



SeaWorld/Busch Gardens Invertebrates

9-12 Classroom Activities

Invertebrate Survivor

OBJECTIVE

The student will correlate genus and species name with the common name of various invertebrates. The student will identify the anatomy of an invertebrate. The student will identify various facts about invertebrates.

ACTION

1. Divide the class into two equal groups. The two teams should be even, if there is an odd number of students have one of them volunteer to help the teacher run the game.
2. Ask each team to name themselves after an invertebrate.
3. Explain the rules of play as follows: The two teams will play against one another. There will be a series of Invertebrate challenges. If a team wins a challenge, they do not have to vote any of their fellow teammates out of the game. However, if a team loses a challenge, they must vote some of their teammates out of the game. The number of students voted out after each challenge will depend on the size of the class. The voting instructions listed below gives instructions on how to calculate how many students should be eliminated after each challenge according to class size. The students that are voted out of the game will have a seat on the judges' panel. Eventually the panel of judges will determine the final winner of Invertebrate Survivor. During a voting session, each student can ONLY vote for someone else, they CANNOT vote for themselves.

Voting Instructions

These voting instructions are for a class of 24 students. However, any size class can be adapted into this model by modifying the number of people that are eliminated during the first three challenges and the last three. Generally, with class sizes larger than 24 students, more than three students should be eliminated after each challenge. Conversely, with a class smaller than 24 students, less than three students should be eliminated after each challenge. The merge between the two teams is after the third challenge and there shouldn't be more than five candidates for the judges to choose from after the sixth challenge.

Class size of 24: The team that loses a challenge will vote THREE members out of the game. Once the total number of students from both teams is 15 (this will happen after the third challenge), the two teams will merge into one new team. Together the

new team will decide on another invertebrate name to call themselves. The next series of challenges (four through six) are going to be evaluated on an individual basis. FOUR students will be eliminated from the game after each challenge. The students are not voted out by their fellow teammates at this point, they are eliminated if they come into the last four places from each challenge. After the sixth challenge, there should be three students left. The judges' panel will determine from those three who becomes the Invertebrate survivor.

4. Begin the game by starting the first challenge. Refer to the first challenge's directions and instruct students accordingly. The answers may be checked by using the Teacher's Guide. The voting process begins for the team who loses the challenge. The voting process is initiated by every team member writing down three of their teammates names that they feel should be eliminated from the game. Votes should be cast confidentially. The three people that receive the most votes are eliminated.

In the event of a tie, the decision will be determined by the Invertebrate Spelling Challenge. The students that are involved in the tie will draw an invertebrate name and have to spell it backwards (without reading their slips of paper). The word must be spelled correctly the first time. The student(s) (depending on how many elimination spaces have to be filled) that spell their word the slowest or do not spell it correctly the first time are eliminated.

5. Repeat step 4 for challenge two and challenge three.
6. Merge the two groups together after the third challenge (when the two groups together equal 15). The team should rename themselves since they are a new group.
7. Explain that the rest of the challenges are going to be conducted on an individual basis and instead of three eliminations after each challenge there are now four! The team members that fall into the last four places with each challenge are eliminated. The answers to the challenges are in the Teacher's Guide. This process is repeated for challenges four through six. In the event of a tie, the Invertebrate Spelling Challenge is conducted to make the decision.
8. The sixth challenge is the last event and the students remaining after the elimination are considered to be "invertebrate finalists." (There should be three students left if the class started with 24 students).
9. Instruct the invertebrate finalists to make a 1-minute speech to the judging panel about why they should be the sole Invertebrate Survivor. The judges will cast their votes for the student they think should be the SOLE Invertebrate Survivor.

MATERIALS

Per class:

- copy of *Challenge Packet* (see **Preparation**)
- one Teacher's Guide
- two stop watches
- one pencil per student
- one *Invertebrate Spelling Challenge Funsheet*
- large bowl

REPARATION

Make the following copies of the Challenge Packet:

- 2 copies of Challenges 1-3
- 12 or more copies (half class size) of Challenges 4-6

Cut and fold the names from the Invertebrate Spelling Challenge Funsheet and place them in a bowl for the random drawing. This is used in the event of a tie.

