

Name _____

Period _____

AP Biology

Date _____

REVIEW 6: ANIMAL ANATOMY & PHYSIOLOGY UNIT

A. Top “10” — If you learned anything from this unit, you should have learned:

1. Regulation

- a. Homeostasis is maintained through hormones & nervous system control
 - hormone releasing gland, target cells, cell membrane receptors, secondary messengers, cellular response (produce enzyme or turn gene on)

2. Digestive system

- a. function:
 - enzymatic breakdown of food, absorption, elimination
 - supports cellular respiration (fuel) & biosynthesis (raw materials)
- b. structure:
 - mouth, esophagus, stomach, pancreas, liver, gall bladder, small intestines, large intestines
- c. adaptations / evolutionary trends:
 - villi & microvilli = increase surface area for absorption
 - zymogens = protection from self-digestion
 - tooth structure, length of digestive system, number & size of stomachs
 - symbiotic bacteria (*E. coli*) in intestines to breakdown cellulose
- d. regulation:
 - insulin / glucagon control of blood sugar
 - gastrin, GIP, CCK, secretin

3. Respiratory System

- a. function
 - exchange of O₂ & CO₂
 - supports cellular respiration
- b. structure:
 - trachea, bronchi, lungs, diaphragm, gills, hemoglobin
- c. adaptations / evolutionary trends:
 - alveoli & gills = need moist membranes & increase surface area gas exchange
 - counter current gas exchange in gills
- d. regulation:
 - chemoreceptors in medulla monitor pH of cerebrospinal fluid
 - chemoreceptors in aorta & carotid arteries monitor CO₂ & O₂ levels in blood

4. Circulatory System

a. function:

- transport of O₂, CO₂, nutrients, cellular wastes, regulatory molecules, immune cells
- supports cellular respiration & immune response

b. structure:

- heart, atria, ventricles, valves, arteries, veins, capillaries, RBC, hemoglobin

c. adaptations / evolutionary trends:

- open vs. closed system
- 2 → 3 → 4 chambers of heart = supports high metabolic output, endothermy (heat production), flight, increased body size
- 4-chambered heart = double circulation (pulmonary & systemic)
- countercurrent heat exchange
- structure of arteries vs. veins (thickness of wall, elasticity, valves in veins)

d. regulation:

- “pacemaker” (SA node)
- baroreceptors in aorta & carotid arteries monitor blood pressure

5. Excretory system

a. function:

- water balance, filtration of blood, excretion of cellular nitrogenous waste (protein digestion)

b. structure:

- kidney, glomerulus, nephron, Bowman’s capsule, Loop of Henle, collecting duct

c. adaptations / evolutionary trends:

- based on osmosis, diffusion & active transport
- reclaim water & solutes as needed, excrete urea
- ammonia vs. urea vs. uric acid = type of waste product vs. habitat & type of organism

d. regulation:

- ADH = reduces blood osmolarity (high solutes); osmoreceptors in hypothalamus
- aldosterone = increases low blood pressure; monitored by JGA (near kidney)

6. Muscles

a. function: locomotion

b. structure:

- muscle cells, sarcomere, actin (thin) & myosin (thick) fibers, tropomyosin regulatory protein

c. adaptations / evolutionary trends:

- sliding filament system of muscle contraction
 - acetylcholine trigger, ATP, release & uptake of Ca^{+2} from sarcoplasmic reticulum
 - d. regulation: mostly voluntary; acetylcholinesterase
7. Immune
- a. function: protects body from attack by pathogens
 - b. structure:
 - lymph system, leukocytes, lymphocytes, macrophages, B cells, antibodies, T cells
 - c. adaptations / evolutionary trends:
 - innate, non-specific immunity = barrier defense, leukocytes, macrophages
 - acquired immunity = lymphocytes, antibodies, memory B & T cells
 - MHC proteins = antigen production
 - d. regulation:
 - histamines, prostaglandins, interleukins
 - e. miscellaneous:
 - vaccinations trigger immune response
 - HIV outwits immune system
8. Nervous System
- a. function: sensory input, motor function, regulation
 - b. structure: neuron, axon, dendrites, synapse
 - c. adaptations / evolutionary trends:
 - voltage gated channels & ion-gated channels
 - Na & K channels, Na/K pump, neurotransmitters
 - d. regulation:
9. Reproduction
- a. function: produce & deliver gametes, nurture fetus
 - b. structure:
 - testicles, penis, glands, sperm, ovaries, eggs, Fallopian tubes, uterus
 - c. adaptations / evolutionary trends:
 - aquatic egg vs. amniotic egg
 - external vs. internal fertilization; external vs. internal development (placenta)
 - sperm production vs. egg production (polar bodies)
 - d. regulation: FSH & LH, testosterone, estrogen, progesterone, female monthly cycle

