or ID sheets needed	Magnify needed	? Difficulty
<b>Z</b>	<p>Identify this aquatic macroinvertebrate.</p> <p>What pollution tolerance group does it belong to?</p>	<p>Cranefly Larva Order: Diptera Family: Tipulidae</p> <p>Group 2 – moderate pollution tolerance</p>	UNlabeled specimen (labeled W in unidentified reference collection) or live specimen	Key / illustration sheet (easier) or none (harder) And pollution tolerance grouping sheet		Moderate
<b>A</b> <b>A</b>	Here are a water scavenger beetle adult, predaceous diving beetle adult, and a shortlegged water strider. They are not found on the Pollution Tolerance Index. Why not?	These creatures are not affected by water pollution as much. All obtain oxygen from the atmosphere so depleted dissolved oxygen levels caused by pollution don't phase them. The water striders stays on top of the water, out of contact of toxins in the water.	Labeled water scavenger beetle adult, predaceous diving beetle, and short-legged strider specimens.	Need "Aquatic Macroinvertebrates Grouped by Pollution Tolerance" Sheet	None	Difficult
<b>B</b> <b>B</b>	This is a riffle beetle adult. There is one major difference between the riffle beetle adult and other aquatic beetle adults. What is the difference that makes the riffle beetle a unique aquatic beetle?	The riffle beetle adult is able to stay underwater for very long periods of time because of its efficient breathing. They use a plastron (thin film of air held by tiny unwettable hairs). Other beetles must surface often and dive back down, carry an air bubble with them on their underside.	Labeled riffle beetle adult specimen.	Need riffle beetle fact sheet and fact sheets for predaceous diving beetle, water scavenger beetle, crawling water beetle.	None	Difficult



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C C	Identify this aquatic macroinvertebrate.	Leech Phylum: Annelida Class: Hirudinea	UNlabeled specimen (labeled CC in unidentified reference collection) or live specimen	Key / illustration sheet (easier) or none (harder)		Easy
D D	Almost anytime you kick net, you might find a common netspinner caddisfly larva that has created a “net” with small rocks and sand, all glued to the bottom of a large rock. Why does a common netspinner caddisfly larva, “spin” this net?	The common netspinner caddisfly larva is a filtering collector of fine particulate organic matter (FPOM) and it uses this net to help catch its food. It also uses the net as a protective place to live. It also pupates in this glued together mass.	Labeled common netspinner caddisfly larva specimen.	A rock with these “nets” would be great to have, but not necessary.	None	Moderate
E E	This is a dragonfly nymph. Answer the following about this aquatic insect: a. What is its scooplike lip called? b. Is this lip open on the preserved specimen? c. How many sets of wing pads does the larva have? d. How can it move itself through the water?	a. Labium. b. Often when preserved, the dragonfly dies with its labium extended out, but you will have to look on the specimen you put out. c. 2 sets of wing pads d. climb, crawl, burrow, or propel by sending water out their rear (rectal chamber).	Labeled dragonfly nymph (clubtail or darner) specimen. A live specimen would be even better.	Include the dragonfly nymph fact sheet	 or 	Easy

Question #	The question	The answer	Bugs to use	Fact or ID sheets needed	Magnify needed	? Difficulty
<b>F</b> <b>F</b>	This is a burrower mayfly nymph. Examine it under the microscope and describe and draw what it possesses to make it easier for it to burrow into the substrate bottom.	The burrowing mayflies have hard tusks up front to use as pick axes and shovels to burrow down into mud, silt, sand, or small gravel.	Use pale burrower mayfly nymph or a common burrower nymph (if not used with another question).	None		Difficult
<b>G</b> <b>G</b>	Identify this aquatic macroinvertebrate.	YOU PICK, especially of one you found in your stream.	Unlabeled specimen or live specimen.	Key / illustration sheet (easier) or none (harder)		?
<b>H</b> <b>H</b>	Identify this aquatic macroinvertebrate.	YOU PICK, especially of one you found in your stream.	Unlabeled specimen or live specimen.	Key / illustration sheet (easier) or none (harder)		?
<b>I</b> <b>I</b>	Identify this aquatic macroinvertebrate.	YOU PICK, especially of one you found in your stream.	Unlabeled specimen or live specimen.	Key / illustration sheet (easier) or none (harder)		?
<b>J</b> <b>J</b>	Identify this aquatic macroinvertebrate.	YOU PICK, especially of one you found in your stream.	Unlabeled specimen or live specimen.	Key / illustration sheet (easier) or none (harder)		?
<b>K</b> <b>K</b>	Identify this aquatic macroinvertebrate.	YOU PICK, especially of one you found in your stream.	Unlabeled specimen or live specimen.	Key / illustration sheet (easier) or none (harder)		?