Challenge 1

CRYPTO-FACT

Directions: The following facts are related to various invertebrates. However, these facts are written in code where one letter actually stands for another. Listed below are a few hints to help solve the CRYPTO-FACT. The team that solves the most CRYPTO-FACTS in ten minutes wins the challenge!

Hints:

- The letter "O" in the CRYPTO-FACT stands for the letter "T"
- The letter "M" in the CRYPTO-FACT stands for the letter "X"
- The letter "U" in the CRYPTO-FACT stands for the letter "G"
- The letter "R" in the CRYPTO-FACT stands for the letter "E"
- The length and formation of the words are all hints.
- If you solve one of the CRYPTO-FACTS, the letters from that fact can be used to determine all the others since all the facts have the same code.

1. VIERTOE ZPKR OZNR R QJSG ERUDRIOE TPWWRS ZRPS, OZJNPM, PIS PQSJDRI.

-----,

2. YWRPE PNR LVIUWREE.

3. EAVSRNE ZPKR OLJ QJSG ERUDRIOE TPWWRS TRAZPWJOZJNPM PIS PQSJDRI.

4. PNOZNAJSE ZPKR RMJECRWROJIE, XJVIO RS WRUE, PIS ERU-DRIO RS QJSVRE.

-----,

5. ZJWRE VI OZR RMJECRWROJI BERS YJN NREAVNPOVJI PNR TPWWRS EAVNPTWRE.

Challenge 2

Directions: Label the fly diagram with their corresponding parts listed below. The team that has the most correct matches in five minutes wins the challenge.

