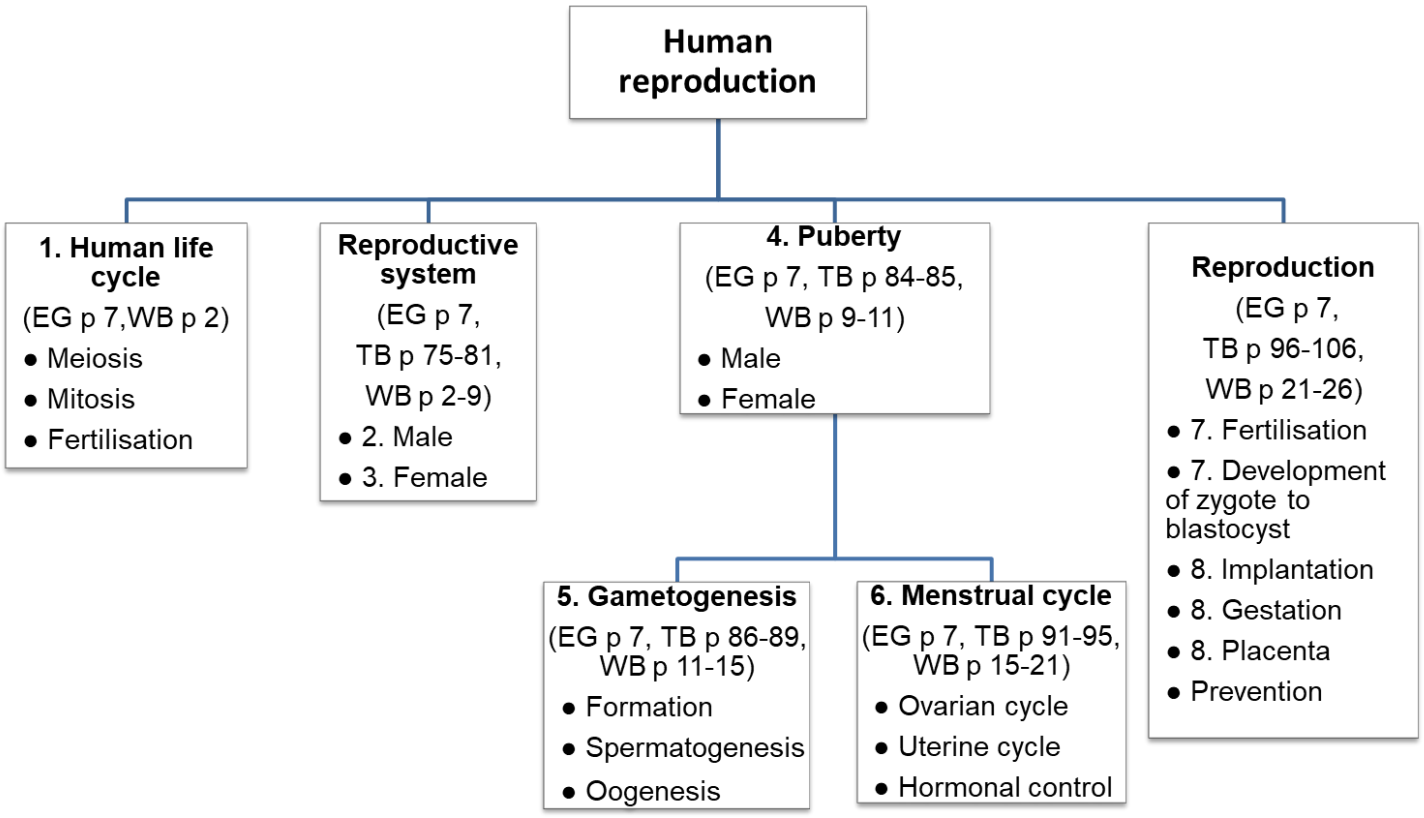
GRADE 12 LIFE SCIENCES WORKBOOK

Topic 4: Human reproduction (3 weeks, Paper 1: 41 marks)

