PHYLUM MOLLUSCA (Ch. 21)

1. INTRODUCTION

diversity - 80k species, size mm to 1.5 m

• coelom - true body cavity around digestive tract
  - completely lined by mesoderm
  - reduced in most adults (incl. molluscs)

• open circulatory system - heart pumps into hemocoel

• shell - hard exoskeleton

ecology - most marine, also freshwater/land

2. H.A.M.

hypothetical ancestral mollusc
  - generalized body plan, model never existed

head - in front, with mouth

foot - along bottom, for movement

visceral hump - on top, holds internal organs

mantle tissue - above hump, secretes shell

mantle cavity - in rear, gills & anus (fouling)

3. CLASSES

1. chitons - intertidal, herbivorous
  - shell (8 jointed plates)
  - foot (flat for attaching to rocks)

2. tusk shells - marine burrowers
  - shell (tubular with 2 openings)
  - head (tentacles for filter-feeding)
  - foot (small spade for burrowing)

3. gastropods - all habitats, herbivorous
  - most abundant & diverse (snails, nudibranchs, slugs)
  - shell (single, cone or coiled)
  - head (retract into mantle cavity)
  - foot (broad for crawling)
4. bivalves - marine & fresh, no head
   - 2nd most abundant class (clam, oyster, scallop, etc.)
   - shell (2 opposing valves)
   - foot (large hatchet for burrowing)
   - mantle cavity (gills for filter-feed)

5. cephalopods - marine predators
   - most advanced (octopus, squid, nautilus)
   - shell (reduced or chambered coil)
   - head (arms with adhesive suckers)

4. TORSION

torsion - unique rotation in gastropods
   - turn 180° to the right during embryonic development
   - mantle cavity moved to front
   - protects head, allows gills to test water

bilateral asymmetry - right side less developed (esp. gills)
   - shell coiled over right side

fouling - digestive tract twisted in U-shape
   - anus empties above head & gills
   - water enters left, waste exits right

detorsion - in nudibranchs (lacks shell)
   - restraightens digestive tract, anus still over right side

5. EXOSKELETON

shell - calcium secreted by mantle tissue
   - enlarged at edge to permit growth

nacreous layer - along inner surface of shell
   - mother-of-pearl (structural color)

bivalves - 2 separate valves (left vs right)
   - ligaments spring open automatically
   - muscles contract to close (attach at muscle scars)

gastropods - cone-shaped or coiled (conispiral)
   - some with operculum (door-like cover)
   - absent in slugs & nudibranchs

cephalopods - chambered & planospiral in nautilus
   - internal in octopus, squid, cuttlefish
6. LOCOMOTION

foot - broad & flat for crawling
  - or vertical & narrow for burrowing

arms - numerous in nautilus
  - 8 in octopus & squid (plus 2 tentacles)

shell - bivalves clap valves to expel water
  - gas-filled in nautilus for buoyancy

sessile - burrow or cement to rocks

7. REPRODUCTION

sexual - dioecious (gonads in visceral hump)
  - panmixia (external fertilization)
  - some monecious or protandry

8. OTHER SYSTEMS

digestion - most with straight digestive tract
  - radula (strap with teeth to scrape algae)
  - pair of gills for filter-feeding

nervous - ganglia (brain in octopus)
  - eyes (photoreception or image-forming, esp. octopus)

circulation - most open system (hemocoel)
  - closed in octopus (more efficient)

respiration - gills if aquatic, lungs on land,
  skin in nudibranchs

excretion - nephridia