Combined Exam 1 study Guide (incomplete)

Hnrs Prin/Entomology (University of Florida)



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Unit One - Arthropod Classification
Study Guide

1. Why are insects considered to be "Key" terrestrial animals?
    i. They make up the vast majority of animal diversity, contribute substantial biomass, and play important ecological roles as a result of what eats them and what they eat.

2. What characteristics of insects contribute to their species richness?
    i. Small size allows them to live in a variety of locations, extremely diverse

3. Where do insects live and what are some of their food habits?
    i. Insects inhabit virtually all land surfaces of the globe except the extreme polar regions, the highest mountains, and oceans, except for the surface and shore. Vast majority are terrestrial.

4. Why can muscles in insects be used so efficiently and what exactly is an exoskeleton?
    i. Insect muscles can be used more effectively in smaller organisms because their power increases in proportion to their cross-sectional area, whereas body volume (and weight) increases as the cube of body dimensions.

5. Describe the range of ways insects contribute to commerce.
    i. Insects serve as food from higher organisms or consumers of other organisms or organic matter. They are important regulators of plant populations and provide crucial interconnections for other organisms as pollinators and as vectors of pathogenic microbes.

6. List the variety of insects used as food. What animals eat insects (entomophagy)?
    i. Butterflies, moths, beetles, ants, bees, wasps, grasshoppers, crickets, cockroaches, termites, dragonflies, and cicadas
7. Name some of the insects and their roles that are or were important in other cultures.
    i. Some insects caused typhus, plague. Some destroy crops like the grain eaters rice weevil and granary weevil.

8. Describe the different reasons insects may be cultured.
    i. Insects are important subjects of ecological, behavioral, genetic, physiological, and biological studies. Provide research for evolution and phylogeny. i.e. drosophila

Thought Questions:

1. How have insects contributed to our understanding of broader biological principles?
2. How do flagship species and the umbrella effect contribute to insect conservation?
3. What are some of the factors that affect conservation status and conservation programs?

Lecture Notes:

1. Classification

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a) Define classification: scheme of categorizing organisms

b) Define taxonomy: basic work of recognizing, describing, naming, and classifying insects

c) What are the kingdoms? The 4 kingdoms of Eukarya are Protista, Fungi, Plantae, and Animalia

d) What is the advantage of using a scientific name over a common name of an organism?

Species may have many common names but only have one scientific name

e) How does classification help us identify an organism?

- It gives an organism a scientific name in which everyone can identify an organism from. It also provides information about its relatives and ancestors.

a. Classification system

f) 1) Kingdom, 2) Phylum, 3) Class, 4) Order, 5) Genus, and 6) Species

c. Father of Classification

h) Carolus Linnaeus

i) Who is he? And what did he do for Classification?

- He is the Father of Classification. He wrote the Systema naturae which addressed the classification of animals, plants, and minerals. He classified 7,700 species of plants and 4,400 of animals.

ii) What would an (L) mean after a species name?

- It was classified by Linnaeus

2. What is an arthropod?

a) Which phylum do insects, crabs and spiders belong to?

- Arthropoda

b) What distinguishes an arthropod from other phyla? For instance, how can you tell an arthropod from a human?

- Segmented body, Jointed external skeleton, Paired jointed appendages on each segment, Dorsal brain, Ventral nerve cord, Open circulatory system, Dorsal heart, Molts

c) What are the advantages and disadvantages to having an exoskeleton?

- Advantages: protection, retardation of water movement, protection as barrier against physical damage and abrasion, barrier, and has concealing colors and shapes.

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- Disadvantages: requires a special modification for gas exchange and sensory pickup and major restriction on growth.

3. Arthropod subphyla

- What are the names of the Arthropod subphyla?
  - Phylum Arthropoda can be divided into the subphylum of Mandibulata and Chelicerata
  - which can then be divided into Trilobita, Chelicerata, Crustacea, Myriapoda, and Hexapoda.
  - Mandibulata consists of Crustacea, Myriapoda, and Hexapoda
- How are these subphyla different from each other? Which ones have antenna? How do they differ in their mouth types?
  - Chelicerata doesn't have antennae or a jaw while Mandibulata has a mandible

Chelicerata

Chelicerate Class:	**Merostomata**	**Arachnida**
Examples:	Horseshoe crap	Spider

5) Define cephalothorax: the fused head and thorax of spiders and other chelicerate arthropods

Arachnid Order	Uropygi	Opiliones	Araneae	Scorpiones	Acari	Pseudoscorpiones
Common Name	Whipscorpions	Harvestmen	Spiders	Scorpions	Ticks & Mites	Pseudoscorpions
Distinguishing characteristics	Any of numerous arachnids of tropical and warm temperate regions, resembling a scorpion but having an	Any of numerous spiderlike arachnids having a compact rounded body and extremely long,	Any of numerous predaceous arachnids most of which spin webs that serve as nests and as traps for	Any of numerous arachnids widely distributed in warmer parts of the world, having a long,	Any number of bloodsucking arachnids, having a barbed proboscis for attachment to the skin of warm-	Any of several small arachnids that resemble a tailless scorpion and that feed chiefly on small insects