This topic can be divided in the following subsections:

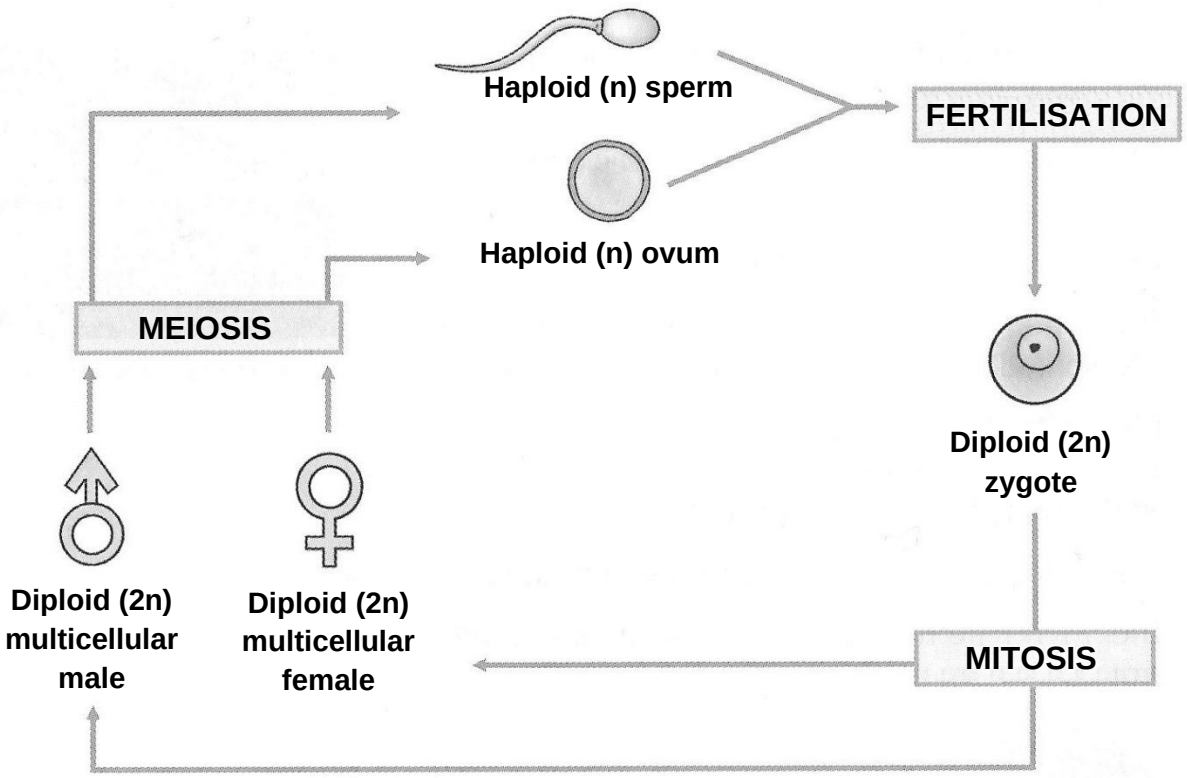
1. Human life cycle
2. Structure male reproductive system
3. Structure female reproductive system
4. Puberty
5. Gametogenesis
6. Menstrual cycle
7. Fertilisation
8. Implantation, gestation



