

the bee unit

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British Columbia Agriculture in the
Classroom Foundation
Summer Institute 1999 Unit Plan
for Grade 8-11 Science



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Summer Institute for Educators

This document is the result of the author's participation in the BC Agriculture in the Classroom Foundations' Summer Institute for Educators. This third year level course in curriculum design is offered through the University of British Columbia's Office of Continuing Professional Education.

Participants (20 educators from Kindergarten to Grade 12) spend one week at the Montfort House Rural Resource Centre situated on UBC's Farm on Vancouver Island. Here they develop a number of practical teaching strategies for their classrooms using examples drawn from the agricultural, environmental, economic and nutritional concepts featured in the Bc Integrated Resource Packages for their particular grade or subject area.

The agricultural community sponsors participants for the costs of learning resources, tuition, meals and accommodation.

Participants taking the course for credit create teaching modules such as this to share with other educators from around the province.

Applications can be made on the BC AITC web site at www.aitc.ca/bc or directly at the AITC office. Contact Lindsay Babineau at 604-556-3088 for an application form.

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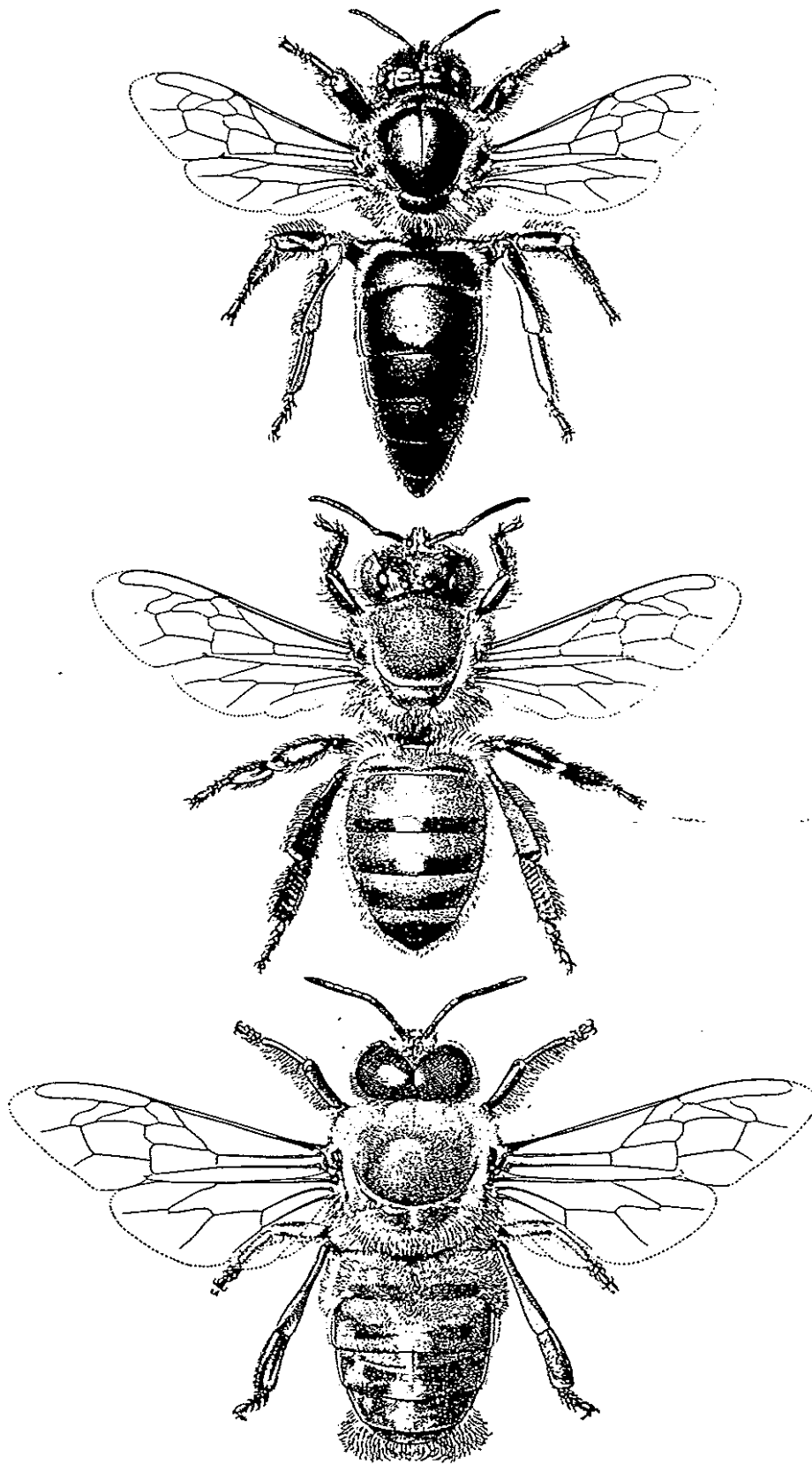
- the Beef Cattle Industry Development Fund

