AVS 371 - Anatomy and Physiology

Quiz #1 - September 1, 2000

Name: Emily Danligan

1. What are the four primary categories of cells and tissues? (4 pts.)
   
   Connective, Epithelial, Nervous, Muscular

2. Concerning protein structure, define the following: (4 pts.)
   
   A. Primary structure: Amino Acid Sequence
   
   B. Secondary structure: Structural parts of the protein (α-helix, β-sheet)
   
   C. Tertiary structure: 3D structure of the protein
   
   D. Quarternary structure: 3D structure of a protein complex (made of ≥2 proteins)

3. List two cell organelles and briefly describe at least one function of each organelle (2 pts.)
   
   A. Organelle #1 Nucleus
      
      Function: contain DNA - that serves as a template (via gene) for mRNA synthesis ... prot. synth.

   B. Organelle #2 Ribosomal Endoplasmic Reticulum
      
      Function: synthesize proteins via the ribosomes

   -1/2
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Quiz #2 - September, 2000

Name: Emily Dahlgren

1. Four factors influence the binding of a ligand to its specific binding site: chemical specificity, affinity, saturation and competition. Choose two of these factors and define them. (4 pts)

   A. Factor: **Saturation**

      Definition: amount of ligand in relation to the amount of protein. Higher amounts of ligand vs. protein yields higher saturation.

   B. Factor: **Chemical Specificity** - complementary shape fits like puzzle pieces

      Definition: charge of a ligand and/or binding site. Ligand will bind tighter to a binding site of opposite charge.

2. What is a protein kinase? (1 pt)

   Enzyme that attaches a phosphate group to a protein

3. Are protein kinases involved in allosteric or covalent modulation of protein activity? (1 pt)

   Covalent modulation

4. During transcription, how does RNA polymerase recognize which DNA strand is the template strand for mRNA synthesis? (2 pts)

   By the presence of a promoter sequence in the template strand

5. Briefly, describe how tRNA functions during translation. (2 pts)

   tRNA "carries" a specific amino acid on the opposite side of an anticodon. The anticodon matches to a 3-base (3-letter) codon in the mRNA allowing transfer of the "carried" amino acid to the growing protein. This all takes place through a ribosome.
1. True or False: Ion channels play a major role in the movement of large molecules (e.g., proteins, glucose, etc.) through plasma membranes. (1 pt)

2. True or False: Transporter proteins that are involved in mediated transport will only "flip-flop" from one side of the plasma membrane to the other when they are bound to the molecule(s) they are responsible for transporting. (1 pt)

3. Does primary active transport involve covalent modulation or allosteric modulation? (1 pt)

4. In reference to homeostasis, the desired or targeted operating point when the status of a body system is at steady-state is referred to as: (1 pt)
   A. Status point
   B. Reference point
   C. Set point
   D. Error signal
   E. None of the above

5. What is the error signal during a homeostatic process, and what benefit does it serve? (3 pts)
   Error signal is the point a homeostatic processes returns to that is usually higher or lower than the set point. The error signals allows for a continuation of the homeostatic recovery process until the stress is released/remover. The system allows for a steady point, so that bumps or waves in the homeostasis are prevented.

6. True or False: Afferent neurons convey information (via electric signals) from the central nervous system to the peripheral nervous system. (1 pt)

7. True or False: Cyclooxygenase-1 (COX-1) is the constitutively expressed form of this enzyme. (1 pt)

8. True or False: The adverse side-effects of non-steroidal anti-inflammatory drugs (e.g., aspirin) are due to their inhibition of the constitutively expressed form of the cyclooxygenase enzyme. (1 pt)
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Quiz #4 - September 22, 2000

Name: ____________________________

1. True or False All cells have a potential (electrical) difference across their plasma membranes oriented with the inside of the cell positively charged with respect to the outside. (1 pt)

2. Why is the sodium-potassium-ATPase pump considered an electrogenic pump? (1 pt)
   Because it creates an electric potential across a membrane.

