PHYLUM ARTHROPODA (Ch. 23)

1. INTRODUCTION

'jointed-legged' - size mm to 60 cm
- over 1 million species in 3 subphyla
- metamerism (esp. paired appendages)

• tagmata - fuse & differentiate segments
- head–thorax–abdomen
- cephalothorax–abdomen
- head–trunk

• jointed exoskeleton - flexible

• wings - insects (unique among invertebrates)

ecology - dominant invertebrate

2. SUBPHYLUM CHELICERATA

3 classes - cephalothorax & abdomen
- biramous appendages (clawed tips)
- 2 pairs appendages on head (chelicerae & pedipalp)

1. horseshoe crabs - ancient, shallow marine predators
- dorsal shield & telson (spiked tail)
- 5 pairs legs & 6 pairs swimming plates

2. arachnids - spiders, scorpions, ticks, mites
- terrestrial, predators or exoparasites
- 4 pairs legs, plus fangs, pincers, poison

3. sea spiders - marine plankton
- tiny body (organs into 4 pairs legs)

3. SUBPHYLUM CRUSTACEA

4. crustaceans - 6-10 classes, herbivores or predators
- dominant marine invertebrate (crabs, shrimps, sow or pillbugs, barnacles)
- cephalothorax & abdomen, calcium carbonate exoskeleton, many biramous appendages
- 5 pairs appendages on head (2 antenna, 1 mandible, 2 maxillae)

4. SUBPHYLUM UNIRAMIA

3 classes - terrestrial (mandibulates)
- head–thorax–abdomen or head–trunk
- uniramous appendages (pointed tip)
- 3-4 pairs appendages on head
  (1 antenna, 1 mandible, 1-2 maxillae)

5. centipedes - predators, flattened cross-section
- up to 181 segments, each with 1 pair legs

6. millipedes - herbivores, rounded cross-section
- 100 segments, each with 2 pairs legs

7. insects - dominant land invertebrates
- 75% all species, herbivores or predators
- 3 pairs legs + 1-2 pairs wings

5. EXOSKELETON

exoskeleton - secreted by epidermis
- chitin (protein) or calcium carbonate
- waterproof, jointed for movement

molting - required for growth, first shed old one, then
inflate body with air or water before new one hardens

6. LOCOMOTION

muscles - extremely active & efficient
- coordinated in antagonistic pairs

appendages - adapted for swim, walk, fly

silk glands - protein in spiders
- spun by spinnerets, also for webbing

sessile - barnacles cemented at head

7. NUTRITION

mouthparts - specialized pairs of appendages
- sensory, capture, manipulate, chew, poison

chelicerates - #1 chelicerae, #2 pedipalps

others - #1-2 antenna, #3 mandible,

#4-5 maxillae

8. REPRODUCTION

sexual - dioecious, internal fertilization

asexual - some parthenogenesis
- autotomy (replace lost appendages)

metamorphosis - diverse
- direct (larva resembles adult)
- incomplete (larva lacks wings)
- complete (maggot, pupa/cocoon)

9. OTHER SYSTEMS

open circulatory system - hemocoel

respiration - gills or trachea (pores)

nervous system - pair of dorsal ganglia
- connected to 2 ventral nerve cords
- eyes (light, image, or compound)

excretion - many different structures

10. EVOLUTIONARY SUCCESS

exoskeleton - superior to hydrostatic
- decreases water loss, protects, invades land

tagmata - segments & appendages specialized

muscles & nerves - rapid & precise
- complex behavior, many diff senses

respiration - many diff systems
- all rely on diffusion (limits maximum size)

life cycle - short life span, high rate of reproduction
- allows population increase rapidly

dimorphism - larvae diff from adults
- reduce competition for food etc.

wings - unique among insects, exploit land
- improve predation or escape from predation