Signals and Systems

Trace how hormones shape reproductive development and function.

HAP.12.a "Construct an explanation of how the endocrine system influences the growth, development, and functions of the reproductive systems in males and females, including the mechanisms of hormonal birth control."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline hormone sources and circle the hormones they release. Number the steps in one puberty chain and one birth control chain to show how each signal leads to an effect.

From Brain Signals to Reproductive Changes

1. At puberty, the brain begins a chain of chemical messages that changes the reproductive organs. The hypothalamus releases gonadotropin-releasing hormone, or GnRH, which tells the pituitary gland to release follicle-stimulating hormone (FSH) and luteinizing hormone (LH). In a person with testes, FSH helps support sperm production, while LH signals the testes to make testosterone. Testosterone supports sperm production and drives changes such as a deeper voice and increased muscle growth. In a person with ovaries, FSH helps ovarian follicles mature, while LH helps trigger ovulation. Ovarian estrogen helps develop breasts and helps build the uterine lining.

2. These signals keep working after puberty rather than simply turning on once. In a typical menstrual cycle, an ovarian follicle makes increasing estrogen. Near midcycle, sustained high estrogen causes a surge of LH, and that surge releases an egg from the ovary. After ovulation, the ovary makes progesterone, which helps maintain the uterine lining. If pregnancy does not occur, estrogen and progesterone levels fall, and the lining is shed during menstruation. In people with testes, the pituitary continues to send FSH and LH, supporting ongoing sperm and testosterone production. Hormones also feed back to the brain and pituitary, adjusting future signals.

3. A combination hormonal birth control pill supplies synthetic estrogen and progestin, a substance that acts like progesterone. These hormones create negative feedback at the hypothalamus and pituitary, reducing FSH and LH signals. Without the usual LH surge, ovulation is usually prevented, so no egg is released for sperm to fertilize. Progestin also thickens cervical mucus, making it harder for sperm to enter the uterus, and changes the uterine lining. These effects depend on continued use; fertility generally returns after a person stops the pill, although timing varies. The pill does not protect against sexually transmitted infections.

2 ANSWER WITH EVIDENCE

Use the passage

1. Trace how a signal from the hypothalamus can lead to both sperm production and a puberty-related body change in a person with testes.

2. How do pituitary signals lead to both follicle maturation and egg release in a person with ovaries?

3. How does the ovary's hormone output after ovulation affect the uterus, and what changes if pregnancy does not occur?

4. Why does a combination pill usually prevent egg release even though the pituitary normally helps trigger it?

3 YOUR TURN

Your own words

A classmate says, "The pill permanently shuts down the ovaries, so taking it undoes puberty." Write four or five sentences correcting this claim. Trace the signals from the pill to the pituitary and ovary, and explain one other way it reduces the chance of pregnancy.

Signals and Systems

PART 1 · READ AND MARK

Underline hormone sources and circle the hormones they release. Number the steps in one puberty chain and one birth control chain to show how each signal leads to an effect. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Trace how a signal from the hypothalamus can lead to both sperm production and a puberty-related body change in a person with testes.	**GnRH prompts the pituitary to release FSH and LH. FSH supports sperm production, while LH prompts the testes to make testosterone, which supports sperm production and changes such as a deeper voice.**
2	How do pituitary signals lead to both follicle maturation and egg release in a person with ovaries?	**Pituitary FSH helps follicles mature. Sustained high estrogen from a follicle causes an LH surge, which releases an egg.**
3	How does the ovary's hormone output after ovulation affect the uterus, and what changes if pregnancy does not occur?	**The ovary makes progesterone, which helps maintain the uterine lining. If pregnancy does not occur, progesterone and estrogen fall, and the lining is shed.**
4	Why does a combination pill usually prevent egg release even though the pituitary normally helps trigger it?	**The pill's synthetic estrogen and progestin create negative feedback that reduces pituitary FSH and LH signals. Without the usual LH surge, ovulation is usually prevented.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The combination pill supplies synthetic estrogen and progestin, which reduce pituitary FSH and LH through negative feedback. Without the usual LH surge, the ovary usually does not release an egg, but this does not undo the changes of puberty. Progestin also thickens cervical mucus, making it harder for sperm to enter the uterus. These effects depend on continued use, and fertility generally returns after stopping the pill, although the timing varies.

Accept equivalent descriptions of the hormone chains. Students should distinguish a reversible effect on reproductive function from permanent loss of puberty-related development.