

Knowledge

For each question, select the best answer from the four alternatives.

- “The human body can regulate its internal environment and maintain stable conditions suitable for essential biological processes.” Which comment about this statement is correct? (9.1) **K/U**
 - It refers only to the physiology of the circulatory system.
 - It refers to homeostasis in the body.
 - It explains how positive feedback mechanisms work.
 - It refers to the direct control of cellular activities by nucleic acids.
- Which body function is performed by the endocrine system? (9.1) **K/U**
 - regulating the levels of various hormones essential to life processes
 - protecting the body from infections and fighting infections
 - receiving data from the environment and transmitting signals throughout the body
 - carrying hormones and chemicals throughout the body
- What is the correct order of the three components of homeostatic mechanisms? (9.2) **K/U**
 - sensor, integrator, effector
 - sensor, effector, integrator
 - effector, integrator, sensor
 - integrator, sensor, effector
- If human body temperature drops below the set point, the hypothalamus activates effectors. What do these effectors induce? (9.2) **K/U**
 - vasodilation
 - vasoconstriction
 - vasopressin
 - vasospasm
- Which of the following best describes conduction? (9.3) **K/U**
 - the transfer of thermal energy within a fluid
 - the transfer of thermal energy in the form of electromagnetic radiation
 - the flow of thermal energy between molecules that are in direct contact with each other
 - the flow of thermal energy in water only
- Which of the following best describes torpor? (9.3) **K/U**
 - a sleeplike state where metabolic rate and body temperature drop in response to variations in daily temperature
 - a sleeplike state where metabolic rate and body temperature rise in response to variations in daily temperature
 - a state of inactivity and significantly decreased metabolic rate
 - a state of increased activity and metabolic rate
- Which substance is a by-product of deamination and is highly toxic to the body? (9.4) **K/U**
 - urea
 - ammonia
 - nitrogen
 - carbon
- When urine flows from the kidney to the urinary bladder, which structure does it flow through? (9.5) **K/U**
 - urethra
 - proximal tubule
 - medulla
 - ureter
- Which fluid enters the glomerulus? (9.5) **K/U**
 - serum
 - blood
 - water
 - glucose

Indicate whether each statement is true or false. If you think the statement is false, rewrite it to make it true.

- One example of a homeostatic mechanism is the regulation of body temperature. (9.1) **K/U**
- Homeostasis is a constant condition that rarely changes. (9.1) **K/U**
- The set point is the minimum value of a given variable of a system. (9.2) **K/U**
- Signals from the hippocampus are what enable humans to sense a lowered body temperature. (9.2) **K/U**
- Both ectotherms and endotherms have behavioural mechanisms that regulate their body temperature. (9.3) **K/U**
- Thermal acclimatization is the instantaneous adjustment to seasonal variations in temperature. (9.3) **K/U**
- Thermoregulation ensures that the intracellular and extracellular fluids are isoosmotic. (9.4) **K/U**
- Reabsorption refers to the process in which fluid and small molecules pass into the Bowman’s capsule. (9.5) **K/U**

Match each term on the left with the most appropriate description on the right.

- | | |
|--------------------------|---|
| 18. (a) Bowman's capsule | (i) very tiny filtration units in the kidney |
| (b) glomerulus | (ii) tube that leads from the kidney to the urinary bladder |
| (c) nephron | (iii) cuplike capsule around the glomerulus of the kidney |
| (d) ureter | (iv) tube that carries waste away from the bladder |
| (e) urethra | (v) group of blood-circulating capillaries (9.5) K/U |
| 19. (a) loop of Henle | (i) major organ of excretion |
| (b) proximal tubule | (ii) waste product that is high in nitrogen and is found in the urine |
| (c) urea | (iii) blood vessel that carries blood to the kidney |
| (d) renal artery | (iv) part of the system of tubules that filtrate passes through; joins the proximal convoluted tubule and the distal convoluted tubule in the nephron |
| (e) kidney | (v) structure that carries filtrate from the Bowman's capsule to the loop of Henle (9.5) K/U |

Write a short answer to each question.

- In your own words, define "homeostasis." (9.1) **K/U**
- Explain why it is important for organisms to maintain homeostasis. (9.1) **K/U**
- Identify the components of a typical feedback loop, and describe the role of each component. (9.2) **K/U**
- Develop a graphic organizer to compare and contrast positive and negative feedback. Include an example of each type of feedback. (9.2) **K/U C**
- Frogs are best described as poikilotherms. Explain why. (9.3) **K/U**
- Ectotherms have an advantage over endotherms in terms of energy requirements. Explain this advantage. (9.3) **K/U**
- How do shivering and "goose bumps" help to maintain homeostasis? (9.3) **K/U**
- Identify two factors that influence whether osmosis occurs, and explain how each factor works. (9.4) **K/U**
- Describe turgor pressure, and explain why it is particularly important in plant cells. (9.4) **K/U**
- What are the three forms of nitrogenous waste that are produced by animals? (9.4) **K/U**
- Describe how metanephridia are different from Malpighian tubules. (9.5) **K/U**
- Describe the structure and function of the nephron. (9.5) **K/U**
- Describe aquaporins, and explain their function. (9.5) **K/U**
- What causes filtrate to cross from the capillaries of the glomerulus to the Bowman's capsule? (9.5) **K/U**
- Examine **Figure 1**. (9.5) **K/U**

