NAME _____ CLASS _____ DATE _____

IB BIOLOGY · D3.1

Reproduction

Notes to fill in alongside the guide. Each numbered block matches a chapter of the guide, and of the lesson slides. Write in the gaps, answer the cues, annotate the figures, and sum up each section in your own words.

BY THE END YOU CAN

- [ ] Explain sexual reproduction in flowering plants: gametes in pollen and ovules, pollination, the pollen tube, fertilization and the embryo, and why it is sexual even in a hermaphrodite flower D3.1.8
- [ ] Draw and annotate an insect-pollinated flower, naming each structure and its function D3.1.9
- [ ] Explain how plants promote cross-pollination: different timing, separate male and female flowers or plants, and animals and wind D3.1.10
- [ ] Explain how self-incompatibility keeps gametes from the same plant apart, and why inbreeding lowers diversity and vigour D3.1.11
- [ ] Distinguish seed dispersal from pollination, and explain germination: the embryo's growth and the mobilization of food reserves D3.1.12
- [ ] Compare sexual and asexual reproduction, and say which suits an unchanging environment and which a changing one D3.1.1
- [ ] Explain how meiosis breaks up parental combinations of alleles and fertilization makes new ones, and follow the chromosome number round the life cycle D3.1.2
- [ ] Explain why the male gamete is small and the female gamete large, and how that shapes their numbers and the parents' strategies D3.1.3
- [ ] Draw and annotate the male-typical and female-typical reproductive systems with each structure's job D3.1.4
- [ ] Explain the ovarian and uterine cycles and how FSH, LH, oestradiol and progesterone regulate them through negative and positive feedback D3.1.5
- [ ] Describe fertilization in humans, from the fusion of the two cell membranes to the first mitosis D3.1.6
- [ ] Explain how hormones suspend a woman's own cycle and bring on superovulation in IVF D3.1.7
- [ ] Explain how GnRH, LH, FSH and the sex hormones bring on puberty D3.1.13
- [ ] Compare spermatogenesis and oogenesis: the stages, the numbers made and the cytoplasm D3.1.14
- [ ] Explain how the acrosome reaction lets one sperm through and the cortical reaction keeps the others out D3.1.15
- [ ] Describe the blastocyst and its implantation in the endometrium D3.1.16
- [ ] Explain how a pregnancy test detects hCG with monoclonal antibodies D3.1.17
- [ ] Explain what crosses the placenta, how, and why its villi's large surface area matters D3.1.18
- [ ] Explain how progesterone keeps a pregnancy going, and how its fall lets oxytocin and positive feedback drive birth D3.1.19
- [ ] Judge the evidence on HRT and heart disease, and say why an early observational link was not cause and effect D3.1.20

01 A flower, part by part D3.1.9

CUES	NOTES
Predict: A flower's petals are removed before it opens. What does the plant lose?	

What is meant by sepals?

What is meant by petals?

What is meant by stamens?

What is meant by carpel?

What is meant by stamen?

What is meant by anther?

What is meant by filament?

What is meant by stigma?

What is meant by style?

What is meant by ovary?

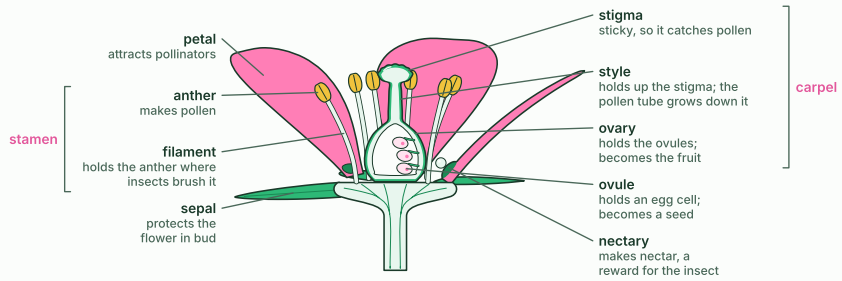
What is meant by ovules?

What is meant by hermaphrodite?

Your own notes

ANNOTATE THE FIGURE

Number the 2 steps on the figure and note what happens at each.



REMEMBER IT

The parts from the outside in: Sweet Peas Smell Clean

S Sweet	P Peas	S Smell	C Clean
S	P	S	C

SUMMARY

Sum up section 01 in two or three sentences of your own.

02 From pollen to embryo

D3.1.8

CUES

Predict: A flower is fertilized by pollen from its own anthers. Is the seed the product of sexual reproduction?

What is meant by pollination?

What is meant by pollen tube?

What is meant by fertilization?

What is meant by zygote?

What is meant by embryo?

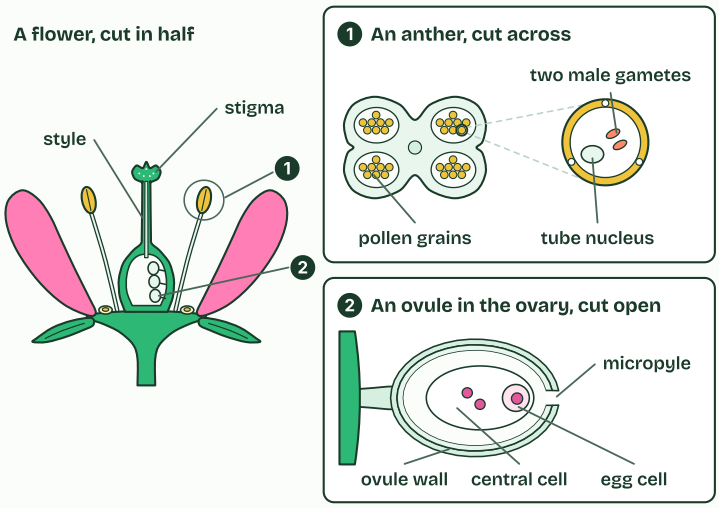
What is meant by micropyle?

NOTES

Your own notes

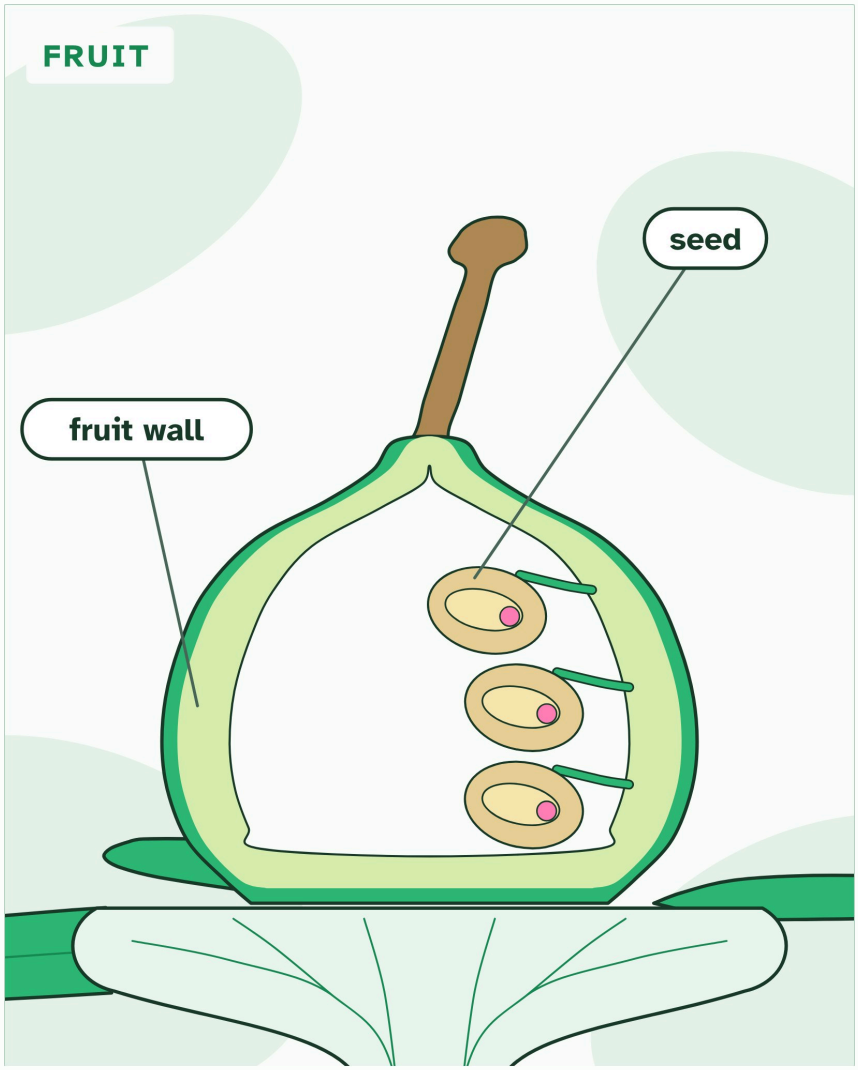
ANNOTATE THE FIGURE

Label each part and say what it does: anther, style, ovule, stigma, anther, ovule, anther, pollen grains, pollen grains, tube nucleus, two male gametes, ovule wall, central cell, egg cell, micropyle.



ANNOTATE THE FIGURE

Annotate this still from the animation (From pollen to embryo): what is happening, and why?



SUMMARY

Sum up section 02 in two or three sentences of your own.

03 Built for an insect

D3.1.9

CUES

Predict: A flower has no scent, tiny green petals and feathery stigmas hanging outside it. How is it pollinated?

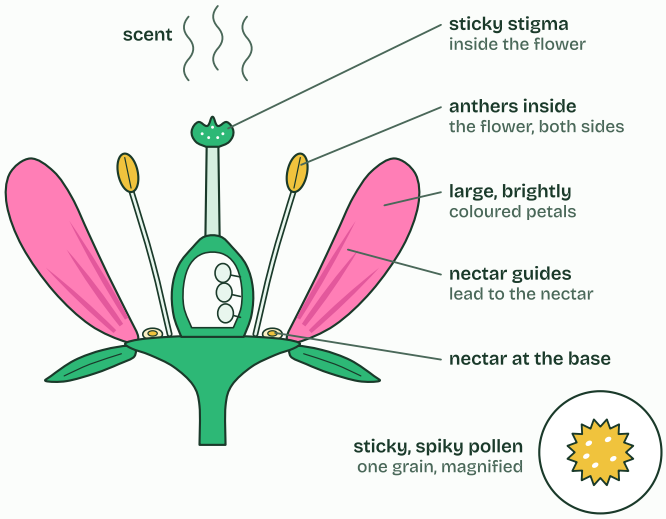
What is meant by mutualism?

NOTES

Your own notes

ANNOTATE THE FIGURE

The figure shows it as Insect pollinated and Wind pollinated. Note what changes each time.



ANNOTATE THE FIGURE

Label the key parts and add a note on what it shows.

Which kind of flower is built this way?

Insect-pollinated
built to attract and dust an insect

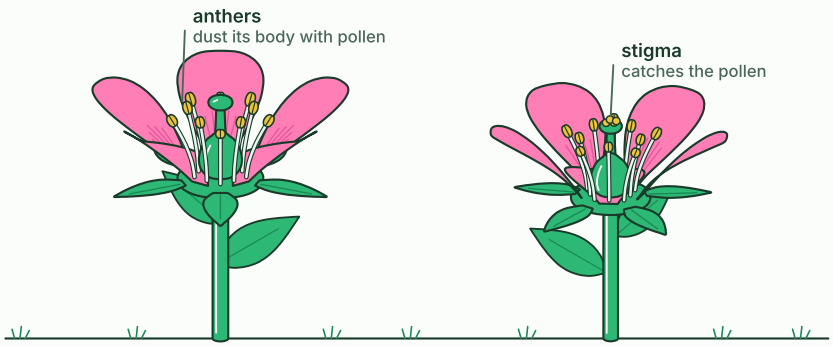
- bright petals
- sticky grains
- anthers inside
- scent, nectar
- less pollen
- sticky stigma

Wind-pollinated
built to shed and catch pollen

- feathery stigma
- no scent
- lots of pollen
- smooth grains
- anthers out
- dull petals

ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each.



SUMMARY

Sum up section 03 in two or three sentences of your own.

04 Getting pollen to another plant

D3.1.10

CUES

Predict: In one species, some plants have only male flowers and the rest only female ones. What does this guarantee?

What is meant by self-pollination?

What is meant by cross-pollination?

What is meant by flower?