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- BC Association of Cattle Feeders
- BC Broiler Hatching Egg Commission
- BC Cattlemen's Association Public Affairs Committee
- BC Chicken Marketing Board
- BC Horticultural Coalition
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- BC Milk Producers Association
- BC Turkey Marketing Board
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- JR Appel Contracting
- Mainland Dairymen's Association
- Nechako Regional Cattlemen
- North Okanagan Livestock Association
- Royal Bank, Agriculture Division
- Upper North Thompson Livestock Association
- Whitta Farm



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The three castes of the honeybee, *Apis mellifera*. From above downwards queen, worker, and drone.

Curriculum Outcomes

The activities in this unit support the following Curriculum Goals and General Learning Outcomes for the Junior Secondary Science, Biology, and Agriculture Curriculum guides:

Junior Secondary Science

Goal A: the Junior Secondary Science Program should provide opportunities for students to develop positive science attitudes. In this unit opportunities will be provided to:

- develop curiosity about natural events and interests in trying to understand them
- discuss some science related activities which could be done during leisure time

Goal B: the Junior Secondary Science Program should provide opportunities for students to develop the skills and processes of science. In this unit opportunities will be provided to:

- observe
- classify
- quantify
- communicate

Goal C: The Junior Secondary Science Program should increase the student's scientific knowledge.

Goal D: The Junior Secondary Science Program should provide opportunities for students to develop creative, critical and formal thinking abilities.

* These goals are excerpted from the *Junior Secondary Curriculum Guide and Resource Book*, 1986.

Biology

Goal A: The Biology Curriculum should provide opportunities for students to develop scientific attitudes, and to develop positive attitudes towards science.

Goal B: The Biology Curriculum should provide opportunities for students to acquire the skills and understand the processes of science.

Goal C: The Biology Curriculum should provide students to increase their understanding of the basic concepts and principles of biological science.

Goal D: The Biology Curriculum should provide opportunities for students to develop critical and abstract thinking abilities.

Specific learning outcomes for Biology 11

Insects—the students should be able to :

- describe the general arthropod body plan as well as that of a common insect.
- describe the life cycles of insects with complete metamorphosis
- describe the ecological or economic importance of a local insect

*These goals are excerpted from the *Biology Curriculum Guide*.

Agriculture

Specific learning outcomes—the students should:

- develop a responsible attitude toward animal care and management.
- develop an appreciation of specific animal classes and their uses.
- gain a knowledge of animal health practices.
- gain a working knowledge of the management techniques of an animal commodity.
- gain a working knowledge of the processing and marketing of animal products.

*These goals are excerpted from the *Agriculture Curriculum Guide*, 1985.

Prepare for the unit

- 1) Find a place for your hive and inform your principal.
- 2) Visit a bee store in your area.

J.J. Bee Supplies (Basic bee keeping supplies)
5693 176 Street
Surrey, BC B3S 4C5
Telephone (604) 574-3400
Fax (604) 574-9728

- 3) Construct or buy a hive.
If you are going to build a hive see the patterns provided in the Ministry of Agriculture, Food and Fisheries brochure on beehive construction. Talk to your woodwork teacher about student construction. If you are going to purchase a hive have students put the frames together, it is very simple.
- 4) Find as many resources as you can on bee keeping and keep them in the classroom.
Look in your local resource centre for films, picture kits, or other material available.
- 5) Contact your local beekeeping club. You may want to assist at some of their meetings.
You may find someone who could visit your class as a guest speaker.
- 6) Read on the subject to familiarize yourself with beekeeping
- 7) Download Information Sheets for handouts from <http://ag.arizona.edu/>

The Hive

To start keeping bees you can:

- buy established, mature colonies,
- install mail-order package bees in new hives and
- install natural bee swarms in new hives.

You will need some tools:

- a smoker
- hive tool
- bee brush
- veil
- gloves
- bee suit or cover all

To build your own hive you can order a brochure on beehive construction from
BC Ministry of Agriculture, Food and Fisheries
1767 Angus Campbell Rd.
Abbotsford, BC V3G 2M3
Phone (604) 556-3001

Lesson 1—Why beekeeping and History of Beekeeping

Objectives

Students will gain an understanding of the how and why of beekeeping. They will learn that bees are very useful for humans and learn some new vocabulary. Students will learn where beekeeping came from and realize its importance.