3. A resting membrane potential: (1 pt)
   A. Occurs only in nerve and muscle cells
   B. Occurs in all cells
   C. Typically has a value of approximately -70 mV
   D. A and C
   E. B and C

4. In a "resting" neuron: (1 pt)
   A. The plasma membrane is freely permeable to sodium
   B. The sodium concentration is higher inside the cell than outside
   C. The plasma membrane is approximately 50 to 75 times more permeable to sodium than potassium
   D. The potassium concentration is higher outside the cell than inside
   E. None of the above

5. True or False A graded potential can occur in all cells. (1 pt)

6. The depolarizing phase of an action potential is primarily due to: (1 pt)
   A. The opening of voltage-gated calcium channels
   B. The opening of voltage-gated sodium channels
   C. The opening of voltage-gated potassium channels
   D. All of the above
   E. None of the above

More questions on back
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Quiz #5 - October 6, 2000

Name: Emily Deplygan

1. Briefly, describe the classical definition of a hormone, and then describe how the classical definition has been updated to its current definition. (2 pts)

Hormone: a chemical signal that is released from one tissue to cause a change in a distant tissue. via bloodstream

Updated to include paracrine/autocrine hormones which act locally

2. Which of the following is a paracrine/autocrine agent? (1 pt)
   a. Oxytocin
   b. Luteinizing hormone
   c. Follicle stimulating hormone
   d. Prostaglandin F2α
   e. None of the above

3. True or False? Receptor activation only occurs with intra-cellular receptors and is related to their role as transcription factors. (1 pt)

4. Which of the following chemical messengers utilizes a plasma-membrane receptor for its signal transduction pathway? (1 pt)
   a. Oxytocin
   b. Luteinizing hormone
   c. Follicle stimulating hormone
   d. Prostaglandin F2α
   e. All of the above

5. Please complete the mid-semester course (lecture-only) evaluation. (5 pts)
   ☑ check here if you completed the evaluation.
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Quiz #6 - October 13, 2000

Name: Emily Daphyan

1. List four of the major endocrine glands described in class. (2 pts)
   Pituitary, Hypothalamus, Gonads, Thyroid

2. True or False During the synthesis of a peptide/protein hormone the active form of the
   peptide/protein hormone is always the form of the hormone produced
   during the process of translation. (1 pt)

3. Briefly, describe the difference between the anterior pituitary gland and the posterior
   pituitary gland, and list one hormone secreted from both locations. (2 pts)
   Anterior pituitary is made of highly vascular portion and secretes hormones such as LH and FSH. The
   Posterior pituitary is made of more neural tissue (axons from hypothalamus)
   and secretes hormones such as oxytocin which are synthesized
   in the hypothalamus, but stored in the axon terminals of the neurohypophysis

4. Why is the hypothalamo-pituitary portal blood system important for the functional
   interaction between the hypothalamus and anterior pituitary gland? (2 pts)
   Many hormones breakdown quickly or become diluted in general circulation.
   So, for the hormones secreted by the hypothalamus to have maximum
   effect on the pituitary, their time in the bloodstream must be short.
   The portal system allows for more direct transfer of the hormones

5. True or False Short- and long-loop feedback mechanisms that regulate hormone
   secretion from the hypothalamus/pituitary gland only provide negative
   feedback. (1 pt)

6. True or False During muscle contraction the thick and thin filaments shorten causing the
   contraction to occur. (1 pt)

7. Which of the following statements is false: (1 pt)
   A. Myosin is a contractile protein
   B. Actin is a contractile protein
   C. Cross bridges are part of the actin molecule
   D. Cross bridges have two ATP binding sites
   E. None of the above
1. In order for a myosin cross bridge to bind to actin during contraction of a skeletal muscle fiber, which of the following must occur? (1 pt)
   A. Calcium must bind to troponin
   B. Tropomyosin must be moved to expose cross-bridge binding sites
   C. Calcium must bind to calmodulin
   D. A and B
   E. B and C

