Study Guide – Texas 4-H Entomology ID Contest
Megaloptera

1. Review the Megaloptera YouTube video(s) for your age level at the Bexar Entomology page.
2. Follow along with your 4-H Entomology Study Guide (https://entomology.tamu.edu/extension/youth/4-h/4h-contest/)
3. Review the definitions for the key words for Neuroptera.
4. Read the Megaloptera Facts
5. Answer the study guide questions
6. Quiz yourself to identify the species of Megaloptera and if they are a pest/beneficial/ inconsequential and where they are found in nature and/or their host.

Key Words to Know for Neuroptera:
Aquatic
Holometabolous
Mandibulate
Hellgrammite

Neuroptera Facts:

- Megaloptera are large insects with have lacey, membranous looking wings, with many veins.
- Megaloptera is considered beneficial0.
- Megaloptera has mandibulate, or chewing, mouthparts.
- Megaloptera is holometabolous.
- The only species you need to know are dobsonflies.

Study Guide Questions:
What do we commonly call the larvae of a dobsonfly?
Where do larvae of Megaloptera live?
What is the type of lifecycle Megaloptera have?

Study Guide – Texas 4-H Entomology ID Contest
Neuroptera

7. Review the Neuroptera YouTube video(s) for your age level at the Bexar Entomology page.
8. Follow along with your 4-H Entomology Study Guide (https://entomology.tamu.edu/extension/youth/4-h/4h-contest/)
9. Review the definitions for the key words for Neuroptera.
10. Read the Neuroptera Facts
11. Answer the study guide questions
12. Quiz yourself to identify the species of Neuroptera and if they are a pest/beneficial/ inconsequential and where they are found in nature and/or their host.

Key Words to Know for Neuroptera:
Aquatic
Holometabolous
Mandibulate

Neuroptera Facts:
- Neuropteran have lacey, membranous looking wings, with many veins.
- All Neuroptera listed for the contest are beneficial.
- All Neuropterans have mandibulate, or chewing, mouthparts.
- Neuroptera are holometabolous.

Study Guide Questions:
Which Neuropterans are aquatic in at least one part of their lifecycle?
Which Neuropteran has a larva called a doodle bug?
Why are Neuropterans beneficial?

Junior Species (1):, antlions
Intermediate Species (2): antlions, green lacewings
Senior Species (5): antlions, brown lacewing, green lacewing, mantispids, owlflies

Study Guide – Texas 4-H Entomology ID Contest
Coleoptera

1. Review the Coleoptera YouTube video(s) for your age level at the Bexar Entomology page.
2. Follow along with your 4-H Entomology Study Guide (https://entomology.tamu.edu/extension/youth/4-h/4h-contest/)
3. Review the definitions for the key words for Coleoptera.
4. Read the Coleoptera Facts
5. Answer the study guide questions
6. Quiz yourself to identify the species of Coleoptera and if they are a pest/beneficial/ inconsequential and where they are found in nature and/or their host.

Key Words to Know for Coleoptera:
Elytra
Holometabolous
Mandibulate

Coleoptera Facts:

- Notice that the forewings on beetles, called elytra, meet in a straight line down the middle. This is a good and easy tip to identify beetles from other orders of insects.
- There are many species of beetles, they can beneficial or harmful and found in many habitats throughout Texas. They are a very diverse order of insects.
- All beetles have mandibulate, or chewing, mouthparts. All beetles are holometabolous. Beetle larvae are often called grubs.

Study Guide Questions:
Name the aquatic beetles.
Are all the aquatic beetles beneficial?
Name the beneficial beetles.
Name the beetles that are agricultural pests.
Name the hosts of the agricultural pests.
What does holometabolous mean?

