

1. A unicellular protist may use a contractile vacuole to expel excess water. Contractile vacuoles most likely would be found in protists that are
 - a. In a freshwater environment.
 - b. In a marine environment.
 - c. Hyperosmotic to their environment.
 - d. A & C only.
 - e. All of the above.

2. Transport epithelia are responsible for
 - a. Pumping water across a membrane.
 - b. Transporting urine in the ureter and urethra.
 - c. The movement of solutes for osmoregulation or excretion.
 - d. None of the above.
 - e. All of the above.

3. Which of the following is not part of the filtrate entering Bowman's capsule?
 - a. Water, salt, electrolytes.
 - b. Glucose.
 - c. Urea.
 - d. Amino acids.
 - e. Plasma proteins.

4. Aldosterone
 - a. Stimulates the active reabsorption of sodium ion in the distal tubules.
 - b. Is secreted by the adrenal glands in response to a high osmolarity in blood.
 - c. Is converted from a blood protein by the action of renin.
 - d. Is a hormone that stimulates thirst.
 - e. All of the above.

5. Which of the following statements is incorrect?
 - a. Long loops of Henle are associated with steep osmotic gradients and the production of hyperosmotic urine.
 - b. Uric acid is the form of nitrogenous waste that requires the least amount of water to excrete.
 - c. Ammonia is a toxic nitrogenous waste molecule that passively diffuses out of the bodies of aquatic invertebrates.
 - d. In the mammalian kidney, urea diffuses out of the collecting duct and contributes to the osmotic gradient within the medulla.
 - e. Uric acid is produced by a mammalian fetus and removed through the placenta to the mother's excretory system.

6. The peritubular capillaries
 - a. Intertwine with the proximal and distal tubules and exchange solutes with the interstitial fluid.
 - b. Rejoin to form the efferent arteriole.
 - c. Form a countercurrent flow of blood through the medulla to supply nutrients without interfering with the osmolarity gradient.
 - d. A & C only.
 - e. All of the above.

7. Which of the following sections of the mammalian nephron is incorrectly paired with its function?

- a. Bowman's capsule & glomerulus – blood filtration.
 - b. Proximal tubule – secretion of ammonia and H^+ into filtrate and transport of glucose and amino acids out of tubule.
 - c. Descending loop of Henle – diffusion of urea out of filtrate.
 - d. Ascending loop of Henle – diffusion and pumping of $NaCl$ out of filtrate.
 - e. Distal tubule – regulation of pH and K^+
8. What is the mechanism for the filtration of blood within the nephron?
- a. The active transport of Na^+ and glucose, followed by osmosis.
 - b. Both active and passive secretion of ions, toxins, and ammonia into the tubule.
 - c. High hydrostatic pressure of blood forcing water and small molecules out of the capillary.
 - d. A lower osmotic pressure in Bowman's capsule compared to that in the glomerulus.
 - e. All of the above.
9. What stimulus causes the juxtaglomerular apparatus to release renin?
- a. A drop on blood pH.
 - b. A drop in blood pressure.
 - c. A rise in blood osmolarity.
 - d. A & C only.
 - e. All of the above.
10. Which of the following would be a good mechanism for a drug to treat hypertension?
- a. Increase the production of ADH.
 - b. Block the production of ANP.
 - c. Vasoconstriction of renal arteries.
 - d. Inhibit enzyme involved in producing angiotensin II.
 - e. All of the above.
11. Which of the following is incorrectly paired with its function?
- a. Scrotum – encases testes and suspends them below abdominal cavity.
 - b. Prostate gland – adds fluid to semen.
 - c. Vas deferens – transports sperm from epididymis to ejaculatory duct.
 - d. Epididymis – produces sperm.
 - e. All of the above are correctly paired with their functions.
12. The function of the developing follicle is to
- a. Secrete estradiol.
 - b. Secrete progesterone.
 - c. Nourish and protect the egg cell.
 - d. A & C only.
 - e. All of the above.
13. The primary spermatocyte is _____ and undergoes _____ to produce the secondary spermatocyte.
- a. Diploid; meiosis
 - b. Diploid, mitosis
 - c. Haploid; meiosis
 - d. Haploid; mitosis
 - e. None of the above.