abdomen

antenna

compound eye

wing

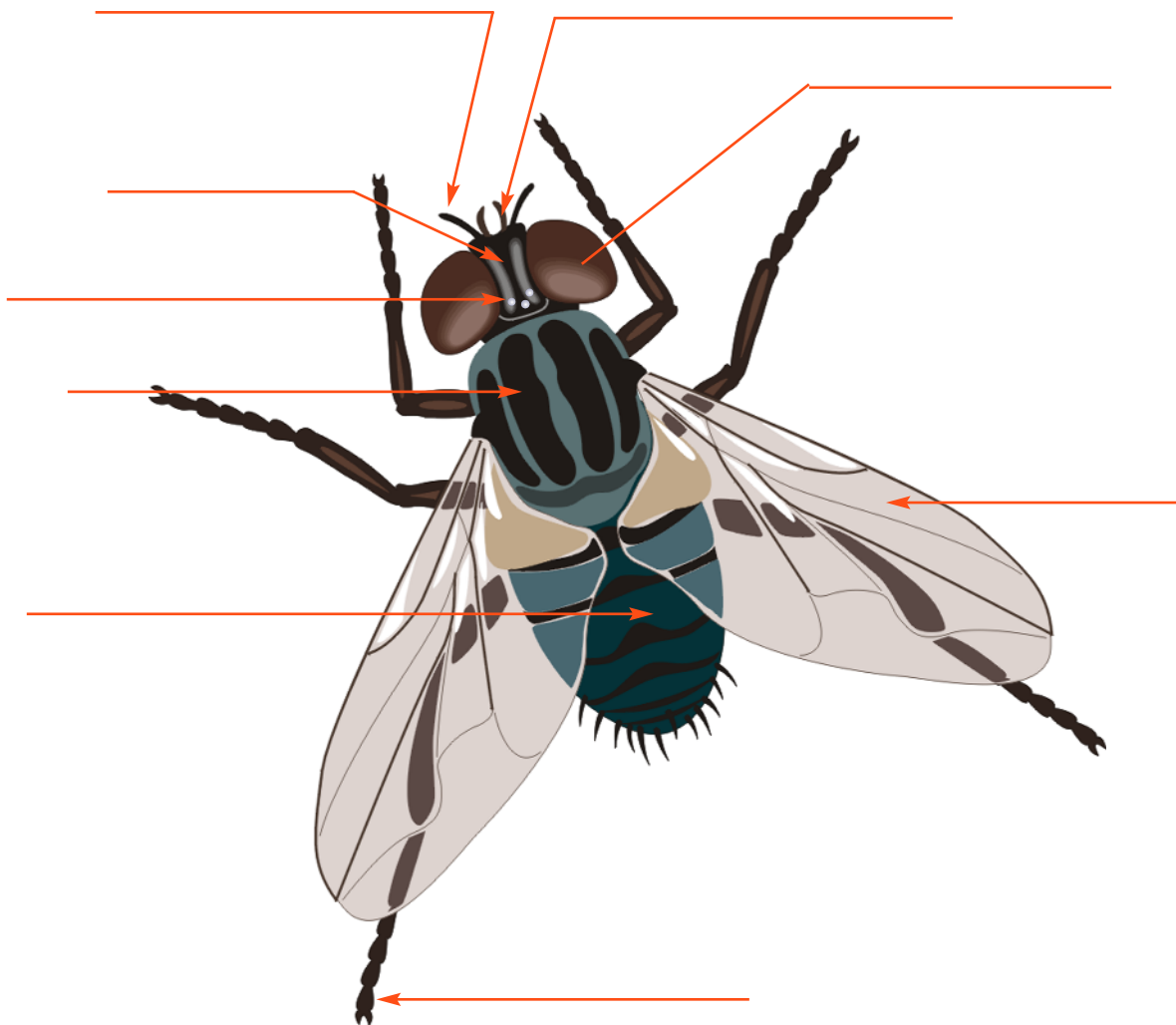
simple eye

head

mandibles

leg

thorax



Challenge 3

Directions: Answer the following questions. The team that has the most correct answers in 10 minutes wins, the challenge.

- Praying mantises belong to what phyla?
 - Chordata
 - Arthropoda
 - Mollusca
 - Lycopodiophyta
- Which of the following is the smallest insect?
 - hairy winged beetle
 - ladybug
 - fruit fly
 - katydid
- What are the three main body parts of an insect?
 - eye, head, and abdomen
 - brain, thorax, and abdomen
 - head, antennae, and thorax
 - head, thorax, and abdomen
- How many legs does an insect have on its thorax?
 - two
 - four
 - six
 - eight
- All of the following are insects EXCEPT?
 - pillbug
 - dragonfly
 - mosquito
 - lubber
- The class Chelicerata includes all of the following EXCEPT.
 - scorpions
 - spiders
 - horseshoe crabs
 - hermit crabs
- The only arthropods that lack antennae belong to which group of animals?
 - Myriapoda
 - Chelicerata
 - Crustacea
 - Insecta
- Tape worms and flat worms belong to what phyla?
 - Platyhelminthes
 - Annelida
 - Cnidaria
 - Porifera
- The exoskeleton of an invertebrate comprises all of the following EXCEPT?
 - sclerotin
 - wax
 - chitin
 - keratin
- Spiracles (holes in the exoskeleton) open to the tracheal tube for which of the following purposes?
 - digestion
 - respiration
 - excretion
 - sensation
- All of the following insects vary in color from males to females EXCEPT?
 - dragonflies
 - sawflies
 - grasshoppers
 - ladybugs
- Which of the following tells the 4 stages of complete metamorphosis?
 - egg, nymph, cocoon, adult
 - egg, larva, pupa, adult
 - egg, cocoon, pupa, adult
 - egg, pupa, juvenile, adult
- All of the following are useful products that insects make EXCEPT?
 - Silk
 - Plastic
 - Shellac
 - Wax
- Which of the following is an example of incomplete metamorphosis?
 - mealworm to beetle
 - caterpillar to butterfly
 - juvenile roach to winged adult
 - egg to honeybee
- Which of the following is an advantage to having an exoskeleton?
 - prevents water loss
 - provides attachment for muscles
 - Provides expansion capabilities for growth
 - both A and B

Challenge 4

Directions: Some invertebrates are beneficial to environment while others could be harmful. Match the benefit or problem from column A to their corresponding invertebrate in column B by drawing a line. Note: Some benefits or problems in Column A may use more than one answer in Column B. The students that have the most correct matches in five minutes will move onto the next round.