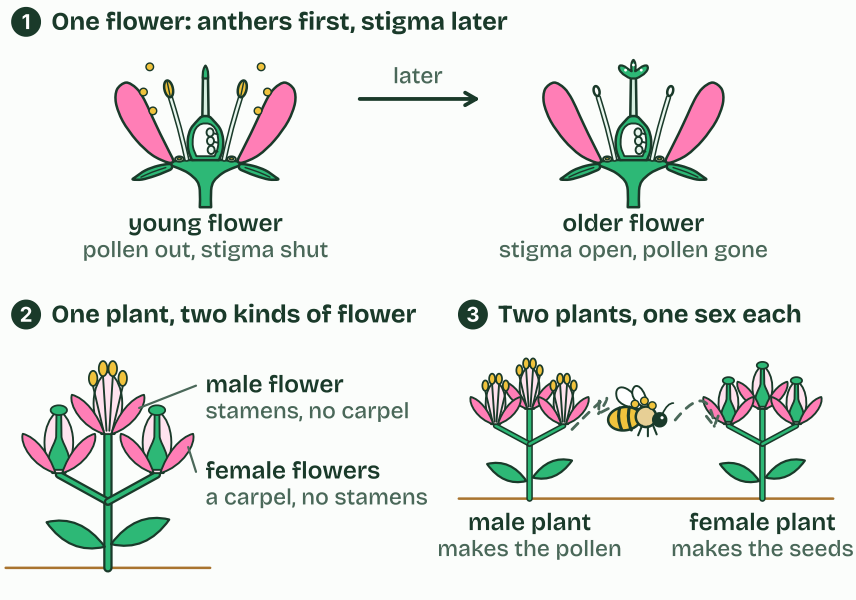
NOTES

1 _____ on one plant. Pollen has to travel at least from one flower to another, though it can still be on the same plant.

Your own notes

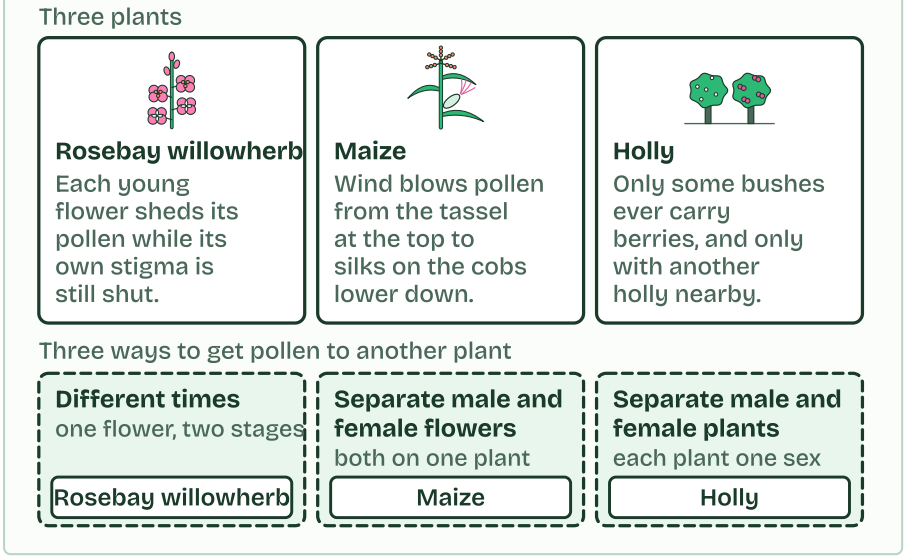
ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each: 1 Different times.; 2 Separate male and female flowers; 3 Separate male and female plants..



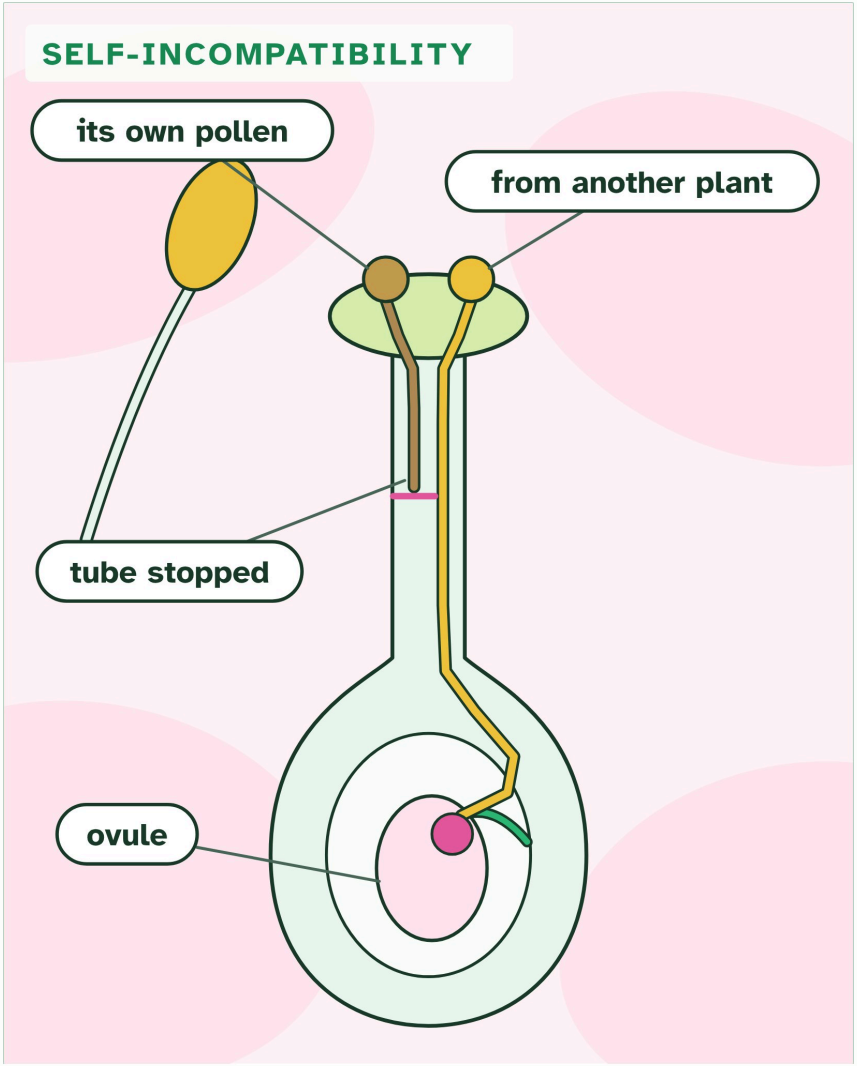
ANNOTATE THE FIGURE

Label the key parts and add a note on what it shows.



ANNOTATE THE FIGURE

Annotate this still from the animation (Keeping pollen from its own stigma): what is happening, and why?



SUMMARY

Sum up section 04 in two or three sentences of your own.

05 Refusing your own pollen

D3.1.11

CUES

Predict: Plant B, with alleles S1 and S3, sheds pollen onto the stigma of plant A, whose alleles are S1 and S2. What share of that pollen can grow a tube to an ovule?

What is meant by inbreeding?

What is meant by self-incompatibility?

What is meant by homozygous?

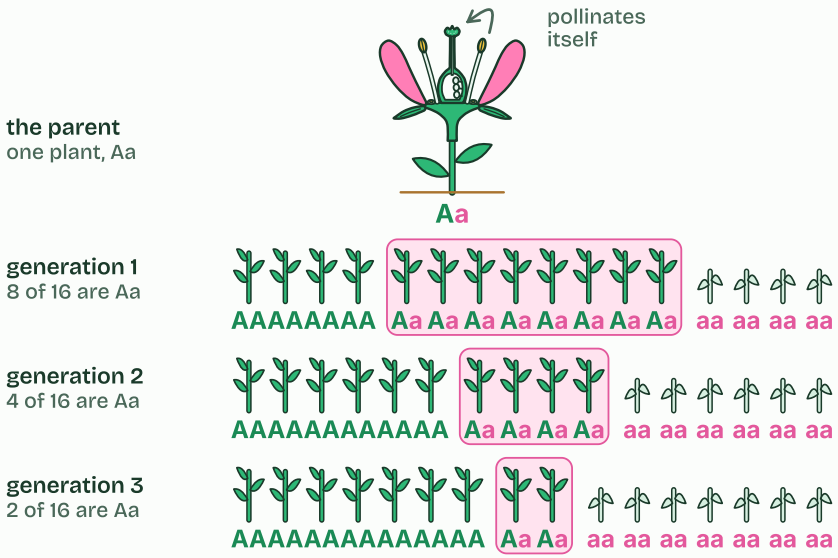
NOTES

1. A plant carries two different alleles of a gene, _____ and _____, where a is a harmful recessive allele. It pollinates itself, and we suppose every seedling grows up to do the same.
2. Its offspring: a quarter AA, a half Aa and a quarter aa. Only _____ still have two different alleles. The aa plants show the harmful allele: they are small and pale.
3. Every plant pollinates itself again. AA and aa plants pass on only one kind of allele, so only the Aa plants can make Aa offspring, and only half of theirs are Aa: _____.
4. One more generation: _____. The share with two different alleles halves every generation, from a half to a quarter to an eighth, while the weak aa plants rise from 4 to 6 to 7 of 16.

Your own notes

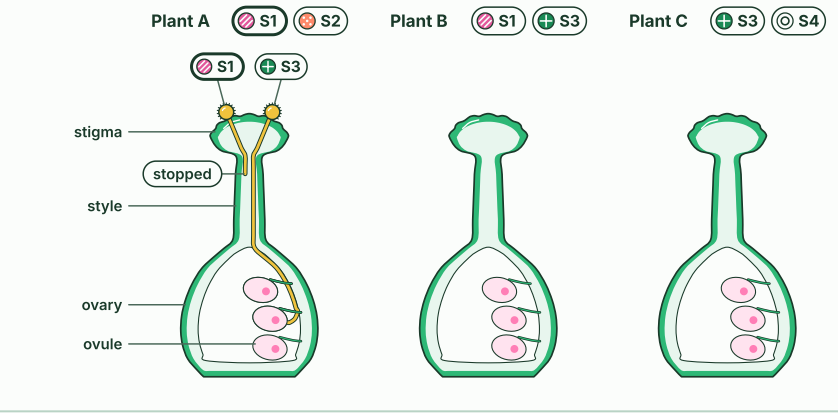
ANNOTATE THE FIGURE

Number the 4 steps on the figure and note what happens at each: 1 A, a; 2 8 of 16; 3 4 of 16; 4 2 of 16.



ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each.



SUMMARY

Sum up section 05 in two or three sentences of your own.

06 Moving the seeds

D3.1.12

CUES

Predict: Why do many plants spend energy making fruits that animals eat?

What is meant by seed dispersal?

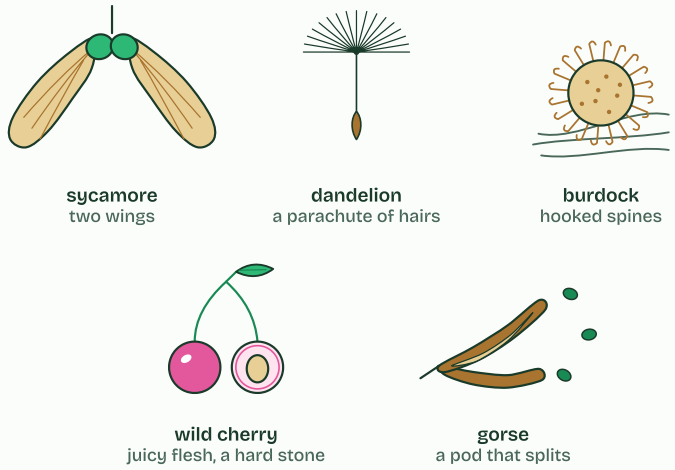
What is meant by pollination?

NOTES

Your own notes

ANNOTATE THE FIGURE

Label each part and say what it does: sycamore: wind, dandelion: wind, burdock: animals, on the outside, wild cherry: animals, on the inside, gorse: the plant itself.



sycamore
two wings

dandelion
a parachute of hairs

burdock
hooked spines

wild cherry
juicy flesh, a hard stone

gorse
a pod that splits

ANNOTATE THE FIGURE

Label the key parts and add a note on what it shows.

What is being moved: pollen or seeds?

Pollination
pollen moved to a stigma

bee | hazel catkins | moth at night | hummingbird

Seed dispersal
seeds moved from the parent

sycamore fruit | cherry stone | burdock burs | gorse pod

SUMMARY

Sum up section 06 in two or three sentences of your own.

07 A seed wakes up

D3.1.12

CUES

Predict: Seeds are kept warm and damp in a jar with almost no oxygen. What happens?

What is meant by embryo?

What is meant by testa?

What is meant by radicle?

What is meant by plumule?

What is meant by micropyle?