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	abdomen that ends in a slender, nonvenomous whip	slender legs	prey	narrow, segmented tail that terminates in a venomous sting	blooded animals	

Mandibulata

Subphylum	**Crustacea**	**Myriapoda**	**Hexapoda**
Class	Malacostraca	Chilopoda	Insecta
		Diplopoda	
Distinguishing characteristics:	Biramous appendages	Two pairs of legs per segment, chewing mouthparts, exoskeleton, detritivorous	Exoskeleton of chitin, 3 body segments, 3 pair of mouthparts, 1 pair of antennae, compound and simple eyes, 3 pairs of legs,
Examples:	Crab	Millipede	Wasp

b) What are the two Crustacean Orders discussed in this unit?

- Isopoda and Decapoda (Class Malacostraca)

i) List three characteristics of Decapods:

- Calcium carbonate in exoskeletons, 5 pairs of legs

a) How do you differentiate between a spider, an insect and a crustacean?

	Arachnids	Crustaceans	Insects
Mouth Parts	Chelicera	Mandibles	Mandibles
Body region	Two	Two	Three
Antennae	None	Two Paid	One Pair
Legs	4 pair (8)	Many	3 Pair (6)

Unit Two - Insect Evolution

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Study Guide

1. Which types of insects are the most diverse? How many total species might there be?
    i. Family Curculionidae in Order Coleoptera, 65,000 species

2. What are some of the advantages wings and flight provide?
    i. Can escape prey and get food

Evolutionary Stages

Apterygota

1. What does "apterygote" mean?
    i. Without wings

2. Describe this stage and which insects represent this group.
    i. Archeognatha which has elongate monocondylic mandible with incisor lobe distinct from the molar lobe. Thysanura has dicondylic mandible with incisor lobes and molar lobes closer (as in pterygotes)

Paleopterous

1. What does "paleopterous" mean?
    i. Old wing

2. Which two Insect Orders currently make up Paleoptera?
    i. Ephemeroptera and Odonata

3. Describe this stage and which insects represent this group.
    i. Wings cannot be flexed over the back at rest; dragonfly, damselfly, mayfly

4. Explain the difference between the direct flight musculature found in dragonflies and the indirect musculature found in mayflies and other winged insects.
    i. Odonata has direct flight musculature which is attached directly to wing bases while Ephermeroptera has indirect musculature attached to the thoracic terga.

Wing Flexon (Infraclass Neoptera)

1. What does "neopterous" mean?
    i. New wing

2. Describe this stage and which insects represent this group.
    i. The new wing had a flexon, or the ability to bend at the base; crickets, cockroaches, earwigs, grasshoppers, thrips

3. How was this stage an advantage over the previous stages?
    i. They are able to bend their wings and hide to escape prey.

4. Why do some researchers prefer to use the terms exopterygota and endopterygota to hemimetabola and holometabola?

Metamorphosis terms

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Type of metamorphosis	**Definition**	**Insects that do this**
ametabolous	"without change", egg, several larval instars, and seveal imaginal instars, hexapods that are apterous (Collembola, Diplura, Thysanura, Archeognatha), larvae change little except in size and proportion, continuously molt	Collembola, Diplura, Thysanura, Archeognatha
hemimetabolous	Incomplete metamorphosis, involves a partial change in appearance from larvae to imago, typically has egg, several larval instars, and the final winged sexually mature imago	Paleoptrea and exopterygota
holometabolous	Complete metamorphosis, characterized by larvae that undergoes histological reorganization, egg, several larval instars, one pupal instar, and the final winged and sexually mature imago	Endopterygotes and thysanura

1. Describe complete metamorphosis and which insects represent this group.
    i. A type of metamorphosis in which an insect passes through distinct egg, larval, pupal, and adult stages, and the larva does not resemble the adult; holometabolous

2. Why are insects in this group so successful?
    i. Metamorphosis is one of the key elements that makes insects so successful. Many insects have immature stages with completely different habitats from the adults. This means that insects can often exploit valuable food resources while still being able to disperse into new habitats as winged adults. The potential for adaptation and evolution is greatly enhanced by metamorphosis

2. The evolution of what other organisms contributed most to the evolution of insects?
    i. Land plants

3. What body structure is the most common fossil of insects? (p335)
    i. wings or fragments of wings

2. Which age is referred to as the “Age of Cockroaches” (p338)?

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i. Pennsylvanian

4. Insects are best preserved in amber. How can the abundance of only amber fossils and the lack of other fossil types bias the fossil record?
    1. Because amber inclusions form only where trees or other resinous plants grew, the insect evidence recorded in amber documents the relationship between ancient insects and forests. Put simply, insects trapped in amber lived in or near wooded areas

5. Were the first insects aquatic or terrestrial? What evidence is there to support this conclusion? Note that primitive insects appeared during the Devonian "Age of Fishes", but didn't expand and radiate (flight) until the Carboniferous.