COLUMN A

bubonic plague

Lyme disease

flower pollinator

malaria

yellow fever

If bitten, toxin attacks
the nervous system

predator of more harmful insects

sleeping sickness

encephalitis

American Trypanosomiasis or
Chagas' Disease

COLUMN B

Tsetse fly (Genus: *Glossina*)

Trypanosoma cruzi (protozoan)

Black Widow Spider (*Latrodectus hesperus*)

Bumblebee (*Bombus morrisoni*)

Ladybug (*Coccinella septempunctata*)

Corkscrew-shaped bacteria carried by
the black-legged tick (*Ixodes scapularis*)

Flea (*Xenopsylla cheopis*)

Butterfly (*Danaus plexippus*)

Mosquito (Genus: *Aedes*)

Mosquitos in the Genera *Aedes* and
Culex

Praying Mantis (*Tenodera aridifolia sinensis*)

Protozoans that are transmitted by the
Anopheles mosquito

Challenge 5

Directions: Even though about 90% of the world's animal species are invertebrates, some invertebrate populations are at risk for becoming extinct. Identify each insect listed below as either at risk ("R") or common ("C") by writing the initial in the blank provided. The students that have the most correct answers in five minutes will move onto the next round.

INSECT LIST

1. American burying beetle, *Nicrophorus americanus* _____
2. Delta green ground beetle, *Elaphrus viridis* _____
3. Two-lined Spittlebug, *Prosapia bicincta* _____
4. Northeastern beach tiger beetle, *Cicindela dorsalis dorsalis* _____
5. Puritan tiger beetle, *Cicindela puritana* _____
6. Tooth cave beetle, *Rhadine persephone* _____
7. Southeastern lubber, *Romalea microptera* _____
8. Bay checkerspot butterfly, *Euphydryas editha bayensis* _____
9. Corsican swallowtail, *Papilio hospiton* _____
10. Desert Locust, *Schistocerca gregaria* _____
11. Homerus swallowtail, *Papilio homerus* _____
12. Karner blue butterfly, *Lycaeides melissa samuelis* _____
13. Lange's metalmark butterfly, *Apodemia momio langei* _____
14. Earwig, *Forficula auricularia* _____
15. Luzon peacock swallowtail, *Papilio chikae* _____
16. Spotted snake millipede, *Blaniulus guttulatus* _____
17. Chinese praying mantis, *Tenodera aridifolia* _____
18. Myrtle's silverspot, *Speyeria zerene myrtleae* _____
19. Oregon silverspot butterfly, *Speyeria zerene hippolyta* _____
20. Palos Verdes blue, *Glaucopsyche lygdamus palosverdesensis* _____
21. Queen Alexandra's birdwing, *Ornithoptera alexandrae* _____
22. San Bruno elfin butterfly, *Incisalia mossii bayensis* _____
23. Linearwinged grasshopper, *Aptenopedes sphenariodes* _____
24. Southeastern field cricket, *Gryllus rubens* _____
25. Seaside earwig, *Anisolabis maritima* _____
26. African millipede, *Archespirostreptus* sp. _____
27. Ash meadows naucorid, *Ambrysus amargosus* _____
28. Madagascar hissing cockroach, *Gromphadorhina portentosa* _____
29. Delhi sands flower-loving fly, *Rhaphiomidas terminatus abdominalis* _____
30. Monarch Butterfly, *Danaus plexippus* _____
31. Vivid Dancer, *Argia vivida* _____
32. Ground Mantid, *Litaneutria minor* _____
33. Ground-hopper, *Tetrix undulata* _____
34. Robber Fly, *Megaphorus willistoni* _____
35. Quiet-calling katydids, *Meconema thalassinum* _____
36. Viceroy, *Limenitis archippus* _____
37. Emperor Scorpion, *Pandinus imperator* _____

Challenge 6

Directions: Match the common name in the left column to its *genus species* name in the right column by number. The students with the most correct matches will prepare to make their speeches about “Why They Should Become the Sole Invertebrate Survivor.”

Example: human 21 21) *Homo sapien*

COMMON NAME	_____	GENUS SPECIES
bumblebee	_____	1) <i>Somatochlora incurvata</i>
butterfly	_____	2) <i>Aphonopelma chalcodes</i>
ant	_____	3) <i>Pandinus imperator</i>
dragonfly	_____	4) <i>Romalea microptera</i>
scorpion	_____	5) <i>Henricia aspera</i>
praying mantis	_____	6) <i>Scarabaeus sacer</i>
ladybug	_____	7) <i>Latrodectus mactans</i>
tarantula	_____	8) <i>Photinus pyralis</i>
lobster	_____	9) <i>Melanoplus regalis</i>
lubber	_____	10) <i>Bombus morrisoni</i>
millipede	_____	11) <i>Coccinella septempunctata</i>
dung beetle	_____	12) <i>Strongylocentrotus franciscanus</i>
cockroach	_____	13) <i>Gromphadorhina portentosa</i>
earthworm	_____	14) <i>Cirripedia verrucomorpha</i>
firefly	_____	15) <i>Danaus plexippus</i>
black widow spider	_____	16) <i>Scaphiostreptus paralis acuticonus</i>
grasshopper	_____	17) <i>Homarus americanus</i>
sea star	_____	18) <i>Tetramorium caespitum</i>
barnacle	_____	19) <i>Allolobophora chlorotica</i>
sea urchin	_____	20) <i>Tenodera aridifolia sinensis</i>