NOTES

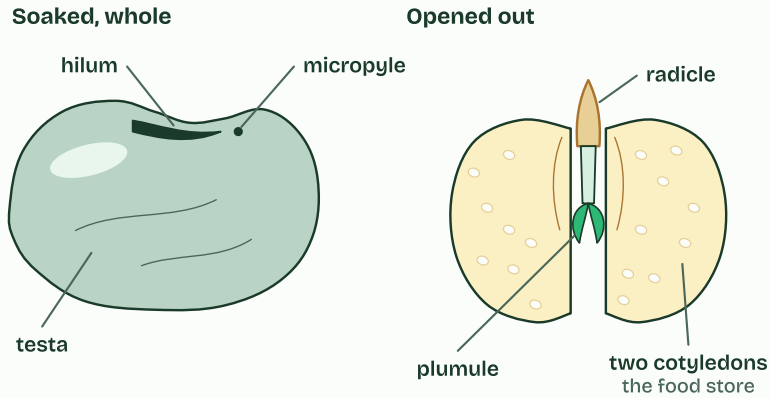
1 In the cotyledons, _____ hydrolyses starch to maltose, and _____ splits maltose into glucose. Proteins are broken down to amino acids. The radicle breaks out through the testa.

2 In a growing tip, glucose is _____ to make ATP, or _____ for new cell walls. The radicle grows longer and the plumule pushes up.

Your own notes

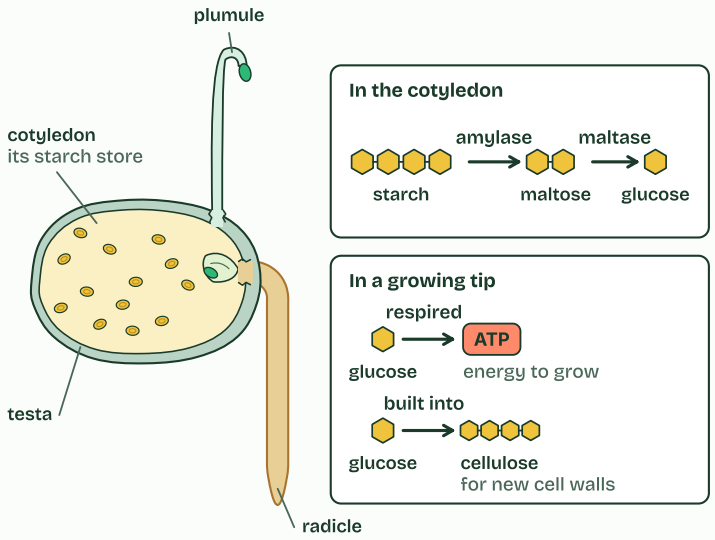
ANNOTATE THE FIGURE

Label each part and say what it does: testa, hilum, micropyle, cotyledons, radicle, plumule.



ANNOTATE THE FIGURE

Number the 4 steps on the figure and note what happens at each.



REMEMBER IT

What a seed needs: a waking seed says "Wow! Oh, wow!"

W Wow	**O** Oh	**W** Wow
W	O	W

SUMMARY

Sum up section 07 in two or three sentences of your own.

08 Copies or new combinations

D3.1.1

CUES

Predict: A new disease sweeps through two fields: one of plants all grown from cuttings of a single parent, and one of plants grown from seed. Which field is more likely to lose almost every plant, and why?

What is meant by asexual reproduction?

What is meant by clone?

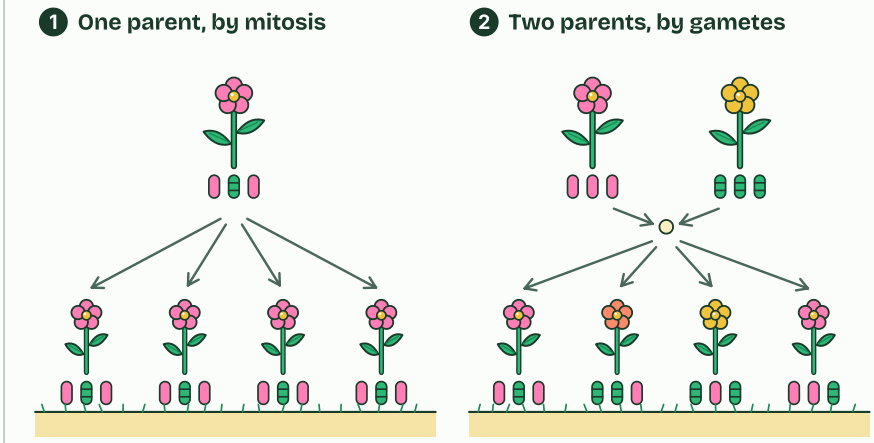
What is meant by sexual reproduction?

NOTES

Your own notes

ANNOTATE THE FIGURE

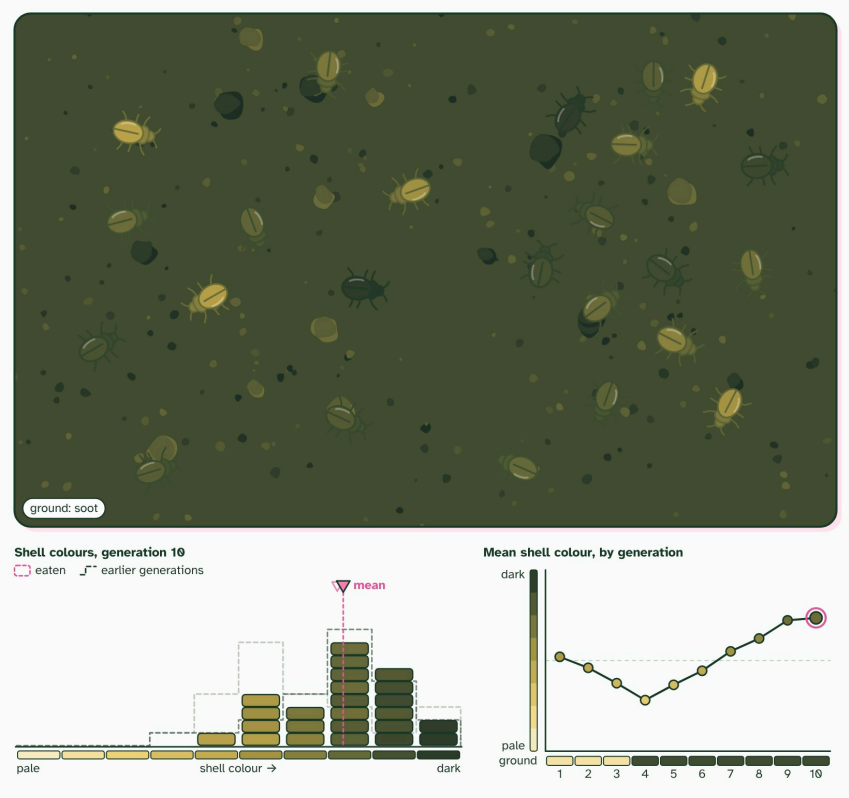
Number the 3 steps on the figure and note what happens at each.



the same field, no change: every young plant grows

ANNOTATE THE FIGURE

Annotate this still from the animation (When the environment changes): what is happening, and why?



SUMMARY

Sum up section 08 in two or three sentences of your own.

09 Halve, then fuse, round and round

D3.1.2

CUES

Predict: Two brothers have the same two parents and are not identical twins. Why are they not copies of each other?

What is meant by meiosis?

What is meant by haploid?

What is meant by diploid?

NOTES

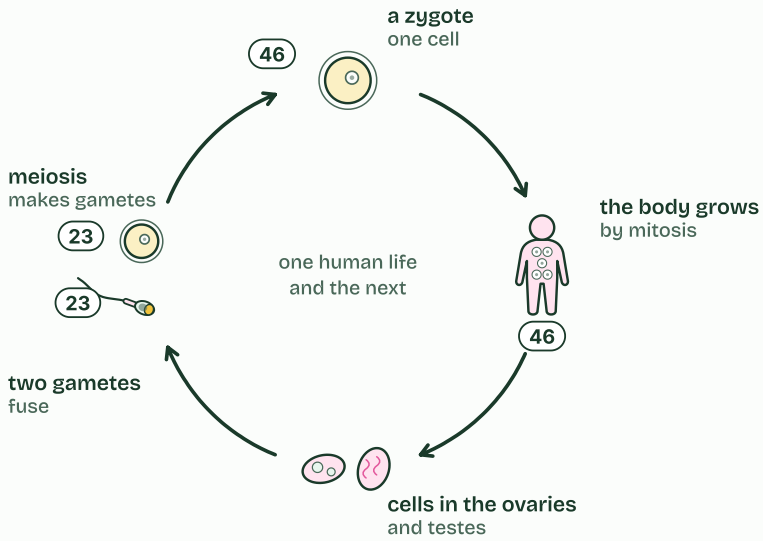
1 The body grows by mitosis: every cell keeps all _____ chromosomes.

2 They divide by meiosis: each gamete has _____, one of each pair.

Your own notes

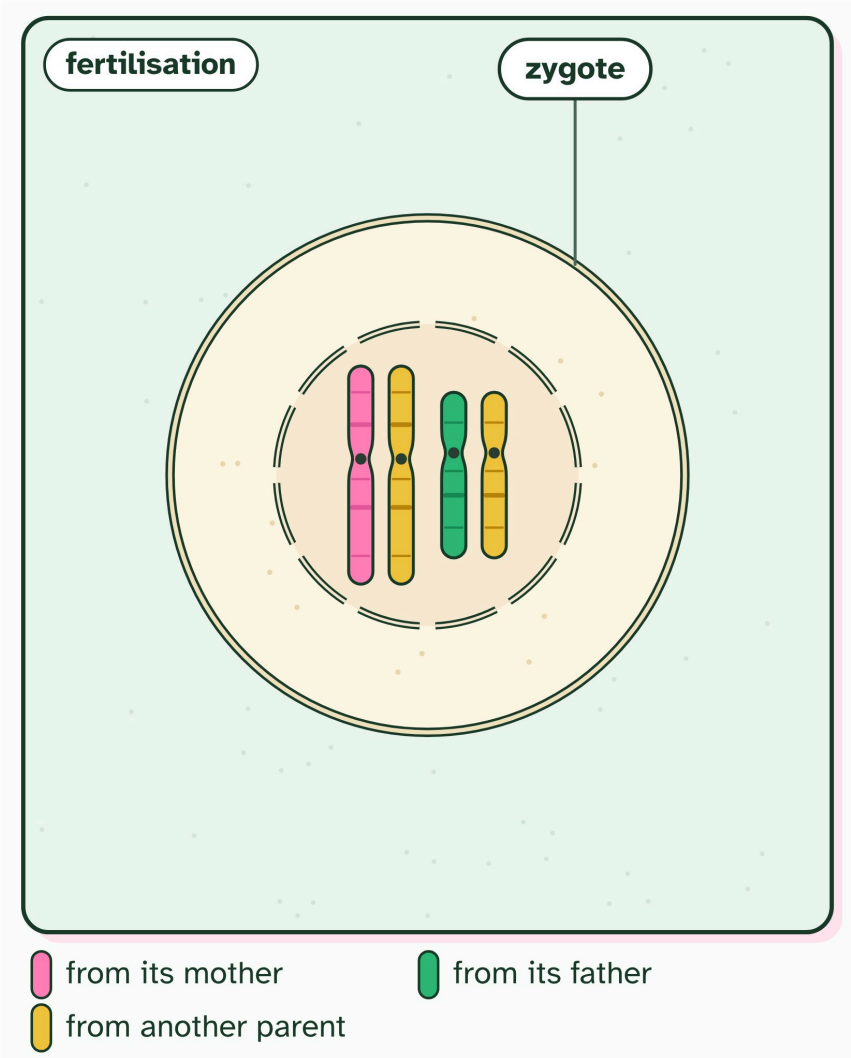
ANNOTATE THE FIGURE

Number the 5 steps on the figure and note what happens at each.



ANNOTATE THE FIGURE

Annotate this still from the animation (Halving, then fusing, again): what is happening, and why?



SUMMARY

Sum up section 09 in two or three sentences of your own.

10 One travels, one waits

D3.1.3

CUES

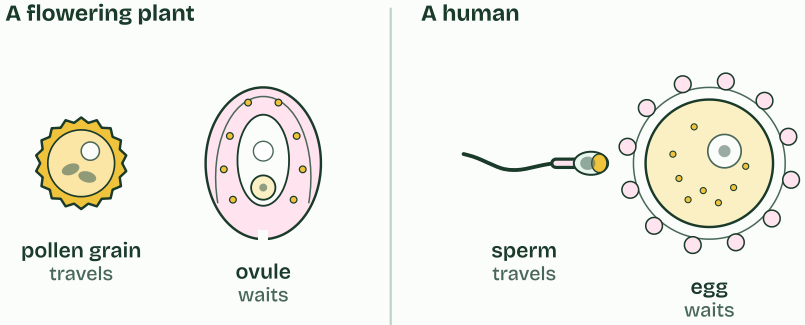
Predict: A gamete has to swim a long way to reach its partner. What does being small let the parent do, and what does it cost the gamete?