    2. For what evolutionary reason did wings evolve?
        1. Important for local movement as they help insects search for mates and select suitable feeding or breeding sites

5. What life changes occurred to produce the holometabolic mode of metamorphosis from the hemi metabolic mode? How do the life stages of each strategy correspond to one another?

- More recently, an increased focus on the hormonal control of insect metamorphosis has helped resolve some of the evolutionary links between hemi- and holometabolan groups. In particular, the orchestration of the Juvenile Hormone (JH) and ecdysteriods in molting and metamorphosis processes has received much attention. The molecular pathway for metamorphosis is now well described: periodic pulses of ecdysteroids induce molting to another immature instar (nymphal in hememetabolan and larval in holometabolan species) in the presence of JH, but the programmed cessation of JH synthesis in instars of a threshold size leads to ecdysteroid secretion inducing metamorphosis. Experimental studies show that, with the exception of higher Diptera, treatment of the final instar stage with JH causes an additional immature molt and repetition of that stage. The increased understanding of the hormonal pathway involved in metamorphosis enabled direct comparison between hemimetabolan and holometabolan development.
  In hemimetabolous insects, JH disappears in the last larval instar and at the next of final molt, the insect differentiates into the adult. Holometabolous insects are similar, but the process of metamorphosis is more complex. In the last larval instar, JH drops to an undetectable level followed by secretion of ecdysteroid, which commits the insect to metamorphosis into the pupa instar.

6. What is homology? Would beetles with chewing mouthparts and mosquitoes with piercing-sucking mouthparts be homologous?
    - Homology is the structural likeness of anatomical parts due to a common evolutionary origin. Yes, the mouthparts are homologous

7. What is an example of convergent evolution between insects and birds?
    - Wings

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7. What term is used to define a single cell of the epidermis that is modified into something that resembles a hair? How can this be used for defense? (p20)
    - Setae, posion setae are hollow and filled with toxic fluids for defense, innervated by the peripheral nervous system and function as sensory organs called sensilla

9. How are muscles attached to the exoskeleton? (p 20)
    1. Small Apodemes or larger Apophyses are rapid fingerlike growths of the integument associated with muscle attachment. They function as the endoskeleton attached to the exoskeleton
9. What are Hox genes? (p47-50)
    1. Hox genes are responsible for regulating the development of animal body forms. Regulation of Hox genes is complex. Whether or not a particular gene is active in a particular segment is defined in the early embryo by signals. Gradual changes in Hox genes may contribute to the evolution of segment morphology

What do Hox genes tell us about the fate of gills among the arthropod subphyla (p 50)?

    2. Gills are only present in Crustaceans and Horseshoe crabs bc they did not have terestrialization events

Do centipedes have gills? What about spiders?

    3. Centipedes do not have gills, neither do spiders who have book lungs instead

Unit 3 Insect Orders

1. *Anamorphic*
    - development in some parainsects where abdominal segments are added during molting

2. *Ametabolous:*
    - an insect that goes under slight or no metamorphosis. The young just look like an adult

3. *Hemimetabolous:*
    - Incomplete metamorphosis, involves a partial change in appearance from larvae to imago, typically has egg, several larval instars, and the final winged sexually mature imago
4. *Holometabolous:*
    - Complete metamorphosis, characterized by larvae that undergoes histological reorganization, egg, several larval instars, one pupal instar, and the final winged and sexually mature imago

5. *Apterygote:*
    - *no wings*

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6. *Paleopterous:*
   - insects have wings but they do not fold over the insect's abdomen

7. *Pterygote:*
   - referring to all insects with wings

8. *Neoptera:*
   - having wings, but the wings have flexon or hinge that allows the wings to fold over the back of the abdomen

9. *Exopterygote:*
   - insects with wings that develop from the wing pad located on the outside of the growing insect

10. *Endopterygote:*
    - insects with wings that develop from the wing pad located on the inside of the growing insect

Insect Orders

Note The column for ***Development*** *refers to metamorphosis, i.e. whether or not the order is ametabolous, hemimetabolous or holometabolous. The column for* ***Wing Type*** *refers to whether or not the order is a) Apterygote, b) Paleopterous or b) Neoptera;* ***and*** *whether or not the order is: a) Endopterygote or b) Exopterygote.*

Table 1 - Subphylum Hexapoda

Parainsect Order (Entognatha)	***Common Name***	***Development***	***Facts***	***Economic or Ecological Importance***	***Wing Type or Leg Adaptation***
Protura	*Coneheads*				
Diplura	*Diplurans*				
Collembola	*Springtail*				

