

16.4.1 The reproductive systems, the gametes and the placenta

Name: _____ Class: _____ Date: _____ Total: 31 marks

KEY WORDS sperm • placenta • fetus • fertilisation • embryo

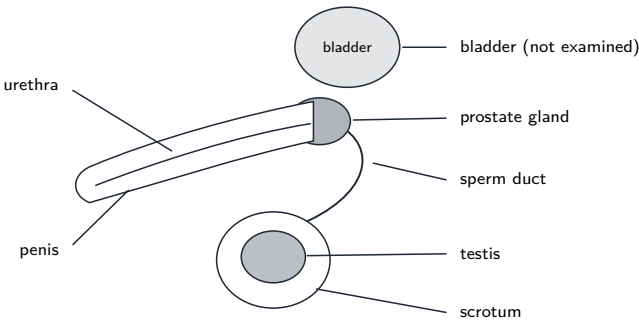
Objective

Identify the reproductive structures and link each to its function. Compare sperm and egg adaptations, follow fertilisation to implantation, and explain exchange and protection during fetal development. The tables below teach the named structures required for syllabus 16.4; use a structure plus its function in an explanation.

1 Key knowledge and worked examples

Study these first. Each one shows a **method** that a question later on this sheet needs.

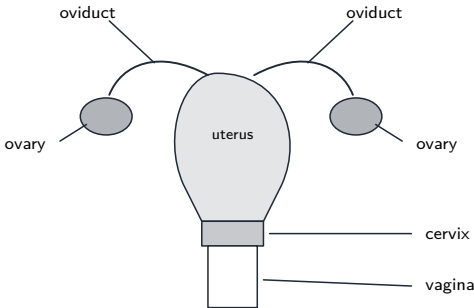
■ The male system: six parts, six functions



Each part has *one* function to learn: **testis** makes sperm and testosterone; **scrotum** holds the testes outside the body, slightly cooler; **sperm duct** carries sperm; **prostate gland** adds fluid; **urethra** carries sperm (and urine) out; **penis** places sperm inside the vagina.

part	function
testis	makes sperm, and the hormone testosterone
scrotum	holds the testes outside the body, where it is slightly cooler than body temperature
sperm duct	carries sperm from the testis towards the urethra
prostate gland	adds fluid to the sperm, which the sperm swim in
urethra	carries sperm (and, at other times, urine) out of the body
penis	becomes firm and places the sperm inside the vagina

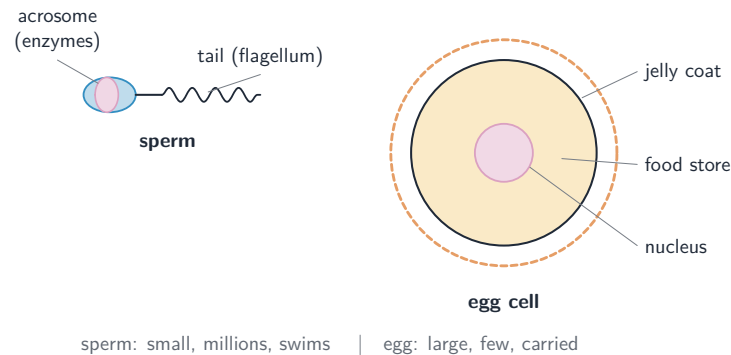
■ The female system: five parts, five functions



Ovary releases an egg cell each month; **oviduct** carries it, and is where **fertilisation** happens; **uterus** is where the embryo implants and the fetus develops; **cervix** is the ring of muscle at its neck; **vagina** receives the sperm and is the birth canal.

part	function
ovary	makes egg cells and releases one about once a month
oviduct	carries the egg cell towards the uterus; fertilisation happens here
uterus	where the embryo implants and the fetus develops; its muscular wall pushes the baby out at birth
cervix	a ring of muscle at the neck of the uterus, which holds the fetus in and widens at birth
vagina	receives the sperm, and is the birth canal

■ The gametes, and why each is shaped as it is



Fertilisation is the fusion of the nucleus of a sperm with the nucleus of an egg cell. Two haploid nuclei join, giving a diploid zygote. Say *nuclei*, not “the sperm joins the egg”.