10. Development

a. function:

- going from one-celled zygote to a multi-celled organism with differentiated tissues & organs

b. adaptations / evolutionary trends:

- cleavage, gastrulation, neurulation, organogenesis
- 3 tissues layers: body plan
 - ectoderm: skin, teeth, nails, nerves
 - mesoderm: bone, blood, muscle
 - endoderm: digestive system
- differentiation: turning off some genes turning on others

B. Labs

1. Physiology of Circulatory System

Be sure to review the procedures and the conclusions, and understand:

- a. Factors that affect heart rate
- b. How to set up a similar experiment
- c. Controls vs. Experimental

C. Sample Multiple Choice Questions

1. Gas exchange in all living organisms requires (1999:12)
 - a. gills
 - b. lungs
 - c. tracheoles
 - d. moist membranes
 - e. blood

 2. Oxygen consumption can be used as measure of metabolic rate because oxygen is (1999:16)
 - a. necessary for ATP synthesis by oxidative phosphorylation
 - b. necessary to replenish glycogen levels
 - c. necessary for fermentation to take place
 - d. required by all living organisms
 - e. required to break down the ethanol that is produced in muscles

 3. In animals, all of the following are associated with embryonic development EXCEPT (1999:21)
 - a. migration of cells to specific areas
 - b. formation of germ layers
 - c. activation of all the genes in each cell
 - d. inductive tissue interactions
 - e. cell division at a relatively rapid rate

 4. Which of the following is LEAST likely to result in a release of epinephrine (adrenaline) from the adrenal glands?
 - a. Competing in an athletic event
 - b. Going out on a first date
 - c. Falling asleep during a lecture
 - d. Swimming in a very cold pool
 - e. Taking a test while unprepared

 5. Which of the following characterizes glomerular filtrate, the fluid that passes from the blood in the glomerulus into the tubule of the nephron? (1999:40)
 - a. It is clear in appearance and contains no glucose
 - b. It is a concentrated solution of waste products
 - c. It is identical to blood plasma
 - d. It is blood plasma that lacks most proteins
 - e. It is whole blood
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6. Which of the following is the direct result of the presence of acid chyme in the small intestine? (1999:58)
- The liver produces insulin.
 - The pancreas produces hydrolytic enzymes.
 - The stomach produces pepsin.
 - The intestinal lining produces the hormone secretin.
 - The gall bladder releases bile.

Use the following choices for Questions 7- 10 (1999:74-77)

- Testis
 - Lining of small intestines
 - Anterior pituitary
 - Thyroid
 - Pancreas
7. Releases hormones that control blood sugar levels by stimulating glycogen formation or breakdown
8. Secretes steroid hormones that affect secondary sex characteristics
9. Releases hormones that increase the rate of cellular respiration throughout the body
10. Secretes the hormones FSH and LH, which control ovulation

Sample Free Response Questions

1. 2005:4

An important defense against diseases in vertebrate animals is the ability to eliminate, inactivate, or destroy foreign substances and organisms. Explain how the immune system achieves THREE of the following:

- Provides an immediate nonspecific immune response
- Activates T and B cells in response to an infection
- Responds to a later exposure to the same infectious agent
- Distinguishes self from nonself

2. 2004B:3

Homeostasis, maintaining a steady-state internal environment, is a characteristic of all living organisms. Choose three of the following physiological parameters and for each, describe how homeostasis is maintained in an organism of your choice. Be sure to indicate what animal you have chosen for each parameter. You may use the same animal or different animals for your three descriptions.

- Blood-glucose levels
- Body temperature
- pH of blood
- Osmotic concentration of the blood
- neuron resting-membrane potential

3. 2003:2

Regulatory (control) mechanisms in organisms are necessary for survival. Choose THREE of the following examples and explain how each is regulated.

- Flowering in plants
- Water balance in plants
- Water balance in terrestrial vertebrates
- Body Temperature in terrestrial vertebrates