Study Guide – Texas 4-H Entomology ID Contest
Coleoptera Species to Know

Juniors (8):

1. Blister beetles
2. Caterpillar hunter
3. Cottonwood borer
4. Fireflies/lightning bugs
5. Lady beetles
6. May beetles/June beetles/Junebugs
7. Spotted cucumber beetle
8. Tiger beetle

Intermediates (15):

1. Blister beetles
2. Boll weevil
3. Caterpillar hunter
4. Colorado potato beetle
5. Cottonwood borer
6. Fireflies/lightning bugs
7. Lady beetles
8. Lesser grain borer
9. Maize weevil/rice weevil
10. May beetles/June beetles/Junebugs
11. Plum curculio
12. Spotted cucumber beetle
13. Sweet potato weevil
14. Tiger beetle

Seniors (32):

1. Alfalfa weevil
2. Blister beetles
3. Boll weevil
4. Carpet beetles
5. Carrion beetles
6. Caterpillar hunter
7. Click beetles
8. Colorado potato beetle
9. Cottonwood borer
10. Elm leaf beetle
11. Fireflies/lightning bugs
12. Flat headed borer / metallic wood borer
13. Flea beetles
14. Lady beetles
15. Lesser grain borer
16. Locust borer
17. Maize weevil/rice weevil
18. May beetles/June beetles/Junebugs
19. Mealworm
20. Plum curculio
21. Red flour beetle
22. Rove beetles
23. Sawtoothed grain beetle
24. Soldier beetle
25. Spotted cucumber beetle
26. Sweet potato weevil
27. Tiger beetle
28. Tumbling flower beetles
29. Water scavenger beetles
30. Whirligig beetles

Study Guide – Texas 4-H Entomology ID Contest
Mecoptera
Intermediates & Seniors Only

1. Review the Mecoptera YouTube video for your age level at the Bexar Entomology page.
2. Follow along with your 4-H Entomology Study Guide (https://entomology.tamu.edu/extension/youth/4-h/4h-contest/)
3. Review the definitions for the key words for Mecoptera.
4. Read the Mecoptera Facts
5. Answer the study guide questions
6. Quiz yourself to identify the species of Mecoptera and if they are a pest/beneficial/ inconsequential and where they are found in nature and/or their host.

Key Words to Know for Mecoptera:
Holometabolous
Mandibulate

Mecoptera Facts:
- There is only one species of Mecoptera to know. The common name is scorpionfly, although they are not true flies.
- Scorpionflies get their name from the male genetalia being enlarged into what appear to be a stinger, but they are not stinging insects. Females do not have this stinger looking object.
- Scorpionflies have mandibulate mouthparts and are holometabolous.
- They are usually only present for a few weeks out of the year and not considered to be a common insect.

Study Guide Questions:
Are scorpionflies beneficial? Why?
How can you differentiate between male and female scorpionflies?

Study Guide – Texas 4-H Entomology ID Contest
Siphonaptera
Intermediates & Seniors Only

1. Review the Siphonaptera YouTube video(s) for your age level at the Bexar Entomology page.
2. Follow along with your 4-H Entomology Study Guide (https://entomology.tamu.edu/extension/youth/4-h/4h-contest/)
3. Review the definitions for the key words for Siphonaptera.
4. Read the Siphonaptera Facts
5. Answer the study guide questions
6. Quiz yourself to identify the species of Siphonaptera and if they are a pest/beneficial/ inconsequential and where they are found in nature and/or their host.

Key Words to Know for Siphonaptera:
Holometabolous
Parasite
Haustellate

Siphonaptera Facts:
- Fleas are parasites, feeding on the blood of animals with their piercing/sucking mouthparts. There are many different species of fleas and they can feed on mammals, birds, and even reptiles.
- Fleas are laterally flattened, which means they are flat from side to side (like a knife). They also have hairs and barbs on their body that allow them to get stuck in hair when they are being chased.
- All fleas have haustellate, or piercing/sucking, mouthparts. All fleas are holometabolous, their larva live around the bedding and resting places of their host and feed on dried blood (fecal material from the adults).

Study Guide Questions:
What is a parasite?
Why are fleas considered a parasite? Is this good or bad?
What type of mouthparts do fleas have?
Where do the larvae of fleas live? What do they feed on?
What adaptations do fleas have to allow them to live on animals and feed on blood?

Study Guide – Texas 4-H Entomology ID Contest
Diptera

1. Review the Diptera YouTube video(s) for your age level at the Bexar Entomology page.
2. Follow along with your 4-H Entomology Study Guide (https://entomology.tamu.edu/extension/youth/4-h/4h-contest/)
3. Review the definitions for the key words for Diptera.
4. Read the Diptera Facts
5. Answer the study guide questions
6. Quiz yourself to identify the species of Diptera and if they are a pest/beneficial/ inconsequential and where they are found in nature and/or their host.