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CLASS INSECTA					
Archaeognatha	*Bristletails*				
Zygentoma/ Thysanura	*Silverfish/ firebarats*				
Ephemeroptera	*Mayflies*				
Odonata	*Dragonflies/ Damselflies*				
Plecoptera	*Stoneflies*				
Dermaptera	*Earwigs*				
Embioptera	*Webspinner*				
Zoraptera	*Angel insects*				
Orthoptera	*Grasshopper, crickets, katydid*				

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Phasmatodea	*Walking sticks*				
Grylloblattodea	*rockcrawlers*				
Mantophasmatodea	*Heel walkers/ Gladiators*				
Mantodea	*Praying mantis*				
Blattodea	*Cockroaches / Termites*				
Psocodea	*Lice*				
Thysanoptera	*Thrips*				
Hemiptera	*True bugs (stinkbug), cicadas, leafhoppers, whiteflies*				
Neuroptera	*Lacewings, antions, mantisflies*				
Megaloptera	*dobsonflies*				

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Raphidioptera	*snakeflies*				
Coleoptera	*beetles*				
Strepsiptera	*Twisted-wing parasites*				
Diptera	*True flies (mosquitoes, lovebugs)*				
Mecoptera	*Scorpionflies, hangflies*				
Siphonaptera	*Fleas*				
Lepidoptera	*Butterflie, moths*				
Hymenoptera	*Bees, ants, wasps*				

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Table 2

Note: Reviewing table 2 will help you to organize vocabulary terms and relate them to the insect and entognathan orders. For example, which orders are both hemimetabolous and paleopterous? How about which orders have wings that develop externally (exopterygote) and are hemimetabolous and have a wing flexon? Use this table as a visual to see how the characteristics of these orders are grouped.

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Arthropoda

Entognatha: Collembola, Diplura and Protura

Class Insecta

Ametabola

- Order Archaeognatha (Bristletails)
- Order Zygentoma (Silverfish)

Apterygota

Hemimetabola

- Order Ephemeroptera (Mayflies)
- Order Odonata (Dragonflies, Damselflies)

Paleoptera

- Order Plecoptera (Stoneflies)
- Order Dermaptera (Earwigs)
- Order Embioptera (webspinners)
- Order Zoraptera (Angel insects)
- Order Orthoptera (Grasshoppers, Crickets)
- Order Phasmatodea (Walking sticks)
- Order Grylloblattodea (Rock crawlers)
- Order Mantophasmatodea (heelwalkers)
- Order Mantodea (Praying mantids)
- Order Blattodea (Cockroaches, Termites)
- Order Psocodea (lice)
- Order Thysanoptera (Thrips)

