Endocrine System: Endocrine System Review

1. Hormones act at specific target organs because these organs contain __________ specific for the hormones.

2. Growth hormone, secreted by the _____ gland, stimulates growth of bones and muscle by activating intermediary proteins called __________.

3. __________ (hormone) from the anterior pituitary stimulates secretion of cortisol from the _____ (gland). The anterior pituitary consists of ______ tissue.

4. The parafollicular or C-cells of the __________ gland produce __________, a peptide hormone that lowers plasma calcium levels.

5. Hormones secreted by the pancreatic islets of the pancreas include __________ from the _ cells and __________ from the _ cells. Which of these hormones raise blood glucose levels?

6. Specialized muscle cells in the heart produce _______ (hormone), which increases excretion of ______ (electrolyte) by the kidneys.

7. __________ (hormone) promotes the final conversion of vitamin D to _______ in the kidney.

8. __________ (hormone) produced by G-cells in the pyloric antrum stimulates _____ secretion in the stomach.

9. One ventral hypothalamic hormone (__________) is essential for the stress response and another (__________) inhibits release of prolactin.

10. __________ (hormone) is a stimulus for sperm production in the male and maturation of ovarian follicles in the female.

11. ________, secreted by the pineal gland, helps regulate body activities with the light-dark cycle.
12. The zona glomerulosa of the adrenal cortex primarily produces the hormone __________, which acts on the __________ (organ) to increase ___ (electrolyte) reabsorption.

13. _______ ________ (gland) is a modified sympathetic ganglion producing the amine hormones known as _______________. This category of amine hormones includes both __________ and _____________ (two hormones).

14. The ___________ (organ) produces a steroid hormone called _____________ in the interstitial cells and a peptide hormone called _____________ that inhibits FSH.

15. Large follicles in this gland (__________) contain a protein colloid called ______________ from which the hormones _______ and ______ are made. These hormones regulate many metabolic functions and are important for nervous system development and growth.

16. Nuclei in the ventral hypothalamus produce two hormones that are stored in the posterior pituitary. Name the two nuclei that produce these hormones and name the two hormones, one of which is important for water balance.
Endocrine System: Biochemistry, Secretion and Transport of Hormones

1. Place the following hormones into one of the three categories of hormones (peptides, amines or steroids): T4 (thyroxin), estradiol, norepinephrine, insulin, aldosterone, glucagon, cortisol, growth hormone, T3 (triiodothyronine), epinephrine, testosterone and vasopressin (ADH).

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<thead>
<tr>
<th>Peptides</th>
<th>Amines</th>
<th>Steroids</th>
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2. Peptide hormones are synthesized as large precursor hormones called ______________. The hormones (or prohormones) are stored in _______ _______ and released from the cell by ___________. Do peptide hormones require a carrier in the blood stream?

3. Catecholemines are produced in the __________ of the adrenal gland and are classified as ___________ hormones since they are derived from ___________. Stimulation of the chromaffin cells causes an influx of _______ ions, which causes the vesicles to merge with the plasma membrane and release the hormone by ___________. Are catecholemines water-soluble or lipid-soluble?

4. Thyroid hormones include two molecules called _____and ____. T3 consists of two _______ molecules plus ___ iodine molecules and is (more or less) abundant than T4. Are carriers required for the transport of thyroid hormones?

5. All steroid hormones are derived from ______________, which steroid hormone is produced is determined by the ___________ present in the cell. The common precursor molecule for all steroid hormones is ______________. Steroid hormones enter the blood stream by ___________ and ___________ (do or do not) require a carrier. The rate of secretion of steroid hormones is
(faster or slower) than catecholemines because steroid hormones are not __________.

6. Preganglionic sympathetic fibers trigger the release of ___________ and ___________ (hormones) from the _________ _________ (gland), this is an example of neural regulation of hormone secretion.

7. Two examples of hormonal regulation of hormone secretion include: 1) the negative feedback of T3 & T4 to decrease _____ levels; and 2) the negative feedback of cortisol which decreases both ______ and _____ levels.

8. Besides increased levels of plasma glucose and amino acids (humoral regulation), increased levels of both _______ (hormone) and the __________ nervous system increase plasma insulin levels.

