Signals and Shifts

Read hormone patterns to explain changes in the body.

HAP.6.b "Obtain, evaluate, and communicate information describing the role of endocrine axes involving the thyroid and gonads in controlling growth, development, metabolism, and reproduction."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the hormone signals that connect one gland to another, circle the effects those signals help control, and number the steps in each axis. Use your marks to trace a signal and evaluate what a hormone result can tell you.

What a Hormone Test Can Tell Us

1. On a cold morning, your body needs energy to stay warm. One system that helps set the pace of energy use is the thyroid axis. The hypothalamus releases TRH, which signals the pituitary gland to release TSH. TSH tells the thyroid gland to release thyroid hormones, mainly T_4 and T_3. These hormones help regulate metabolism, body temperature, and normal growth and development. As thyroid hormone levels rise, they signal the hypothalamus and pituitary to reduce their output. This negative feedback helps keep hormone levels within a useful range rather than letting them rise without limit.

2. A second pathway, the gonadal axis, helps control puberty and reproduction. The hypothalamus releases GnRH, which signals the pituitary to release LH and FSH. In ovaries, these pituitary hormones help follicles develop, trigger ovulation, and support the release of estrogen and progesterone. In testes, LH supports testosterone production, while FSH and testosterone support sperm production. Sex hormones contribute to changes at puberty and help regulate reproductive functions. They also provide feedback to the hypothalamus and pituitary. Unlike thyroid hormone levels, some gonadal hormone levels change greatly across the menstrual cycle, so the timing of a test matters.

3. Hormone tests provide clues about an axis, not a complete diagnosis. A pituitary signal and a target-gland hormone should be considered together. If a target-gland hormone is low while the pituitary signal is high, the pituitary may be responding to a gland that is not releasing enough hormone. If both levels are low, the signal from farther upstream may need investigation. A single result can be affected by time of day, menstrual-cycle stage, illness, or the test's reference range. Comparing results with symptoms and, when appropriate, repeat tests helps people evaluate a claim about what has changed.

2 ANSWER WITH EVIDENCE

Use the passage

1. Trace the thyroid axis from the hypothalamus to the thyroid. How does the final hormone affect earlier steps in the axis?

2. Compare one role of the thyroid axis with one role of the gonadal axis in growth, development, metabolism, or reproduction.

3. A test shows high TSH and low thyroid hormone. What might this pattern suggest about the thyroid gland? Explain using the passage's rule for reading hormone results.

4. Someone claims that one low estrogen result proves the pituitary is not working. Evaluate the claim using two details from the passage.

3 YOUR TURN

Your own words

A 16-year-old has low testosterone and high LH and FSH on two morning tests. TSH and thyroid hormones are within their reference ranges. Write a 3- to 4-sentence clinic note identifying the axis most directly implicated, explaining the feedback pattern, predicting one developmental and one reproductive effect, and stating one limit of the evidence.

Signals and Shifts

PART 1 · READ AND MARK

Underline the hormone signals that connect one gland to another, circle the effects those signals help control, and number the steps in each axis. Use your marks to trace a signal and evaluate what a hormone result can tell you. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Trace the thyroid axis from the hypothalamus to the thyroid. How does the final hormone affect earlier steps in the axis?	**The hypothalamus releases TRH, which prompts pituitary TSH release. TSH prompts the thyroid to release T_4 and T_3. Rising thyroid hormones signal the hypothalamus and pituitary to reduce their output.**
2	Compare one role of the thyroid axis with one role of the gonadal axis in growth, development, metabolism, or reproduction.	**The thyroid axis helps regulate metabolism and normal growth and development. The gonadal axis supports puberty and reproductive functions such as ovulation or sperm production.**
3	A test shows high TSH and low thyroid hormone. What might this pattern suggest about the thyroid gland? Explain using the passage's rule for reading hormone results.	**It may suggest that the thyroid gland is not releasing enough hormone despite a strong pituitary signal. The pattern is a clue, not a diagnosis.**
4	Someone claims that one low estrogen result proves the pituitary is not working. Evaluate the claim using two details from the passage.	**The claim is not supported by one result. Estrogen can change across the menstrual cycle, and its level should be considered with pituitary hormone levels, symptoms, and possibly repeat tests.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The results point more directly to the gonadal axis than to the thyroid axis. High LH and FSH with low testosterone suggest that the pituitary is signaling the testes, but the testes may not be releasing enough testosterone. Low testosterone could slow some changes of puberty, and a problem with testicular function could also reduce sperm production. These results do not identify the cause, so symptoms and further testing would still matter.

Accept other accurate effects of thyroid or gonadal hormones where a question allows a choice. For the clinic note, look for an evidence-based inference rather than a definite diagnosis.