Information

- 6000 BC—Rock painting of ancient honey gatherer, Bicorp Spain
- 1450 BC—Egyption tomb painting of beekeepers extracting and storing honey, Tomb of Rehk-mi-Re, Thebes

Activities

1. Brainstorm with your students why beekeeping. Accept all possible answers.

You can complete the discussion with the following ideas:

- Hobby
- Honey production
- Bee wax craft
- Use of pollen (health food store)
- Pollinator for orchards or garden
- For anybody interested in nature, woodworking, crafts, gardening, making some money)

2. Discuss some of the advantages of beekeeping.

It is very low maintenance, it does not require daily care.

3. Discuss the terms apiarist (beekeeper), apiarian (adjective), apiculture (science of beekeeping).

4. Have students find all possible markets for the products of the hive.

- craft fair
- farmer's market
- roadside produce stands
- grocery store
- health food store
- rent hives to fruit and vegetable growers

5. Have students make a market study in their immediate environment. They could write questions for a survey for example.

Possibility for extension

Have students create a label for a product.

Bring different products in class and discuss their use.

Vocabulary

Apiarist	Beekeeping
Apiarian	Pollen
Apiculture	Pollinator

Lesson 2—Bee dissection

Objectives

Students will learn the different parts of the bee and their functions and perform a dissection

Materials

- dissecting microscope
- hand lens
- honey bees
- blades
- dissection dish
- slides of honey bee mouth parts and legs
- Worksheet 1
- Information sheet—can be downloaded from <http://ag.arizona.edu/pubs/insects/ahb/info2.html>
- picture—Parts of the Worker Bee Hind Leg
- picture—Honey Bee Head and Mouth parts
- picture—Honey Bee Stinging Apparatus
- Bee model

Activities

Bee dissection

- 1) Obtain dead worker bees from a beekeeper or from your hive (freeze them, and then put them into 70% ethyl alcohol) or already preserved specimens.
- 2) Provide student with the Information Sheet and Worksheet 1.
- 3) Have students read the Information Sheet before the lab.
- 4) Have students perform the dissection, completing Worksheet 1 as they go.
- 5) Students can use the bee model to help them label the different parts.

Possibilities for extension

- Study plant reproduction.
- Study plant adaptation to attract pollinator insect.
- Study parts of the flower and pollen, nectar production.
- Have the student examine brood comb with immature bees, and investigate the life stages of the honey bee.
- Have the students write a report about what happens within a honey bee colony.
- Study how wax is produced by the bees and the possible uses of bee wax.
- Have students research why some people are allergic to bee stings.

Vocabulary

See information sheet for bee parts.

