

HSS 307: Human Physiology

Exam 3

Name _____

Please circle the correct response(s). There may be 0-4 correct responses for each item. Assume normal conditions at rest unless otherwise specified.

1. Regarding glucose in the nephron:
 - a. Normally all that is filtered is reabsorbed (FIG. 18.16 AND P.524, ALMOST VERBATIM)
 - b. When plasma glucose concentration is abnormally high, some may be secreted (FIG. 18.16; EXCRETED, NOT SECRETED)
 - c. Amount excreted always equals amount filtered minus amount reabsorbed (P.524-5 AND FIG.18.16; EVEN WHEN THERE IS SPILLOVER, THIS IS STILL THE CASE)
 - d. Some is reabsorbed by cotransport with sodium (FIG.18.15; VERBATIM)

2. The countercurrent multiplier:
 - a. Is the cycle by which the nephron continually changes between no medullary osmotic gradient (300 mOsm) and a strong gradient (1400 mOsm) (P.541 AND FIG.19.7 AND CLASS DISCUSSION; KIDNEY EXISTS THIS WAY ALL THE TIME – IT DOES NOT CYCLE)
 - b. Requires some impermeability to water of the ascending loop of the peritubular capillaries (FIG.19.6; THE ASCENDING LIMB OF THE NEPHRON, NOT THE PERITUBULAR CAPILLARIES, WHICH ARE ALWAYS PERMEABLE TO WATER)
 - c. Creates the hypo-osmotic margin needed for reabsorption of up to approx. 18 L/day of water in the collecting duct (P.543, 10% REABSORBED IN THE COLLECTING DUCT = 18 L/DAY. OTHERWISE, ALMOST VERBATIM)
 - d. Establishes the medullary osmotic gradient for both the nephron tubules and the collecting duct (P.541-543; IT'S THE SAME OSMOTIC GRADIENT)

3. Aldosterone:
 - a. Is a tropic hormone (P.550; ITS TARGET CELLS ARE NOT ENDOCRINE CELLS SO IT CANNOT BE TROPIC)
 - b. Acts on target cell membranes near both the tubule lumen and the peritubular space (FIG.19.14; ACTIONS a AND b IN THE FIGURE)
 - c. Unlike ANP, is a hormone (TABLE 6.1; BOTH ARE)
 - d. Like ANP, promotes sodium reabsorption in the distal tubules (FIG.19.16 AND 19.18; ONLY ALDOSTERONE DOES. ANP INHIBITS SODIUM REABSORPTION)

4. In the nephron, the proximal tubule differs from the distal tubule in the following:
 - a. Reabsorption surface area (FIG.18.17 AND P.526; THE BRUSH BORDER IS MUCH MORE PRONOUNCED IN THE PROXIMAL TUBULE – LEADS TO MORE SURFACE AREA)
 - b. Amount of potassium reabsorption (TABLE 18.2; PROXIMAL ABSORBS POTASSIUM AND DISTAL DOESN'T)
 - c. Variations in the balance of water and solutes reabsorbed (P.525; MUCH MORE IN THE DISTAL WHICH IS HIGHLY REGULATED)
 - d. Water permeability (P.540 AND 543; PROXIMAL IS PERMEABLE, DISTAL IS SELECTIVELY PERMEABLE AND REQUIRES AQUAPORINS)

5. In the post-absorptive state:
 - a. The formation of glucose from amino acids and glycerol is much more prominent than in the absorptive state (P.612; THIS IS GLUCONEOGENESIS, WHICH IS MUCH MORE PROMINENT IN THE POST-ABSORPTIVE)
 - b. Glucose sparing is marked by increased storage of glucose in liver and muscle (FIG.21.3; THIS DESCRIBES THE ABSORPTIVE STATE)
 - c. Fatty acids are more likely to leave adipose tissue than in the absorptive state (FIGS 21.3 AND 21.4; MORE LIKELY)
 - d. The total energy expenditure rate is typically much higher than that in the absorptive state (P.610; ENERGY EXPENDITURE RATE IS ABOUT THE SAME IN EITHER AT REST)

6. Nutrient molecules in the bloodstream include (P.607-608, FIG.21.1 FOR ALL)
 - a. Glycogen (ONLY GLUCOSE)
 - b. LPL (LIPOPROTEIN LIPASE IS IN THE BLOOD BUT IT'S NOT A NUTRIENT)
 - c. Adipose cells (ADIPOSE CELLS ARE THE STORAGE BIN FOR TRIGLYERIDES)
 - d. Triglycerides (CONTAINED IN LIPOPROTEINS)

7. The following hormones have a generally inhibitory action on plasma osmolarity (ALL; TABLE 6.1 AND OTHERS AS NOTED):
 - a. Aldosterone (STIMULATES SODIUM REABSORPTION WHICH INCREASES PLASMA mOsm)
 - b. ADH (P.545; PROMOTES WATER REABSORPTION WHICH DECREASES PLASMA mOsm)
 - c. Renin (FIG.19.15; RENIN INDIRECTLY STIMULATES ALDOSTERONE WHICH INCREASES PLASMA mOsm VIA SODIUM REABSORPTION)
 - d. ANP (INHIBITS SODIUM REABSORPTION WHICH INHIBITS INCREASES IN PLASMA mOsm)

8. The pancreas and the adrenal gland are different in the following (P.157; ADRENAL GLAND CONTAINS BOTH THE ADRENAL CORTEX AND THE ADRENAL MEDULLA):
 - a. Only one secretes a hormone that raises blood glucose levels (TABLE 6.1; ADRENAL CORTEX'S CORTISOL DOES AND PANCREAS'S GLUCAGON DOES)
 - b. Only one secretes hormones that are antagonistic (exert opposite responses) to each other (TABLE 6.1; PANCREAS: INSULIN AND GLUCAGON)
 - c. Only one secretes hormones into a duct (P.149; HORMONES ARE SECRETED INTO BLOOD ONLY, NOT THROUGH DUCTS – THE PANCREAS, P.155, DOES SECRETE ENZYMES AND FLUID INTO A DUCT THAT LEADS TO A SMALL INTESTINE BUT THESE AREN'T HORMONES)
 - d. Only one secretes a hormone that helps regulate ion levels (p.154; ADRENAL CORTEX SECRETES ALDOSTERONE THAT HELPS REGULATE SODIUM AND POTASSIUM LEVELS; PANCREAS'S ENDOCRINE FUNCTION IS NOT LINKED TO ION BALANCE)

9. The following stimulate the release of other tropic hormones:
 - a. Prolactin releasing hormone (P.152-3, STIMULATES THE RELEASE OF PROLACTIN, WHOSE TARGET CELLS ARE MAMMARY GLANDS – NOT ENDOCRINE GLANDS)
 - b. Thyrotropin releasing hormone (P.152-3, TRH – TSH – THYROID HORMONES)
 - c. Corticotropin releasing hormone (P.152-3, CRH – ACTH – OTHER ADRENAL CORTEX HORMONES)
 - d. ADH (TABLE 6.1 AND P.545; ADH TARGET CELLS ARE NOT ENDOCRINE: THEY ARE THE EPITHELIAL CELLS OF THE LATE DISTAL TUBULES AND THE COLLECTING DUCTS)