

Sex hormones in humans

Revision notes • Testosterone and oestrogen in puberty, the menstrual cycle, and how FSH, LH, oestrogen and progesterone control the cycle and pregnancy.

For Cambridge IGCSE Biology 0610 (and 0970, which has the same content). **Supplement** is Extended content, only examined on Papers 2 and 4.

Sex hormones in humans

Spec 16.5

Testosterone, oestrogen and puberty

Spec 16.5.1

At **puberty**, the body changes and becomes able to reproduce. These changes are controlled by sex hormones. **Testosterone** is made in the testes. **Oestrogen** is made in the ovaries.

The hormones cause the development of **secondary sexual characteristics**. They also regulate them once they have developed.

Secondary sexual characteristics at puberty

Hormone	Secondary sexual characteristics
Testosterone (boys)	Growth of facial hair, pubic hair and underarm hair; voice deepens; muscles develop; testes and penis grow; sperm production begins
Oestrogen (girls)	Breasts develop; pubic hair and underarm hair grow; hips widen; the menstrual cycle begins and eggs are released from the ovaries

Exam tip: Name the hormone and the organ that makes it: testosterone from the testes, oestrogen from the ovaries. Do not say 'male hormone' on its own.

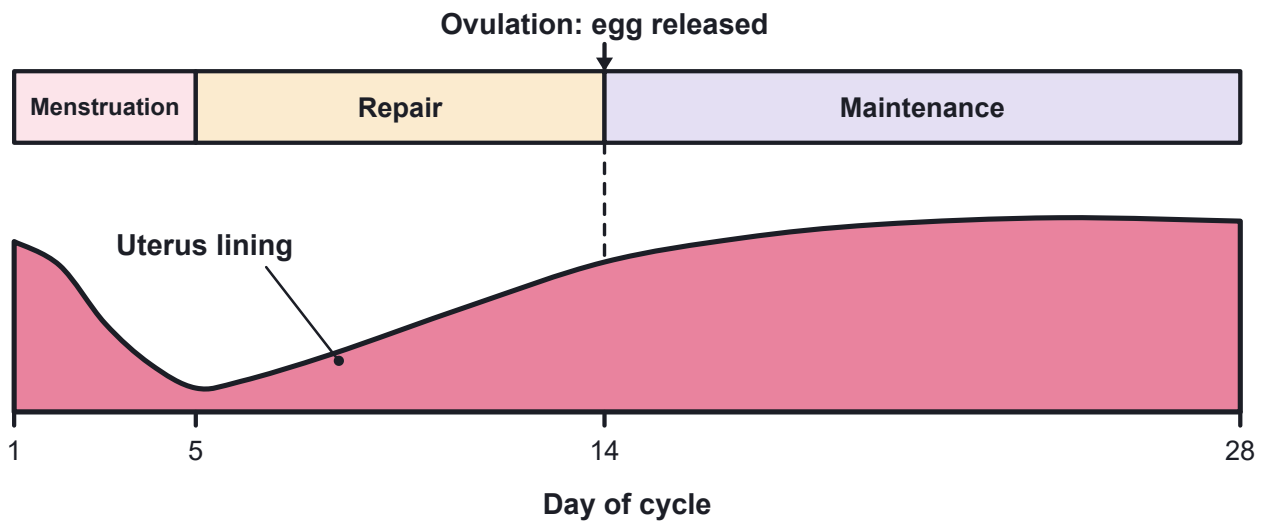
The menstrual cycle and pregnancy hormones

Spec 16.5.2, 16.5.3, 16.5.4

The **menstrual cycle** is a series of changes in the ovaries and in the lining of the uterus. It repeats about every 28 days.

Stages of the menstrual cycle (days are approximate)

Stage	Days	Change in the ovary and the uterus lining
Menstruation	1 to 5	The lining of the uterus breaks down and is lost through the vagina with blood
Repair	5 to 14	An egg cell matures in an ovary. The uterus lining is repaired and thickens
Ovulation	Around 14	An egg cell is released from an ovary into the oviduct
Maintenance	14 to 28	The lining stays thick, ready for an embryo. If there is no pregnancy, the lining breaks down and the cycle starts again



The stages of the menstrual cycle and how the thickness of the **uterus lining** changes.