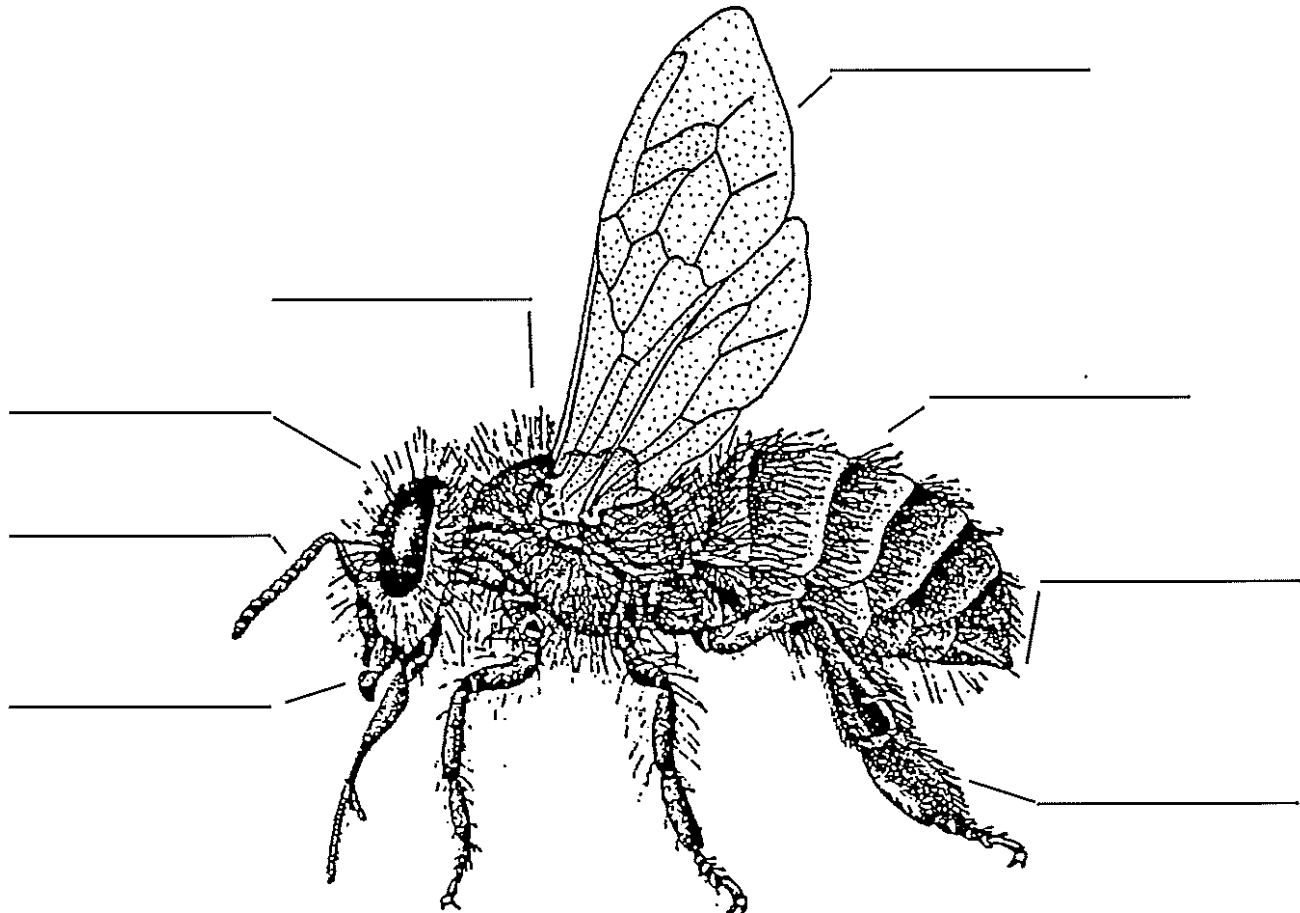
Bee Dissection

What is the scientific name of the honey bee—*Apis mellifera*

Part 1—General anatomy

Take one worker bee and put it in a dissection dish. Observe the general anatomy of the bee.

- 1) How many pairs of legs does the honey bee have? _____
- 2) How many wings does the honey bee have? _____
- 3) How many body sections does a honey bee have? _____
- 4) Name them. _____
- 5) Label the following parts on the picture—head, thorax, abdomen, antenna, mouth parts, pollen basket, wings, stinger.
- 6) Observe the abdomen closer with a hand lens. How many segments do you count? _____



- 7) What covers the bee body? _____
- 8) Why do you think bees are so hairy? _____
- 9) Look closer at the hair, what do you notice? _____
- 10) Pollen sticks to it like a magnet. Try it! Bring some pollen closer to the bee, what happens?

Part 2—Head and mouth parts

- 1) Dissect mouth parts of the bee. Try to identify the following parts—ocellus, antennae, compound eyes, mandible, proboscis.
- 2) What is the shape of the head? _____
- 3) Read the Information Sheet to find the function of each part.
 - a. ocellus _____

 - b. antennae _____

 - c. compound eye _____

 - d. mandible _____

 - e. proboscis _____

- 4) Examine a slide of honey bee mouth parts and draw a diagram of the head. On your diagram label the following parts—ocellus, antennae, compound eyes, mandible, proboscis.

Part 3—Hind leg

- 1) Dissect hind leg of the bee. Try to identify the following parts—femur, tibia, tarsi, pollen basket, pollen press, rake, comb.
- 2) Read the Information Sheet to find the function of each part.
 - a. pollen basket _____