Exopterygote

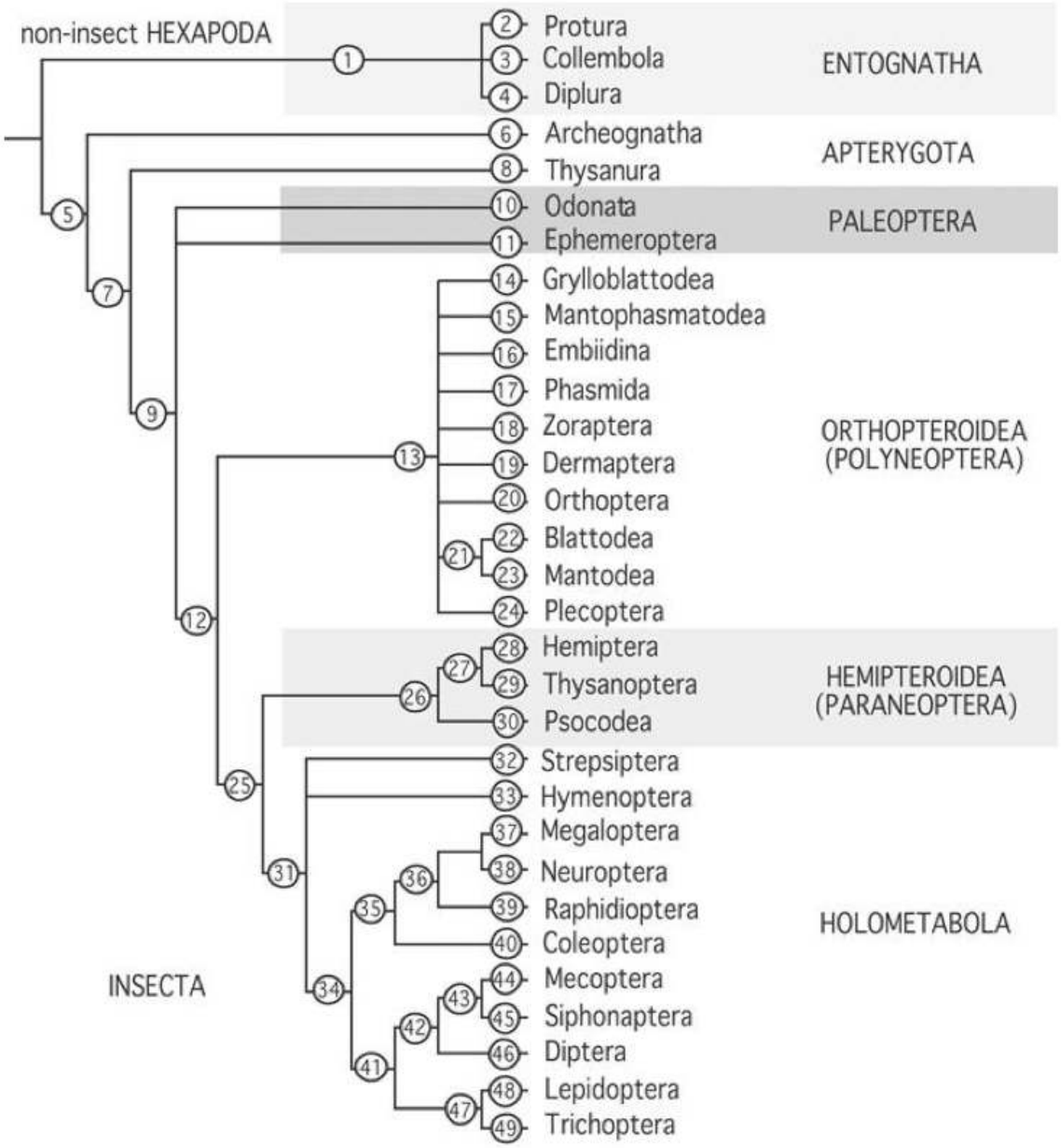
Neoptera

Holometabola

- Order Neuroptera (Lacewings)
- Order Megaloptera (Alderflies, Dobsonflies)
- Order Raphidioptera (Snakeflies)
- Order Coleoptera (Beetles)
- Order Strepsiptera (Twisted wing parasites)
- Order Diptera (True Flies)
- Order Mecoptera (Scorpionflies)
- Order Siphonaptera (Fleas)
- Order Trichoptera (Caddisflies)
- Order Lepidoptera (Moths, Butterflies)
- Order Hymenoptera (Ants, Wasps, Bees)

Endopterygote

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Unit 4 - Integument, Development & Reproduction
Study Guide

Introduction

Integument Layers

Which layers make up the exoskeleton?

What is the epicuticle made of?

- Waterproof (made of lipids and proteins)

What is the exocuticle made of? How do these two compounds interact?

- Hardened layer (chitin-protein microfibers)

Which layer of the exoskeleton is flexible but still contains protein and chitin?

Which layer is waterproof? What makes it waterproof?

- Epicuticle

Which layer is cellular?

- Epidermis

Which layers make up the integument?

- Cuticle and epidermis (epicuticle, exocuticle, endocuticle, and epidermis)

What is the function of the basement membrane?

Explain the three methods of color production. (pp.58-60)

Exoskeleton advantages

What are three functions (or advantages) of the exoskeleton?

- Advantages include protection, retardation of water movement, protection as barrier against physical damage and abrasion, barrier, and has concealing colors and shapes

Disadvantages

What are the disadvantages to having an exoskeleton?

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- Disadvantages include requires a special modification for gas exchange and sensory pickup and major restriction on growth

Molting process

Name and describe the four molting steps:

Distinguish apolysis from ecdysis. (p. 52, 56-57)

Explain what an instar is. (p. 69)

- A stage when an insect is between two successive molts

Why is the growth of an insect saltatory (occurring in distinct jumps in size)?

Molting hormones

Where is Juvenile Hormone secreted? (p. 73)

- Corpora allata

Where is ecdysone secreted? (p. 73)

- Prothoracic glands

What is the function of JH in the larval stage? (pp. 74-75)

- JH is secreted continuously throughout each molt except during the last molt. When JH is secreted, it keeps a larva from becoming an adult

What is its function in the adult stage? (pp. 73-74)

- JH stimulates egg production in adult insects

What is the function of ecdysone (or ecdysteroids)? (pp. 73-75)

- It travels to the epidermal cells where it stimulates the epidermal cells to secrete molting fluid. Ecdysone, by itself, stimulates the epidermis to form an adult cuticle

When JH levels drop, and the insect is ready to molt, what kind of cuticle is formed? (pp. 74-75)

What is sclerotization? (pp. 55)

- The polymerization and cross bonding of chitin and protein to produce the hardened insect exoskeleton

What is another name for an imago? (p. 69)

Explain:

Ametabolous Development:

Hemimetabolous Development:

Holometabolous Development:

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List an insect order for each metamorphic strategy.