9. Some hormones are released in rhythmic 24 hour patterns know as _____________ rhythms. ______________ is a hormone where stressful stimuli can override this pattern and increase the plasma hormone levels. In contrast, ________ hormones (amine hormones) are an example where large amounts of the hormones are bound to carrier proteins in the plasma forming a large circulating reservoir. Thus, acute changes do not produce large changes in the plasma level of this hormone.

10. The ________ and _________ are the major organs that metabolize hormones. The type of hormone determines how fast they are metabolized. ____________ and _______________ are rapidly metabolized, while ____________ and ____________ take longer to metabolize.
Endocrine System: The Actions of Hormones on Target Cells

1. The receptor is activated by the input signal that is the ______________. This signal causes a biochemical change in the cell. Name three of the five possible changes listed. ________________
   ________________
   ________________

2. Water soluble proteins such as __________ and ______________ bind to receptors located where on the cell? ________________

3. G proteins:
   -What is bound to the G protein in the inactive state? ________ In the active state? ________
   -What catalyzes the conversion of ATP to cAMP? ________ ________
   -What is known as the first messenger? ________Second messenger? ________
   -A molecule of cAMP activates ________ ________ __, which can phosphorylate many proteins.
   -A single molecule of a hormone can have a large effect on the cell due to this process called ________.
   -What is the enzyme that inactivates cAMP? ________________

4. Insulin:
   -Insulin decreases plasma glucose, amino acids and fatty acids by stimulating the conversion of them to their storage form. Name these storage forms.
     glucose ◊ ________________
     amino acids ◊ ________________
     fatty acids ◊ ________________
   -Conversion to the storage form is known as ________ metabolism.
   -After a meal, high levels of glucose, amino acids and fatty acids lead to a/an (decrease or increase) in insulin secretion.
   -The autonomic nervous system also regulates insulin secretion. What effects would the sympathetic and parasympathetic system have on insulin secretion?
- Insulin travels in the blood and binds to what type of receptors on the cell membrane? 
- What is the approximate half-life of insulin? 
- What hormone increases plasma glucose levels? This hormone breaks down the storage forms and this is known as metabolism.

5. Diabetes:
- Type (1 or 2) diabetes is characterized by a resistance of the target cells to insulin. Plasma insulin levels are normal or high.
- In type 1 diabetes, the lack of insulin and glycogenolysis in the liver leads to (hypoglycemia or hyperglycemia).
- With the increase in filtration of glucose at the kidneys the carriers become and glucose appears in the urine, also known as .
- Glucose acts as an leading to increased urine flow.
- Increased lipolysis produces an increase in which when used as fuel produces .
- The presence of these in plasma and urine is known respectively as and .

6. Lipid soluble hormones such as and hormone bind to receptors located .
- Once the hormone binds to the receptor, the dissociates from the receptor complex.
- The hormone receptor complexes act as .
- The receptor-hormone complex then binds to .
- The mRNA produces that catalyze biochemical reactions in the cell.

7. Cortisol is classified as a hormone. Name 4 major actions of Cortisol.

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These actions are important for the stress response.

8. The main function of thyroid hormones is: ______________________.

Three other specific functions include:

___________________________

___________________________

___________________________
Endocrine System: The Hypothalamic – Pituitary Axis

1. The anterior pituitary is composed of ____________ tissue. Name the six classic hormones whose functions are well known.
   a. 
   b. 
   c. 
   d. 
   e. 
   f. 

2. TRH, GNRH, CRH etc. are known as ____________ hypothalamic hormones which regulate the function of the _________ pituitary. These hormones are released into capillary beds and carried directly to the pituitary by the ____________ ________ located in the ________________.

3. ____________ and ________________, the posterior pituitary hormones are synthesized in the ____________ and _______________ nuclei of the hypothalamus. They are stored in the axon terminals located in the ____________ pituitary. Similar to neurotransmitters, an ________ ________ in the neuron causes their release.

4. In negative feedback, the target hormone feeds back to alter the release of the anterior or hypothalamic hormones thus (increasing or decreasing) its own release.

5. Give an example of a hormone that has negative feedback mainly to the anterior pituitary. ____________
   Give an example of a hormone that has negative feedback to both the anterior pituitary and the ventral hypothalamus. ____________

6. Prolactin is unique in that the main ventral hypothalamic hormone regulating its secretion (___________), inhibits its release.
   ____________ (hormone) increases prolactin release. Very high levels of this hormone during pregnancy actually block the effect of prolactin on milk production.
7. _________ hormones are necessary for the release of ____________ hormone. This is an example of modulation of a hormone by a target hormone of another series.