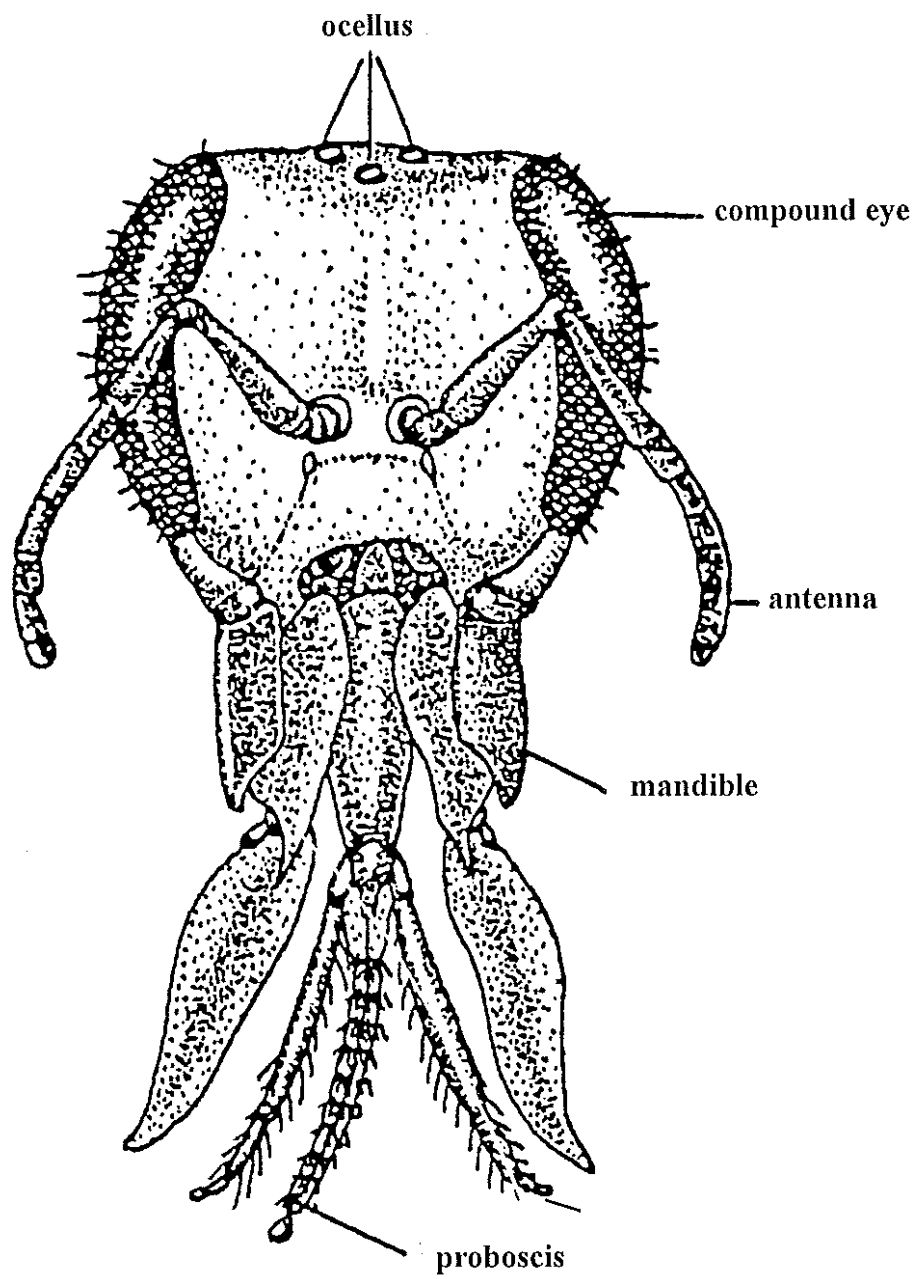
 - b. pollen press _____

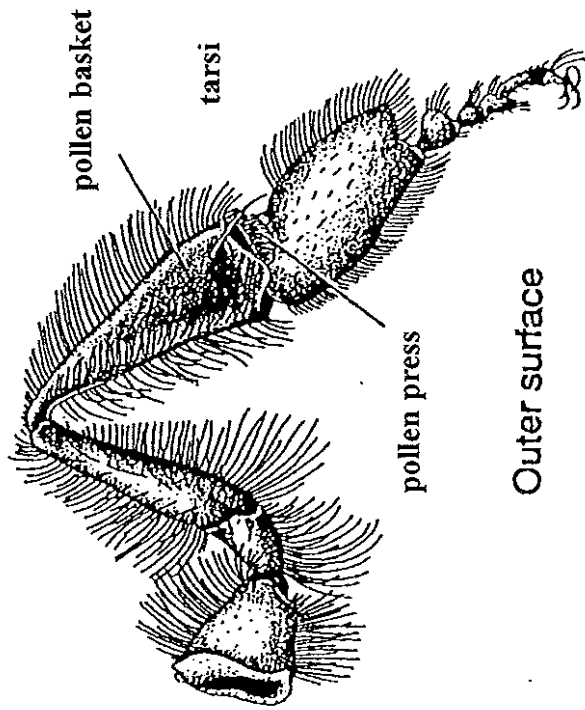
c. combs _____

- 3) Examine a slice of a honey bee hind leg and draw a diagram. On your diagram label the following parts—femur, tibia, tarsi, pollen basket, pollen press, rake, comb.