Key Words to Know for Diptera:

Maggot
Holometabolous
Parasite
Vector
Carrion
Halteres

Diptera Facts:

- Flies usually have very large eyes, shaped almost like a triangle and nearly touching at the top of the head.
- Diptera means two wings – flies only have two wings (one pair). The second pair are modified into knobs called halters, which help with balance.
- Flies can be beneficial, harmful, or variable. Variable means that in some situations they are good and others they are bad. For instance, blow flies are variable because in nature they help decompose carrion but would be a nuisance around homes or businesses.
- Mosquitoes are the deadliest animals to humans. They vector (carry or transmit) diseases to humans that can be deadly.
- All flies lay their eggs in aquatic or semiaquatic environments. The larvae require a very moist environment to develop. Fly larva are called maggots.
- Flies have various types of mouthparts: from chewing, to piercing/sucking, to sponging. They are the only order in which the adults do not all have the same type of mouthpart.

Study Guide Questions:

Name the beneficial flies.
Name the flies that are considered pests.
Name the flies that are considered variable.
What do halters do for flies?
Which flies feed on carrion?
What type of lifecycle do flies have?

Junior Species (5): Crane flies, horse fly, house fly, mosquitoes, syrphid fly/flower fly/hover fly
Intermediate Species (8): Crane flies, common cattle grub, horn fly, horse fly, house fly, mosquitoes, syrphid fly/flower fly/hover fly, sorghum midge
Senior Species (16): Bee flies, black flies, blow flies, crane flies, common cattle grub, deer fly, flesh fly, horn fly, horse fly, house fly, mosquitoes, robber flies, sheep keds, syrphid fly/flower fly/hover fly, sorghum midge, stable fly

Study Guide – Texas 4-H Entomology ID Contest
Trichoptera
(intermediate and seniors only)

1. Review the Trichoptera YouTube video for your age level at the Bexar Entomology page.
2. Follow along with your 4-H Entomology Study Guide (https://entomology.tamu.edu/extension/youth/4-h/4h-contest/)
3. Review the definitions for the key words for Lepidoptera.
4. Read the Trichoptera Facts
5. Answer the study guide questions
6. Quiz yourself to identify the species of Lepidoptera and if they are a pest/beneficial/ inconsequential and where they are found in nature and/or their host.

Key Words to Know for Lepidoptera:
Mandibulate
Holometabolous
Larvae
Pupae
Aquatic

Lepidoptera Facts:

- The only species name to know is caddisflies
- Adults do not feed. Caterpillars have chewing/mandibulate mouthparts and feed on aquatic vegetation.
- Trichoptera are holometabolous.
- Some larvae will make a case from sticks, leaves, pebbles, etc. Some species do not. The case protects them, they live inside it, poke out to move, but drag case with them.

Study Guide Questions:
What type of mouthparts do Trichoptera larvae have?
What type of metamorphosis do Trichoptera have?
What do adults feed on?
.

Study Guide – Texas 4-H Entomology ID Contest
Lepidoptera

1. Review the Lepidoptera YouTube video for your age level at the Bexar Entomology page.
2. Follow along with your 4-H Entomology Study Guide (https://entomology.tamu.edu/extension/youth/4-h/4h-contest/)
3. Review the definitions for the key words for Lepidoptera.
4. Read the Lepidoptera Facts
5. Answer the study guide questions
6. Quiz yourself to identify the species of Lepidoptera and if they are a pest/beneficial/ inconsequential and where they are found in nature and/or their host.

Key Words to Know for Lepidoptera:
Haustellate
Siphoning
Holometabolous
Mandibulate
Larvae
Pupae

Lepidoptera Facts:

- There are many species of Lepidoptera to know, this is a large group of insects.
- All Lepidopterans are holometabolous.
- Caterpillars (larva) have chewing mouthparts and feed on plants. Adults have haustellate/siphoning mouthparts and are nectar feeders.
- Lepidoptera are pests, beneficial, and inconsequential. They are pests because caterpillars are plant feeders. If they are beneficial, it is because they are pollinators. If they are inconsequential they don't do enough damage as caterpillars to be considered pests and probably don't pollinate enough to be considered beneficial.
- Lepidoptera wings are covered in scales, which gives them their color.