Day 1 **Date**: _____

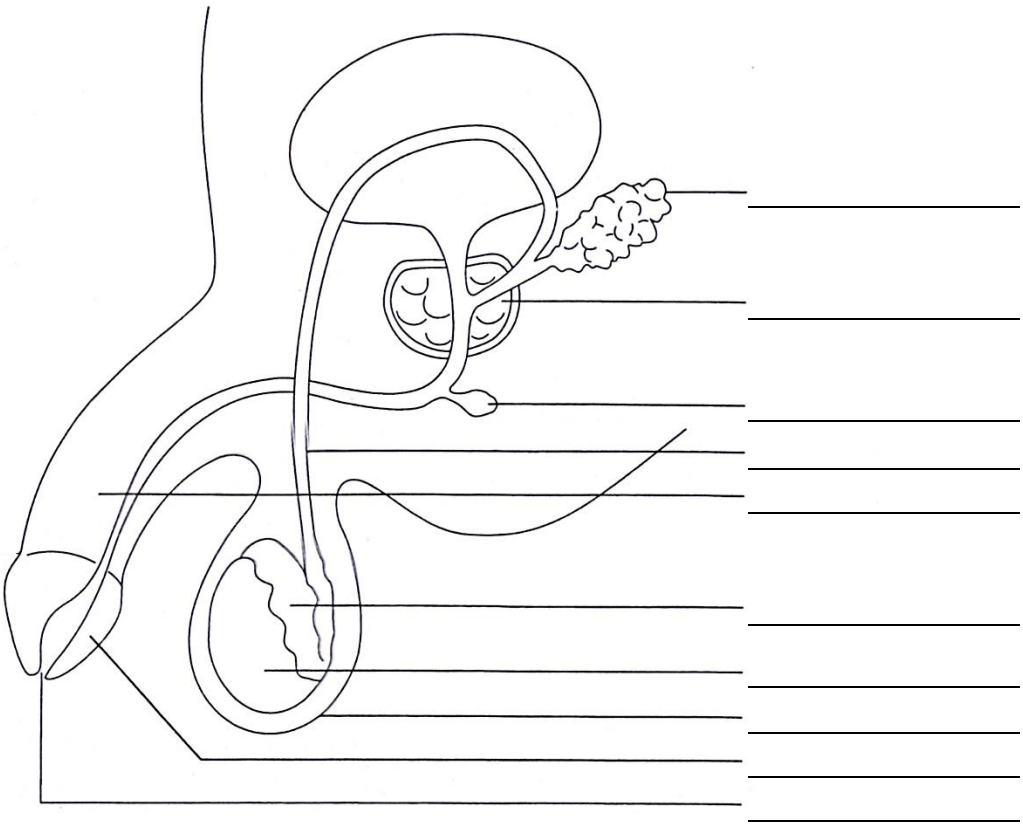
⌦ **Complete page 2 using Teacher's Guidelines slide 4.**

1. Human life cycle



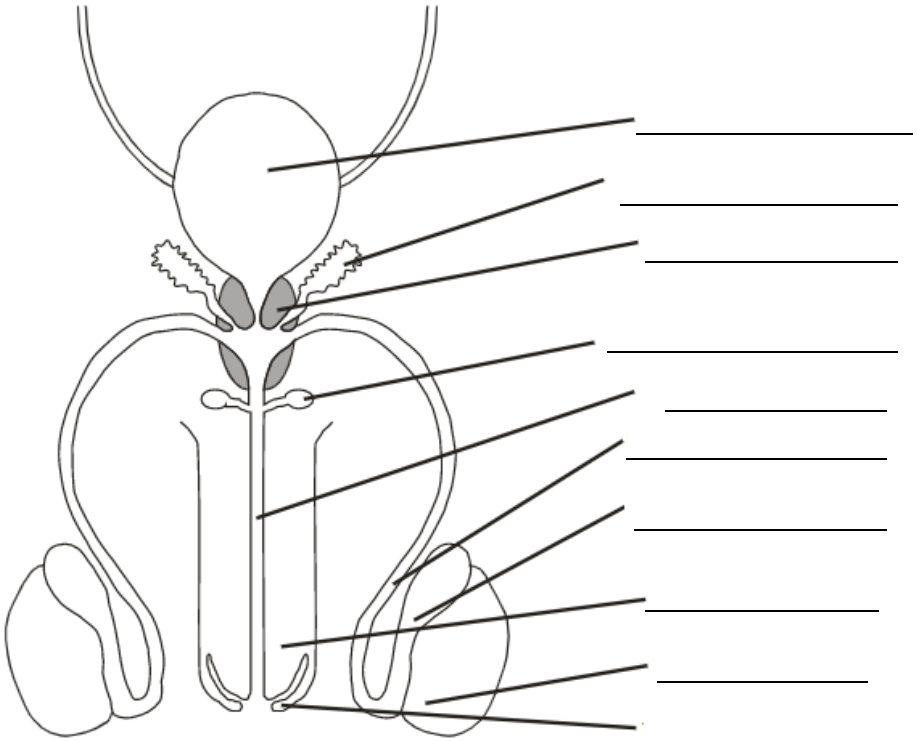
2. Male reproductive system

Structure



⌦ Complete Self-Activity 1.