NOTES

Your own notes

ANNOTATE THE FIGURE

Label each part and say what it does: pollen grain, ovule, sperm, egg.



SUMMARY

Sum up section 10 in two or three sentences of your own.

11 The male-typical system

D3.1.4

CUES

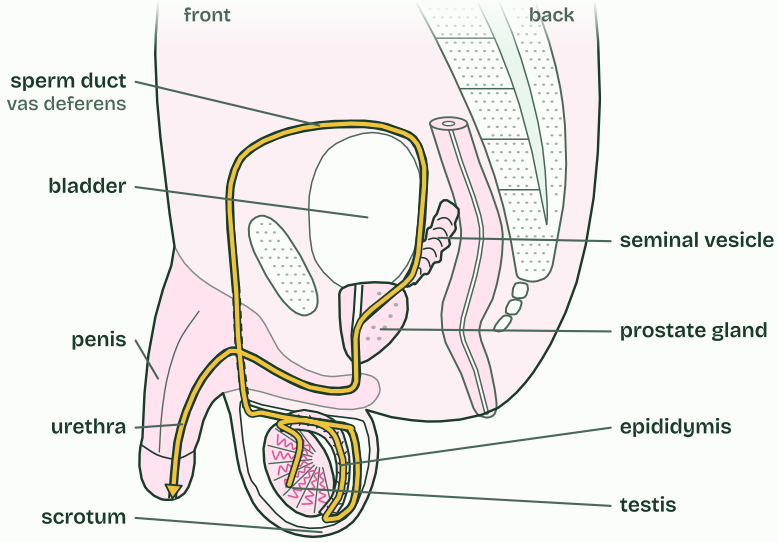
Predict: The testes hang in a bag outside the body, where it is a little cooler than inside. What does that suggest about making sperm?

NOTES

Your own notes

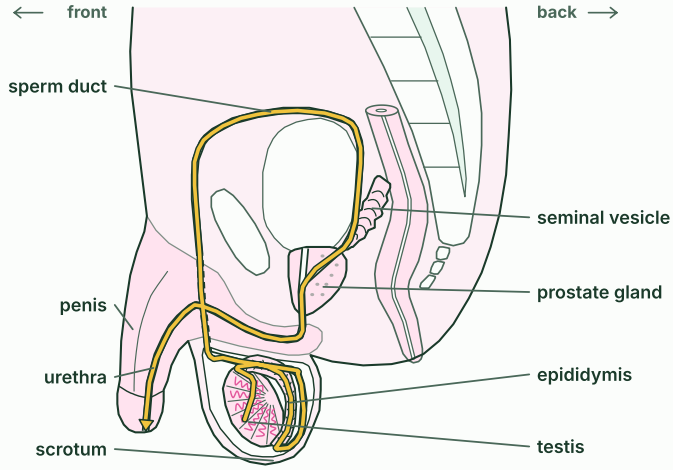
ANNOTATE THE FIGURE

Number the 5 steps on the figure and note what happens at each.



ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each.



SUMMARY

Sum up section 11 in two or three sentences of your own.

12 The female-typical system

D3.1.4

CUES

Predict: An egg lives for only about a day after ovulation. In which part of the female system is it most likely to meet a sperm, and why there?

What is meant by ovary?

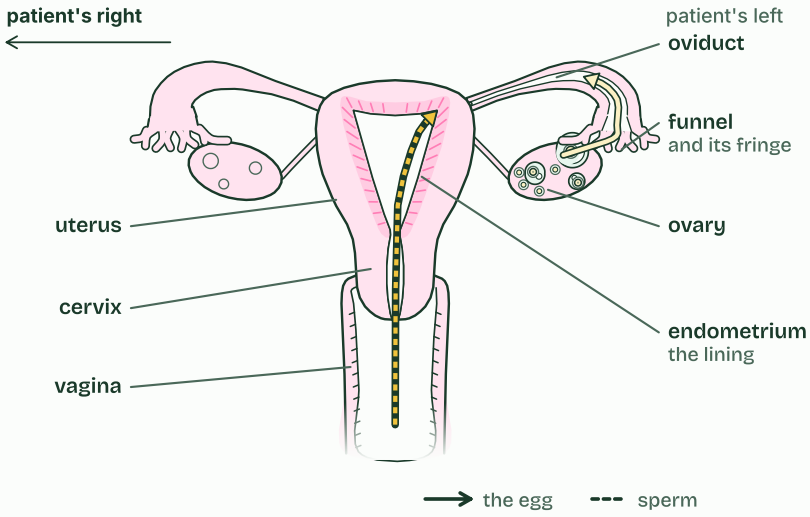
What is meant by endometrium?

NOTES

Your own notes

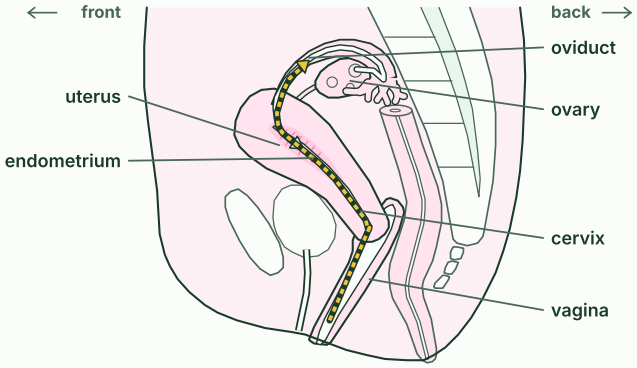
ANNOTATE THE FIGURE

Number the 5 steps on the figure and note what happens at each.



ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each.



SUMMARY

Sum up section 12 in two or three sentences of your own.

13 A month in the ovary and the uterus

D3.1.5

CUES

Predict: After ovulation the empty follicle does not just disappear. What does it become, and what would you expect it to do?

What is meant by ovulation?

What is meant by corpus luteum?

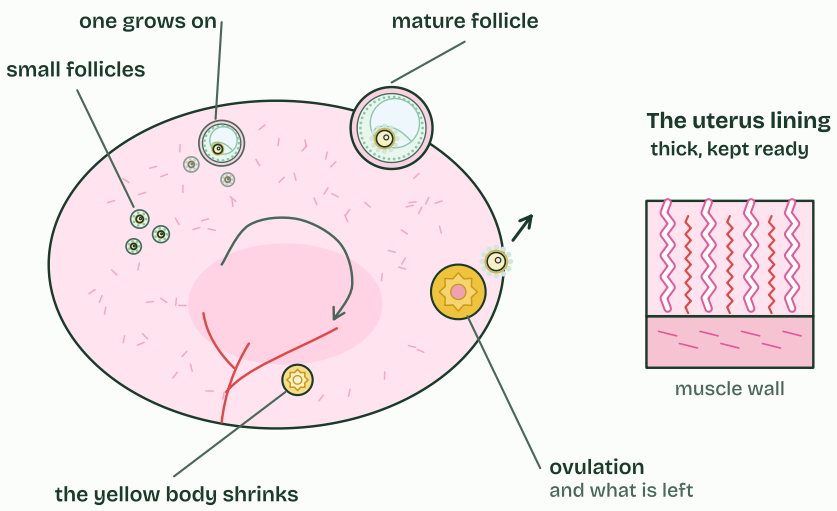
What is meant by menstruation?

NOTES

Your own notes

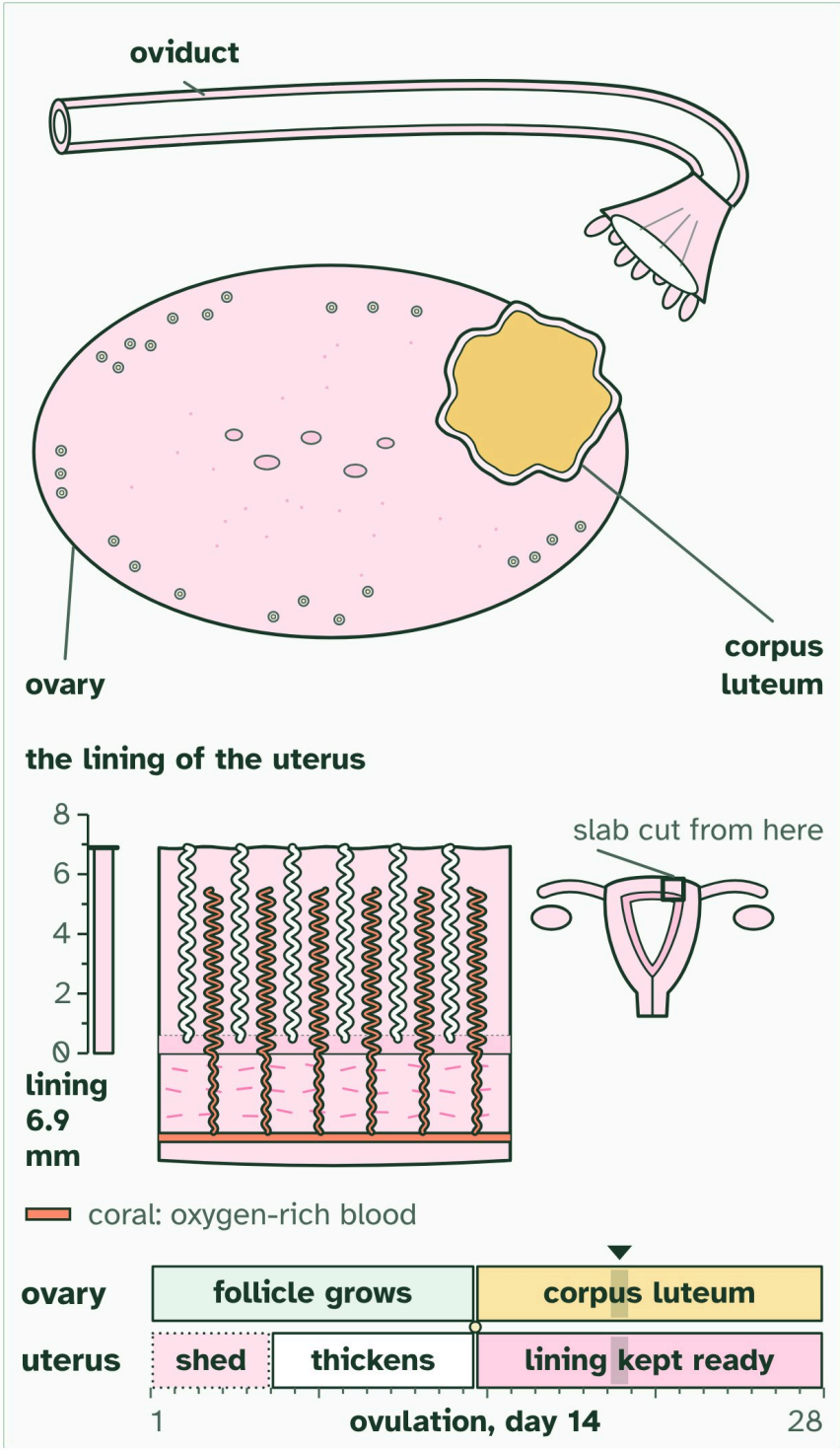
ANNOTATE THE FIGURE

Number the 5 steps on the figure and note what happens at each.