2. True or False Maximal shortening of a muscle fiber occurs after the peak of the action potential. (1 pt)

3. The transverse tubules in a skeletal muscle fiber: (1 pt)
   A. Store calcium ions
   B. Form the z-lines
   C. Provide a means of transmitting an action potential to the inner areas of the muscle fiber.
   D. Store ATP
   E. None of the above

4. Which of the following statements about the neuromuscular junction are true? (1 pt)
   A. They are always stimulatory
   B. Acetylcholine is the neurotransmitter
   C. A single action potential in the motor neuron is usually adequate to cause an action potential in the muscle fiber
   D. All of the above
   E. None of the above

5. True or False The rate of cross-bridge cycling is 10 to 100 times faster in smooth muscle than skeletal muscle. (1 pt)

6. During contraction of smooth muscle, the enzyme myosin light-chain kinase uses ATP to phosphorylate: (1 pt)
   A. Troponin
   B. Tropomyosin
   C. Calmodulin
   D. Actin
   E. Myosin

*More questions on back*
1. Briefly, describe the path of blood flow throughout the circulatory system beginning with the blood returning to the heart from the systemic (whole body) circulation. (2 pts)
   Blood from systemic goes into the right atrium, from right atrium → right ventricle → pulmonary circulation (lungs) → left atrium → left ventricle → systemic circulation

2. Briefly, describe the order of the events (and structures involved) that occur during excitation of conducting system cells and contractile cardiac cells that lead to a coordinated heartbeat. (2 pts)
   SA node "fires" (excitation) → contraction of atria & travel of signal to AV node, → signal through bundle of His → signal to Purkinje fibers → contraction of ventricles

3. True or False The action potential has a longer duration in a cardiac muscle cell than a skeletal muscle cell. (1 pt)

4. The reason for a difference in the duration of an action potential in cardiac versus non-cardiac cells is due to differences in the permeability of what two ions? (1 pt)
   Potassium and Calcium (K⁺ & Ca²⁺)

5. What is the formula for calculating cardiac output? (1 pt)
   \[ CO = HR \times SV \] (Cardiac output = Heart rate × Stroke volume)

6. Which of the following increase heart rate: (1 pt)
   A. Parasympathetic stimulation
   B. Sympathetic stimulation
   C. Epinephrine from the adrenal medulla
   D. A and C
   E. B and C

7. True or False The mechanism by which neural or hormonal input increases the heart rate is by increasing the rate at which sodium enters conducting system cells during the generation of a pacemaker potential. (1 pt)

8. According to the Frank - Starling Mechanism of the heart: (1 pt)
   A. The left ventricle ejects a larger volume of blood with each contraction than the right ventricle.
   B. The intrinsic rate of the human heart’s pacemaker potential is 100 bpm.
   C. Cardiac output increases with increased heart rate.
   D. Stroke volume increases with increased filling of the ventricle.
   E. Both ventricles contract simultaneously.
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Quiz #9 - November 10, 2000

Name: [Signature]

1. All of the following are determinants of venous pressure except: (1 pt)
   A. Blood volume.
   B. Vascular (venous) smooth muscle contraction or relaxation.
   C. Skeletal - muscle pump.
   D. Respiratory pump.
   E. None of the above.

2. Why is the mean arterial pressure in the systemic circulation the major cardiovascular variable that is regulated by a homeostatic control system? (2 pts)
   Because MAP changes are the result of changes in CO and peripheral resistance. By regulating MAP, you are also regulating the other factors. Also, MAP is the pressure of the resistance which determines the blood flow to all organs except the lungs.

3. True or False: All changes in mean arterial pressure must be the result of changes in cardiac output and/or total peripheral resistance. (1 pt)
   [False]

4. True or False: The kidneys play a major role in the short-term homeostatic control of mean arterial pressure by regulating blood volume. (1 pt)
   [True]

5. List one of the human cardiac diseases covered in class and describe the primary pathological problem causing it. (2 pts)
   Disease: Myocardial Infarction
   Pathological Problem: (Heart attack) - blood clot or constriction causes the death of part of the heart muscle, can lead to heart failure.