14. What would you expect a healthy 25-year old female to ovulate each month?
- Oogonia.
 - Primary oocyte.
 - Secondary oocyte.
 - Ovum.
 - Zygote.
15. Which of the following does not occur during the luteal phase?
- Progesterone levels reach their peak.
 - Estradiol levels reach their peak.
 - The endometrium continues to thicken.
 - LH levels decrease drastically at first and then continue to decrease on a gradual basis.
 - All of the above occurs during the luteal phase.
16. Which of the following birth control methods prevent the production or release of gametes?
- Sterilization and chemical contraception.
 - Birth control pills and IUD's.
 - Condoms and diaphragms.
 - Abstinence and coitus interruptus.
 - MAP's and abortion.
17. Which of the following is involved in triggering and maintaining child labor?
- hCG produced by the fetus.
 - Oxytocin produced by fetus and mother, and prostaglandins produced by the placenta.
 - Prolactin produced by the fetus and mother.
 - A surge in the production of LH.
 - All of the above.
18. Progesterone
- Is responsible for maintaining a pregnancy.
 - Initiates thickening of the endometrium.
 - Is produced by the maturing follicle.
 - Causes a rise in LH & FSH release when secreted at high levels.
 - Inhibits the release of LH & FSH when secreted at low levels.
19. In maternal immune tolerance, the Fas Ligand (FasL)
- Is an enzyme produced by the placenta that disables the mother's cytotoxic T cells
 - Binds to and destroys the mother's activated cytotoxic T cells by promoting apoptosis.
 - Produces antibodies that protect the developing embryo from the mother's cytotoxic T cells.
 - A & C only.
 - All of the above.
20. What is the correct order of occurrence for the following processes?
- Cleavage, fertilization, implantation, ovulation
 - Fertilization, ovulation, cleavage, implantation
 - Ovulation, fertilization, cleavage, implantation
 - Fertilization, cleavage, ovulation, implantation

- e. Ovulation, cleavage, implantation, fertilization.

21. The blastocoel

- a. Develops into the archenteron or embryonic gut.
- b. Is a fluid-filled cavity in the blastula.
- c. Opens to the exterior through a blastopore.
- d. Forms a hollow chamber during gastrulation.
- e. Is lined with mesoderm.

22. Which of the following is incorrectly paired with its embryonic germ layer?

- a. Muscles – mesoderm
- b. Central nervous system – ectoderm
- c. Liver and pancreas – endoderm
- d. Heart – endoderm
- e. All of the above are correctly paired with their embryonic germ layers.

23. Somites are

- a. Blocks of mesoderm circling the archenteron.
- b. Condensations of cells from which the notochord arises.
- c. Serially arranged mesoderm blocks lateral to the notochord in a vertebrate embryo.
- d. Structures arising from neural crest cells.
- e. All of the above.

24. What forms the fetal portion of the placenta?

- a. The trophoblast and some mesoderm.
- b. The epiblast.
- c. The allantois and yolk sac.
- d. The endometrium.
- e. None of the above.

25. During egg fertilization, the sperm must first bind to

- a. ZP1
- b. ZP2
- c. ZP3
- d. A & C only.
- e. The sperm binds to all of the above at the same time.

26. Which of the following is not true of the resting potential of a typical neuron?

- a. The inside of the cell is more negative than the outside.
- b. The concentration gradient of sodium is higher outside the cell.
- c. It results from the combined equilibrium potentials of potassium and sodium.
- d. It is about -70 mV.
- e. The concentration gradient of potassium is lower inside the cell.

27. Nodes of Ranvier are

- a. Gaps where Schwann cells abut and at which action potentials are generated.
- b. Neurotransmitter-containing vesicles located in the synaptic terminals.