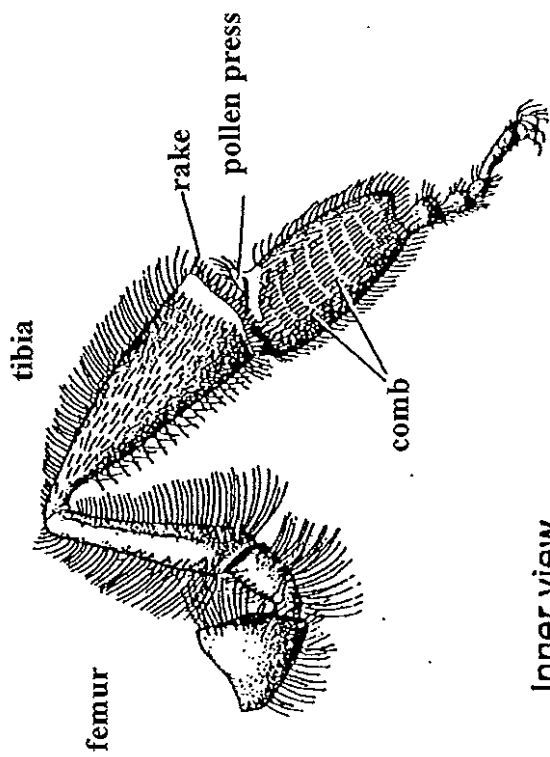
Part 4—Stinger

- 1) Dissect stinging apparatus of the bee. Try to identify the parts shown in the picture

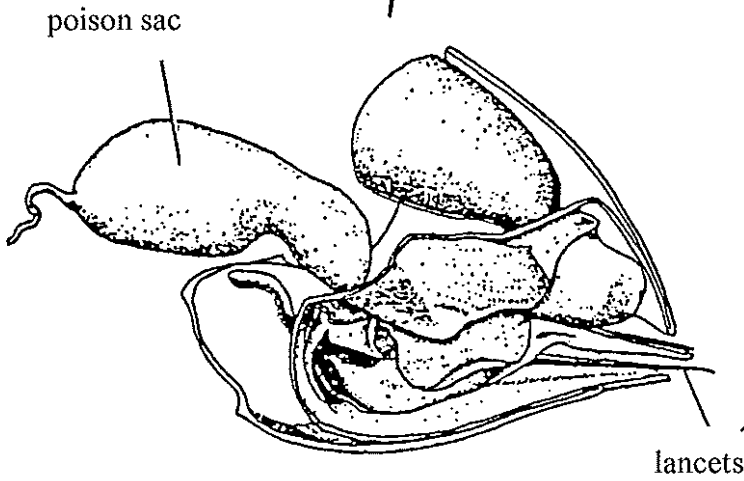
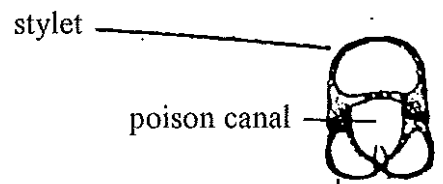
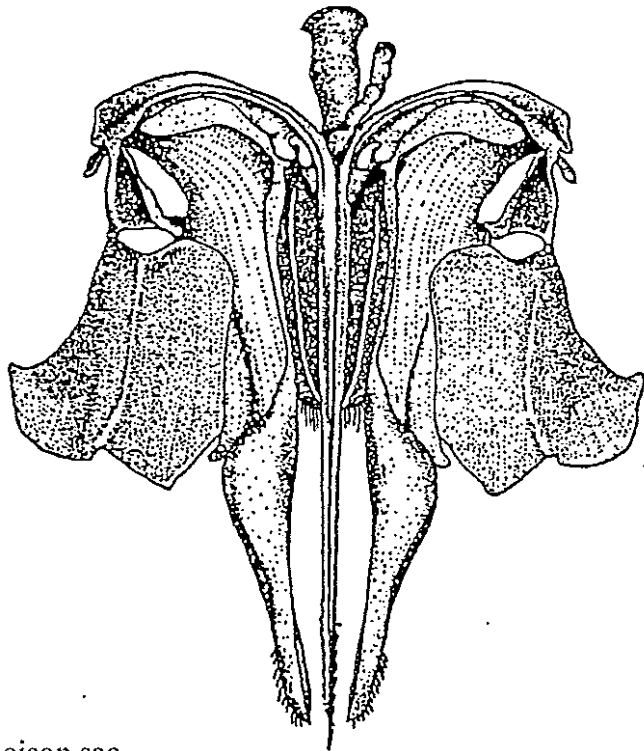




Outer surface



Inner view



Lesson 3—Life cycle

Objectives

Students will learn about the bee life cycle.