8. Suckling of an infant causes milk letdown by stimulating what hormone? ____________

Changes in osmolarity detected by chemically sensitive neurons in the hypothalamus will alter what hormone’s level? ____________

9. Cortisol release is synchronized by the light/dark cycle and has a 24 hour pattern of secretion known as a ____________ rhythm. Levels are highest at what part of the day? ____________

10. Besides controlling levels of T3 and T4, TSH also promotes ____________ of the thyroid gland. T3 and T4 are carried in the blood stream bound to ____________ ____________ because they are (hydrophilic or lipophilic).

11. T3 and T4 enter the target cells by ____________ and bind to receptors located ____________. T3 and T4 are synthesized from ____________ and ____________.

12. Which of the following would be symptoms of hypothyroidism also known as ____________?

   - lethargy or hyperexcitability
   - high BMR or low BMR
   - high heart rate or low to normal heart rate
   - feeling cold or sweating
   - weight loss or weight gain

13. Lack of dietary iodine would cause (primary or secondary) hypothyroidism and the patient would probably get an iodine-deficient ____________.

14. Graves’ disease is the most common cause of primary _________________. The body secretes ____________ ____________ ____________, which mimics the action of TSH and thus may cause a ____________ as well as high levels of thyroid hormones.
Endocrine System: Response to Stress

1. What two body systems work together to provide well coordinated, generalized, nonspecific responses to combat stress? _______________ and _______________

2. Increased levels of what three hormones indicate that an individual is experiencing stress? ____________, _____________ and _______________

3. In the nervous system’s response to stress, ____________ and ______________ exert many effects on the body. Choose the correct response in the pairs listed.
   - ↑ or ↓CO
   - ↑ or ↓sweating
   - ↑ or ↓ventilation
   - ↑ or ↓insulin
   - ↑ or ↓BP
   - ↑ or ↓blood flow to digestive system
   - ↑ or ↓plasma levels of glucose, fatty acids etc

4. In response to stress, the hypothalamus increases the release of CRH, which increases ________ from the anterior pituitary and ___________ from the adrenal cortex. These hormones prolong the response to stress provided by the nervous system.

5. Cortisol enhances ________________ (in vessels) to help maintain blood pressure and also (increases or inhibits) the inflammation and immune response.

6. Besides cortisol, the adrenal cortex releases ________________, which promotes salt and water retention, which helps maintain blood volume and blood pressure.

7. ____________ (posterior pituitary hormone) also aids in the stress response by promoting water retention and at high levels it is a potent _______________. Both of these help maintain blood pressure.

8. Epinephrine is a (lipophilic or hydrophilic) hormone. Thus it (does or does not) require a protein carrier and the receptors at the target cell are located...
Epinephrine is synthesized from ______________ and has a very short half-life of ______.

9. _______________ is a condition in which there is hypersecretion of catecholamines by a tumor in the adrenal medulla. Which of the following symptoms would be present in a patient with this condition?
   - sweating or cool dry skin
   - ↓ BP or ↑ BP
   - ↓ blood glucose or ↑ blood glucose
   - ↑ HR or ↓ HR
   - ↑ TPR or ↓ TPR

10. Cortisol is a (lipophilic or hydrophilic) hormone. Thus it (does or does not) require a protein carrier and the receptors on the target organ are located _______________. Cortisol is synthesized from ______________ and has a half-life of ___________.

11. Hypercortisolism is better known as ______________, which is due to a hypersecreting tumor in the anterior pituitary. What hormone is being hypersecreted? _________________. Hypercortisolism from all other causes, such as glucocorticoid drugs, is known as ______________

12. Primary adrenal insufficiency is better known as ________________. What two hormones are deficient? ________________ and ________________

13. The following symptoms would be characteristic of which disease?
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   Low blood pressure, decreased plasma sodium and hypoglycemia

14. The following symptoms would be characteristic of which disease?
   ------------
   high blood pressure, poor wound healing and hyperglycemia

15. Classify the following as either part of the rapid response (R) to stress mediated by the sympathetic nervous system or the prolonged (P) response of the endocrine system: maintains gas exchange _____
   maintains fuel levels _____
maintains body defenses
redirects blood flow
makes fuel available