What do we mean when we say a particular life stage is pharate? (p. 71)

- Referring to the developmental stage enclosed in the integument of the preceding instar

Research on your own

Define:

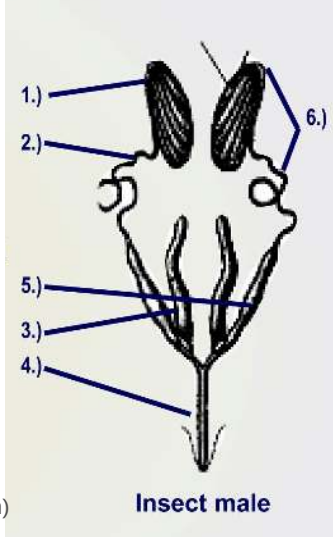
- Diapause – arrested development in an insect's life cycle that is genetically predetermined and caused by neurohormones
- Aestivation – A period of summer dormancy
- Hibernation – A period of winter dormancy
- Quiescence – Irregular dormancy that is not seasonal and does not involve physical changes
- Univoltine- A species that has one brood a year
- Bivoltine- A species that has two broods a year.
- Multivoltine- A species that has many broods a year.
- Hypermetamorphosis- Holometabolous insects whose larvae are distinctly different
- Triungulin – A larva of a hypermetamorphic insect

Larval Types:

- eruciform– Larva shaped like a caterpillar
- Scarabaeiform- "grub like,'" translucent body, shaped like a C
- Campodeiform- Elongated and flattened, well developed legs, antennae, and cerci, often predaceous
- Elateriform- Looks like a worm with short legs, short hairs
- Vermiform- maggot-like larvae with elongate bodies and no heads.

Reproductive System

Fill in the names of the insect reproductive organs:

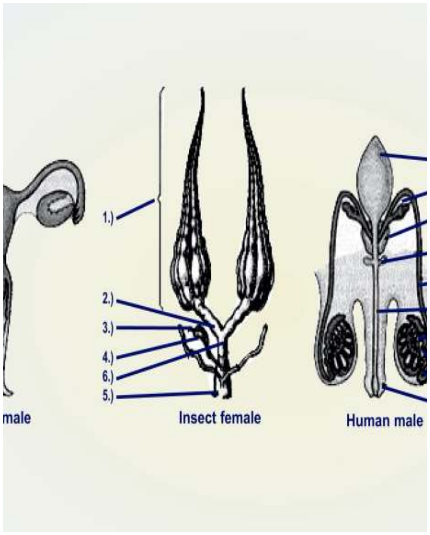


Insect male

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Female:
1.) Ovary
2.) Lateral oviduct
3.) Spermatheca Gland
4.) Spermatheca
5.) Vulva
6.) Common Oviduct

Male:
1.) Vas efferens
2.) Vas deferens
3.) Accessary Glands
4.) Ejaculatory Duct
5.) Seminal Vesicle
6.) Testis



Reproductive Organ Functions

List the functions of the following reproductive organs.
Male
- aedeagus:
  - male copulatory organ that transfers his sperm to the female
- accessory gland:
  - produces seminal fluid and spermatophore (packet of sperm)
- testes:
  - sperm producing follicles
- vas deferens:
  - where sperm travels through
- seminal vesicle:
  - where sperm is collected and stored
- ejaculatory duct:
  - leads sperm the aedeagus

Female
- ovary:
  - contains a number of follicles that contain developing eggs
- ovarioles:
  - where eggs mature from germ cells

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- lateral oviduct:
  - where the egg passes through on its way to the common oviduct

- spermatheca:
  - saclike organ that receives and stores sperm

- oviduct:
  - One of the paired tubes that passes the eggs from the ovaries to the vagina

- accessory glands:
  - provide lubricating fluids and secret the chorion (protective cell that encases the egg)

- spermatheca:
  - saclike organ that receives and stores sperm

- common oviduct:
  - the unpaired, median duct

Reproductive Physiology

Explain the haplodiploid sex determination system.
- fertilized eggs are diploid and develop into females, males are haploid and not fertilized

Distinguish between the three reproductive strategies: oviparity, ovoviviparity, and viviparity.
- Oviparity: eggs are retained in the female's genital tract until embryonic development is complete, larvae or nymphs are deposited, not an egg

- Ovoviviparity: eggs are deposited by the female shortly after fertilization

- Viviparity: embryo is fed by female after development begins

What is pedogenesis and why is it so unusual. What favors the appearance of this strategy?
- Paedogenesis is reproduction in immature forms. For example, the Surinam cockroach is parthenogenic in North America as there are no males. The female produces clones of herself

Panoistic ovary:
- simple ovary found in older insect, each cystoblast develops into an oocyte

Meroistic ovary:
- Nurse cells (trophocytes) are associated with each oocyte

Meroistic polytrophic:
- trophocytes accompany each oocyte into the vitellarium and are included in the follicle

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Meroistic teltrophic:

- Trophocytes remain in the germarium and are connected with the oocytes by nutritive chords
- Arrhenotoky: Parthenogenesis in which males develop from unfertilized eggs
- Thelytoky: Parthenogenesis in which females develop from unfertilized eggs
- Deuterotoky: Parthenogenesis in which both males and females develop from unfertilized eggs

What is polyphenism?