Materials

- dissecting microscope
- hand lens
- honey bees
- Information Sheet—can be downloaded from http://ag.arizona.edu/pubs/insect_ahb/inf3.html
- Worksheet 2

Activities

- 1) Have students complete Worksheet 2 after reading Information Sheet
- 2) If you have a hive, bring a frame in a glass hive and have students find the egg, larva, pupa and adult.
- 3) Ask them to draw the different stages in a life cycle, identify them, indicate the number of days between stages.

Possibilities for extension

- Write a diary of a honey bee from day one to the end of its life.
- Write a children's book showing the different stages of development of the honey bee.
- Write a story using the worker bee, the drone and the queen as characters.

Vocabulary

Worker	Egg
Larva	Pupa
Drones	Beebread
Royal jelly	Swarming
Colony	Nuptial flight

Honey Bee Biology

1) What are the different member of the bee colony?

2) Which members are present in the greatest numbers? Are they male or female?

3) What are their tasks in the colony?

4) What are the 4 life stages of the honey bee?

5) How long does it take for a worker bee to become an adult? _____

6) How long does it take for a make bee to become an adult? Why does it take longer?

7) What is beebread?

8) What is the proper term for the make bee? _____

9) How can you recognize the make bee in the colony?

10) What is the function of the queen?

11) How can you recognize her in the hive?

12) How many eggs a day can she lay?

13) Explain what is the nuptial flight?

14) What is the life span of a queen?

15) What is swarming? When does it occur?

Lesson 4

Objectives

- Students will learn the specific tasks a beekeeper has to do in order to maintain a good honey production and a healthy hive.
- Students will learn to name the parts of the hive and the beekeeping tools.

Materials

- Worksheet 3—parts of the hive
- Beekeeping tools and clothing
- Video—*Honey bees and beekeeping: A year in the life of an apiary*

Activities

- 1) Present the video or invite a guest speaker to your class.
- 2) Demonstrate (teacher or the guest speaker) the parts of the hive on a real hive and name each part—honey supers, excluder, brood nest. Have students record them on Worksheet 3.
- 3) Demonstrate the beekeeping tools and discuss the use of each. Do the same thing with the clothing
- 4) Have a student dress up as an apiarist. prepare small cards with the name of equipment part on it and have students come up and place the cards on the corresponding piece of equipment. The student also should say what the tool is used for—smoker, hive tool, bee brush, veil, gloves, bee suit.

Possibility for extension

- Have students look in a catalogue and find the price of each equipment part
- Have students estimate how much it would cost to get started as a beekeeper.
- Students can build hive models.
- Students can build a real hive in their woodwork class.
- Study how bees make the combs and investigate the form of the honey combs.

Vocabulary

honey supers	excluder
brood nest	smoker
hive tool	bee brush
veil	gloves
bee suit	

Information Sheet

Beekeeping tools and clothing

Honey bees sting. Yes, they do and that is why they are still around! Nevertheless, the beekeeper must manage this behaviour and keep it under control with special tools and protective clothing.

Smoker

The smoker is the most important tool for the beekeeper. It helps to calm bees and reduce stinging. The smoke distracts the bees from defensive behaviour, they run deeper inside the nest. It also masks alarm odours that bees emit when the nest is opened, thereby suppressing an escalating defence response from the colony. Pine straw, grass, corn cobs, and burlap can be used in the smoker.

Hive tool

Bees produce beeswax and propolis which glue together everything in their hive. The hive tools are used for prying apart supers and frames, and as a general scraper. The prying end is broad to reduce damage to wooden parts.

Bee brush

The brush is used for sweeping bees off surfaces. It is especially used during harvest.

Veil

This is the most important part of clothing. The veil is made to fit over a broad-rimmed hat. Put it on by passing the draw strings completely around your waist and tying them in front. This will secure the veil tightly all around.

Gloves

The gloves are usually made of leather and canvas, only or plastic-covered canvas and they reach to the elbows. They are not essential. As beekeepers get used to working in the hive they sometimes prefer to work without gloves as they can lead to rough treatment and aggravated bees.