Self-Activity 1: Provide labels for the following diagram.



Answer to Self-Activity 1 will be shared the morning of Day 2 on the group.

END OF DAY 1

How do you feel about the work from Day 1? 😊 or ☹

If you did not receive 80 % for the Self-Activity, consider working through the content again.

Day 2 **Date**: _____

⌦ **Complete page 4 using Teacher's Guidelines slide 6 to 8.**

Functions and pathway

Scrotum → _____

_____

⬇

Testis → _____ → _____

_____

_____

⬇

Epididymis → _____ → _____

⬇

Vas deferens → _____ → _____

⬇

Seminal vesicles → _____ → _____

⬇

Ejaculation tubes → _____

_____

⬇

Prostate → _____ → _____

_____

_____

⬇

Cowper's gland → _____ → _____

_____

_____

⬇

Urethra → _____ → _____

_____

_____

⬇

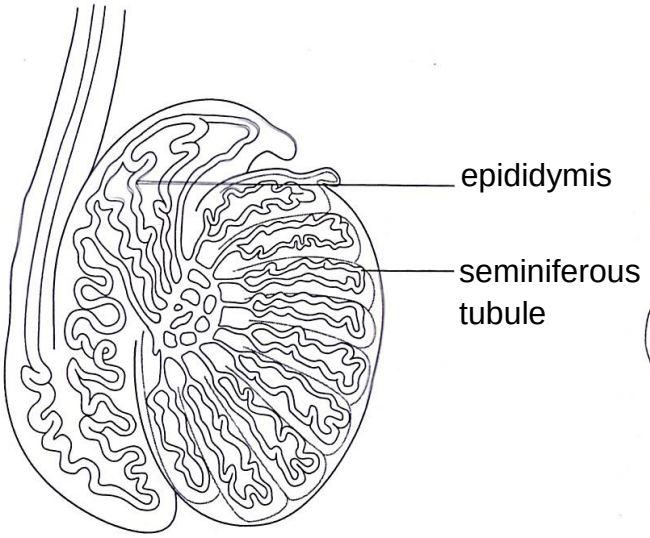
penis → _____ → _____

_____

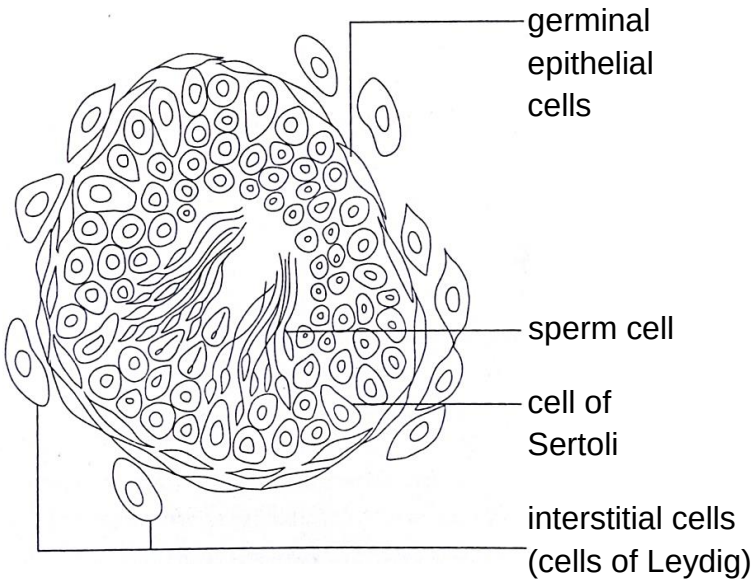
_____

_____

Structure of testis



Structure of seminiferous tubes



⌦ **Complete Self-Activity 2.**

Self-Activity 2

Question 1: State the function of each of these parts of the male reproductive system. (16)

1.1 Testis: _____

1.2 Scrotum: _____

_____

1.3 Penis: _____

1.4 Vas deferens: _____

1.5 Urethra: _____

_____

_____

1.6 Prostate gland: _____

_____

_____

Answer to Self-Activity 2 will be shared the morning of Day 3 on the group.