6. Briefly, describe how normal respiratory inspiration occurs. In your answer describe the relationship between the thoracic wall, pleural space and the lungs. (3 pts)
   Chest cavity expands and diaphragm moves down. This allows the lungs to expand by the pulling of the pleura since the pleural space is fluid filled, it does not separate, and so makes the inner pleura with it, allowing for further lung expansion. The lungs expand, which lowers the pressure in the alveoli; "pulling" air into the lungs.
Reproduction - Quiz (10 points)

December 1, 2000

Name: [Student Name]

IMPORTANT: ANSWER ONLY 10 QUESTIONS (choose any 10 questions).
P.S.: There is no bonus question.

Questions: (Each one is worth 1 point)

1. What are the primary sex hormones in the male and female?  
   - Male: testosterone  
   - Female: estrogen, progesterone, estradiol

2. What is the event that induces ovulation?  
   - Surge of LH from anterior pituitary

3. What would you expect to happen with the plasma concentrations of gonadotropins in a castrated individual?  
   - Decrease significantly, or disappear entirely
   - INCREASE (no negative feedback)  
   - FSH, LH

4. What are the events of a meiotic division that result in genetic variability?

5. What are the basic functions of the gonads?  
   - Produce germ cells and hormones (sex hormones)

6. Each spermatogonia gives rise to ___ (n) spermatozoa(n).

7. Each oogonia gives rise to ___ (n) ovum(ova).

8. When the egg is ovulated, it is a secondary oocyte (stage of egg development).

9. How does spermatogenesis guarantee a stable number of spermatogonia?

10. Circle the correct answer: "The (Leydig/Sertoli) cells are found in the interstitial space between the seminiferous tubules."

11. What is the main source of androgens in the female?  
   - Adrenal cortex

12. What are the 2 phases of the menstrual cycle regarding the ovarian events?  
   - Follicular and luteal phases

13. What is the site of sperm production in the testis?

14. A new menstrual cycle begins after the (formation/loss) of the corpus luteum.

15. What are the 3 phases of the menstrual cycle regarding the uterine events?

16. Circle the correct answer: "In the menstrual cycle, the first increase in plasma estrogen is due to the secretion of this hormone by the (follicles/corpus luteum)."

17. Circle the correct answers: "A newborn male has (all the/ some) germ cells, while a newborn female has (all the/ some) germ cells."
1. List three specific functions of the kidneys: (3 pts.)
   - Filtration of foreign chemicals
   - Filtration of metabolic wastes
   - Concentration of urine

2. Briefly describe how glomerular filtration occurs. In your answer be sure to indicate the structures and the forces that are involved in glomerular filtration. (3 pts.)

   The afferent and efferent glomerular arteries flow into the glomerulus where they disperse into a capillary bed. The capillaries are "leaky" (highly so) and so allow for passage of liquids and plasma (all but proteins and cellular material). The materials pass through the leaky capillary bed, through the basal membrane and between the podocytes into the Bowman's space. The materials are drawn through the membranes by concentration gradients. Blood pressure moves fluid back into capillaries, proteins still in blood also absorb some water back across the membrane.

3. Tubular reabsorption and secretion are regulated by the tubular epithelium surrounding the tubule. What functional characteristics of the tubular epithelium are physiologically controlled that result in the regulation of tubular reabsorption and secretion? (2 pts.)

   The active transport proteins are regulated, which in turn regulate tubular reabsorption & secretion. The active transport proteins regulate sodium, K⁺, and similar salt movement ion channels, too.

4. **True or False** The tubular reabsorption of all substances is physiologically regulated (i.e., can be increased or decreased). (1 pt.)

5. **True or False** The proximal tubule is the major site of reabsorption and secretion. (1 pt.)