- Two or more forms of the same insect species can be found

Give an example of a polymorphic insect. How do the forms of the insect differ?

Unit 5 - Maintenance and Movement

Study Guide

Table 1

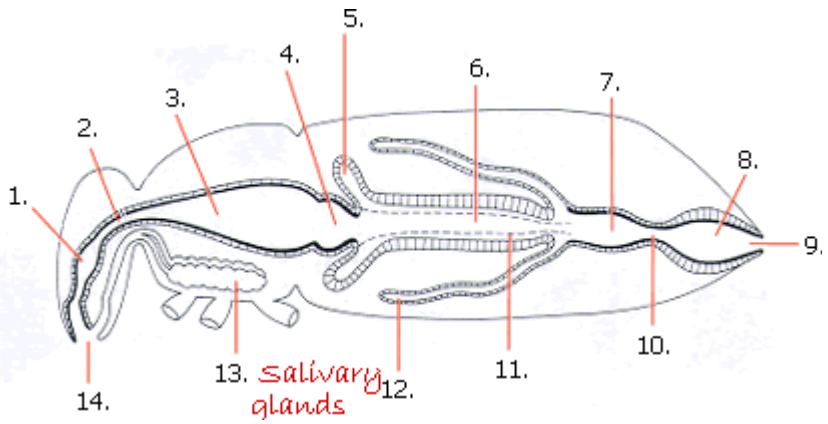
Structure	**Function**
preoral cavity	The mouth opens into the preoral cavity which grinds and receives the food as it first enters the body.
pharynx	The first region of the foregut which is heavily muscled to help in swallowing.
esophagus	Swallows food and dumps it into crop
salivary gland	Secretes fluid to lubricate food as it passes out of pharynx and down the esophagus and into the crop. Secretes some digestive enzymes.
crop	Stores food while midgut enzymes (in some insects) are allowed to enter through proventriculus to digest the food.
proventriculus	Acts as a valve between crop and midgut. It often contains heavy teeth for further grinding of food.
midgut	Secretes digestive enzymes and the peritrophic membrane. It absorbs nutrients from food broken down by digestive enzymes
gastric caeca	Fingerlike pouches off the midgut. They are known to house symbiotic bacteria

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Malpighian tubules	Filters harmful substances and nitrogenous waste from the hemolymph.
peritrophic membrane	Membrane secreted by the midgut cells. Protects the cells of the mid- and hindgut. Encloses the food but is permeable to enzymes and permits digestive products to leave and be further digested or absorbed by the midgut cells.
ileum	First part of the hindgut, larger than the colon
colon	Narrower portion of the hindgut
rectum	Posterior part of the hindgut. Dehydrates waste and compresses it into pellets
anus	Expels compressed waste out of the insect's body

Diagram 1



<u>Alimentary canal embryonic origins</u>

Which embryonic layer formed the midgut?

- Endoderm

Which one formed the hindgut?

- Ectoderm

What happens to the foregut and hindgut lining when the insect molts?

- The foregut and hindgut are made from the ectoderm, so they have a cuticular lining like the exoskeleton made of chitin and proteins. When an insect molts, the foregut and hindgut is shed with the exoskeleton

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What is the lining made of?

- The peritrophic membrane is made up of chitin and proteins

Tracheal system

Why don't insects have lungs?

- Instead of lungs, insects have a tubular network of tracheal tubes through their body. Air enters the body through tine holes in the cuticle called spiracles which can be opened and closed by muscles. Trachea bring oxygen to the cells

What is the function of the tracheal system?

- Brings oxygen into the cells and dispels carbon dioxide

What is the function of spiracles?

- Tiny holes in the cuticle that allow air to enter the insect's body and go into the trachea

What is the function of taenidia?

- Thickened bands on the tracheal tubes that allows the tubes to be flexible

How does oxygen get to every cell in the insect body?

Circulatory system

Why is insect blood **not** red?

- It does not have hemoglobin

Does hemolymph transport oxygen to cells?

- No, it regulates salt content, transports nutrients, fights disease, and heals wound

What is the insect heart?

- Part of the dorsal vessel that has ostia

Define ostia:

- Tiny openings in the abdominal region of the dorsal bessel that controls how much hemolymph enters the vessel

Define aorta:

- the remainder of the dorsal vessel that is not the ostia or the insect heart, where blood leaves through

How does hemolymph move throughout the insect body? What direction does it flow?