END OF DAY 2

How do you feel about the work from Day 2? 😊 or ☹

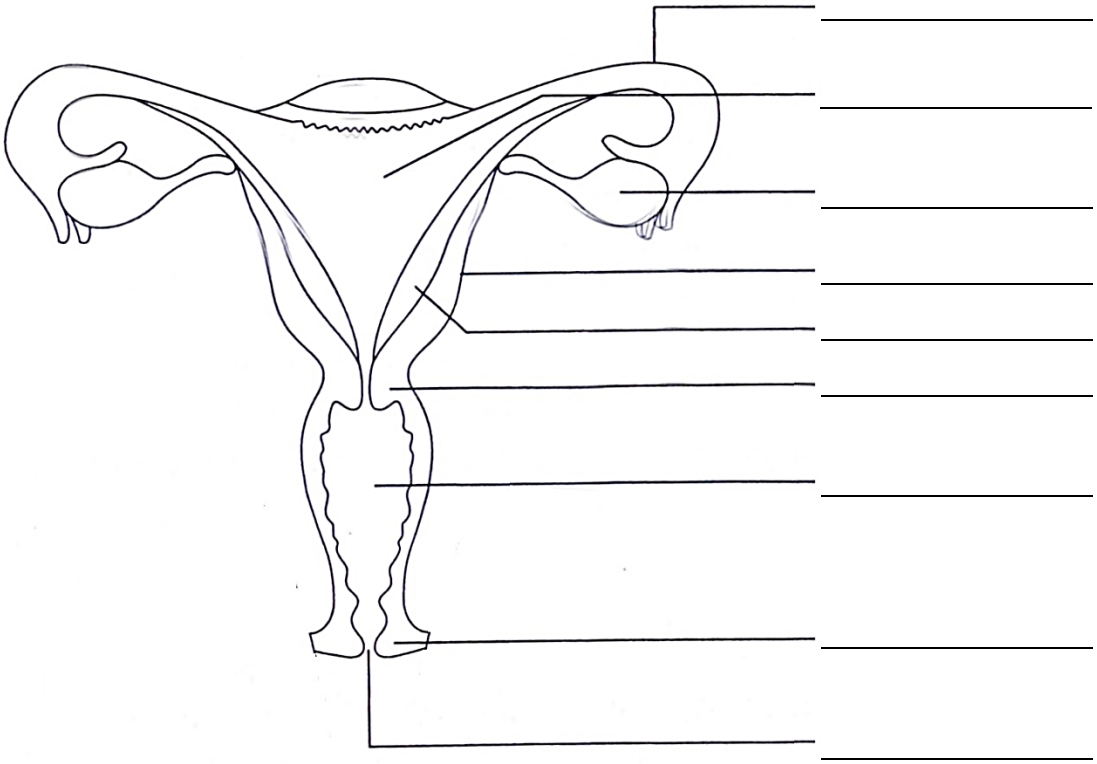
If you did not receive 80 % for the Self-Activity, consider working through the content again.