feature of a sperm		what it does
flagellum (tail)		beats so the sperm can swim to the egg cell
many mitochondria in the middle piece		release the energy for swimming, by respiration
enzymes in the acrosome		digest a way through the jelly coat so the nucleus can enter

feature of an egg cell		what it does
energy stores in the cytoplasm		feed the embryo until it implants and the placenta takes over
the jelly coat		changes the instant one sperm enters, so no second sperm can get in

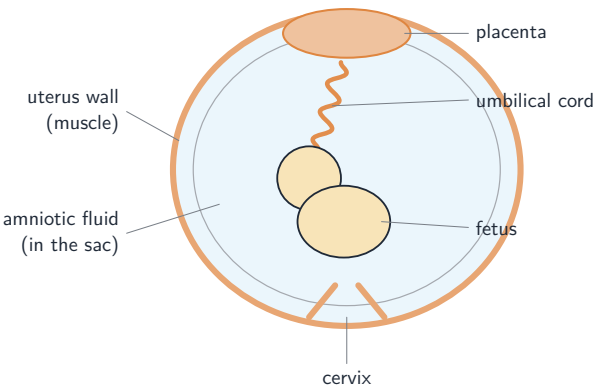
The comparison question asks for four things, so answer in four pairs:

	sperm	egg cell
size	much smaller	much larger
structure	a flagellum and many mitochondria	energy stores and a jelly coat, no flagellum
motility	moves itself	cannot move itself; it is carried along the oviduct
numbers	millions released at once	usually one a month

■ From zygote to implantation

1. The sperm nucleus fuses with the egg nucleus in the **oviduct**, giving a **zygote**
2. The zygote divides by **mitosis** into a **ball of cells**, the **embryo**, as it travels down the oviduct.
3. The embryo **implants** into the **lining of the uterus**, and the placenta begins to develop.

■ The placenta: what crosses, and what does not



structure	function
placenta	the exchange surface between the mother’s blood and the fetus’s blood
umbilical cord	carries the fetus’s blood to and from the placenta
amniotic sac	encloses the fetus and holds the amniotic fluid
amniotic fluid	protects the fetus from knocks and supports its weight

- **From mother to fetus:** dissolved **nutrients** (glucose, amino acids) and **oxygen**.
- **From fetus to mother:** **carbon dioxide** and **urea** – the excretory products.
- The placenta has a **large surface area** and a **thin barrier** for efficient exchange. Oxygen and carbon dioxide cross by **diffusion** over a short distance.
- The two blood supplies stay **separate**. They normally remain separate across the exchange barrier.
- Δ Some **pathogens** and **toxins** can cross the placenta as well – for example nicotine and carbon monoxide from smoking, and alcohol.

2 Practice

Now use the methods above.

2.1 Name the part of the male reproductive system that makes sperm, and the part that adds fluid to them. [2]

2.2 Name the part of the female reproductive system where fertilisation happens, and the part where the embryo implants. [2]

2.3 Describe what happens at fertilisation. [2]

2.4 State the function of the jelly coat of an egg cell, and explain why it changes at fertilisation. [3]

2.5 State **two** ways, other than size, in which an egg cell differs from a sperm cell. [2]

2.6 Describe what happens to the zygote between fertilisation and implantation. [3]

3 Exam-style questions

3.1 Which row correctly compares a human egg cell with a human sperm cell? [1]

	size of egg	which gamete moves itself	number released
A	larger	the egg	more eggs than sperm
B	larger	the sperm	fewer eggs than sperm
C	smaller	the sperm	more eggs than sperm
D	larger	the sperm	more eggs than sperm

3.2 A sperm cell and an egg cell are both adapted to their functions.

(a) Explain how the **acrosome**, the **mitochondria** and the **flagellum** each adapt a sperm cell to its function. [3]

(b) Explain how the **energy stores** and the **jelly coat** each adapt an egg cell to its function. [3]

3.3 A fetus develops in its mother's uterus, joined to the placenta.

(a) Name the structure that joins the fetus to the placenta, and state the function of the amniotic fluid. [2]

(b) Name **two** substances that pass from the mother's blood to the fetus's blood, and **one** that passes from the fetus's blood to the mother's. [3]

(c) The placenta has a large surface area and a very thin barrier between the two blood supplies. Explain why both of these features are needed. [2]

(d) A pregnant woman smokes. Explain how this can affect her fetus. [3]