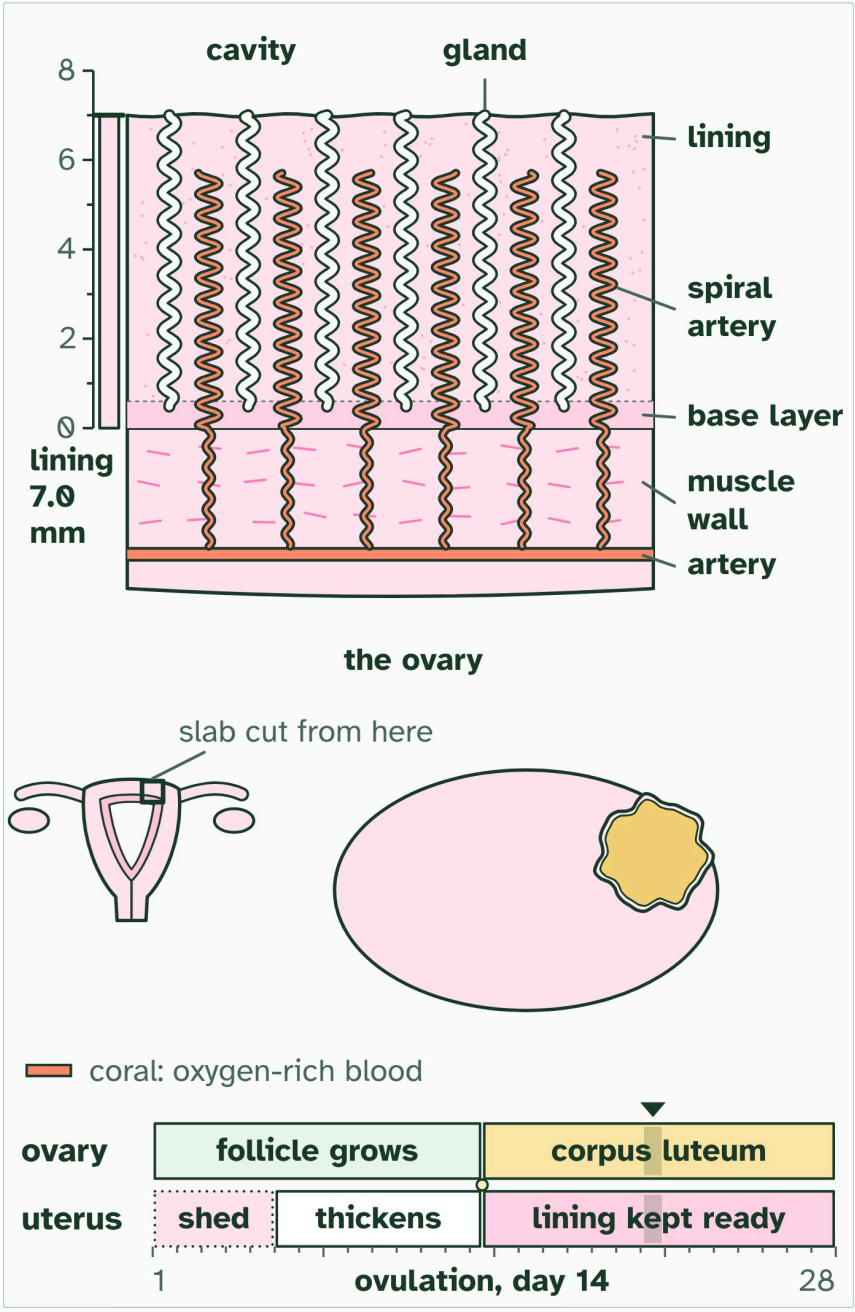
ANNOTATE THE FIGURE

Annotate this still from the animation (A month in the ovary): what is happening, and why?



ANNOTATE THE FIGURE

Annotate this still from the animation (A month in the uterus): what is happening, and why?



SUMMARY

Sum up section 13 in two or three sentences of your own.

14 Four hormones, two kinds of feedback

D3.1.5

CUES

Predict: Oestradiol from the growing follicle rises through the first half of the cycle, while FSH falls over the same days. What does that suggest oestradiol does to the pituitary at these levels?

What is meant by negative feedback?

What is meant by positive feedback?

NOTES

1 Rising oestradiol _____ FSH release by the pituitary: negative feedback.

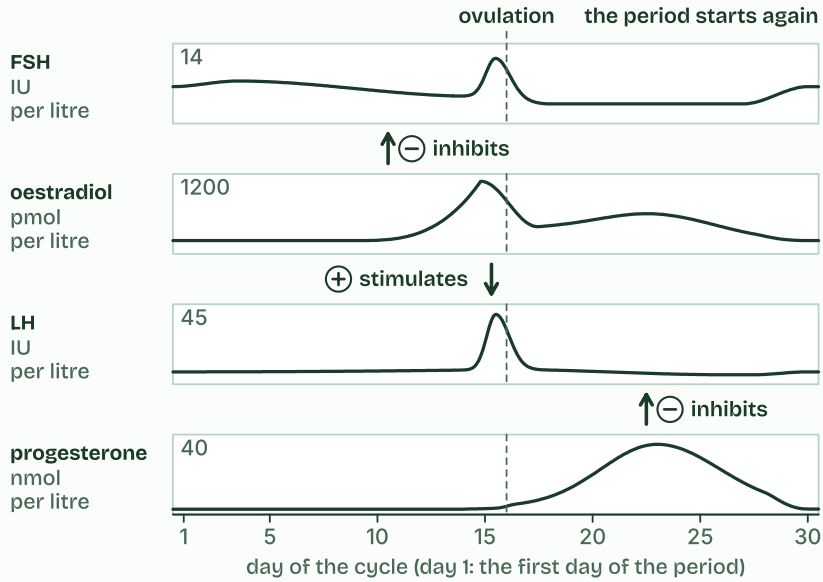
2 High oestradiol now _____ a surge of LH: positive feedback. The surge triggers ovulation.

3 The corpus luteum secretes progesterone. With oestradiol, it _____ FSH and LH: negative feedback again.

Your own notes

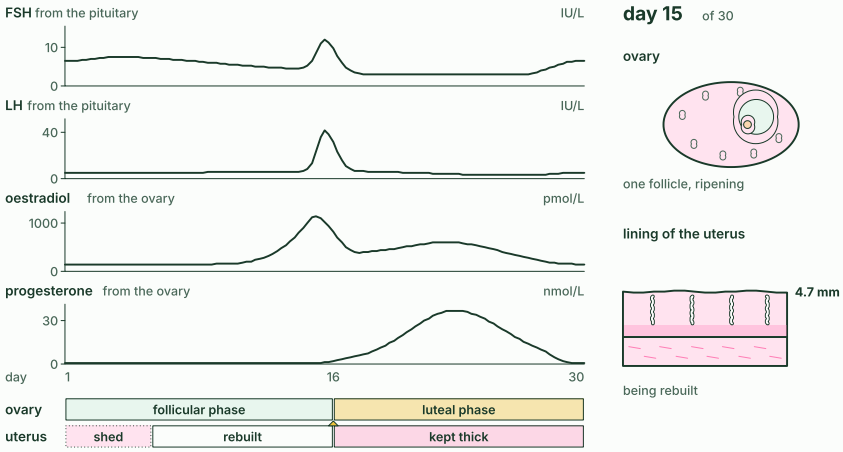
ANNOTATE THE FIGURE

Number the 5 steps on the figure and note what happens at each.



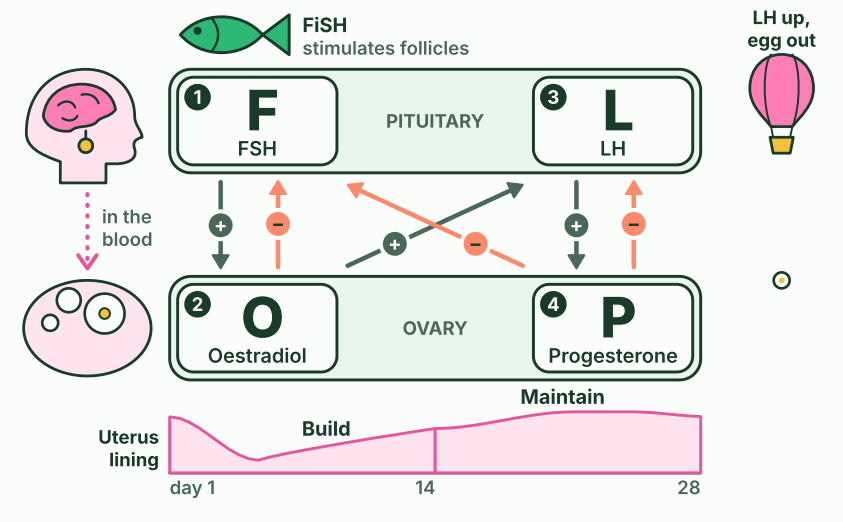
ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each.



ANNOTATE THE FIGURE

Number the 4 steps on the figure and note what happens at each.



SUMMARY

Sum up section 14 in two or three sentences of your own.

15 The first hours of a new cell

D3.1.6

CUES

Predict: After the sperm's nucleus has entered the egg, its tail and mitochondria are broken down. What does that mean for the mitochondria in the cells of the new embryo?

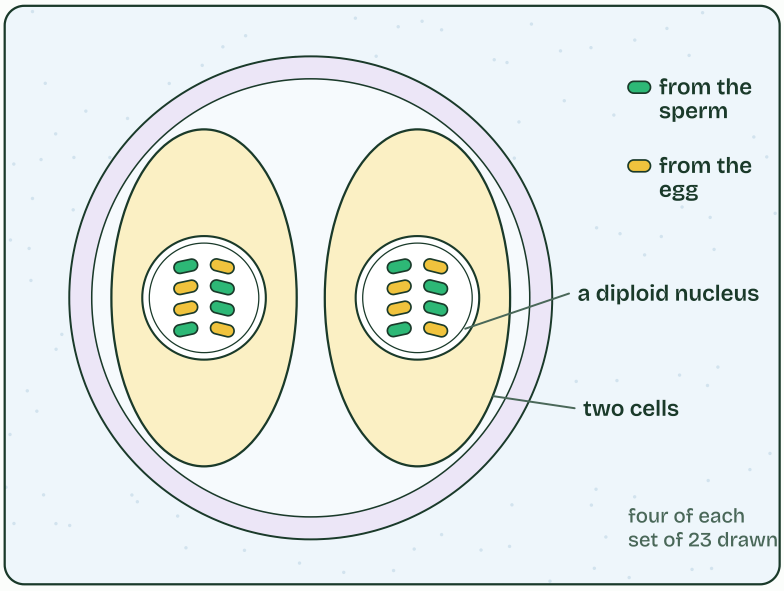
What is meant by zygote?

NOTES

Your own notes

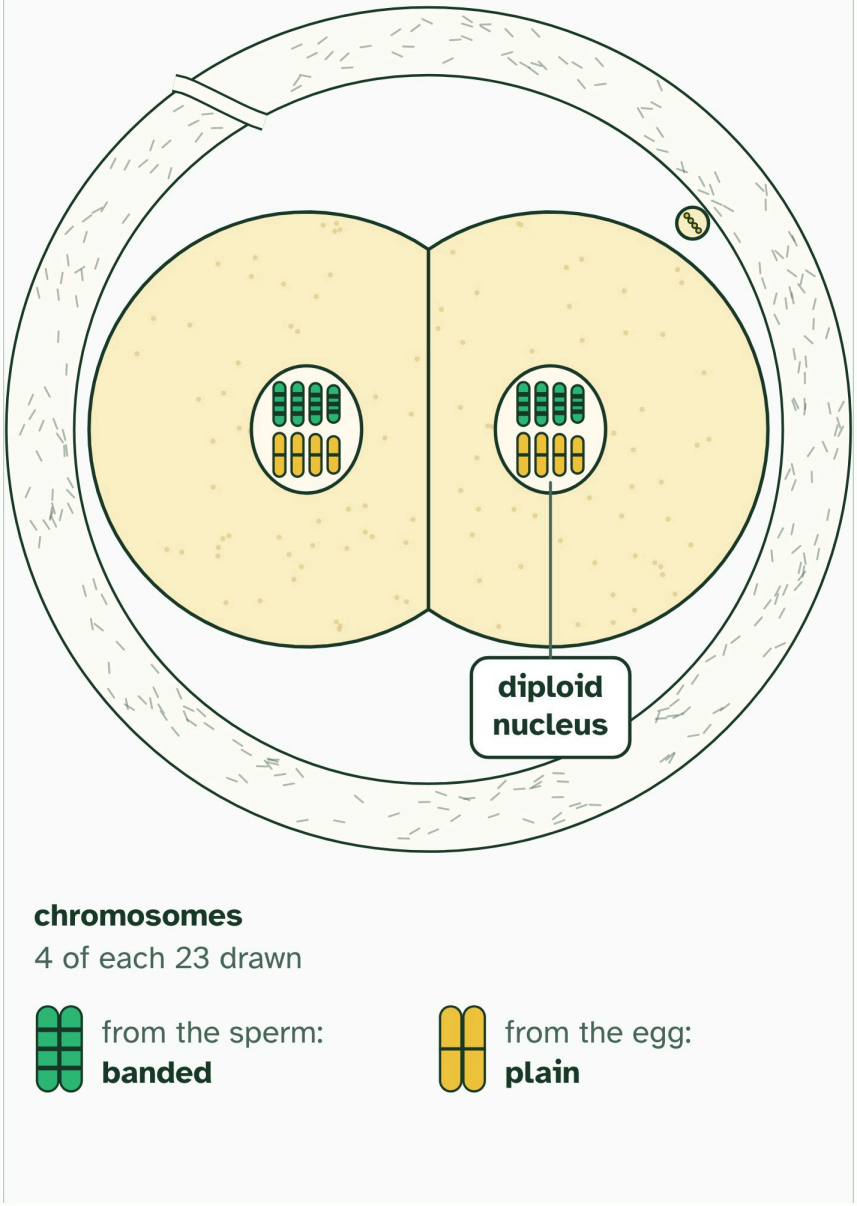
ANNOTATE THE FIGURE

Number the 5 steps on the figure and note what happens at each.



