Invertebrate Phyla Characteristics

Phylum Porifera (sponges)

- means "pore bearing"
- no true tissues or organs (most primitive of the multicellular animals)
- adults are sessile
- adults typically asymmetrical
- have some regeneration capabilities
- flagellated cells (choanocytes) drive water through canals and chambers
  - water flows in through the ostia to the atrium and exits the osculum (filter feeders)
- many commensal organisms live in their water passages
- skeletal elements (spicules) provide support, they are composed of calcium carbonate, silica and/or collagen fibers, spicules used for identification
- asexual reproduction by buds and sexual reproduction

Phylum Cnidaria (jellyfish, sea anemones, corals, gorgonians, hydroids)

- many have alternation of generations (two different adult morphologies)
  - polyp form (sessile, tube-like body, mouth directed up)
  - medusa form (mobile-planktonic or free-swimming, mouth directed down)
- radial symmetry
- body organized about an oral-aboral axis
- contain specialized cells called cnidocytes, which contain stinging structures called nematocysts; used for prey capture (carnivorous) and defense
- possess a two-way gut
- many possess zooxanthellae (dinoflagellates) or (rarely) zoochlorellae (green algae), resulting in a symbiotic relationship
  - symbiont receives carbon dioxide, nutrients and shelter
  - cnidarian host receives oxygen, food (from the photosynthesis) and help with $CaCo_3$ secretion
- asexual reproduction by budding or sexual reproduction
- Class Anthozoa (sea anemones, corals, gorgonians)
- Class Hydrozoa (hydroids)
- Class Scyphozoa (true jellyfish)

Phylum Platyhelminthes (flatworms)

- Class Turbellaria (free living flatworms)
- Unsegmented body
- bilaterally symmetrical
- flattened dorsoventrally
- possess a two-way gut
- move by contracting muscles (glides over rocks or undulates through water)
- carnivorous, prey on small invertebrates by entangling them with body & mucus
- capable of regeneration
- sexual reproduction (usually hermaphroditic), some reproduce asexually by fission

Phylum Annelida (segmented worms)
- Class Polychaeta (bristleworms)
- body metamerically segmented (division of the body into similar segments arranged in a linear series)
- bilaterally symmetrical
- can be mobile (carnivorous) or sessile (suspension feeders)
- possess a one-way gut
- each segment contains a pair of appendages called parapodia (used for movement and gas exchange)
- sexual reproduction

Phylum Mollusca
- bilaterally symmetrical
- possess mantle which secretes the shell plates or shells
- large, well defined muscular foot, often with a flattened creeping sole
- buccal region provided with a radula (file-like feeding structure); modified in some classes
- possess a one-way gut
- sexual reproduction

  Class Polyplacophora (chitons)
  - shell is composed of eight interlocking dorsal plates
  - herbivorous

  Class Gastropoda (snail, nudibranchs, slugs)
  - can be herbivorous or carnivorous
  - snails possess operculum (trap door)
  - nudibranchs (means "naked gills"); have external gills, mostly carnivorous
  - slugs: have interior gills, mostly herbivorous

  Class Bivalvia (bivalves)
  - shell is in two pieces
  - can be sessile, sedentary or mobile
  - ventral siphon brings water and food in, while dorsal siphon expels water and waste material (filter feeders)
  - sessile forms use byssal threads to attach themselves to the substrate

  Class Cephalopoda (squid, octopus)
  - means "head foot"
  - carnivorous
  - shell is usually reduced or absent
  - ink bag produces sepia
  - special pigments allow skin to change color

Phylum Arthropoda (shrimp, crabs, barnacles, isopods, etc.)
- bilateral symmetry, metameric segmented body, each with a pair of jointed appendages
- most have regional body specialization
- usually possess compound eyes
- exoskeleton made of chiton and must be shed in order to grow
- possess a one-way gut
- sexual reproduction

Subphylum Crustacea

Barnacles
- outer and inner shell of fused plates
- feather-like feet (suspension feeder)

Isopods
- flattened dorsoventrally

Amphipods
- flattened laterally

Shrimp
- scavengers

Brachyura (regular crabs)
- four sets of walking legs
- chelipeds
- most are omnivores, larger ones usually predaceous

Anomura (porcelain crabs, hermits crabs)
- three sets of walking legs
- porcelain crabs
  - majority are suspension feeders (setose mouth parts)
- hermit crabs
  - use empty gastropod shells for protection, have soft, vulnerable abdomens
  - scavengers

Phylum Bryozoa (bryozoans)
- means “moss animal”
- colonial, sessile
- feels “hard” (calcareous exoskeleton) or mossy
- each individual, or zooid, posses a lophophore which is a ciliary feeding device (suspension feeders)
- colonies reproduce asexually by budding or sexually by release of sperm and eggs

Phylum Echinodermata (sea stars, brittle stars, sea urchins, sand dollars, sea cucumber)

- means "spiny skin"
- exclusively marine
- adults have pentamerous radial symmetry – larva are bilaterally symmetrical
- calcareous endoskeleton, composed of separate plates or ossicles
- body organized about an oral-aboral axis
- water vascular system composed of a complex series of fluid-filled canals (used for locomotion and respiration)
- sexual reproduction or asexual reproduction by regeneration

Class Asteroidea (sea stars)

- use tube feet for locomotion
- predaceous (evert stomach and have external digestion)

Class Ophiuroidea (brittle stars)

- use tube feet, spines and arms for locomotion
- can be suspension feeders, scavengers or predaceous

Class Echinoidea (sea urchins, sand dollars)

- internal skeleton is fused
- use spines and tube feet for locomotion
- herbivorous grazers (use "Aristotle's lantern" a mouth surrounded by teeth)

Class Holothuroidea

- pentamerous symmetry is elongated internally
- internal skeleton is reduced, allowing for greater flexibility
- when under stress, they can eviscerate (expel their respiratory, digestive and reproductive parts), these eventually regenerate
- can be suspension feeders or deposit feeders (or combination of both)
- produce "sand sausages" or "castings" as waste products
- many species are harvested for human consumption (eg, *Isostichopus fuscus*)

Phylum Chordata

- possess a notocord, hollow dorsal nerve cord and pharyngeal gill slits at some stage in their life cycle

Class Ascidiacea (tunicates)

- soft-bodied, sessile
- feels "soft and slimy"
- can be solitary or colonial
- filter feeders

Class Osteichthyes (bony fish)

Class Chondrichthyes (cartilagenous fish: sharks, rays, skates and chimaeras)