1) What is the synapomorphy of the Ecdysozoa and Lophotrochozoa lineages?
   a. Possession of a hemocoel
   b. Protostome development
   c. Lack of a coelom
   d. Deuterostome development

2) Among protostomes, which morphological trait has shown the most variation?
   a. Direction of gastrulation (protostome vs. deuterostome)
   b. Type of body cavity (coelom vs. pseudocoelom vs. acoelom)
   c. Type of symmetry (bilateral vs. radial vs. asymmetry)
   d. Number of embryonic tissue types (diploblastic vs. triploblastic)

3) Which of the following organisms would you expect to have the largest surface-area-to-volume ratio?
   a. A mollusk
   b. An annelid
   c. An arthropod
   d. A rotifer
   e. A platyhelminth

4) Upon close inspection of movement in annelids and nematodes, you would notice an obvious difference. Nematodes tend to wriggle back and forth, while annelids tend to contract along their length as their girth swells and then thin out as they stretch. What anatomical feature explains this type of movement?
   a. Nematodes lack a coelom.
   b. The annelids possess longitudinal muscle fibers that the nematodes lack.
   c. The nematodes lack circular muscle fibers.
   d. Annelids have a highly specialized nervous system capable of more complex movements.

5) Lophotrochozoans are characterized by
   a. A specialized feeding structure
   b. A characteristic ciliated larva
   c. Being triploblastic
   d. All of the above

6) Excreted waste and egested waste both have passed through a cell membrane.
   a. True
   b. False
7) Which of the following is a deuterostome?
   a. Echinoderm  
   b. Annelid  
   c. Arthropod  
   d. Mollusk  
   e. All of the above

8) Eutely
   a. Is a characteristic of arthropods
   b. Has the consequence that the organism cannot repair body damage
   c. Means that the organism has a reduced coelom.
   d. All of the above

9) A brain
   a. Is associated with cephalization
   b. Is a big ganglion
   c. Is part of a nervous system
   d. All of the above

10) Organisms in the Ecdysozoa
    a. molt  
    b. have a cuticle  
    c. are part of the most diverse and most abundant animal species lineage  
    d. All of the above

11) Which of the following is NOT a synapomorphy of the phylum chordate?
    a. Pharyngeal gill slits  
    b. Vertebrae  
    c. Dorsal hollow nerve cord  
    d. Muscular post-anal tail

12) Which of the following is a true statement about body size and physiology?
    a. The amount of food and oxygen an animal requires and the amount of heat and waste it produces are inversely proportional to its mass.
    b. Small and large animals face different physiological challenges because an animal's body mass increases cubically while its surface area increases as a squared function.
    c. The rate at which an animal uses nutrients and produces waste products is independent of its volume.
    d. The wastes produced by an animal double as its volume doubles, and triple as its surface area triples
13) When the mammalian brain compares the actual temperature of the body to the preferred temperature of the body, which general component is being used?
   a. Effector
   b. both constriction of skin blood vessels to decrease heat loss and stimulation of sweat glands to increase evaporation
   c. sensor
   d. stimulating sweat glands to increase evaporation
   e. Integrator.

14) Which term best describes an animal that, although generating a significant amount of heat through metabolism, nonetheless does not maintain a constant body temperature?
   True
   a. Homeothermic ectotherm
   b. Heterothermic endotherm
   c. Heterothermic ectotherm
   d. Homeothermic endotherm

15) An animal warming up in the sun is gaining heat via _________.
   a. Evaporation
   b. Radiation
   c. Convection
   d. conduction

16) Evolutionary history of the vertebrates includes the following process
   a. Neoteny
   b. Modification of the pharyngeal gill slits for feeding
   c. Development of a bony endoskeleton
   d. All of the above

17) Basal metabolic rate is taken when an organism is at rest, in a “normal” temperature, and immediately after a meal.
   a. True
   b. False

18) Organisms that display conformational homeostasis use counter current heat exchange mechanisms to do so.
   a. True
   b. False

19) The development of the amniotic egg
   a. Allowed true colonization of terrestrial habitats.
   b. Provided a food source for developing young
   c. Provided for gas exchange for the developing young
   d. All of the above
20) There are no arthropods the size of elephants because
   a. Their exoskeleton would be so heavy the muscles would not be strong enough to move it
   b. The basal metabolic rate would be too low to allow the organism to survive
   c. They would overheat and die.
   d. All of the above.

21) Freshwater fish are hypertonic compared to their environment. To maintain homeostasis in this environment, they must _____.
   a. consume large quantities of water
   b. excrete large quantities of electrolytes
   c. take in electrolytes through simple diffusion
   d. excrete large quantities of water

22) Water loss from insect surface is minimal due to which of the following structures?
   a. A proteinaceous epidermis
   b. Tracheae and spiracles
   c. Chitin and the cuticle
   d. A small surface area/volume ratio

23) Why is uric acid advantageous for nitrogenous waste excretion?
   a. It has low toxicity.
   b. Uric acid is insoluble in water.
   c. Uric acid is a main component of urine
   d. It costs less energetically to produce uric acid rather than ammonia.