Invertebrate Spelling Challenge Funsheet

invertebrate	mosquito
ladybug	millipede
dragonfly	butterfly
praying mantis	bumblebee
scorpion	tarantula
earthworm	lobster
caterpillar	cricket
insect	arthropod
sea anemone	horsefly

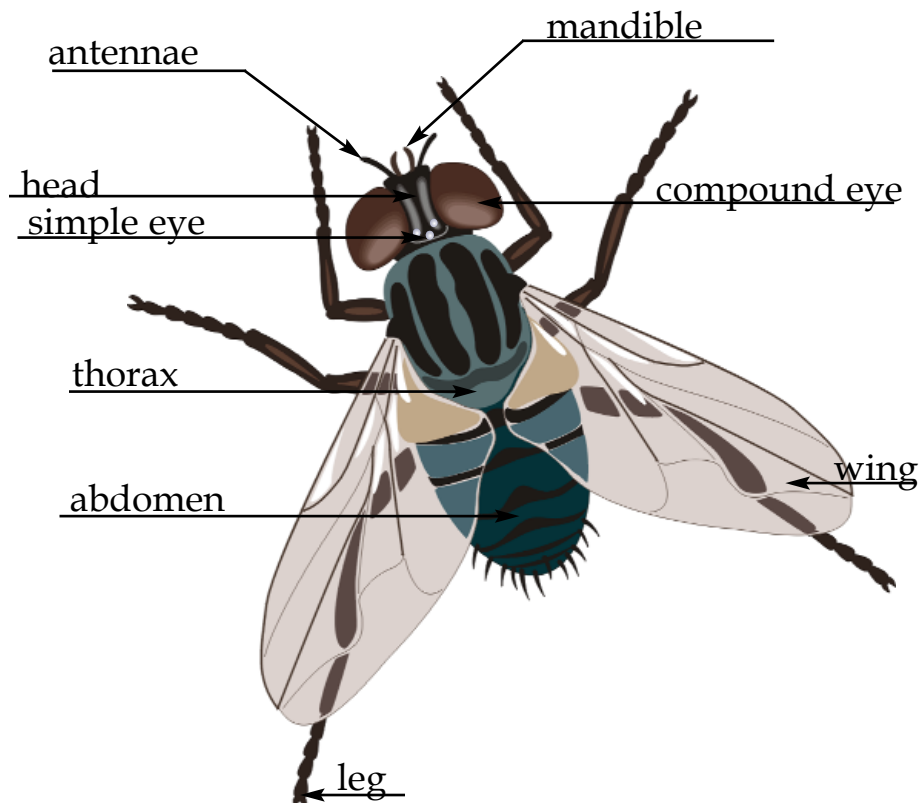
Teacher's Guide

Challenge 1 Answers

1. Insects have three body segments called head, thorax, and abdomen.
2. Fleas are wingless.
3. Spiders have two body segments called cephalothorax and abdomen.
4. Arthropods have exoskeletons, jointed legs, and segmented bodies.
5. Holes in the exoskeleton used for respiration are called spiracles.

Challenge 2 Answers

- Abdomen: Last three segments of a fly.
- Antenna: One of two sensory appendages attached to the head of flies.
- Compound Eye: One of two large eyes that are composed of many hexagonal lenses.
- Wing: One of the two large, upper wings that are attached to the thorax.
- Head: The head is the part of the fly that contains the brain, eyes, mandibles, and antennae.
- Mandibles: a pair of jaws located on the lower sides of the head. Mandibles are used to carry objects and bite.
- Simple Eye: Small eyes located between the compound eyes. These eyes detect light from dark.
- Thorax: The mid-body segment between the head and abdomen.
- Legs: Insects have 6 jointed legs attached to the thorax.



