

**Health Science Test
Westminster Invitational
11/12/05**

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Urinary System

Section 1

1. An increase in GCP will do what to GFR?
2. How does increasing age affect the GFR?
3. Starting with the proximal tubule, order the structures listed below in terms of when they are encountered by filtrate as it travels out of the body.
 - a. Loop on Henle
 - b. Renal pelvis
 - c. Distal tubule
 - d. Proximal tubule
 - e. Major calyx
 - f. Collecting duct

Section 2

Fill in the blanks using the following terms

7.35-7.45	Afferent	amino acids	antidiuretic hormone
blood plasma	collecting duct	Glomerular capsule	glomerulus
glucose	loop of Henle	microvilli	micturition
nitrogenous	pelvis	peristalsis	potassium
proteins	reabsorption	renal	sodium
tubule	urethra	urine	urochrome

For your journey through the urinary system, you must be made small enough to filter through the filtration membrane from the bloodstream into a renal 1. You will be injected into the subclavian vein and must pass through the heart before entering the arterial circulation. As you travel through the systematic circulation, you have at least 2 minutes to relax before reaching the 2 artery supplying a kidney. Soon you see the kidney looming brownish red through the artery wall. Once you have entered the kidney, the blood vessel conduits become increasingly smaller until you finally reach the 3 arteriole feeding into the filtering device, or 4.

Once in the filter, you maneuver yourself so that you are directly in front of a pore. Within a fraction of a second, you are swept across the filtration membrane into the 5 part of the renal tubule. Drifting along, you lower the specimen cup to gather your first filtrate sample for testing. You study the readout from the sample and note that it is very similar in composition to 6, with one exception – there are essentially no 7. Your next sample doesn't have to be collected until you reach the "hairpin,"

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or, using the proper terminology, the ___8___ part of the tubule. As you continue your journey, you notice that the tubule cells have dense fingerlike projections extending from their surfaces into the lumen of the tubule. These are ___9___, which increase the surface area of tubule cells, because this portion of the tubule is very active in the process of ___10___. Soon you collect your second sample, and later, in the distal convoluted tubule, your third sample. When you read the computer's summary of the third sample, you make the following notes in your register:

1. Virtually no nutrients such as ___11___ and ___12___ are left in the filtrate.
2. The pH is acid, 6.0. This is quite a change from the pH of ___13___ recorded for the newly formed filtrate.
3. There is a much higher concentration of ___14___ wastes here.
4. There are fewer ___15___ ions but more ___16___ ions than there were earlier.
5. The color of the filtrate is yellow, indicating a high relative concentration of the pigment ___17___.

Gradually you become aware that you are moving along much more quickly. You see that the water level has dropped dramatically and that the stream is turbulent and rushing. As you notice this, you realize that the hormone ___18___ must have been released recently to cause this water level drop. You take an abrupt right turn and then drop straight downward. You realize that you must be in a ___19___. Within a few seconds, you land with a splash in what appears to be a large tranquil sea with an ebbing tide toward a dark area at the far shore. You drift toward the dark area, confident that you are in the kidney ___20___. As you reach and enter the dark tubelike structure, your progress becomes rhythmic – something like being squeezed through a sausage skin. Then you realize that your progress is being regulated by the process of ___21___. Suddenly, you free-fall and land in the previously stored ___22___ in the bladder, where the air is very close. Soon the walls of the bladder begin to gyrate, and you realize you are witnessing a ___23___ reflex. In a moment, you are propelled out of the bladder and through the ___24___ to exit your hose.

Section 3

Decide whether the following conditions would result in an increase or a decrease in the specific gravity of urine. Write **I** in the answer blank to indicate an increase and **D** to indicate a decrease.

1. Drinking excessive fluids
2. Chronic renal failure
3. Pyelonephritis
4. Using diuretics
5. Limited fluid intake
6. Fever

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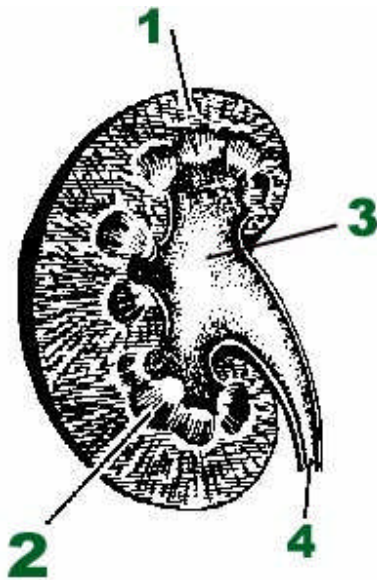
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Decide whether the following conditions would cause urine to become more acidic or more basic. If more acidic, write **A** in the blank; if more basic, write **B** in the blank.