Supplement

Where the hormones are made

Supplement

Sites of production of the sex hormones

Hormone	In the menstrual cycle	In pregnancy
Oestrogen	Ovaries	Placenta
Progesterone	Ovaries (the empty follicle after ovulation, the corpus luteum)	Placenta
FSH and LH	Pituitary gland	Pituitary gland, but their release is inhibited by progesterone

Supplement

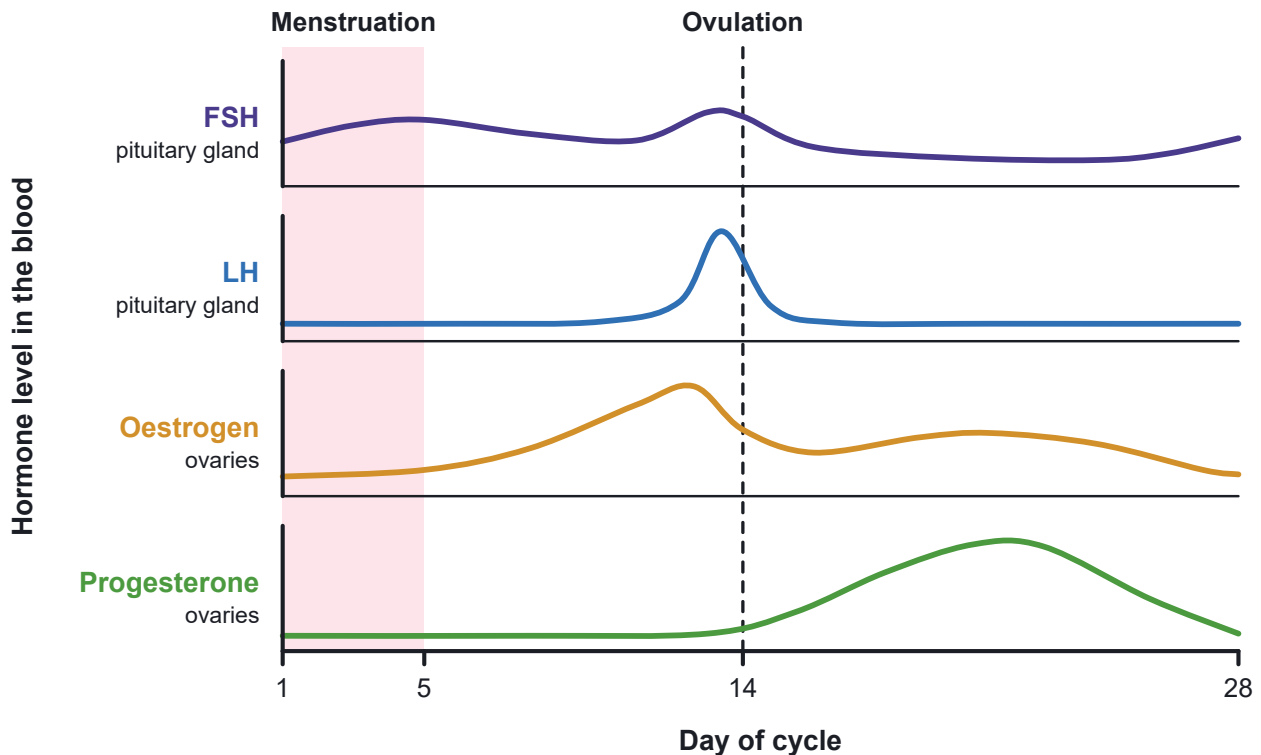
How hormones control the cycle

Supplement

The roles of FSH, LH, oestrogen and progesterone

Hormone	Role
FSH	Causes an egg cell to mature in the ovary. Stimulates the ovary to make oestrogen
Oestrogen	Repairs and thickens the uterus lining. Inhibits FSH. Stimulates the release of LH
LH	Causes ovulation (release of the egg cell) around day 14
Progesterone	Maintains the thickness of the uterus lining. Inhibits FSH and LH

Supplement



Levels of FSH, LH, oestrogen and progesterone. The **LH surge** triggers ovulation around day 14.

Supplement

Hormones in pregnancy

Supplement

If an embryo implants, the **placenta** makes **progesterone** (and oestrogen). High progesterone keeps the uterus lining in place, so there is no menstruation. It also inhibits FSH and LH, so no more egg cells mature or are released during pregnancy. If there is no pregnancy, progesterone falls and the lining breaks down.

Supplement

Exam tip: Say what each hormone does to the next one: 'stimulates' or 'inhibits'. Writing 'oestrogen affects LH' will not score. When you read a hormone graph, quote the day and say whether the level rises, falls or peaks.

Quick check

1. Which hormone is made in the testes?
2. Name two secondary sexual characteristics that oestrogen causes in girls.
3. What happens to the uterus lining during menstruation?
4. **Supplement** Which hormone causes ovulation?
5. **Supplement** Name the organ that makes progesterone in pregnancy.

Quick check answers

Sex hormones in humans

1. Testosterone.
2. Any two from: breast development, pubic and underarm hair, wider hips, start of the menstrual cycle.
3. It breaks down and is lost through the vagina with blood.
4. LH.
5. The placenta.