Day 3 **Date:** _____

⌦ **Complete page 6 using Teacher's Guidelines slide 6 to 8.**

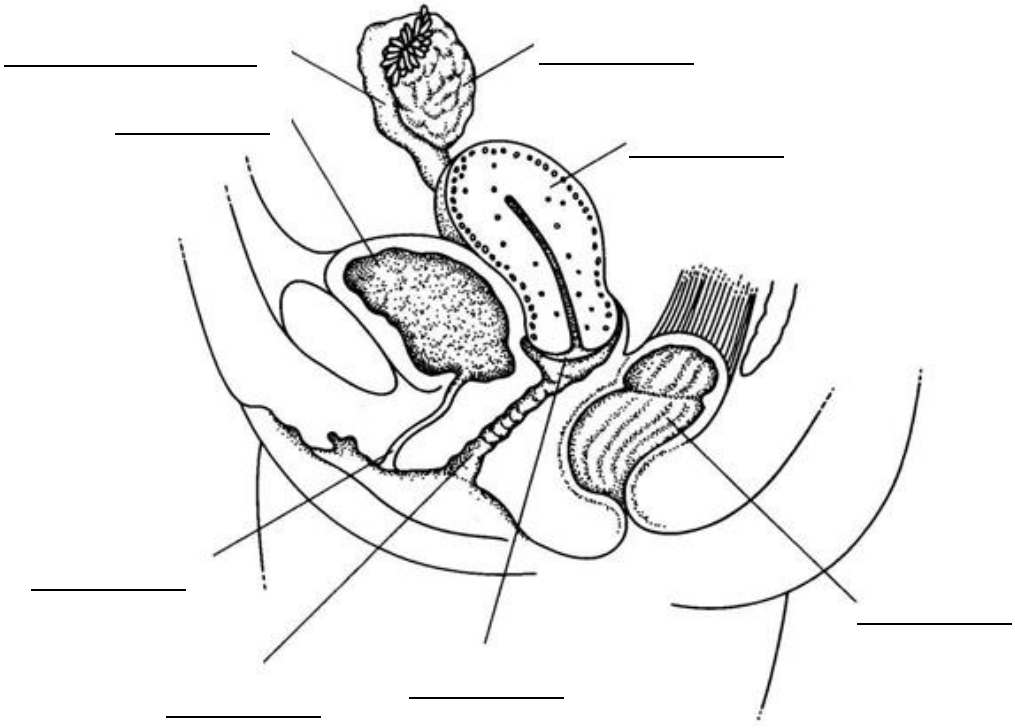
3. Female reproductive system

Structure



⌦ **Complete Self-Activity 3.**

Self-Activity 3: Provide labels for the following diagram.



⌦ Complete page 7 using Teacher's Guidelines slide 6 to 8.

Functions and pathway

Ovaries → _____ → _____

↓

Fallopian tube → _____ → _____

↓

Uterus → _____ → _____

↓

Cervix → _____

↓

Vagina → _____ → _____

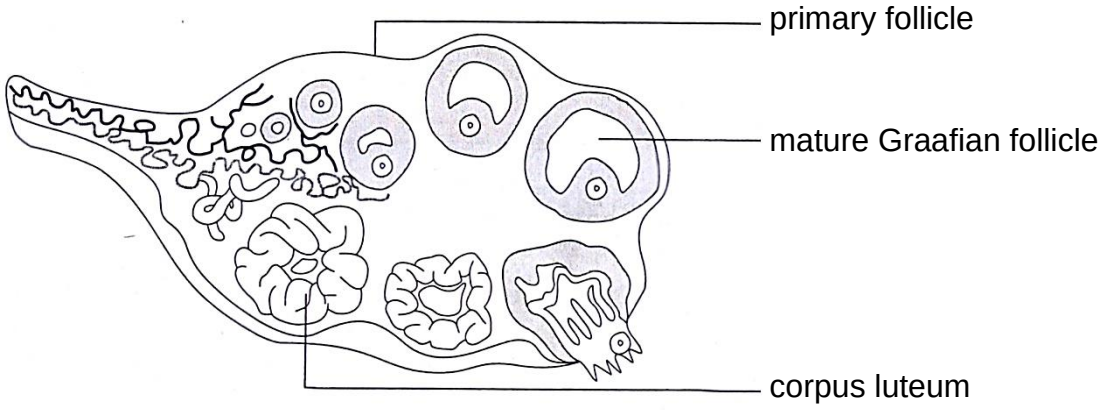
↓

Vulva → _____

- _____

- _____

Structure of ovary



Answer to Self-Activity 3 will be shared the morning of Day 4 on the group.