- 7. Protein-rich diet
- 8. Bacterial infection
- 9. Starvation
- 10. Diabetes mellitus
- 11. Vegetarian diet

Section 4

Identify the following parts of the kidney.



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Endocrine System

Section 1:

Match the hormones listed in 1-17 with the functions listed in a-q, then name the organ which secretes the hormone in the blanks next to each answer.

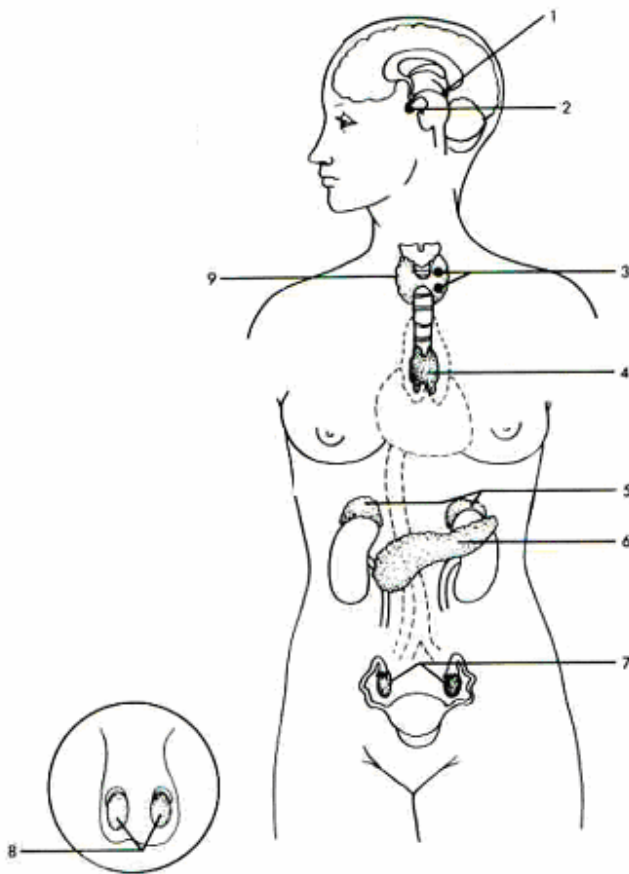
1. Growth hormone releasing hormone (GH_RH)
 2. Parathyroid hormone (PTH)
 3. Cortisol
 4. Testosterone
 5. Thyroid stimulation hormone
 6. Prolactin (PRL)
 7. Melatonin
 8. Epinephrine
 9. Oxytocin (OT)
 10. Gonadotropin releasing hormone (GnRH)
 11. Prolactin inhibiting hormone (PIH)
 12. Antidiuretic hormone (ADH)
 13. Growth hormone (GH)
 14. Glucagon
 15. Estrogen
 16. Aldosterone
 17. Insulin
-
- a. Increases the contractions of the uterus during birth and promotes the release of breast milk.
 - b. Increases the release of FSH and LH from the anterior pituitary
 - c. Decreases the release of PRL from the anterior pituitary
 - d. Increases growth in most tissues
 - e. Increases the release of thyroxin from the thyroid gland
 - f. Affects release of GnRH by hypothalamus
 - g. Stimulates milk production in the breasts
 - h. Increases the retention of water by the kidneys
 - i. Increases the release of GH from the anterior pituitary
 - j. Sex hormone in males
 - k. Increases blood calcium levels by increasing osteoclast activity
 - l. Enhances sympathetic response
 - m. Increases protein and fat breakdown in most tissues
 - n. Increases the retention of sodium by the kidneys
 - o. Lowers blood glucose by stimulating cells to absorb glucose
 - p. Raises blood glucose by causing liver to release glucose
 - q. Sex hormones in females.

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Section 2:

Identify the following Endocrine Glands



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Section 3:

Name the hormone that would be produced in inadequate amounts in each of the following conditions:

1. Maturation failure of reproductive organs
2. Tetany
3. Polyuria without high blood glucose levels; causes dehydration and tremendous thirst
4. Goiter
5. Cretinism
6. Excessive thirst, high glucose levels, acidosis
7. Abnormally small stature, normal proportions, a "Tom Thumb"
8. spontaneous abortion
9. Myxedema in the adult

Section 4:

