

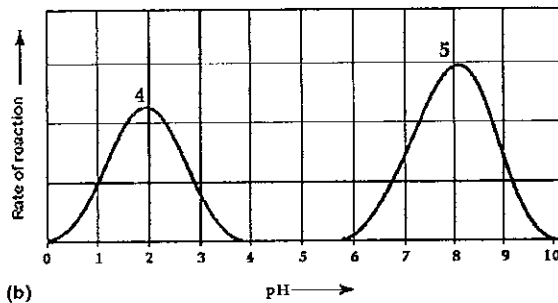
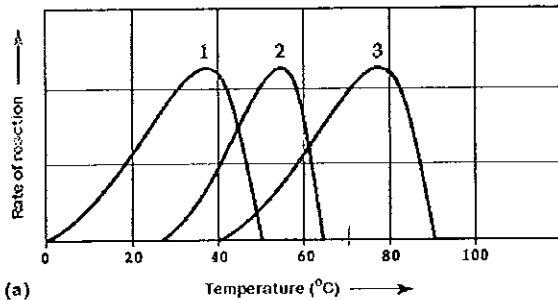
## Thermoregulation Exam

### Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

1. Heat loss by direct exchange of energy between molecules is called
  - a. conduction.
  - b. radiation.
  - c. convection.
  - d. metabolism.
  - e. evaporation.
2. Which of the following types of molecules are the major structural components of the cell membrane?
  - a. phospholipids and cellulose
  - b. nucleic acids and proteins
  - c. phospholipids and proteins
  - d. proteins and cellulose
  - e. glycoproteins and cholesterol
3. Which of the following is *not* an aspect of temperature acclimation?
  - a. The increase in production of certain enzymes by cells.
  - b. Cells may produce enzymes with different temperature optima.
  - c. Organisms may adjust some of the mechanisms that control internal temperature.
  - d. The proportion of saturated and unsaturated fats may change in cell membranes.
  - e. Allowing denaturation of proteins that cannot withstand extreme temperature.
4. Probably the most important factor(s) affecting the distribution of biomes is (are)
  - a. wind and water current patterns.
  - b. species diversity.
  - c. community succession.
  - d. temperature and precipitation.
  - e. day length and rainfall.
5. Species richness increases
  - a. as one travels north from the equator.
  - b. as one travels north from the South Pole.
  - c. on islands as distance from the mainland increases.
  - d. as rates of transpiration decrease.
  - e. as community size decreases.

Refer to the figure below to answer the following questions.



6. Which curve represents the behavior of an enzyme taken from a bacterium that lives in hot springs at temperatures of 70°C or higher?
  - a. curve 1
  - b. curve 2
  - c. curve 3
  - d. curve 4
  - e. curve 5
7. Plant cells begin synthesizing large quantities of heat-shock proteins
  - a. after the sun sets.
  - b. in response to the lack of CO<sub>2</sub> following the closing of stomata.
  - c. when desert plants are quickly removed from high temperatures.
  - d. after the plant cells freeze in order to thaw them.
  - e. when the air around species from moderate temperature regions is above 40°C or more.
8. Temperature regulation is important to organisms for many reasons. Choose the statement below that is not a reason for temperature regulation.
  - a. Temperature affects solubility of gases.
  - b. High temperatures can alter the structure of important biological molecules.
  - c. Temperature affects a membrane's permeability.
  - d. Cold temperatures between (between 0-5 degrees Celsius) cause mutations in DNA.
  - e. Freezing temperatures can cause ice crystals to form and puncture the cell membrane.

9. Which of the following is the best example of an effector's response in negative feedback?
- an increase in body temperature resulting from shivering
  - an increase in body temperature resulting from exercise
  - an increase in body temperature resulting from exposure to the sun
  - an increase in body temperature resulting from fever
  - a decrease in body temperature resulting from shock
10. The tertiary structure of a protein is the
- bonding together of several polypeptide chains by weak bonds.
  - order in which amino acids are joined in a polypeptide chain.
  - unique three-dimensional shape of the fully folded polypeptide.
  - organization of a polypeptide chain into an  $\alpha$  helix or  $\beta$  pleated sheet.
  - overall protein structure resulting from the aggregation of two or more polypeptide subunits.
11. Ectothermic animals
- are more likely to use metabolism for heat.
  - shun the sun during the daylight hours.
  - are more adapted to cold.
  - are more likely to use behavioral temperature regulation.
  - all of these
12. The  $\alpha$  helix and the  $\beta$  pleated sheet are both common polypeptide forms found in which level of protein structure?
- primary
  - secondary
  - tertiary
  - quaternary
  - all of the above

*Match the terms below to the following questions. Each term may be used once, more than once, or not at all*