Challenge 3 Answers

1. Which of the following Phylums do praying mantises belong to?
B. Arthropoda is the animal phylum in which insects (praying mantis), spiders, crustaceans, spiders, scorpions, and centipedes belong. They have exoskeletons, jointed legs, and segmented bodies.
Chordata is the animal phylum in which humans and many other vertebrates belong. Lycopodiophyta is the phylum in which vascular plants belong. Mollusca is the in which phylum of soft-bodied un-segmented animals belong.
2. Which of the following is the smallest insect?
Some of the **A. hairy winged beetles** are barely one-hundredth of an inch in length and they are smaller than a ladybug or fruit fly.
3. What are the three main body parts of an insect?
D. Head, thorax, and abdomen
4. How many legs does an insect have on its thorax?
C. Six
5. The exoskeleton of an invertebrate comprises all of the following EXCEPT?
D. Keratin. Many vertebrates have their hair, nails, scales, etc. comprised out of keratin. Sclerotin has proteins, wax prevents water loss, and chitin is durable substance that creates the hard surface of arthropods.
6. Spiracles (holes in the exoskeleton) open to the tracheal tube for which of the following purposes?
B. Respiration. The spiracles' function is for respiration.
7. All of the following are insects EXCEPT?
A. Pillbugs. Pillbugs are not insects, they are belong to the class crustacea. In general insects are composed of three body segments (head, thorax, and abdomen), three pairs of legs, and two pairs of wings.
8. The class Chelicerata includes all of the following EXCEPT.
D. Hermit crabs Hermit crabs belong to the class crustacea because they are true crabs.
9. The only arthropods that lack antennae belong to which of the following groups of animals?
B. Chelicerata. Members of chelicerata (scorpions, spiders, etc.) do not have antennae and they are the only arthropods that lack them.
10. Tape worms and flat worms belong to which of the following phyla?
A. Platyhelminthes. Sponges belong to the phylum Porifera; jellyfish, corals, and sea anemones belong to Cnidaria; segmented worms (polychates) belong to the phylum Annelida.
11. All of the following insects vary in color from males to females EXCEPT?
D. Ladybugs

12. Which of the following represents the 4 stages of complete metamorphosis?
B. Egg, larva, pupa, and adult. Metamorphosis means a change of body form and appearance. An invertebrate's outer coating is hard and cannot expand as the invertebrate grows. The coating must split, with a new larger one forming underneath. Complete metamorphosis has 4 stages of growth, egg, larva, pupa and adult. In complete metamorphosis the insect changes its shape completely.
13. All of the following are useful products that insects make EXCEPT?
B. Plastic. Plastic is a man-made substance whereas silk, shellac and wax can all be derived from various types of insects.
14. Which of the following is an example of incomplete metamorphosis?
C. Juvenile roach to winged adult. Incomplete metamorphosis has three stages: egg, nymph, and adult. The insects hatch from their eggs looking like tiny versions of the adults. A juvenile roach looks like a tiny version of the winged adult whereas all the other examples are examples of complete metamorphosis. Complete metamorphosis involves a distinct change in appearance and form from beginning to end.
15. Which of the following is an advantage to having an exoskeleton?
D. Both A & B. Prevention of water loss and provision for muscle attachment are both advantages to having exoskeleton. The exoskeleton provides a place for muscle attachment, allowing much greater leverage than attachment to an internal skeleton. This explains the apparent greater muscular strength of insects. Once an exoskeleton is formed and hardened, it is not elastic, and does not allow for growth. It must be shed and a new larger exoskeleton made.

