

CHESSIE LIFE SCIENCE CLASS READING, VIDEOS TO WATCH & QUESTIONS TO PREPARE

IN PREPARATION FOR CLASS ON SEPT 27

1. Please watch two you-tube videos. The first one is called Honey Bees-Natural History one and the second is called Honey Bees—Natural History two. The links for these videos are:

<https://www.youtube.com/watch?v=x7cX2cjFunw>

<http://www.youtube.com/watch?v=VsCmSWoF8PY>

2. Read this handout

3. Come prepared with one or two questions to ask the beekeeper. Write out the two questions that you would like to ask.

The History of Honey

Honey bees (as well as many other insects) are one of science's greatest mysteries because they have remained unchanged for years & years, while the world changed around them. As the years passed, man learned to work with bees. Many agree that the first evidence of beekeeping (as opposed to foraging honey from wild bee colonies) appears in the paintings of ancient Egypt, dating from around 2500 B.C. Ancient Egyptians are believed to have kept bees in mud and clay hives. Thousands of years later, the ancient Greeks studied new ways of raising honey bees. By 50 B.C. the Romans were using melted, dyed beeswax to paint pictures. In the Middle Ages, beekeepers wearing wicker veils kept bees in straw skeps, which were put in stone shelters called bee boles. Pilgrims brought the first honey bees to North America in the 1600s. By the 1850s, honey bees were found all the way across the continent in California. Pioneers used boxes to trap honey bees and then released them so that the bees could be followed back to the hive. In 1852, a teacher and part-time beekeeper invented the movable-frame beehive and the honey business boomed.

Honey Bees

More than **25,000** species of bees have been identified around the world. In the continental United States, scientists believe there are approximately **3,500** species of bees. Bees known as honey bees are represented by **eight to ten species in the genus Apis**, a name from which comes the word for beekeeping (apiculture) and the word for a bee yard (apiary). The species of honey bee commonly found today in the Americas is *Apis mellifera*, which means honey carrier. This name is not technically correct as the bees carry nectar from flowers, which they then use to produce honey back in the hive. Races of *Apis mellifera* have different physical and behavioral characteristics such as body color, wing length, and susceptibility to disease. As insects, honey bees pass through four distinct life stages: the **egg, larva, pupa and adult**. Complete meta-morphosis takes between **16 and 24 days** depending on the sex of the developing bee. A queen bee lays an egg in an individual wax cell. The egg hatches into a white

legless larva on the fourth day. The larva feeds on royal jelly and beebread (a mixture of nectar and pollen) until it reaches mature size and then spins a cocoon around itself. The cell is capped with wax and the larva transforms into the pupa. The pupa develops into a mature adult bee inside the capped cell. When fully developed, the mature bee chews its way out of the cell.

Adult worker bees live approximately 45 days during the summer months. There are **three types of adult bees** that make up a honey bee colony. The great majority (about 99 percent) of adult honey bees are sterile **female worker** bees. Worker bees develop from fertilized eggs. Worker bee larvae are fed **royal jelly** for only three days. Then they are **fed beebread** (a **mixture of nectar and pollen**) for the remaining larval stage. Passing through the immature stages (complete metamorphosis) takes 21 days for worker bees. The **male members of the colony are called drones**. Drones (male bees) develop from unfertilized eggs that are laid in larger cells. Drones are also fed royal jelly for three days and are then fed beebread. Drones remain in the pupal stage for 15 days and emerge as adults on day 24. **Drones have wider bodies than worker bees, rounded abdomens, and no stingers.** Queen bees develop from fertilized eggs in the largest cells in the hive. **Larva destined to become a queen bee is fed royal jelly for the entire larval stage.** Queen bees develop in only 16 days.

Glossary of Honey Bee

Anatomical Characteristics

Abdomen — the rear body region of a honey bee composed of nine segments and contains many organs including those for digestion, reproduction and respiration.

Antenna(e) — the moveable, sensitive feelers on an insect's head which detect odor and movement.

Cocoon — the silk chamber a larva spins around itself just prior to the pupal stage of development.

Compound eye — an eye made up of thousands of tiny lenses that allow a honey bee to see ultraviolet light, which is invisible to the human eye, as well as visible light (except red).