- ectothermy
- endothermy
- evaporation
- torpor
- thermogenesis

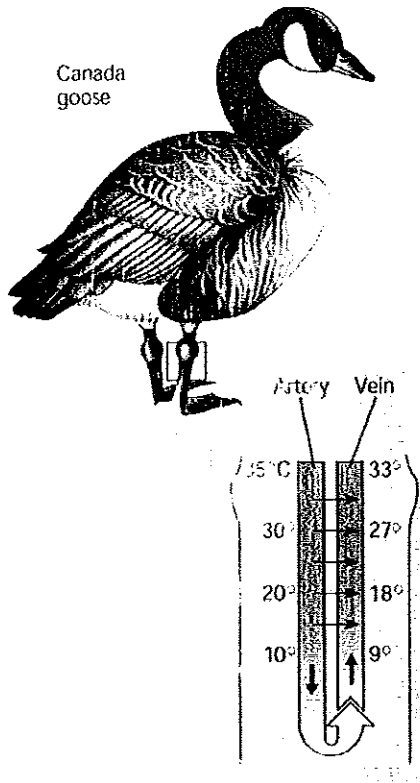
13. fur and feathers
- A
  - B
  - C
  - D
  - E
14. process that occurs in the brown fat of some mammals
- A
  - B
  - C
  - D
  - E

15. panting in dogs
- A
  - B
  - C
  - D
  - E
16. absorption of heat from the surroundings
- A
  - B
  - C
  - D
  - E
17. The water lost during transpiration is an unfortunate side effect of the plant's exchange of gases. However, the plant derives some benefit from this water loss in the form of
- evaporative cooling.
  - above average sugar production.
  - increased support and rigidity.
  - A and B only
  - A, B, and C
18. Which organism is *ectothermic* and *has little behavioral ability* to adjust its body temperature?
- lizard
  - sea star
  - king snake
  - hummingbird
  - human
19. Which of the following assertions about regulation of body temperature is *true*?
- Most animals are endotherms.
  - Endothermy involves production of heat through metabolism.
  - Ectothermic animals have cold blood, they are "cold-blooded".
  - Mammals are always ectothermic.
  - Insects are always ectothermic.
20. All of the following are responses of plants to cold stress *except*
- the production of a specific "plant antifreeze".
  - preventing the formation of or removing ice crystals from the interior walls.
  - conversion of the fluid cell membrane to a solid one.
  - an alteration of membrane lipids so that the membranes remain flexible.
  - increasing the proportion of unsaturated fatty acids in the membranes.
21. Of the mechanisms by which organisms exchange heat with their surroundings, which one results *only* in loss of heat from the organism?
- conduction
  - convection
  - radiation
  - evaporation
  - metabolism

22. Altering which of the following levels of structural organization could change the function of a protein?
- primary
  - secondary
  - tertiary
  - quaternary
  - all of the above
23. Terrestrial animals mainly exchange heat with the environment by all of the following physical processes *except*
- conduction.
  - convection.
  - evaporation.
  - illumination.
  - radiation.
24. All of the following are mechanisms of thermoregulation in terrestrial mammals *except*
- changing the rate of evaporative heat loss.
  - changing the rate of metabolic heat production.
  - changing the rate of heat exchange by conforming to environmental temperatures.
  - changing the rate of heat loss by vasodilation and vasoconstriction.
  - relocating to cool areas when too hot, or to warm areas when too cold.
25. What would be an unexpected consequence of changing one amino acid in a protein consisting of 325 amino acids?
- The primary structure of the protein would be changed.
  - The tertiary structure of the protein might be changed.
  - The biological activity or function of the protein might be altered.
  - Only A and C are correct.
  - A, B, and C are correct.
26. Photosynthesis begins to decline when leaves wilt because
- flaccid cells are incapable of photosynthesis.
  - CO<sub>2</sub> accumulates in the leaves and inhibits photosynthesis.
  - there is no water for photolysis during light reactions.
  - stomata close, preventing CO<sub>2</sub> entry into the leaf.
  - the chlorophyll of flaccid cells cannot absorb light.
27. Upon chemical analysis, a particular protein was found to contain 556 amino acids. How many peptide bonds are present in this protein?
- 139
  - 554
  - 555
  - 556
  - 558
28. What is one of the ways that the membranes of winter wheat are able to remain fluid when it is extremely cold?
- by increasing the percentage of unsaturated phospholipids in the membrane
  - by increasing the percentage of saturated phospholipids in the membrane
  - by decreasing the number of hydrophobic proteins in the membrane
  - A and C only
  - Band C only