- c. The parts of neurons where action potentials are initiated.
 - d. Ganglia adjacent to the spinal cord.
 - e. None of the above.
28. After the depolarization of an action potential, the fall in the membrane potential occurs due to the
- a. Closing of sodium inactivation gates.
 - b. Closing of potassium and sodium channels.
 - c. Refractory period in which the membrane is hyperpolarized.
 - d. Opening of voltage-gated potassium channels and the closing of sodium inactivation gates.
 - e. All of the above.
29. The threshold of a membrane
- a. Is an all-or-none event.
 - b. Is a graded potential that is proportional to the strength of a stimulus.
 - c. Is the depolarization that is needed to generate an action potential.
 - d. A & C only.
 - e. All of the above.
30. Which of the following is incorrectly paired with its function?
- a. Axon hillock – originates action potential.
 - b. Schwann cells – create myelin sheath around axon in CNS.
 - c. Synapse – space between presynaptic and postsynaptic cells into which neurotransmitter is released.
 - d. Dendrite – receives signals from other neurons.
 - e. All of the above are correctly paired with their functions.
31. Why is signal transmission faster in myelinated axons?
- a. These axons are thicker and provide less resistance to voltage flow.
 - b. These axons use electrical synapses rather than chemical synapses.
 - c. The action potential can jump from node to node along the insulating myelin sheath.
 - d. A & C only.
 - e. All of the above.
32. What is the main effect of the neurotransmitter GABA in the CNS?
- a. Increase pain.
 - b. Create excitatory postsynaptic potentials.
 - c. Create inhibitory postsynaptic potentials.
 - d. Induce sleep.
 - e. Decrease pain and induce euphoria.
33. Which of the following is not true of the autonomic nervous system?
- a. It is a subdivision of both the CNS & PNS.
 - b. It consists of the sympathetic, parasympathetic, and enteric divisions.
 - c. It controls smooth and cardiac muscles.
 - d. Control is generally involuntary.
 - e. All of the above are true of the autonomic nervous system.
34. What makes up the white matter of the spinal cord?

- a. Myelinated sheaths of axons.
 - b. Motor and interneuron cell bodies.
 - c. Sympathetic ganglia.
 - d. A & C only.
 - e. All of the above.
35. Which of the following structures is incorrectly paired with its function?
- a. Pons – conducts information between spinal cord and brain.
 - b. Thalamus – sorts and relays incoming impulses to the cerebrum.
 - c. Corpus callosum – bands of axons connecting left and right hemispheres.
 - d. Hypothalamus – homeostatic regulation, pleasure centers.
 - e. All of the above are correctly paired with their functions.
36. When striated muscle fibers contract
- a. The Z lines are pulled closer together.
 - b. The sarcomere expands.
 - c. The thin filaments become shorter.
 - d. The thick filaments become longer.
 - e. All of the above occur.
37. What is the role of ATP in muscle contraction?
- a. To form cross-bridges between thick and thin filaments.
 - b. To release myosin head from actin when it binds to myosin and to provide energy when hydrolyzed to form myosin's high-energy form.
 - c. To remove the tropomyosin-troponin complex from blocking the binding sites of actin.
 - d. To bend the cross-bridge and pull the thick filaments toward the center of the sarcomere.
 - e. All of the above.
38. How does calcium affect muscle contraction?
- a. It is released from the T tubules in response to an action potential to initiate contraction.
 - b. The binding of acetylcholine opens calcium channels in the plasma membrane, creating an action potential that travels down the T tubules.
 - c. It binds to tropomyosin and helps to stabilize cross-bridge formation.
 - d. Its binding to troponin causes tropomyosin to move away from myosin-binding sites on the actin filament.
 - e. Its release from the sarcoplasmic reticulum changes the membrane potential of the muscle cell so that contraction can occur.
39. Which of the following is not a characteristic of cardiac muscle?
- a. Intercalated disks that spread action potentials between cells.
 - b. Action potentials that last a long time
 - c. Ability to generate action potentials without nervous input.
 - d. Striations.
 - e. All of the above are characteristics of cardiac muscle.
40. Smooth muscle contracts relatively slowly because
- a. The only ATP available is supplied by fermentation.
 - b. Its contraction is stimulated by hormones, not motor neurons.

- c. It does not have a well-developed sarcoplasmic reticulum, and Ca^{2+} enters the cell through the plasma membrane during an action potential.
- d. It is not striated.
- e. It is composed exclusively of slow-twitch muscle fibers.