ANNOTATE THE FIGURE

Annotate this still from the animation (The first hours of a new cell): what is happening, and why?



SUMMARY

Sum up section 15 in two or three sentences of your own.

16 Switching the cycle off and on again

D3.1.7

CUES

Predict: Before the FSH injections start, a woman's own FSH and LH release is stopped with a drug. Why do that first?

What is meant by IVF?

What is meant by superovulation?

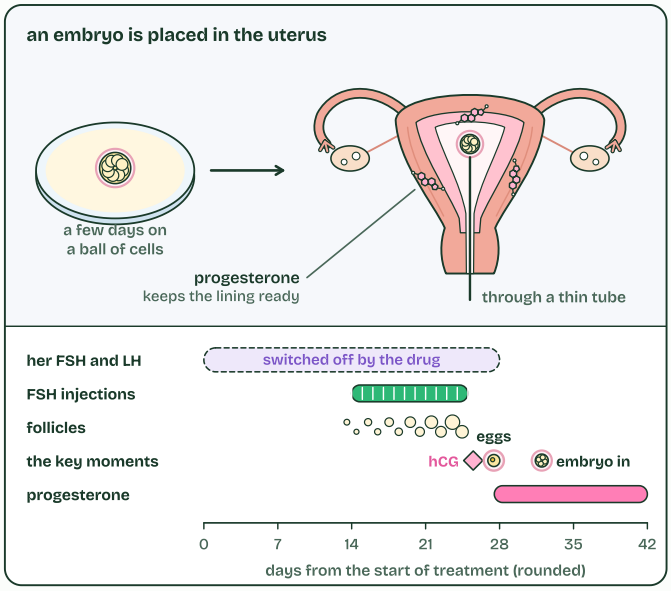
What is meant by hCG?

NOTES

Your own notes

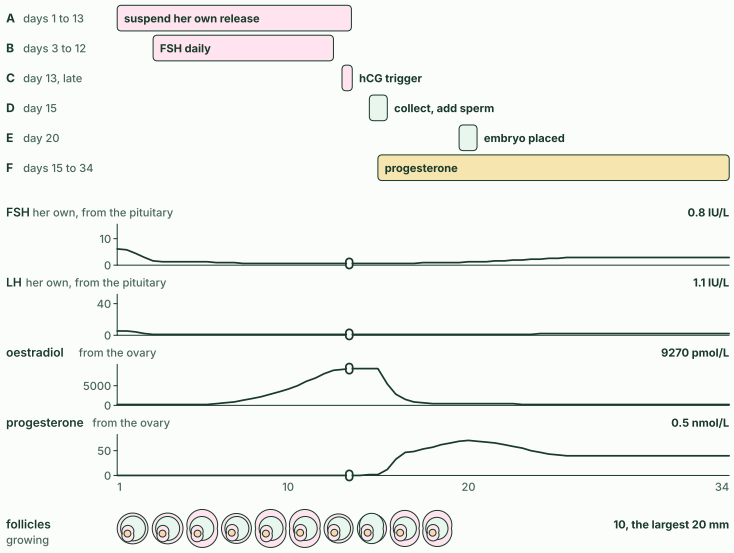
ANNOTATE THE FIGURE

Number the 5 steps on the figure and note what happens at each.



ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each.



SUMMARY

Sum up section 16 in two or three sentences of your own.

17 The signal that starts puberty

D3.1.13 HL

CUES

Predict: In a child, the hypothalamus starts to release more GnRH. What do you expect to happen next to the blood levels of LH and FSH, and then to the gonads?

What is meant by hypothalamus?

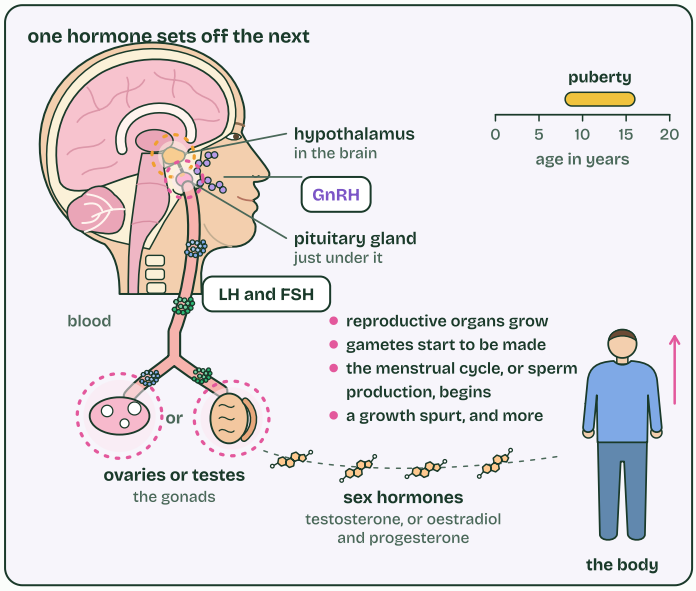
What is meant by gnRH?

NOTES

Your own notes

ANNOTATE THE FIGURE

Number the 4 steps on the figure and note what happens at each.



SUMMARY

Sum up section 17 in two or three sentences of your own.

18 One cell in, four or one out

D3.1.14 HL

CUES

Predict: One cell in the testis and one cell in the ovary each go through meiosis. How many cells that can become functional gametes does each make?

What is meant by spermatogenesis?

What is meant by oogenesis?

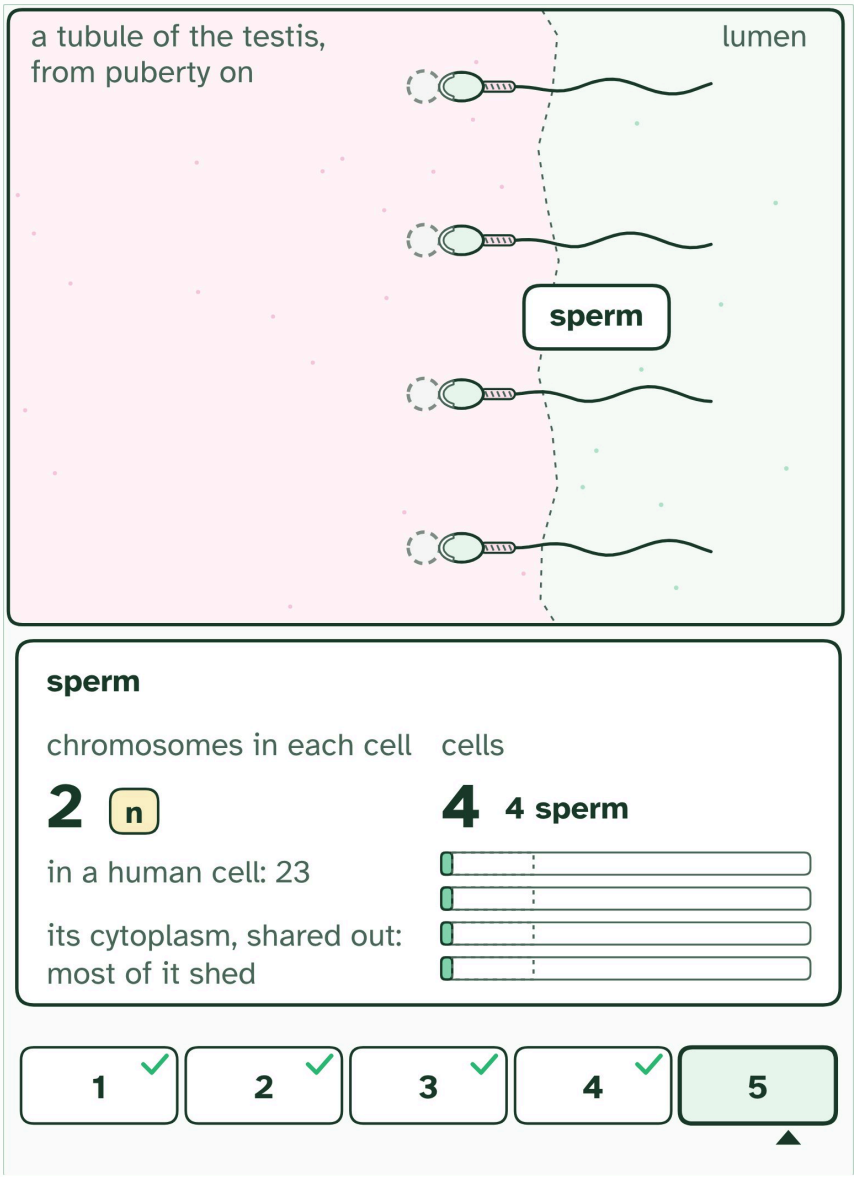
What is meant by polar bodies?

NOTES

Your own notes

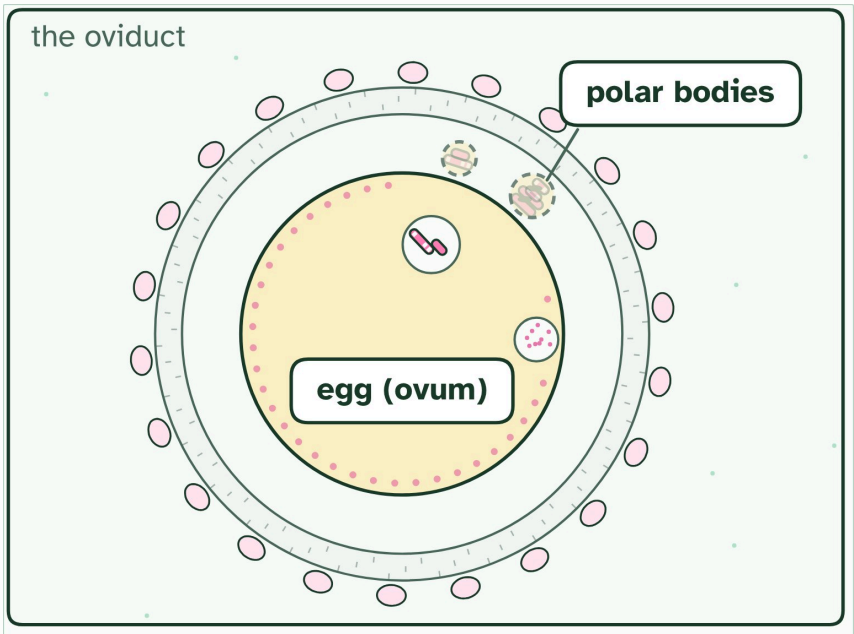
ANNOTATE THE FIGURE

Annotate this still from the animation (Making sperm): what is happening, and why?



ANNOTATE THE FIGURE

Annotate this still from the animation (Making an egg): what is happening, and why?



egg (ovum), polar bodies

chromosomes in each cell	cells
2 n	**3** 1 egg
in a human cell: 23	
its cytoplasm, shared out: almost all in one cell	

1 ✓ 2 ✓ 3 ✓ 4 ✓ **5**

SUMMARY

Sum up section 18 in two or three sentences of your own.

19 One sperm and no more

D3.1.15 HL

CUES

Predict: The first sperm has fused with the egg. What stops a second sperm from getting in?

What is meant by polyspermy?

What is meant by acrosome reaction?

What is meant by zona pellucida?

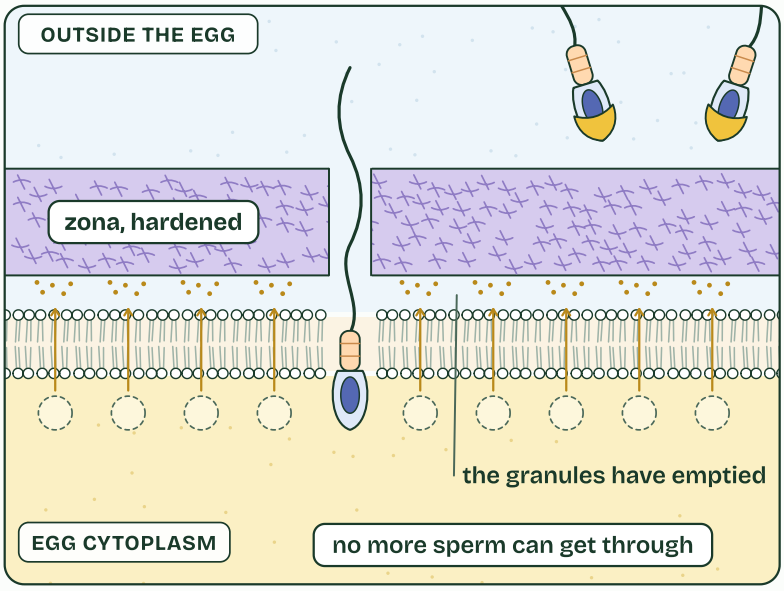
What is meant by cortical reaction?