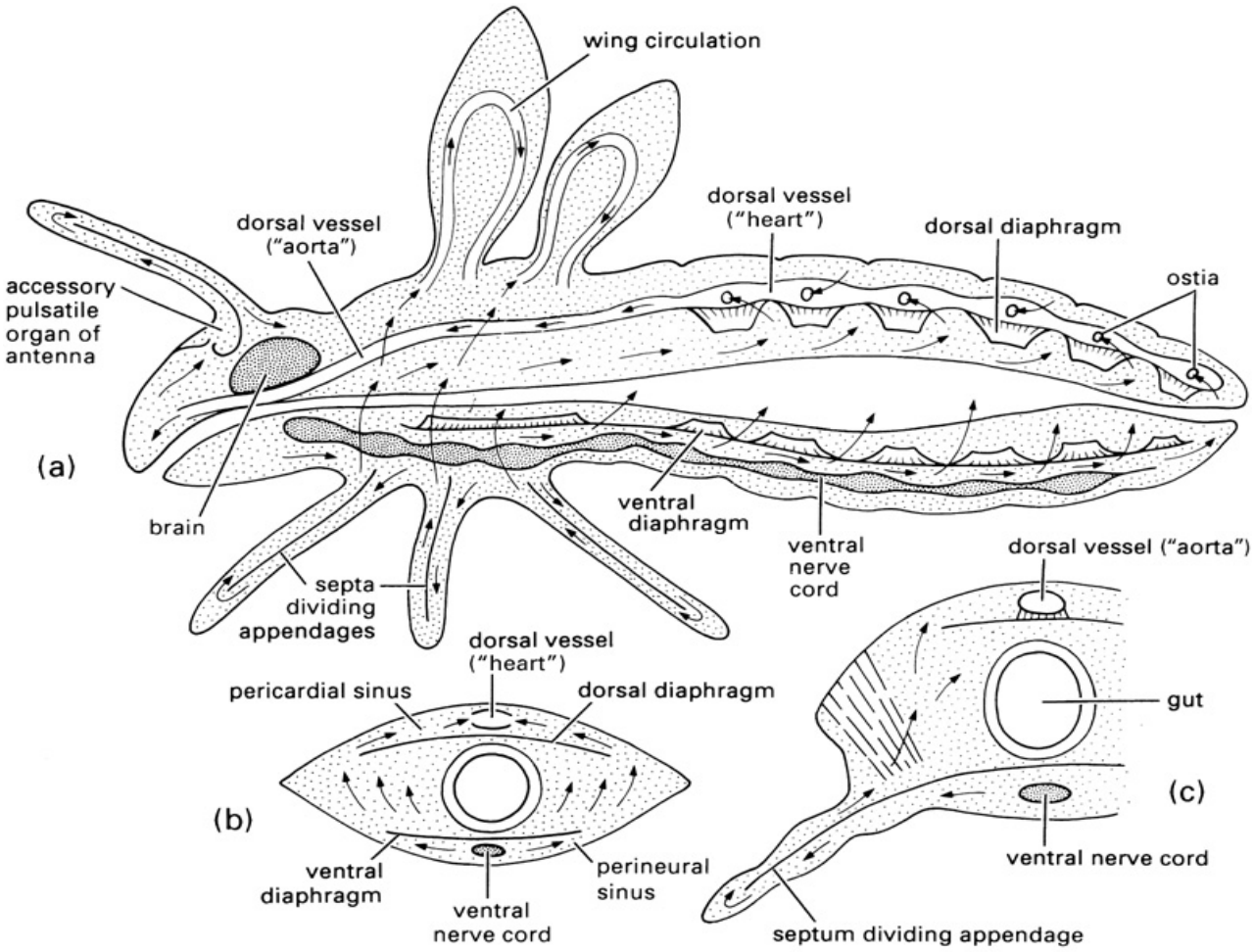
How does hemolymph get into the wings and antenna?

- Pulsating organs

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Diagram 2



Maintaining body temperature

When an insect is at rest, what is its body temperature?

What are some ways insects increase their body temperature?

What are some ways insects keep from freezing?

- Some insect's hemolymph contain a type of antifreeze

Other Body Features

What distinguishes setae from other cuticular projections?

- Setae can have a sensory function (connected to nerves)

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- Structural Color: affect the way light bounces off of an animal; often responsible for shiny Iridescent colors

- Pigment Color: uses pigments that reflect off light to generate colors

Define:

1) Dorsal: Relating to the upper side or back of the animal
2) Ventral: Relating to the underside of an animal
3) Anterior: Nearer to the front, situated to the front of the body or close to the head
4) Posterior: Further back in position, nearer to the rear or hind end
5) Proximal: Situated nearer to the center of the body or point of attachment
6) Distal: Situated away from the center of the body or point of attachment
7) Dorsum: The dorsal part of an organism or structure
8) Venter: The underside or abdomen of an animal
9) Pleuron: The platelike lateral part of a segment, including the episternum and epimeron
10) Tergum: The dorsal portion of a body segment
11) Sternum: The ventral portion of a body segment, deliminated from the pleura by sutures

What are the two kinds of flight muscles and how do they differ in their function?

Why does decapitation not immediately kill an insect?

- The ganglia in the head are for eyes, mouth, antennae of an insect. It does not have a central nervous system like humans

Describe the functions of ecdysteroids, juvenile hormone, and prothoriacicotropic hormone.

How are endosymbionts important to insects?

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