29. Most scientists agree that global warming is underway; thus it is important to know how plants respond to heat stress. Which of the following is an immediate short-term response of plants to heat stress?
- the production of heat-shock carbohydrates unique to each plant
  - the production of heat-shock proteins like those of other organisms
  - the closing of stomata to increase evaporational heat loss
  - their evolution into more "desert like" plants
  - all of the above
30. Convert -20 degrees Fahrenheit to Celcius.
- 94 degrees Celcius
  - 20 degrees Celcius
  - 29 degrees Celcius
  - 22 degrees Celcius
  - 7 degrees Celcius
31. Which of the following organisms relies on behavior the most to control its body temperature?
- green frog
  - penguin
  - blue whale
  - house sparrow
  - gray wolf
32. Most terrestrial animals dissipate excess heat by
- countercurrent exchange.
  - acclimation.
  - vasoconstriction.
  - hibernation.
  - evaporation.
33. Which prokaryotes should be expected to be most strongly resistant to DNA denaturation in very hot environments?
- extreme halophiles
  - extreme thermophiles
  - methanogens
  - cyanobacteria
  - nitrogen-fixing bacteria that live in root nodules
34. Which of the following is a reasonable explanation for why unsaturated fatty acids help keep any membrane more fluid at lower temperatures?
- The double bonds form a kink in the fatty acid tail, forcing adjacent lipids to be further apart.
  - Unsaturated fatty acids have a higher cholesterol content.
  - Unsaturated fatty acids permit more water in the interior of the membrane.
  - The double bonds block interaction among the hydrophilic head groups of the lipids.
  - The double bonds result in a shorter fatty acid tail.