Challenge 4 Answers

bubonic plague: flea (*Xenopsylla cheopis*)

malaria: Protozoans that are transmitted by the *Anopheles* mosquito

Lyme Disease: Corkscrew-shaped bacteria carried by the black-legged tick (*Ixodes scapularis*)

If bitten, toxin attacks nervous system: black widow spider (*Latrodectus hesperus*)

flower pollinator: bumblebee (*Bombus morrisoni*) and butterfly (*Danaus plexippus*)

yellow fever: Mosquito (Genus: *Aedes*)

encephalitis: mosquitos in the Genera *Aedes* and *Culex*

sleeping sickness: Tsetse fly (Genus: *Glossina*)

trypanosomiasis or Chagas' Disease: *Trypanosoma cruzi* (protozoan)

acts as a predator of more harmful insects: praying mantis (*Tenodera aridifolia sinensis*) and ladybug (*Coccinella septempunctata*)

Challenge 5 Answers

1. American burying beetle, *Nicrophorus americanus*, **R**
2. delta green ground beetle, *Elaphrus viridis*, **R**
3. two-lined spittlebug, *Prosapia bicincta*, **C**
4. northeastern beach tiger beetle, *Cicindela dorsalis dorsalis*, **R**
5. puritan tiger beetle, *Cicindela puritana*, **R**
6. tooth cave beetle, *Rhadine persephone*, **R**
7. southeastern lubber, *Romalea microptera*, **C**
8. bay checkerspot butterfly, *Euphydryas editha bayensis*, **R**
9. Corsican swallowtail, *Papilio hospiton*, **R**
10. desert locust, *Schistocerca gregaria*, **C**
11. Homerus swallowtail, *Papilio homerus*, **R**
12. Karner blue butterfly, *Lycaeides melissa samuelis*, **R**
13. Lange's metalmark butterfly, *Apodemia momio langei*, **R**
14. earwig, *Forficula auricularia*, **C**
15. Luzon peacock swallowtail, *Papilio chikae*, **R**
16. spotted snake millipede, *Blaniulus guttulatus*, **C**
17. Chinese praying mantis, *Tenodera aridifolia*, **C**
18. myrtle's silverspot, *Speyeria zerene myrtleae*, **R**
19. Oregon silverspot butterfly, *Speyeria zerene hippolyta*, **R**
20. Palos Verdes blue, *Glaucopsyche lygdamus palosverdesensis*, **R**
21. Queen Alexandra's birdwing, *Ornithoptera alexandrae*, **R**
22. San Bruno elfin butterfly, *Incisalia mossii bayensis*, **R**
23. linearwinged grasshopper, *Aptenopedes sphenariodes*, **C**
24. southeastern field cricket, *Gryllus rubens*, **C**
25. seaside earwig, *Anisolabis maritima*, **C**
26. African millipede, *Archespirostreptus* sp., **C**
27. ash meadows naucorid, *Ambrysus amargosus*, **R**
28. Madagascar hissing cockroach, *Gromphadorhina portentosa*, **C**
29. Delhi sands flower-loving fly, *Rhaphiomidas terminatus abdominalis*, **R**
30. monarch butterfly, *Danaus plexippus*, **C**
31. vivid dancer, *Argia vivida*, **R**
32. ground mantid, *Litaneutria minor*, **R**
33. ground-hopper, *Tetrix undulata*, **C**
34. robber fly, *Megaphorus willistoni*, **R**
35. quiet-calling katydids, *Meconema thalassinum*, **C**
36. viceroy butterfly, *Limenitis archippus*, **R**
37. emperor scorpion, *Pandinus imperator*, **C**

Challenge 6 Answers

bumblebee	10) <i>Bombus morrisoni</i>
butterfly	15) <i>Danaus lexippus</i>
ant	18) <i>Tetramorium caespitum</i>
dragonfly	1) <i>Somatochlora incurvata</i>
scorpion	3) <i>Pandinus imperator</i>
praying mantis	20) <i>Tenodera aridifolia sinensis</i>
ladybug	11) <i>Coccinella septempunctata</i>
tarantula	2) <i>Aphonopelma chalcodes</i>
lobster	17) <i>Homarus americanus</i>
lubber	4) <i>Romalea microptera</i>
millipede	16) <i>Scaphiostreptus paralis acuticonus</i>
dung beetle	6) <i>Scarabaeus sacer</i>
cockroach	13) <i>Gromphadorhina portentosa</i>
earthworm	19) <i>Allolobophora chlorotica</i>
firefly	8) <i>Photinus pyralis</i>
black widow spider	7) <i>Latrodectus mactans</i>
grasshopper	9) <i>Melanoplus regalis</i>
sea star	5) <i>Henricia aspera</i>
barnacle	14) <i>Cirripedia verrucomorpha</i>
sea urchin	12) <i>Strongylocentrotus franciscanus</i>