Exoskeleton — the hard outer covering which forms a bee's body.

Head — the forward body region of the honey bee's three sections that contains the compound eyes, simple eyes, antennae, mandibles, and proboscis.

Honey sac — the stomach-like organ that is connected by a funnel shaped valve to the digestive tract. The nectar stored here will be unloaded into empty hive cells or passed on to house bees for food.

Legs — a honey bee has three pairs of segmented legs used not only for walking but also to dust off antennae, brush pollen out of the thousands of branched hairs that cover the body, and to store pollen.

Mandible — located on either side of the honey bee's head, these jaw-like structures are used to chew honey and pollen, and to knead wax.

Midgut or ventriculus — the stomach section in the abdomen which digests food.

Ocellus — simple eye with a thick lens that can sense changes in the brightness of daylight.

Proboscis or tongue — a straw-like structure used for sucking nectar or honey.

Pollen basket — a smooth, somewhat concave surface of the outer hind leg that is fringed with long, curved hairs that hold the pollen in place.

Stinger — found in a chamber at the end of the abdomen (in female honey bees only) and is used to defend against intruders. **Thorax** — the middle section of the honey bee's three sections that contains the flight muscles, the wings and six legs.

Wax gland(s) — four pairs of glands that are specialized parts of the body wall. During the wax forming period in the life of a worker, they become greatly thickened and take on a glandular structure. The wax is discharged as a liquid and hardens to small flakes or scales.

Wing(s) — the honey bee has two sets of flat, thin, membranous wings, strengthened by various veins. The fore wings are larger than the hind wings. Glossary Honey Bee Anatomical

Glossary of Honey Bee Life Stages

Adult — a fully formed, mature honey bee.

Beebread — a mixture of nectar and pollen.

Bee metamorphosis — the four stages of transformation in the life of a honey bee.

Brood — the offspring produced by the colony (eggs and larvae).

Cell — a hexagonal chamber built of beeswax for brood rearing and storage of honey and pollen.

Drone — a male honey bee that is produced from an unfertilized egg.

Drone cell — a brood cell that is larger than the normal worker brood cells and in which the queen deposits drone eggs.

Egg — laid by a queen bee, this is the first stage in the life of a honey bee.

Larva — hatched from the egg the queen bee lays, the larva will pupate and eventually turn into an adult insect.

Nectar — a sweet liquid secreted by flowers of various plants.

Pollen — the fine, powder-like material produced by the anthers of flowering plants.

Pupa — the third stage in a bee's life, during which the larva's body changes into that of an adult.

Queen — a female bee that lays eggs.

Royal jelly — a milky, yellow syrup that is very high in protein, that young worker bees secrete from glands inside their heads and feed to larvae.

Workers — female bees who build and guard the hive, look after the queen and gather food.

Beekeepers

Throughout the year, honey bees face many environmental hazards: scalding heat waves, freezing weather and honey thieves, like bears and skunks. Fortunately for bees, there are beekeepers who look out for their best interests. They keep the hives protected from the weather and make sure they are always near plenty of flowers and water. Beekeepers raise colonies of bees for several products, the most important of which is honey. Anyone who keeps bees is performing an important ecological service as well, because many plants are dependent on bees for pollination. There are an estimated 139,600 to 212,000 beekeepers in the United States. The vast majority of beekeepers are hobbyist beekeepers who manage less than 25 hives of bees. About four percent are part-time beekeepers with 25 to 299 hives. An estimated 1,600 beekeepers are commercial beekeepers who manage more than 300 colonies of bees each. About one-half of commercial beekeepers are migratory beekeepers. They rent their bees to farmers, following the pollination seasons of the various crops. Modern beehives consist of wooden box-like sections stacked on top of each other. Each box (or super) holds 8-10 wooden frames, each containing a thin sheet of wax foundation. The bees build their combs on these foundations provided by the beekeepers, and therefore save time and effort in honey making. Honey is stored in the combs in the upper parts of the hive. When the bees have filled the combs in this upper section with honey and covered them with wax caps, the beekeeper takes them away to extract the honey and sell the wax for many products.

