Biology 103
Exam 2 practice

1. **Homeostasis**: Homeostasis maintains certain body conditions within an ideal range. Consider the following story:

   Melvin, ace biology student, takes a walk on a cold day but is thinking so deeply about his next science project that he forgets his coat. Cells in his brain that aren't busy thinking about his project sense a change in body temperature and tell the pituitary gland to send a hormone called TSH to his thyroid gland. This signals the thyroid gland to produce a hormone called thyroxin. Thyroxin is secreted into the bloodstream. It causes Melvin's body cells to increase their metabolism, which produces heat. Melvin's alert brain cells also signal his muscles to shiver, creating more heat, and cause the blood vessels in his skin to constrict. These actions help bring Melvin's body temperature back up, until he finally notices it's cold out and decides to go back for his coat.

   From this story, name the following:

   The variable that the feedback system is controlling: _____

   The initial receptor in the system: _____

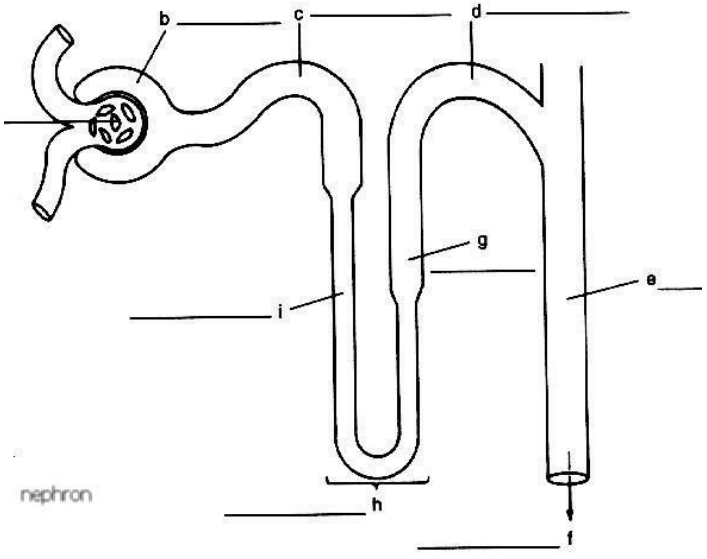
   The ultimate effectors in the system: _____

   This is an example of a _____ feedback loop.

   The thyroid is a type of _____ gland.

   Glandular tissue is a type of _____ tissue.

2. **Urinary system**: Label the parts of the nephron in this diagram, then match the functions with the parts (consider g, h, and i together).



Functions:

____ Tubular secretion, active transport of drugs, potassium into the urine.

____ Filtration of plasma from the blood, using blood pressure.

____ Active transport of salts out of the filtrate.

____ Osmosis of water out of the filtrate due to high salt concentration around this structure.

____ Collection of urine, further concentration by osmosis of water.

____ Collection of plasma from the bloodstream.

What are the effects of diuretics (caffeine, alcohol, herbal diuretics such as parsley or dandelion) on the nephron?

What are the effects of antidiuretic hormone (ADH) on the nephron?

3. **Circulatory system:** Fill in the following description of mammalian circulation using the following words: **atrium, ventricle, vena cava, pulmonary arteries, pulmonary veins, aorta, septum**. Some words may be used more than once, and some will not be used at all.

Deoxygenated blood from the upper and lower vena cavae enters the right _____.

From there, deoxygenated blood passes into the right _____ , then out of the heart and to the lungs through the _____. Blood loses carbon dioxide and picks up oxygen in the lungs. It is carried back to the heart through the _____, and enters the left _____ of the heart. Blood passes through a valve into the left _____, then leaves the heart and goes to the body through the _____.

Where are blood cells produced?

What are the functions of the following blood cells?

red blood cells

white blood cells

platelets

The southern copperhead, a poisonous snake, has a protein called disintegrin in its venom. Disintegrin binds to cell membrane receptors called integrins. Blood platelets use integrin receptors to aggregate at a site of tissue damage and form a clot. What is the advantage to the snake of having disintegrin in its venom?