NOTES

Your own notes

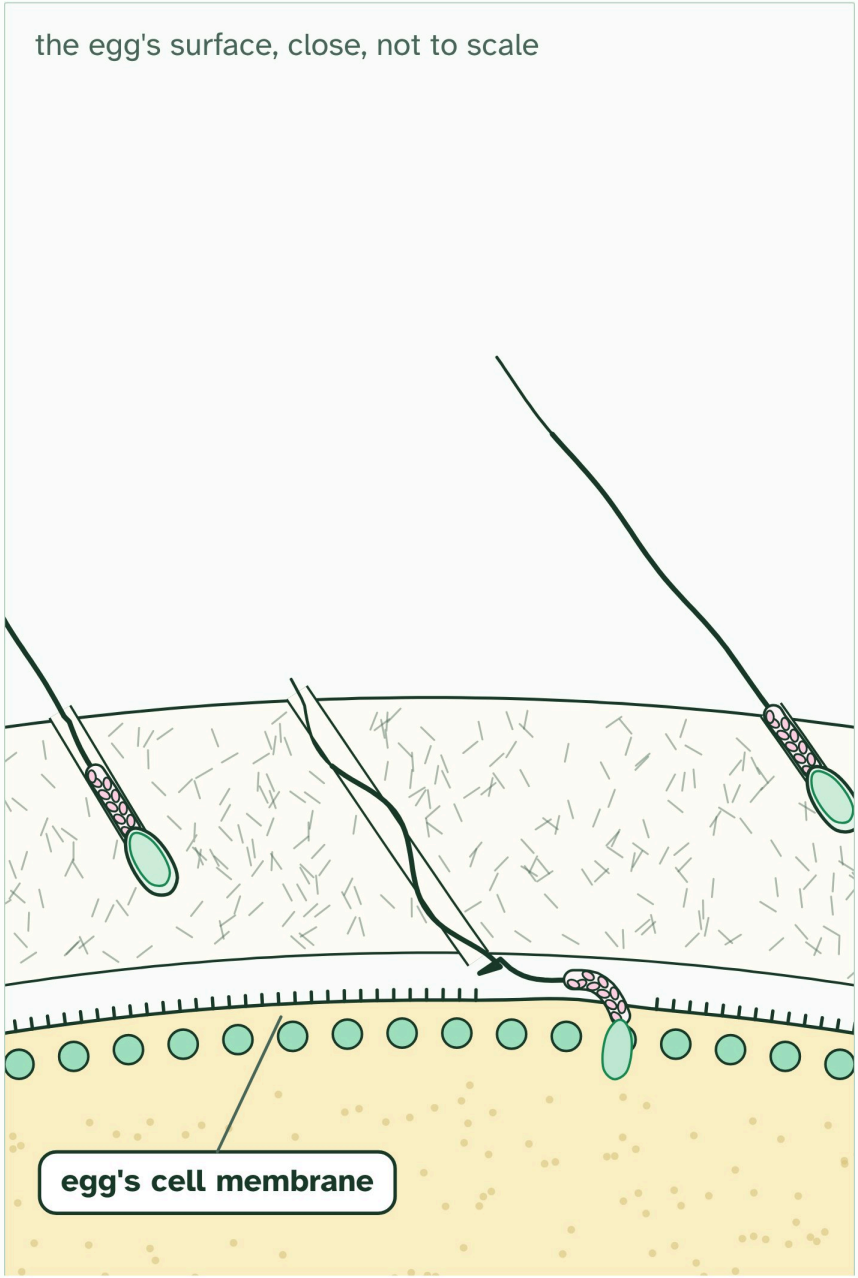
ANNOTATE THE FIGURE

Number the 4 steps on the figure and note what happens at each.



ANNOTATE THE FIGURE

Annotate this still from the animation (One sperm and no more): what is happening, and why?



SUMMARY

Sum up section 19 in two or three sentences of your own.

20 A ball of cells finds a home

D3.1.16 HL

CUES

Predict: A blastocyst, about five days after fertilization, is in the uterus. Why must the lining be thick and rich in blood vessels at just that time?

What is meant by blastocyst?

What is meant by endometrium?

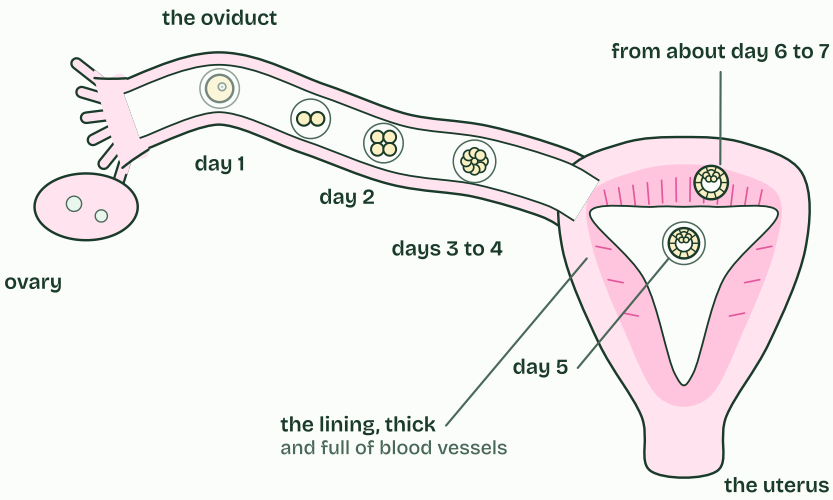
What is meant by implantation?

NOTES

Your own notes

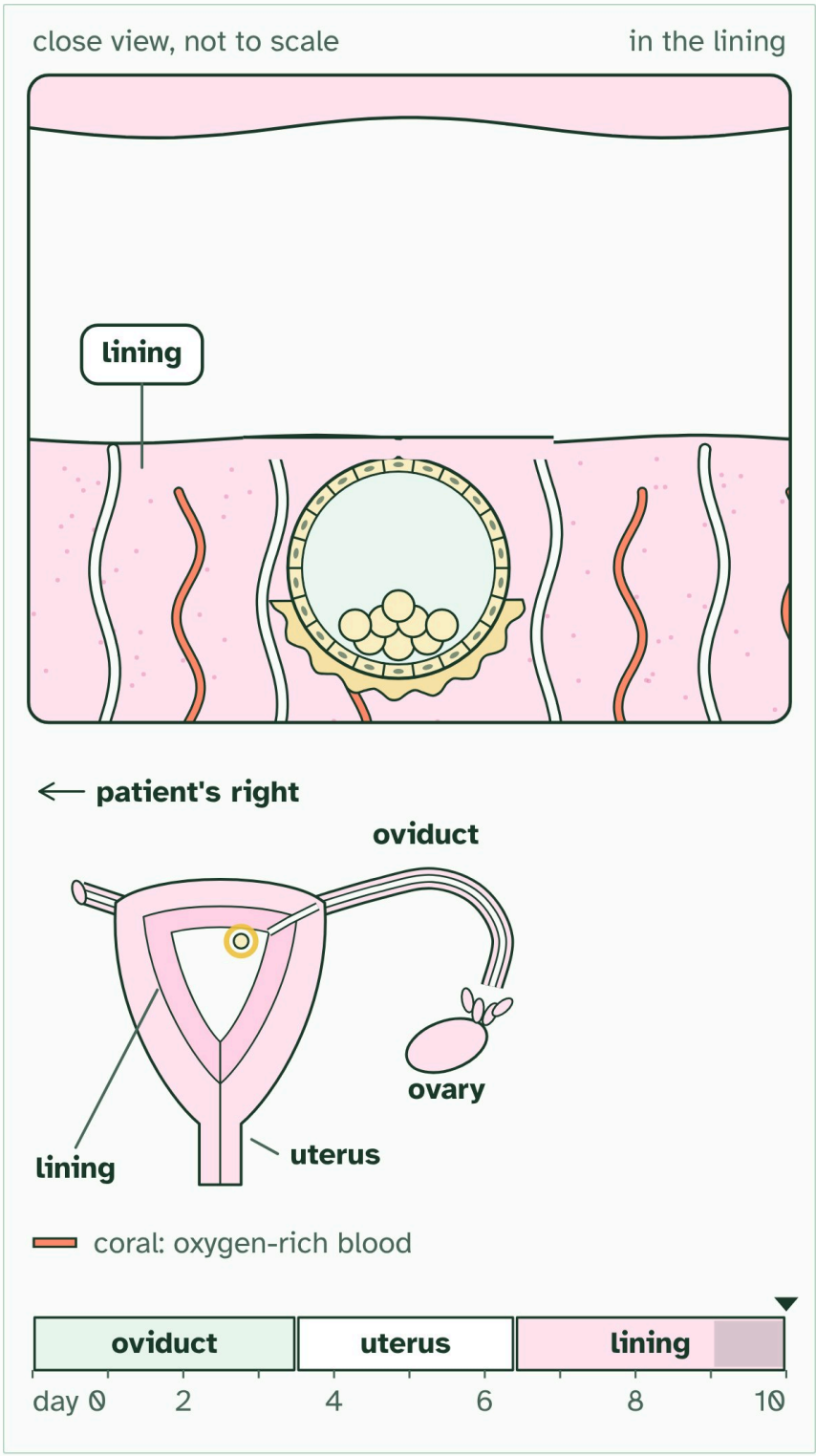
ANNOTATE THE FIGURE

Number the 5 steps on the figure and note what happens at each.



ANNOTATE THE FIGURE

Annotate this still from the animation (From the oviduct to the lining): what is happening, and why?



SUMMARY

Sum up section 20 in two or three sentences of your own.

21 A hormone that gives it away

D3.1.17 HL

CUES

Predict: A test strip uses two different antibodies to hCG: one coloured and free to move, one fixed in a zone. Why not use just one, fixed in place?

What is meant by hCG?

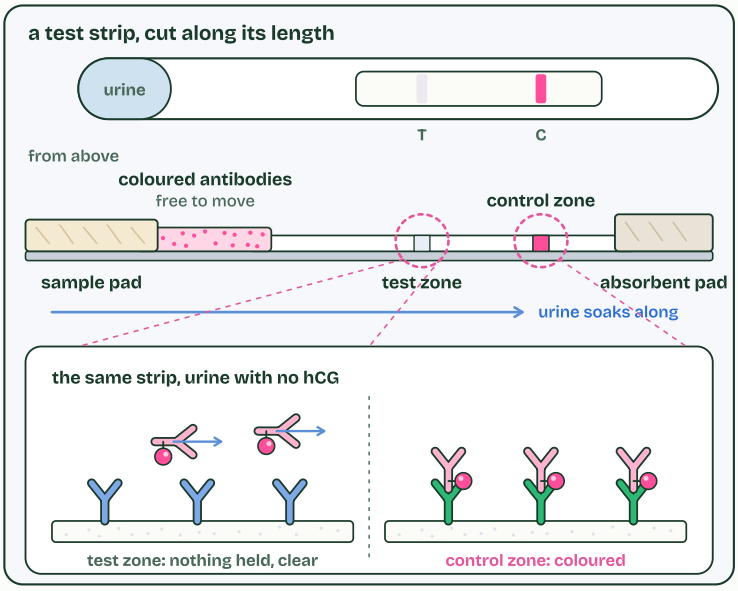
What is meant by monoclonal antibodies?

NOTES

Your own notes

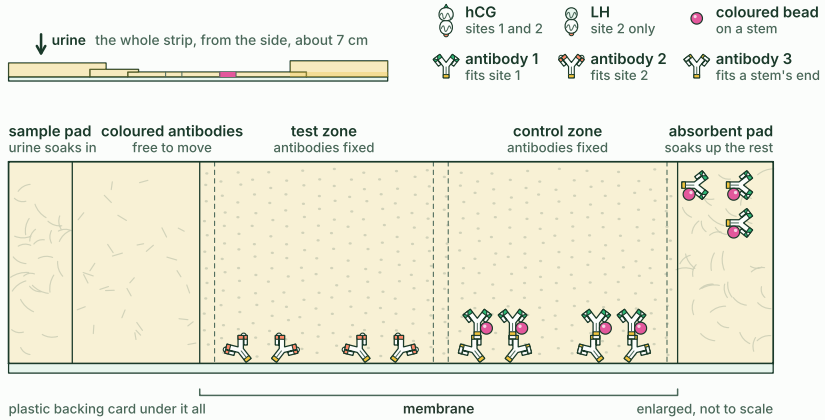
ANNOTATE THE FIGURE

Number the 5 steps on the figure and note what happens at each.



ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each.



SUMMARY

Sum up section 21 in two or three sentences of your own.

22 The organ between two bloodstreams

D3.1.18 HL

CUES

Predict: The mother's blood and the foetus's blood never mix. How, then, does oxygen get from her to the foetus?

What is meant by placenta?

What is meant by villi?

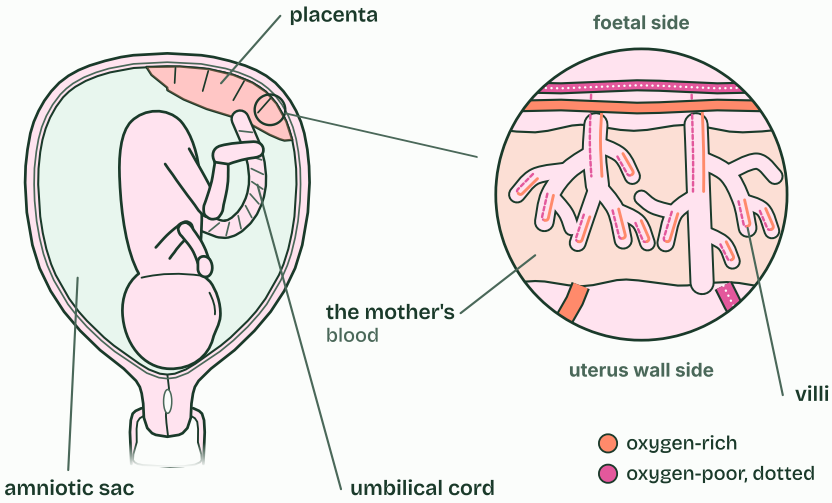
NOTES

1 The _____: foetal _____ in a _____ filled by the _____ and drained by her _____. The foetus's blood flows in a _____ loop in each villus, to and from the _____.

Your own notes

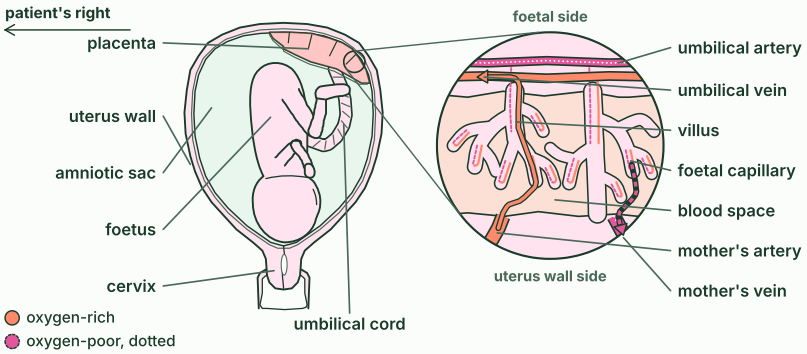
ANNOTATE THE FIGURE

Label each part and say what it does: uterus wall, placenta, umbilical cord, foetus and amniotic sac, the mother's blood, villi, the foetus's blood.



ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each.



SUMMARY

Sum up section 22 in two or three sentences of your own.

23 Keeping a pregnancy going

D3.1.19 HL

CUES

Predict: In a normal cycle the corpus luteum shrinks after about two weeks. In early pregnancy it does not. Which hormone from the embryo do you think prevents that?

What is meant by hCG?

What is meant by corpus luteum?

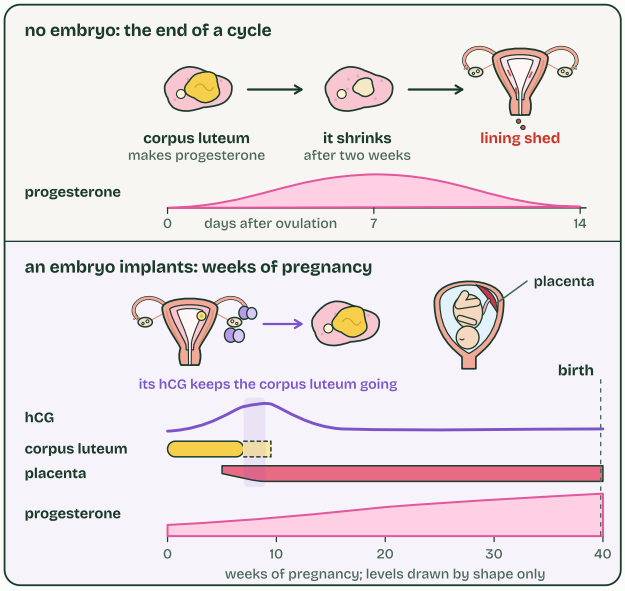
What is meant by placenta?

NOTES

Your own notes

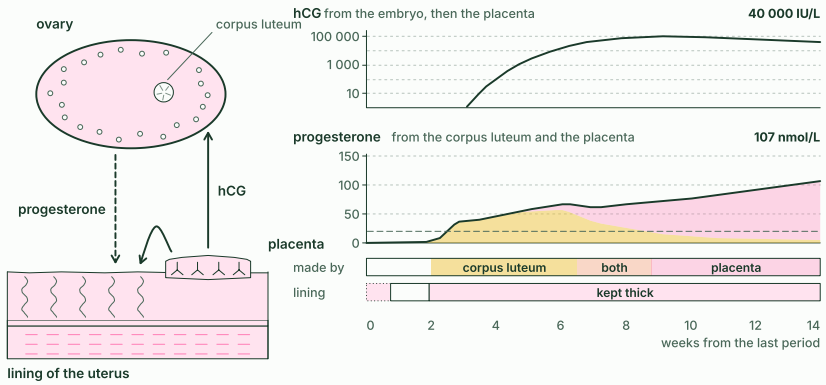
ANNOTATE THE FIGURE

Number the 4 steps on the figure and note what happens at each.



ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each: 1 corpus luteum; 2 hCG, progesterone; 3 placenta.



SUMMARY

Sum up section 23 in two or three sentences of your own.

24 Positive feedback brings the baby

D3.1.19 HL

CUES

Predict: A woman's cervix is stretched a little by the baby's head, and her progesterone has fallen. What happens next?

What is meant by oxytocin?

What is meant by positive feedback?

What is meant by negative feedback?

NOTES

1 Late in pregnancy _____ holds the uterus's muscle quiet.

Predict: what lets the contractions start, and what keeps them growing?

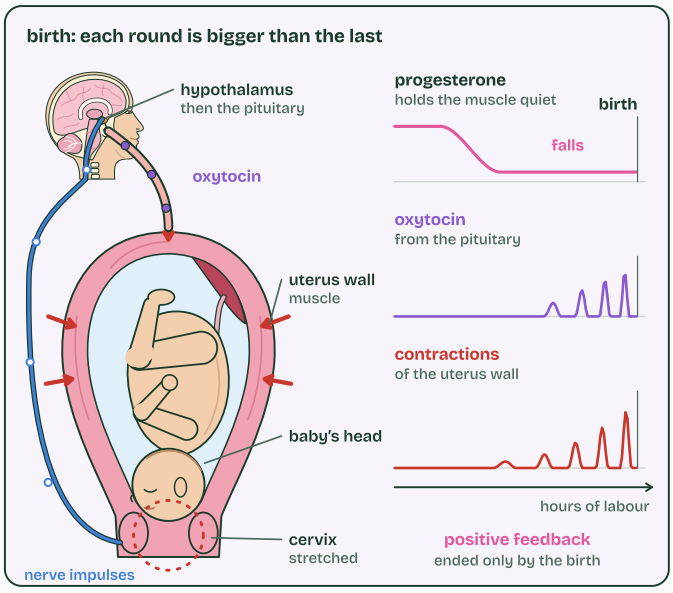
2 Progesterone's hold falls. A contraction pushes the baby's head onto the _____; the stretch sends nerve signals to the brain and the pituitary releases _____, which makes the next contraction stronger.

3 _____: each contraction calls for more oxytocin, which makes a stronger contraction, until the cervix is fully open and the baby is born. Then the stretch ends and the loop stops.

Your own notes

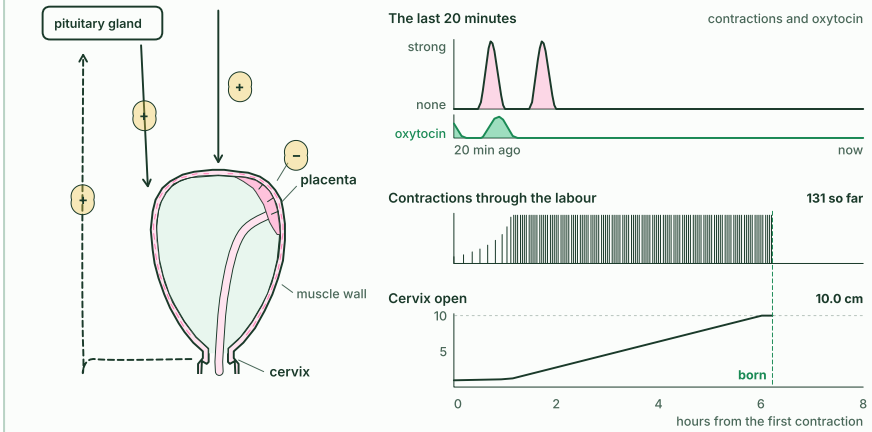
ANNOTATE THE FIGURE

Number the 5 steps on the figure and note what happens at each.



ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each: 1 progesterone; 2 cervix, oxytocin; 3 Positive feedback.



SUMMARY

Sum up section 24 in two or three sentences of your own.

25 Does it prove it? HRT and the heart

D3.1.20 HL

CUES

Predict: In an early study, women who took HRT had fewer heart attacks than women who did not. Which new study would best show whether HRT caused this?

What is meant by HRT?

What is meant by randomized controlled trials?

What is meant by confounding variable?

NOTES

1 _____ (invented data): 2000 women past the menopause, each figure 25 of them, followed for 10 years; filled figures had coronary heart disease. The HRT group had less CHD: risk ratio 0.77. Does HRT protect the heart?

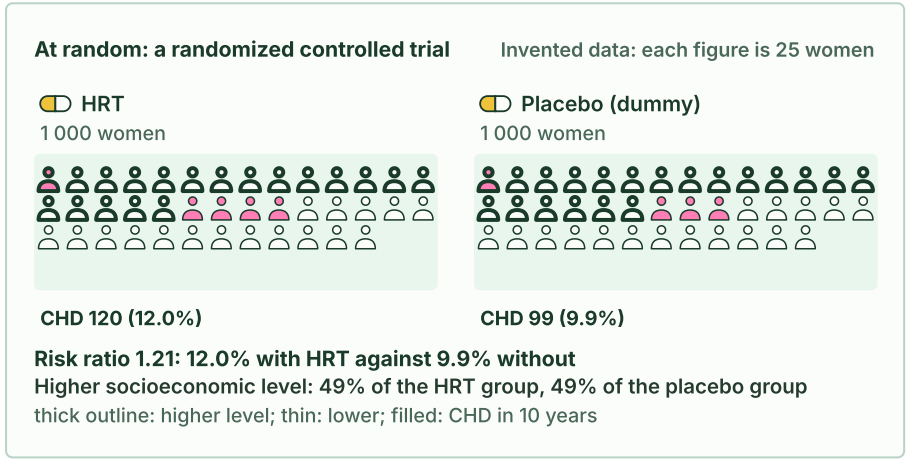
2 The _____: thick outlines are women of a higher socioeconomic level, who were likelier to choose HRT and have a lower risk of CHD anyway. It is a _____: the groups differed before anyone took a tablet.

3 _____: a randomized controlled trial, half on HRT and half on a placebo. Chance shares the levels out evenly, so the tablets are the only planned difference, and HRT shows a small increase: risk ratio 1.21, the small harm this invented model gives it.

Your own notes

ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each: 1 They choose; 2 hidden factor, confounding variable; 3 At random.



SUMMARY

Sum up section 25 in two or three sentences of your own.

Check yourself

The check for this guide is online: a fresh paper of past-paper style questions from the exam bank on D3.1 each time, marked as you go, and saved to your Exam practice progress when you are signed in. Scan the code, or type the link.

biologybybradford.com/exam-maker/sit?topics=D3.1&level=HL&paper=quiz&marks=15&src=ep

How this was made. The course structure, the activities and the teaching choices come from my own classroom, my presentations and my years of teaching IB and AP Biology. I use Claude, an AI, to help write and build the interactive guides, lesson plans, slides and practice questions, and to draw the diagrams and code the interactives. I direct the work and review it against the IB and AP specifications before it goes live.