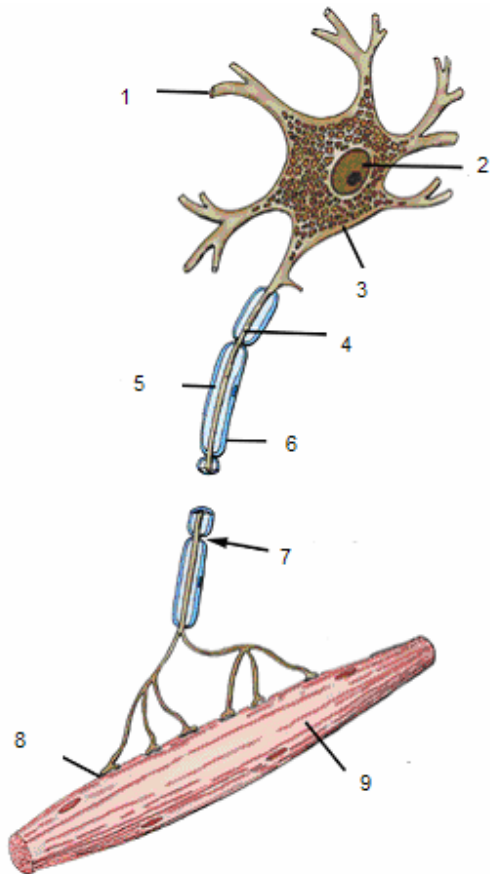
Name the hormone that would be produced in excessive amounts in each of the following conditions:

1. Acromegaly in the adult
2. Graves Disease
3. Demineralization of bones; spontaneous fractures
4. Cushing's syndrome
5. Abnormally large stature, relatively normal body proportions
6. Abnormal hairiness; masculinization

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Nervous System
Section 1: Nervous System



Label the following sites:

1. Axon
2. Cell Body
3. Dendrite
4. Motor end plate
5. Muscle
6. Myelin sheath
7. Node of Ranvier
8. Nucleus
9. Schwann Cell

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Match the Key choices to their functional designation

Key Choices

A. Axon B. Axon hillock C. Axonal terminals D. Dendrite

- 10. Receptive region
- 11. Trigger zone
- 12. Conducting component
- 13. Secretory components

Use the key choices to identify the types of synapses described below. Write the correct answer in the answer blank on your answer sheet.

Key Choices

A. Chemical synapse B. Electrical synapse

- 14. Releases neurotransmitters from vesicles
- 15. Very rapid transmission
- 16. Protein channels connect cytoplasm of adjacent neurons
- 17. Postsynaptic neuron has receptor region
- 18. Transmission may be uni- or bidirectional
- 19. Presynaptic neuron has a knoblike axon terminal
- 20. Synchronizes activities of all interconnected neurons
- 21. Allows the flow of ions between neurons
- 22. Fluid fills synaptic space between neurons

Answer the following questions:

- 23. How many axons does a multipolar neuron have?
- 24. What is the purpose of a non-ciliated ependymal cell?
- 25. A nerve sends a signal from the CNS to the smooth muscles of the intestine. Is this part of the ANS or the SNS?
- 26. What 2 conditions must be met for an axon to regenerate when severed?
- 27. Do axons in the CNS regenerate when severed?
- 28. During depolarization in an axon, what is happening to the sodium ions?

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29. During depolarization in an axon, what is happening to the potassium ions?
30. A signal originates in 1 receptor and ends up creating action potentials in many different places in the CNS and PNS. What kind of neuron arrangement did it pass through?
31. A stimulus on a neuron does not result in an action potential. There are 2 reasons why this might not happen. What are those reasons?
32. An action potential travels along an axon by skipping from node of Ranvier to node of Ranvier. What is this kind of conduction called?
33. Is this faster or slower than an action potential running down an axon by continuous conduction?
34. A signal is stimulated at a receptor and travels to the CNS. The number and frequency of action potentials is exactly the same at the CNS as it was at the receptor. Did the signal travel through a synapse?

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Section 2: Nervous System

Match the functional area of the cerebral cortex with their functions.

1. primary somatic sensory area
 2. somatic sensory association area
 3. visual association area
 4. visual cortex
 5. Wernicke's area
 6. auditory association area
 7. primary auditory area
 8. Broca's area
 9. taste area
 10. prefrontal area
 11. premotor area
 12. primary motor cortex
-
- a. controls skeletal muscle movements
 - b. deals with the comprehension of speech
 - c. interprets the meaning of sound by placing it into context with your past experiences
 - d. interprets the sensory information and puts it into context with your past experiences
 - e. interprets the basic visual information such as shape and color
 - f. works out the sequence of signals needed for complex motion
 - g. initiates the muscle movements for speech
 - h. recognizes the meaning of visual information by putting it into context with your past experiences
 - i. receives and localizes general sensations from the entire body
 - j. interprets taste
 - k. site of motivation and foresight; regulates mood and emotion
 - l. interprets the basics of sound such as pitch and volume