

# Human Reproduction

Matthew Williams • Biology • May 9, 2026

## Human Reproduction

Reproduction ensures the continuation of a species. Two fundamental strategies exist across living organisms.

### Sexual and Asexual Reproduction

Feature	Asexual reproduction	Sexual reproduction
Number of parents	one	two
Gametes involved	no	yes (male and female)
Genetic variation	none (offspring are clones)	yes (offspring are genetically unique)
Speed	usually faster	slower
Examples	budding, binary fission, runners, cuttings	mammals, flowering plants

Asexual reproduction is advantageous in stable environments where the parent is well-adapted. Sexual reproduction produces variation, which is valuable when environments change.

### Male Reproductive System

Male reproductive system — frontal and cross-section views

- |                                   |  |
|-----------------------------------|--|
| 1. Urinary bladder                | 8. Scrotum                               |
| 2. Urethra                        | 9. Prepuce (foreskin)                    |
| 3. Vas deferens (ductus deferens) | 10. Prostate gland                       |
| 4. Epididymis (head)              | 11. Bulbourethral gland (Cowper's gland) |
| 5. Glans penis                    | 12. Seminal vesicle                      |
| 6. Epididymis (body)              | 13. Ejaculatory duct                     |
| 7. Testis                         |  |

Structure	Function
Testes	produce sperm and testosterone

Epididymis	sperm mature and are stored here
Vas deferens	carries sperm from epididymis toward urethra
Seminal vesicles	produce fluid rich in fructose (energy for sperm)
Prostate gland	adds alkaline fluid to neutralise acidity of vagina
Urethra	carries sperm and urine out of the body (not simultaneously)
Penis	deposits sperm in the vagina during intercourse

**Testosterone** is produced by the testes from puberty and controls male secondary sexual characteristics (facial hair, deeper voice, muscle development) and sperm production.

### Sperm cell adaptations:

- streamlined head containing condensed DNA
- acrosome (enzyme-filled cap) — digests through egg membrane
- many mitochondria in the midpiece — release ATP for movement
- long flagellum — propels sperm toward egg

## Female Reproductive System

Labelled diagram of the female reproductive system showing ovaries, fallopian tubes, uterus, cervix, and vagina

Structure	Function
Ovaries	produce eggs (ova) and hormones (oestrogen, progesterone)
Fallopian tubes (oviducts)	carry egg from ovary to uterus; site of fertilisation
Uterus	muscular chamber; site of fetal development
Cervix	lower part of uterus; holds fetus in place; dilates during birth
Vagina	receives sperm during intercourse; birth canal

## The Menstrual Cycle

The menstrual cycle is approximately 28 days and prepares the uterus for a potential pregnancy each month.

Days	Events	Hormones involved
1-5	menstruation: uterine lining shed	progesterone and oestrogen fall
6-13	uterine lining rebuilds; egg develops in follicle	FSH rises; oestrogen rises
~14	ovulation: egg released from ovary	LH surge triggers ovulation
15-28	uterine lining maintained; if no fertilisation, lining breaks down	progesterone (from corpus luteum) then falls

- **FSH (follicle-stimulating hormone)** — from pituitary; stimulates follicle and egg development; triggers oestrogen production
- **LH (luteinising hormone)** — from pituitary; surge at day 14 triggers ovulation
- **Oestrogen** — from ovary; rebuilds uterine lining; triggers LH surge
- **Progesterone** — from corpus luteum (remains of follicle); maintains uterine lining



Overview of the menstrual cycle

## Menstrual Cycle Graphs

Past papers often test the menstrual cycle using hormone graphs. Use these patterns:

- **Oestrogen** rises before ovulation as the follicle develops and the uterine lining repairs.
- A high oestrogen level helps trigger the **LH surge**, which causes ovulation.
- **Progesterone** rises after ovulation because the corpus luteum forms and maintains the uterine lining.
- If there is no pregnancy, progesterone and oestrogen fall, and menstruation begins.
- If pregnancy occurs, progesterone and oestrogen remain high to maintain the uterine lining and prevent another ovulation.

