









Figure 23-26 Invertebrate Body Systems

Phylum (with examples)	Body Support/Movement	Nervous Control	Reproduction	Digestion	Circulation	Excretion	Gas Exchange	
Porifera: Sponges 	Amoebocytes produce a protein called spongin or mineral-based, needle-like structures for support. Adults are sessile.	None	Asexual: budding Sexual: male and female structures are present in same individual; zygotes develop into flagellated larvae.	Digestion, circulation, excretion, and gas exchange are accomplished by multi-purpose amoebocytes. Amoebocytes ingest food particles, and digest and transport the nutrients throughout the sponge. Gas exchange also occurs at the cellular level, primarily by diffusion.				
Cnidaria: Hydras, jellies, and anemones 	Fluid in gastrovascular cavity gives body shape. Microfilaments within cells are arranged into fibers that contract.	Nerve net	Asexual: budding Sexual: male and female structures are present in same individual.	Digestion takes place in a gastrovascular cavity (digestive sac), which has a single opening that is both mouth and anus. The nutrients are distributed to cells that line the cavity. In flatworms the gastrovascular cavity is finely branched, helping the distribution of nutrients throughout the body.		Expulsion from gastrovascular cavity; simple diffusion of wastes from cells into surrounding water	No specialized structures. Diffusion across cell membranes helped by circulation in the gastrovascular cavity.	
Platyhelminthes: Flatworms 	True muscle tissue—muscles run along the length of the animal (longitudinally).	Primitive brainlike ganglia (nerve clusters) and ventral nerve cords	Asexual: fragmentation and regeneration Sexual: male and female structures present in same individual; cross-fertilization between individuals.			Most wastes diffuse from cells into the surrounding water. Ciliated cells move fluid containing wastes through branched ducts opening to the outside.		
Nematoda: Roundworms 	Exoskeleton—called the cuticle—has to be shed as animal grows. Muscles are all longitudinal, causing thrashing movements.	Central brainlike ganglion with nerve cords extending to the front and rear	Sexual: most species have separate males and females; internal fertilization in most species.	Complete digestive tract (tube) with openings at both ends—mouth and anus; digestive tract has specialized regions for digestion, the stomach and intestine.		No specialized circulatory system. Nutrients are transported by fluid in the body cavity, which is a pseudocoelom.	A ventral gland or a tubular system is connected to an excretory pore; mostly used for maintaining water balance	Diffusion across cell membranes
Annelida: Segmented worms 	Fluid-filled compartments provide support; two sets of muscles—circular and longitudinal	Two ventral nerve cords connect to ganglia in each segment; pair of cerebral ganglia in the head	Sexual: male and female structures are present in same individual (except in polychaetes); internal fertilization (external in polychaetes)			Closed circulatory system; dorsal and ventral vessels connected by two vessels per segment; blood with oxygen-carrying hemoglobin; accessory hearts	Tubular structures called metanephridia in each segment remove wastes from blood.	The moist skin serves as the organ for gas exchange; oxygen absorbed across the skin is transported by the circulatory system.
Mollusca: Snails, clams, squids 	Mantle produces a shell in most species; muscular foot	Nerve ring around the esophagus with attached nerve cords				Open circulatory system in most species; dorsal heart circulates fluid to body cavities.	Specialized structures called nephridia remove wastes from blood.	Mantle cavity with gills in aquatic species; mantle cavity can serve as a lung for terrestrial species.
Arthropoda: Insects, crustaceans, spiders 	Exoskeleton of protein and chitin; muscles attached to knobs on interior of exoskeleton	Ventral nerve cord with several ganglia. In the head region, the two cords meet and fuse into a larger ganglion (brain).				Open circulatory system with a dorsal heart; bloodlike fluid transports materials.	In insects and arachnids, Malpighian tubules remove wastes from the bloodlike fluid.	Feathery gills in aquatic species; tracheal tubes inside the body in terrestrial species; book lungs in spiders
Echinodermata: Sea stars, sea urchins, sea cucumbers 	Endoskeleton of hard plates; water vascular system	Nerve ring plus nerve cords along each arm	Sexual: separate males and females; gametes are released externally in water.	Short digestive tract with mouth and anus	Fluid in the body cavity (coelom) transports nutrients throughout the body.	No specialized excretory system; wastes are removed by diffusion from the fluid in the coelom and the water vascular system.	Water vascular system	