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,
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