If the corpus luteum fails to develop after fertilisation, progesterone may not remain high enough to maintain the uterine lining, so the pregnancy may fail. If the ovaries are removed before puberty, ova and ovarian hormones are not produced, so normal menstrual cycles and female secondary sexual development do not occur.

## Fertilisation and Development

Sperm are deposited in the vagina and swim through the cervix and uterus into the fallopian tubes. If an egg is present, one sperm penetrates it — this is **fertilisation**. The fertilised egg (zygote) divides repeatedly and implants in the uterine wall about 7 days after fertilisation.

The **placenta** develops where the embryo attaches to the uterine wall. It allows exchange of substances between maternal and fetal blood without the blood mixing:

- oxygen and nutrients pass from mother to fetus
- CO<sub>2</sub> and urea pass from fetus to mother
- the placenta also produces hormones to maintain pregnancy

The **umbilical cord** connects the fetus to the placenta.

The **amnion** is a fluid-filled sac that surrounds and protects the developing fetus. Amniotic fluid cushions the fetus against physical shocks, prevents desiccation, and allows the fetus to move freely during development.

## Contraception

Method	Type	How it works
Condom	barrier	physical barrier; also protects against STIs
Diaphragm	barrier	covers cervix; prevents sperm reaching egg
Contraceptive pill	hormonal	contains oestrogen/progesterone; prevents ovulation
Contraceptive injection / implant	hormonal	releases progesterone; prevents ovulation
IUD (coil)	intrauterine device	prevents implantation; some release hormones
Vasectomy	surgical	cuts vas deferens; permanent

Tubal ligation	surgical	cuts or blocks fallopian tubes; permanent
Natural (rhythm method)	behavioural	avoiding intercourse near ovulation; least reliable

### Exam Tip

Contraception questions often ask for where the method acts. Condoms stop sperm entering the vagina and also reduce STI transmission. Pills, injections, and implants prevent ovulation. IUDs may prevent implantation. Vasectomy stops sperm travelling through the vas deferens; tubal ligation stops egg and sperm meeting in the oviduct.

## Sexually Transmitted Infections

Infection	Pathogen	Transmission	Treatment / Control
HIV/AIDS	virus (HIV)	unprotected sex, sharing needles, mother to child	no cure; antiretroviral drugs manage symptoms; condoms and not sharing needles prevent transmission
Gonorrhoea	bacterium ( <i>Neisseria gonorrhoeae</i> )	unprotected sex	antibiotics; condoms; testing and contact tracing

HIV attacks helper T-lymphocytes, gradually destroying the immune system. AIDS is the late stage when immunity has collapsed and opportunistic infections occur.

### Exam Tip

HIV is transmitted through blood, semen, vaginal fluids, and breast milk — not through casual contact. An exam question may ask you to distinguish HIV (the virus) from AIDS (the condition that results from advanced HIV infection).

## PRACTICE — HUMAN REPRODUCTION

### Asexual reproduction

Reproduction from one parent; offspring are genetically identical to the parent.

### Sexual reproduction

Reproduction involving two parents and the fusion of gametes; offspring are genetically varied.

**Ovulation**

Release of a mature egg from the ovary; occurs around day 14 of the menstrual cycle.

**Fertilisation**

The fusion of a male gamete (sperm) with a female gamete (egg) to form a zygote.

**Placenta**

Organ that allows exchange of oxygen, nutrients, and waste between mother and fetus without blood mixing.

**Amnion**

A fluid-filled membrane surrounding the fetus; cushions against physical shock and prevents desiccation.

**FSH**

Follicle-stimulating hormone; from the pituitary; stimulates follicle development and oestrogen production.

**LH**

Luteinising hormone; surge at day 14 triggers ovulation.

**HIV**

The virus that causes AIDS; attacks T-lymphocytes, destroying immune function.