Mechanisms of Hormone Action

1. List the two chemical classes of hormones, and give an example of each. How are these hormones transported in the bloodstream?

2. Diagram the mechanism of action of steroid hormones. Where are the steroid hormone receptors found? How do steroid hormones alter cell activity?

3. Diagram the mechanism of action of the water-soluble peptide hormones. Describe the series of events that follows binding of a peptide hormone to its receptor. Include the roles of: G-proteins, adenylate cyclase, cAMP, protein kinases and phosphorylated proteins.

4. List 3 factors that determine the responsiveness of a target cell to a hormone.
Blood glucose homeostasis

1. Make a diagram showing how insulin and glucagon regulate blood glucose levels. Explain the role of the pancreas and liver in this process.

2. What happens when blood glucose levels fall? How is homeostasis re-established?

3. What is the effect of hGH and insulin-like growth factors (IGFs) on blood glucose homeostasis? What target tissues are involved?

4. Low blood glucose levels stimulate ACTH secretion from the anterior pituitary. What effect does ACTH have on the target cells within the adrenal cortex?

5. Explain cortisol's role in glycogenolysis and gluconeogenesis. How do these contribute to homeostasis?

6. Add hGH, IGFs, ACTH and cortisol to your glucose homeostasis diagram (above).
Blood Calcium Homeostasis

1. Make a diagram showing how calcitonin, parathyroid hormone and calcitriol regulate blood calcium levels.

2. How are the actions of PTH and calcitriol similar? Different?

3. Explain the effect of parathyroid hormone on bone. How does this activity contribute to homeostasis?

4. How does PTH affect target cells in the kidney?
Responding to Blood Pressure Changes

1. What is the role of Atrial Natriuretic Peptide (ANP) in responding to changes in blood pressure?

   a. How does ANP affect blood vessels in response to stress situations? How does this contribute to blood pressure homeostasis?

   b. How does ANP affect kidney nephrons? How does this contribute to homeostasis?

2. Describe the role of Antidiuretic Hormone (ADH) in blood pressure control. Include its effects on the kidney, sweat glands and blood vessels.

3. Renin/Angiotensin II also plays a role in blood pressure control.
   a. What does renin do?

   b. In what 2 ways can angiotensin II increase blood pressure? What are its target tissues in each case?

Responding to Metabolic Changes

1. Investigate the effects of TRH, TSH, and Thyroid Hormone on metabolism.
   a. How is the secretion of the thyroid hormones, T3 and T4, regulated?
   b. What are the physiological effects of the thyroid hormones?
   c. Explain how blood levels of T3/T4, TSH and TRH would change in a laboratory animal that has undergone thyroidectomy (removal of the thyroid gland).

2. Describe the function of GHRH and hGH in metabolism. What is the source of these hormones?

Responding to Stress

1. What is the role of the hypothalamus during stress?

2. Describe how the following hormones contribute to the stress response:
   a. epinephrine and norepinephrine
b. cortisol

c. hGH and IGFs

d. T3/T4

3. You have already studied how aldosterone contributes to blood volume homeostasis. How does this hormone also contribute to homeostasis during a stress reaction?

4. What is the basic difference between the stress response and homeostasis?

5. What is the relationship between stress and immunity?