Study Guide Questions:
Name 3 Lepidopterans that are pests.
Name 3 Lepidopterans that are found on crops.
What type of mouthparts do Lepidopterans have?
What type of metamorphosis do Lepidopterans have?

Study Guide – Texas 4-H Entomology ID Contest
Lepidoptera Species to Know:

Junior Species (10):

1. Black swallowtail
2. Bollworm/corn earworm
3. Fall armyworm
4. Gray hairstreak
5. Luna moth
6. Monarch
7. Polyphemus
8. Red admiral
9. Underwing moths
10. Wood nymphs

Intermediate Species (18):

1. Alfalfa caterpillar/clouded sulfur
2. Bagworm
3. Black swallowtail
4. Bollworm/corn earworm
5. Cabbage looper
6. Fall armyworm
7. Giant swallowtail
8. Gray hairstreak
9. Greater wax moth
10. Luna moth
11. Monarch
12. Pink bollworm
13. Polyphemus
14. Red admiral
15. Silver spotted skipper
16. Tomato hornworm
17. Underwing moths
18. Wood nymphs

Senior Species (37):

1. Alfalfa caterpillar/clouded sulfur
2. Armyworm
3. Bagworm
4. Black swallowtail
5. Bollworm/corn earworm
6. Buckeye
7. Cabbage butterfly
8. Cabbage looper
9. Cecropia
10. Cutworms
11. Fall armyworm
12. Fall webworm
13. Forest test caterpillar
14. Giant swallowtail
15. Gray hairstreak
16. Great leopard moth
17. Greater wax moth
18. Indianmeal moth
19. Io moth
20. Luna moth
21. Monarch
22. Mourningcloak butterfly
23. Peachtree borer
24. Pecan nut casebearer
25. Pink bollworm
26. Polyphemus
27. Question mark
28. Red admiral
29. Saltmarsh caterpillar
30. Silver spotted skipper
31. Sorghum webworm
32. Southwestern corn borer
33. Eastern tiger swallowtail
34. Tomato hornworm
35. Underwing moths
36. Viceroy
37. Wood nymphs

Study Guide – Texas 4-H Entomology ID Contest
Hymenoptera
Intermediates & Seniors Only

1. Review the Hymenoptera YouTube video for your age level at the Bexar Entomology page.
2. Follow along with your 4-H Entomology Study Guide (https://entomology.tamu.edu/extension/youth/4-h/4h-contest/)
3. Review the definitions for the key words for Hymenoptera.
4. Read the Hymenoptera Facts
5. Answer the study guide questions
6. Quiz yourself to identify the species of Hymenoptera and if they are a pest/beneficial/ inconsequential and where they are found in nature and/or their host.

Key Words to Know for Hymenoptera:
Holometabolous
Eusocial
Caste System
Parasitoid

Hymenoptera Facts:

- Hymenoptera are holometabolous
- Hymenoptera ants, bees, and wasps.
- Hymenoptera have chewing mouthparts. Bees have chewing and lapping.
- Some Hymenopterans are pollinators, others are predators, and some are pests.
- Some hymenopterans are solitary, some live in colonies, and some are truly social or eusocial.
- Eusocial Hymenopterans live in colonies and have a caste system.

Study Guide Questions:
What type of mouthparts do Hymenoptera have?
What metamorphosis do Hymenoptera have?
Are Hymenoptera beneficial or pests?
Name a truly social Hymenopteran.
Name two pollinating Hymenopterans.
Name two pest Hymenopterans – why are they pests?
Name three Hymenopterans that are wasps.
Name two Hymenopterans that are ants.
Name two Hymenopterans that are bees.

Study Guide – Texas 4-H Entomology ID Contest
Hymenoptera Species to Know:

Junior & Intermediate Species (9):

1. Bumblebees
2. Cicada killer
3. Honeybee
4. Mud daubers
5. Paper wasps
6. Red harvester ant
7. Red imported fire ant
8. Velvet ants
9. Yellow jackets

Senior Species (15):

1. Bumblebees
2. Carpenter bees
3. Cicada killer
4. Honeybee
5. Horntails
6. Ichneumon wasps
7. Leaf cutting bees
8. Mud daubers
9. Paper wasps
10. Red harvester ant
11. Red imported fire ant
12. Sawflies
13. Tarantula hawk
14. Texas leafcutting ant
15. Velvet ants
16. Yellow jackets