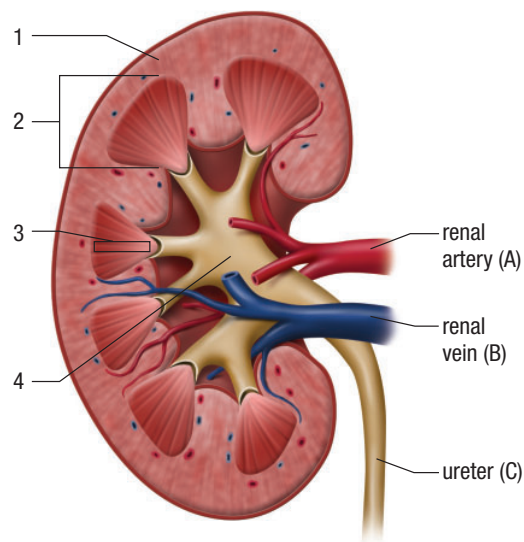


Figure 1

- Identify the structures numbered 1 to 4.
- Which structure would contain the least amount of waste: A, B, or C?
- Name the structure in which filtration occurs.

Understanding

- Identify three organ systems, other than the excretory system, that are involved in homeostasis, and describe the role of each system. (9.1) **K/U**
- Explain how sweating results from a negative feedback mechanism. (9.2) **K/U**
- Give an example of a positive feedback mechanism in the human body. (9.2) **K/U A**
- List and define four mechanisms of heat loss. (9.3) **K/U**
- Compare and contrast thermoregulation in endotherms and ectotherms. (9.3) **K/U**
- Explain the difference between torpor and hibernation. (9.3) **K/U**

41. Explain the specialized thermoregulatory adaptation exhibited by the jackrabbit in **Figure 2**. (9.3) **K/U**



Figure 2 A long-eared jackrabbit

42. (a) Define “osmoregulation.”
(b) Name an organ that that performs osmoregulation and excretion. (9.4, 9.5) **K/U**
43. What are nitrogenous wastes? (9.4) **K/U**
44. List the three main types of nitrogenous wastes that are excreted by organisms. (9.4) **K/U**
45. Identify the main nitrogenous waste that is produced by humans, and describe how it is produced. (9.4) **K/U**
46. Name and explain the three interrelated processes that result in the formation of urine. (9.5) **K/U**
47. Based on what you have learned about hibernation, do you think that bears in a zoo hibernate? Explain why or why not. (9.3) **K/U A**
48. A certain cell has a membrane that is permeable to water, but not to Na^+ , Cl^- , or any other solute. There is more NaCl outside the cell than there is inside the cell. Describe the movement of substances into and out of the cell. Explain your answer. (9.4) **K/U T/I**
49. What two factors, other than osmotic and hydrostatic pressure, can influence the rate at which water flows across a membrane? Explain the mechanism for each factor. (9.4) **K/U T/I**

Analysis and Application

50. An animal has excretory tubules with a closed proximal end that is immersed in hemolymph and a distal end that empties into the gut. (9.5) **K/U T/I**
- (a) What term would you use to describe these tubules?
- (b) What type of nitrogenous waste would be excreted from these tubules?
51. A runner is sweating heavily on a hot summer day. She forgot her water bottle and has no access to water. As a result, the following feedback loop occurs:
- There is a decrease in the blood plasma, so the solute concentration of the blood increases. This causes both the blood volume and the blood pressure to decrease.
 - Osmoreceptors sense the increased solute concentration, decreased blood volume, and decreased blood pressure.
 - The hypothalamus sends messages to the posterior pituitary gland to increase the release of ADH (the hormone that controls water balance).
 - An increased level of ADH causes the kidneys to reabsorb more water and to release less water in the urine.
 - Reabsorbed water in the blood increases the blood volume, increases the blood pressure, and decreases the solute concentration.
 - Information regarding the changes in blood volume, blood pressure, and solute concentration is sent to the hypothalamus.
- Draw a flow chart, with appropriate labels and directional arrows, for this negative feedback loop. Use \uparrow for “increases,” \downarrow for “decreases,” and \rightarrow for “leads to” or “yields.” (9.1, 9.2, 9.4, 9.5) **K/U T/I C**
52. (a) Why do you think doctors ask patients for a urine sample as part of an annual physical examination?
(b) Suggest two conditions or illnesses that could be detected through urinalysis. (9.5) **K/U T/I**
53. Explain the common recommendation to drink six to eight glasses of water per day. (9.4, 9.5) **K/U T/I**
54. How would the volume and characteristics of urine change for each of the following people? (9.4, 9.5) **K/U T/I A**
- (a) a soccer player after playing a game in hot weather
(b) a person who had been consuming alcohol for several hours
(c) a person who had consumed a litre of water after moderate exercise
55. Proteinuria refers to the presence of serum proteins in the urine. Explain why proteinuria would be considered a sign of damage or injury to the glomerulus. (9.5) **K/U T/I**
56. Hematuria is another symptom of renal disease, but it is less specific to the kidneys. Why do you think this is? (9.5) **K/U T/I**
57. Why does the ingestion of coffee or colas increase urination? (9.4, 9.5) **K/U T/I**