24) An example of passive movement across a cell membrane is osmosis.
   a. True
   b. False

25) An organism’s excretory system functions
   a. In osmoregulation
   b. To excrete metabolic waste
   c. To balance electrolytes
   d. All of the above

26) Which organisms use flame cells for excretion?
   a. Porifera
   b. Cnidaria
   c. Platyhelminthes
   d. Mollusks
27) Malpighian tubules and nephridia are similar in that they
   a. Both filter coelomic fluid
   b. Both filter fluid from the blood.
   c. Both act in respiration.
   d. Both create uric acid.

28) Organism that have gills that actively transport salts into their body live
   a. In salt water environments
   b. In fresh water environments
   c. In terrestrial environments
   d. All of the above

29) Which of the following are the most likely to have teeth adapted for grinding and/or tearing?
   a. Suspension feeders
   b. Deposit feeders
   c. Mass feeders
   d. Fluid feeders

30) The function of mechanical digestion is to break down large chunks of food into smaller pieces. Why is this important?
   a. Smaller pieces of food have more surface area for chemical digestion than do larger pieces of food.
   b. Smaller pieces of food do not taste as good as larger pieces of food.
   c. Smaller pieces of food are easier to excrete than are larger pieces of food.
   d. Smaller pieces of food are more easily stored in the stomach than are larger pieces of food.

31) What is the purpose of the villi and microvilli in the small intestine?
   a. The villi and microvilli neutralize stomach acid...
   b. The villi and microvilli emulsify lipid molecules.
   c. The villi and microvilli activate trypsinogen.
   d. The villi and microvilli increase the surface area to increase the efficiency of nutrient absorption.

32) A crop is a modified ________.
   a. Esophagus
   b. Intestine
   c. Mouth
   d. Stomach

33) In ruminants, the rumen is equivalent to a human stomach.
   a. True
   b. False
34) An advantage of a one way gut is
   a. Digestion can happen faster
   b. Waste and food pass through the same opening
   c. Digestive processes can be separated into compartments
   d. The individual does not have to feed all the time.

35) Absorption of nutrients primarily happens in the
   a. Pharynx
   b. Esophagus
   c. Stomach
   d. Intestine

36) What adaptations are observed in trachea and lungs to reduce water loss?
   a. A countercurrent exchange system reduces water loss in animals with either trachea or lungs
   b. The location of the trachea and lungs (inside of the body) reduces water loss
   c. Trachea and lungs secrete specialized oxygen-carrying chemicals to reduce water loss
   d. Limbs are used by animals with trachea or lungs to move water over these structures.

37) The pressure inside the human chest cavity is always positive, so the lungs stay relatively inflated even upon exhalation.
   a. True
   b. False

38) Why are there no endothermic water-breathing animals?
   a. Water is too cold to support endothermic animals
   b. Water pressure interferes with blood flow
   c. Maintaining osmotic balance is too costly
   d. Oxygen is more difficult to extract from water than from air

39) Which is common to gills, lungs, and tracheae?
   a. deliver oxygen directly to cells without a circulatory system
   b. large surface area
   c. countercurrent exchange mechanism
   d. Dead space
40) A blood vessel that takes blood to the heart is a(n) ______.
   a. Artery
   b. Vein
   c. Capillary
   d. Lymphatic vessel

41) The amount of oxygen that diffuses into an organism depends on
   a. The temperature
   b. The amount of surface area
   c. The concentration gradient of the oxygen
   d. The thickness of the respiratory tissue
   e. All of the above

42) The spiracles of insects open into internal lungs.
   a. True
   b. False

43) The advantage of a 2-chambered heart such as fish have is that
   a. Blood pressure is high in the body tissues
   b. There are 2 circulatory circuits
   c. Less energy is expended pumping blood
   d. All of the above

44) Hemoglobin in an iron-containing protein that can accept and release up to 4 molecules of oxygen
   a. True
   b. False

45) Gills are usually associated with
   a. Aquatic organisms
   b. A countercurrent gas exchange system
   c. A circulatory system
   d. All of the above

46) In an animal that switches between sexual and asexual reproduction, when is sexual reproduction more likely to occur?
   a. When conditions for survival are unfavorable
   b. When conditions for survival are favorable
   c. None of the above
47) What is a disadvantage of viviparity?
   a. decreased likelihood of surviving to birth
   b. need for mothers to produce all the nutrition required by the embryo prior to egg laying
   c. eggs not well protected after laying
   d. limited number of offspring

48) Which of the following is an example of internal fertilization without copulation?
   a. weaver birds with false penises
   b. pheromone-coordinated spawning in sea cucumbers
   c. fish spawning
   d. Female salamanders picking up spermatophores with their cloaca.

49) Which of these processes is responsible for asexual reproduction
   a. Mitosis
   b. Meiosis
   c. Both mitosis and meiosis
   d. Neither mitosis or meiosis

50) Parthenogenesis is a form of sexual reproduction.
   a. True
   b. False