Use the figure below to answer the following questions

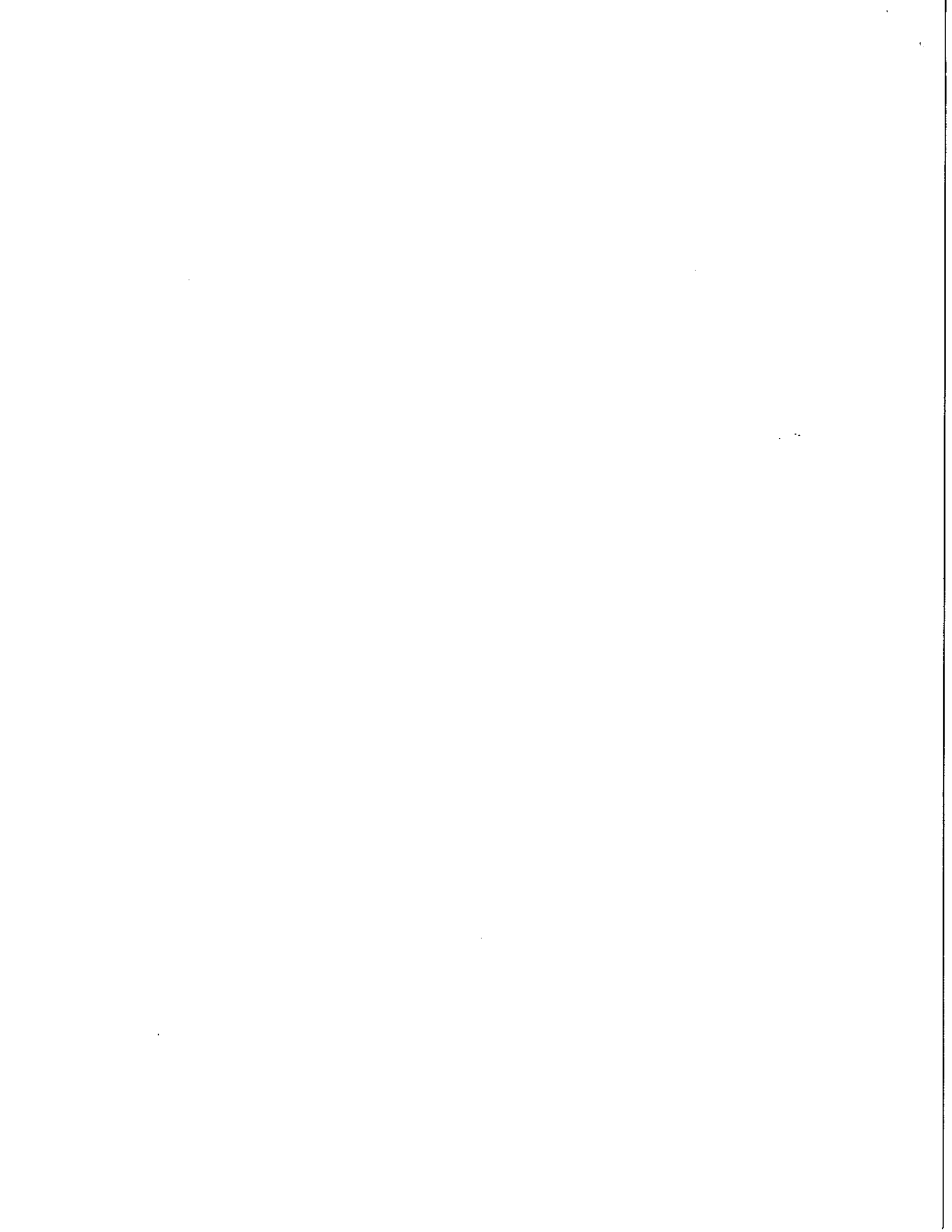


35. The temperature difference between arterial blood and venous blood near the goose's body
- is minimized by countercurrent exchange.
  - is maximized because the blood has run through very cold feet.
  - is minimized by dilation of the capillaries in the feet of the goose, allowing heat to be lost.
  - is more than the difference between the venous blood near the body and the venous blood at the feet.
  - allows the goose to lose maximum heat to the environment.
36. What does the difference in temperature between arteries and veins in the goose's legs indicate?
- The legs need to be kept cool so that muscles will function well.
  - The feet need to be kept very warm so they do not freeze in water.
  - Arterial blood warms venous blood which helps the goose retain more heat and lose less heat to the environment.
  - Arterial blood returns heat to the core of the goose.
  - Warm venous blood carries away from the core of the goose.
37. Which of the following is *not* true of enzymes?
- Enzyme catalysis is dependent on the pH of the reaction environment.
  - Enzyme catalysis is dependent on the three-dimensional structure or conformation of the enzyme.
  - Enzymes produce energy for the reaction they catalyze.
  - Enzymes are composed primarily of protein.
  - Enzyme catalysis is dependent on the temperature of the reaction environment.

38. For most ecosystems \_\_\_\_\_ is (are) the ultimate source of energy, and energy leaves the ecosystem in the form of \_\_\_\_\_.
- sunlight; heat
  - heat; light
  - plants; animals
  - plants; heat
  - producers; consumers
39. Which of the following statements is (are) *true* about enzyme-catalyzed reactions?
- The reaction is faster than the same reaction in the absence of the enzyme.
  - Enzyme are not specific and can catalyze multiple reactions..
  - The structure of an enzyme does not effect its function.
  - A and B only
  - A, B, and C
40. Which is the correct sequence involved in the regulation of organ systems?
- stimulus, receptor, integrator, response, effector
  - stimulus, response, integrator, receptor, effector
  - stimulus, receptor, integrator, effector, response
  - stimulus, integrator, receptor, effector, response
  - stimulus, effector, integrator, receptor, response
41. Convert 93 degrees Celcius to Fahrenheit.
- 232 degrees Fahrenheit
  - 200 degrees Fahrenheit
  - 168 degrees Fahrenheit
  - 84 degrees Fahrenheit
  - 34 degrees Fahrenheit
42. What is the term used for a change in a protein's three-dimensional shape or conformation due to disruption of hydrogen bonds, disulfide bridges, or ionic bonds?
- hydrolysis
  - stabilization
  - destabilization
  - renaturation
  - denaturation
43. Consider an ectotherm and an endotherm of equal body size. The ectotherm is more likely to survive an extended period of food deprivation than the endotherm because
- the ectotherm is sustained by a higher metabolic rate.
  - the ectotherm will expend less energy/kg body weight than the endotherm.
  - the ectotherm will invest little to no energy in temperature regulation.
  - actually, assuming equal size, the ectotherm and the endotherm will have the same energy expenditures.
  - both B and C
44. Endothermic animals
- use up more energy than ectotherms.
  - have more stamina than ectotherms.
  - have a higher metabolic rate than ectotherms.
  - have layers of fat to reduce heat loss.
  - all of these



45. The presence of cholesterol in the plasma membranes
- enables the membrane to stay fluid more easily when cell temperature drops.
  - enables the membrane to stay viscous more easily when cell temperature increases.
  - enables the animal to freeze its membrane to prevent water loss.
  - A and B only
  - A, B and C.
46. Where is the thermostat of vertebrates located?
- medulla oblongata
  - thyroid gland
  - hypothalamus
  - subcutaneous layer of the skin
  - liver
47. Which bonds are created during the formation of the primary structure of a protein?
- peptide bonds
  - hydrogen bonds
  - disulfide bonds
  - phosphodiester bonds
  - A, B, and C
48. Which of the following is true about the activity levels of a snake?
- A snake is less active in winter because the food supply is increased.
  - A snake is more active in winter because it needs to avoid predators.
  - A snake is less active in summer because that is the period for mating.
  - A snake is more active in summer because it can gain body heat by conduction.
  - A snake is more active in summer as a result of being disturbed by other animals.
49. Ignoring all other factors, what kind of day would result in the highest rate of transpiration assuming the stomata remained opened?
- cool, dry day
  - warm, dry day
  - warm, humid day
  - cool, humid day
  - very hot, dry, windy day
50. The transfer of heat by air or water is called
- radiation.
  - conduction.
  - convection.
  - denaturing
  - evaporation.



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