Bee suit

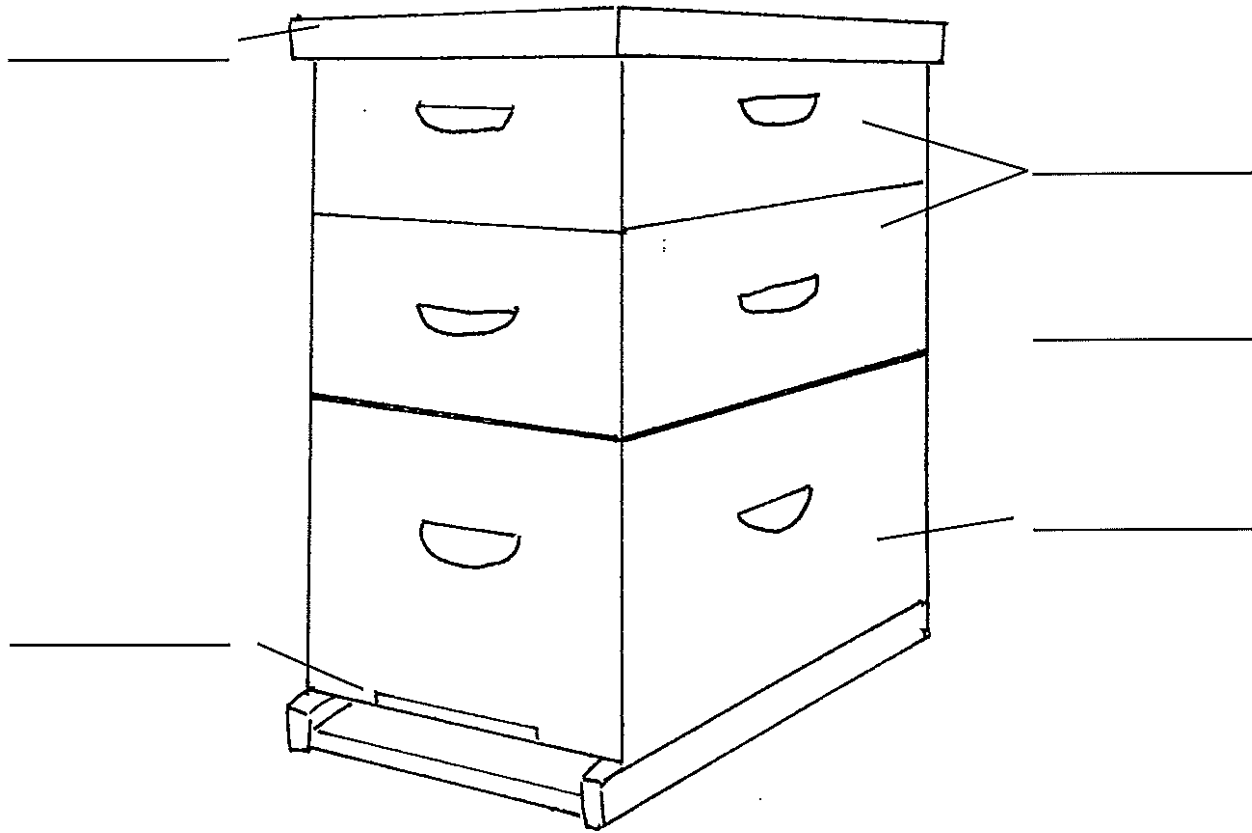
Like the gloves, bee suits are not essential. They are mostly used when bees are especially defensive or when there is a messy job to do. They are the best sting protection but a good coverall could also do.

Parts and configuration of a standard hive

Refer to the BC Ministry of Agriculture, Food and Fisheries brochure *Beehive Construction* for a description of each part of the hive.

Honey Bees and Their Homes

1) Listen to the presentation and identify the parts of the hive.



2) Write a small description of the following tools as well as their use.

a. smoker _____

b. hive tool _____

c. bee brush _____

d. veil _____

e. gloves _____

f. bee suit _____

Key vocabulary

absconding

bee brush

bee suit

brood

brood nest

colony

drone

entomology

excluder

gloves

hive tool

honey supers

larva

nectar

pollen

propolis

pupa

queen

rear

smoker

swarming

veil

worker

Resources

British Columbia Ministry of Agriculture, Food and Fisheries. 1997. Beehive Construction

Delaplane, Keith S. 1993. Honey bees & Beekeeping, A year in the life of an apiary.

The University of Georgia. USA

Donald J. Borror, Richard E. White. 1991. Les Guides Peterson. Les insectes des L;Amerique du Nord.

Editions Broquiel Inc.

Websites

Labonte Honey (<http://labontehoney.com/facts.html>)

Glory bee (<http://www.glorybee.com/art13.html>)

The California Foundation for Agriculture in the Classroom (<http://www.cfaitc.org>)