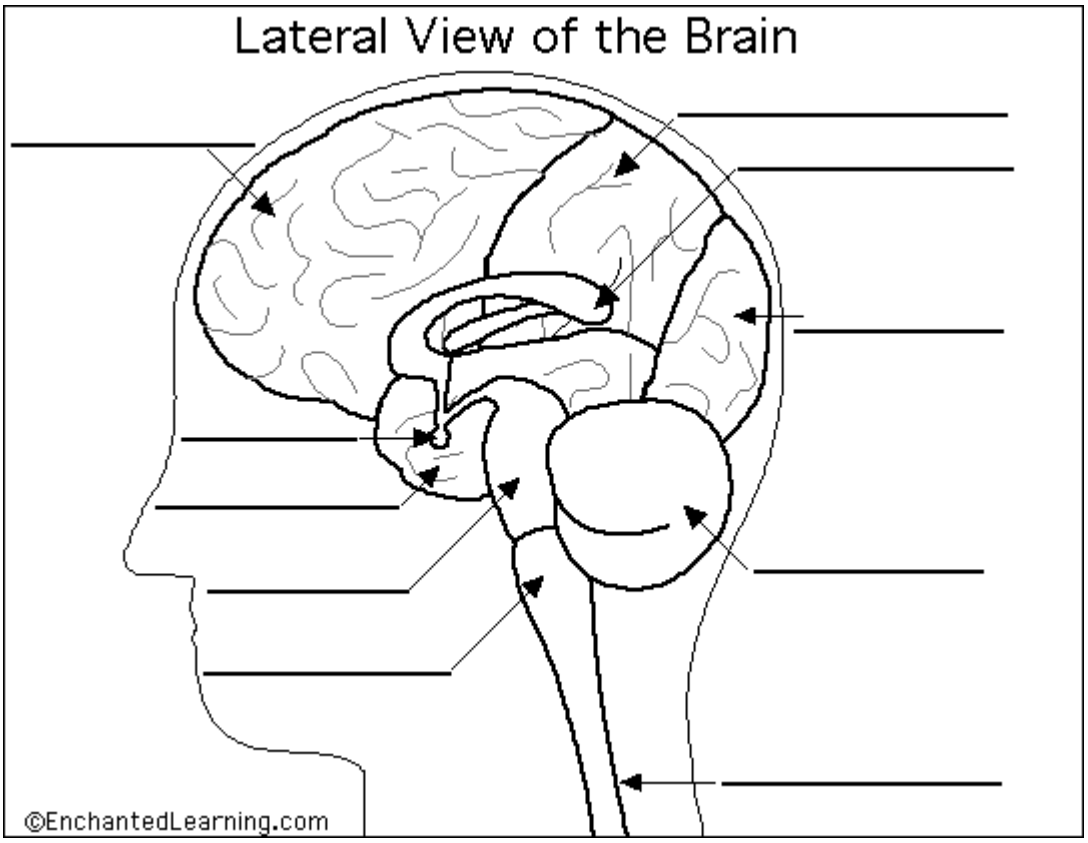
4. **Endocrine system:** The endocrine system produces hormones that serve as chemical messengers. Many hormones are involved in maintaining homeostasis. Among these hormones are insulin and glucagon. In the right-hand column, write what is happening with blood sugar levels and the levels of these two hormones to the person in the story on the left.

Buster wakes up to the sound of his alarm at 7:00 in the morning. As usual, he's hungry and a little cranky.	
After his shower, Buster has a big breakfast, including three doughnuts, a bowl of Choco-Krispies, and, to be healthy, a glass of orange juice. Shortly after eating breakfast, Buster feels much better.	
About 10:00, after his first class, Buster feels hungry again. But he has another class to go to, so he can't stop for a snack yet. By the time his second class gets out at 11:30, Buster is feeling a little tired out, and is quite hungry.	
Buster goes to Burger Baron for lunch. He orders a cheeseburger, fries, and a milkshake. He feels much better.	
About 3:00 in the afternoon, Buster is hungry. He's had a long day of classes and is feeling a little cranky again.	
Buster and his friends go to Moonbeam's Coffee. Buster has large latte and a sticky bun. After eating, Buster feels great, and goes off to play some football with his friends.	

Suppose that Buster goes to a doctor and has a full physical. His doctor does a glucose tolerance test and finds that Buster's blood glucose is slightly high, and there is a small amount of glucose in his urine. What do these tests indicate, and, given what you know about Buster's typical day, what advice should the doctor give Buster?

Draw the feedback loop that is controlling Buster's blood sugar levels:

5. **Nervous system:** Label the parts of the brain indicated on the diagram (including four lobes of the cerebrum):



State the functions of each of these brain parts:

Cerebrum (in general):

Cerebellum:

Pons:

Medulla:

Thalamus:

Hypothalamus:

Pituitary:

Corpus callosum:

In the space below, sketch a reflex arc:

6. **Musculo-skeletal system**

For each of the following activities, state which kind of fiber is most active: slow twitch or fast twitch:

a. sprinting _____

b. hiking _____

c. lifting weights _____

d. high jump _____

e. an all-day canoe trip _____

f. knitting _____

If a researcher did a biopsy on the muscles of an athlete and the muscles of a couch potato, which person would have the most muscle fibers (muscle cells), and why?

State the functions of:

a. compact bone

b. spongy bone

c. red marrow

d. yellow marrow

Buster holds a dumbbell in one hand. As he bends his elbow and brings the dumbbell toward his shoulder:

a. what kind of movement (flexion, extension, adduction, abduction, rotation) is this?

b. what muscle is responsible for the action?

c. where is the origin of this muscle?

d. where is the insertion of this muscle?

Now Buster slowly lowers the dumbbell, straightening his elbow as he does so.

a. what kind of movement (flexion, extension, adduction, abduction, rotation) is this?

b. what muscle is responsible for the action?

c. where is the origin of this muscle?

d. where is the insertion of this muscle?

In the space below, sketch the arrangement of protein filaments inside of muscle cells that allow muscles to contract.