END OF DAY 3

How do you feel about the work from Day 3? 😊 or ☹

If you did not receive 80 % for the Self-Activity, consider working through the content again.

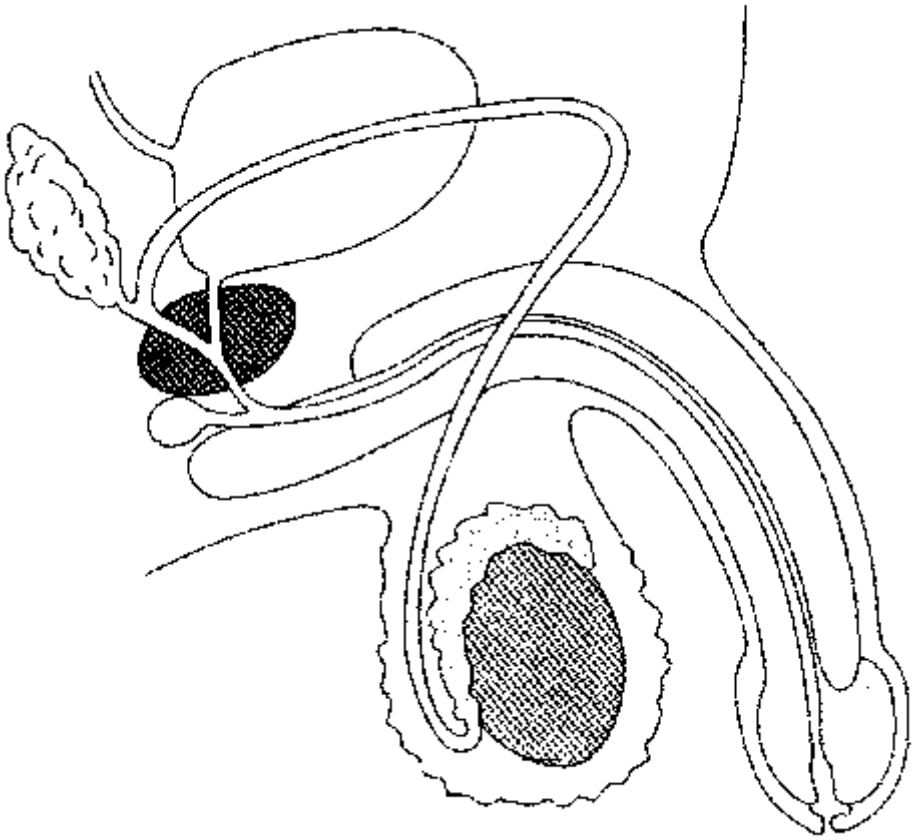
Day 4 Date: _____

⌦ Complete Self-Activity 4.

Self-Activity 4: Answer the following questions.

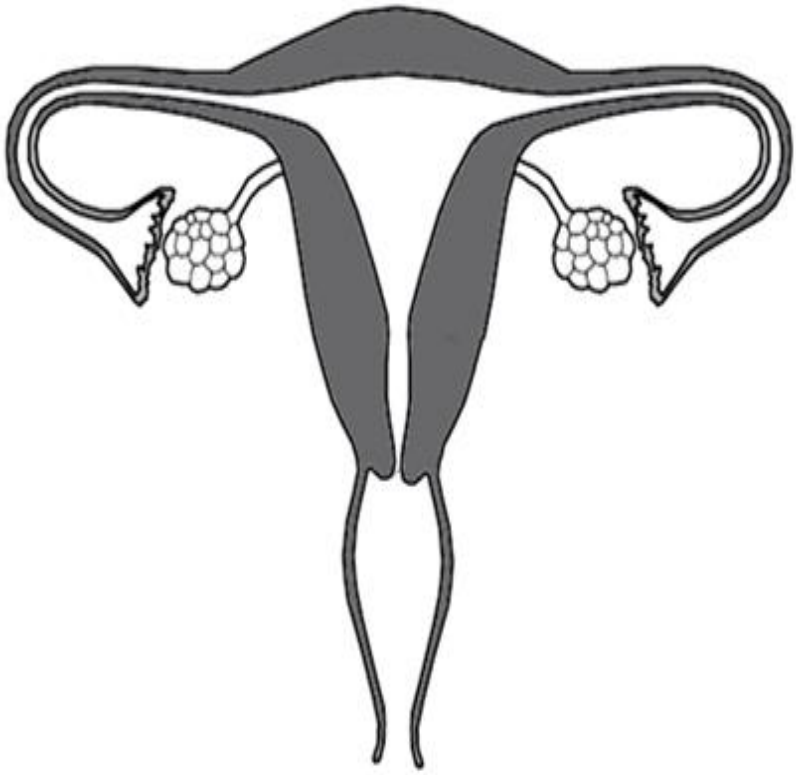
Question 1:

a) Label the male reproductive system.
b) Use arrows to indicate the pathway that spermatozoa must travel to leave the male body



Question 2:

a) Label the female reproductive system.
b) Use arrows to indicate the pathway that an ovum must travel to leave the female body.



END OF DAY 4

How do you feel about the work from Day 4? ☺ or ☹

If you are unsure about the content, consider working through the content again.

Day 5 Date: _____

⌦ Complete page 9 and 10 using Teacher's Guidelines slide 17 to 18.

4 Puberty

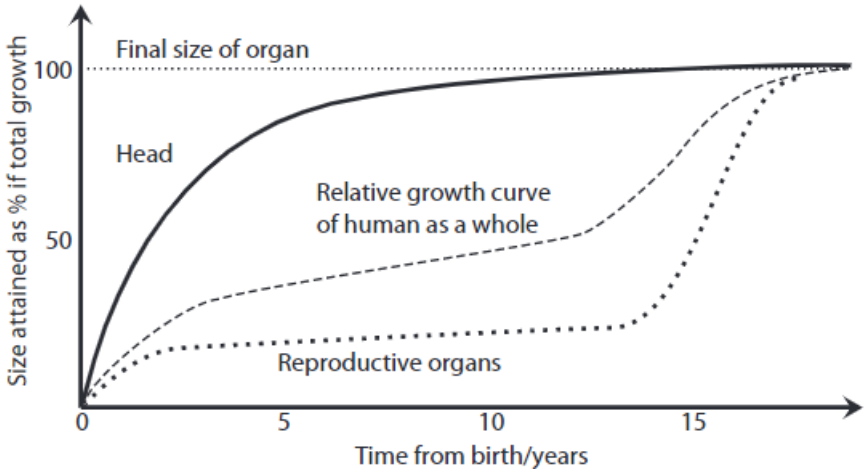
* Reproductive organs mature
* Starts with pituitary gland starts to release specific hormones into bloodstream

Male	Female
Sex hormone - testosterone	Sex hormone – oestrogen and progesterone
-	-
- Main changes in male characteristics	- Main changes in female characteristics
*	*
*	*
*	*
*	*
*	*
*	*
*	*
	*
	*

⌦ Complete Self-Activity 5.

Self-Activity 5: Answer the following questions. (8)

In humans, some organs grow at a different rate to the organism as a whole. The organs grow very little in early life, but grow fast at the start of sexual maturity at puberty. The graph alongside is calculated on an average of the growth of boys and girls. Study the graph and answer the questions that follow.



1. State the dependent variable in this investigation. (1) _____

2. State the independent variable in this investigation. (1) _____

3. Determine the size (as a percentage) of the reproductive organs at age 10. (1) _____

4. Determine the size (as a percentage) of the reproductive organs at age 15. (1) _____

5. What can you conclude from the answers to the previous two questions? (2)

_____

_____

6. State a possible hypothesis that can be tested with the information in the graph. (2)

_____

_____

_____

Answer to Self-Activity 5 will be shared the morning of Day 6 on the group.

END OF DAY 5

How do you feel about the work from Day 5? 😊 or ☹

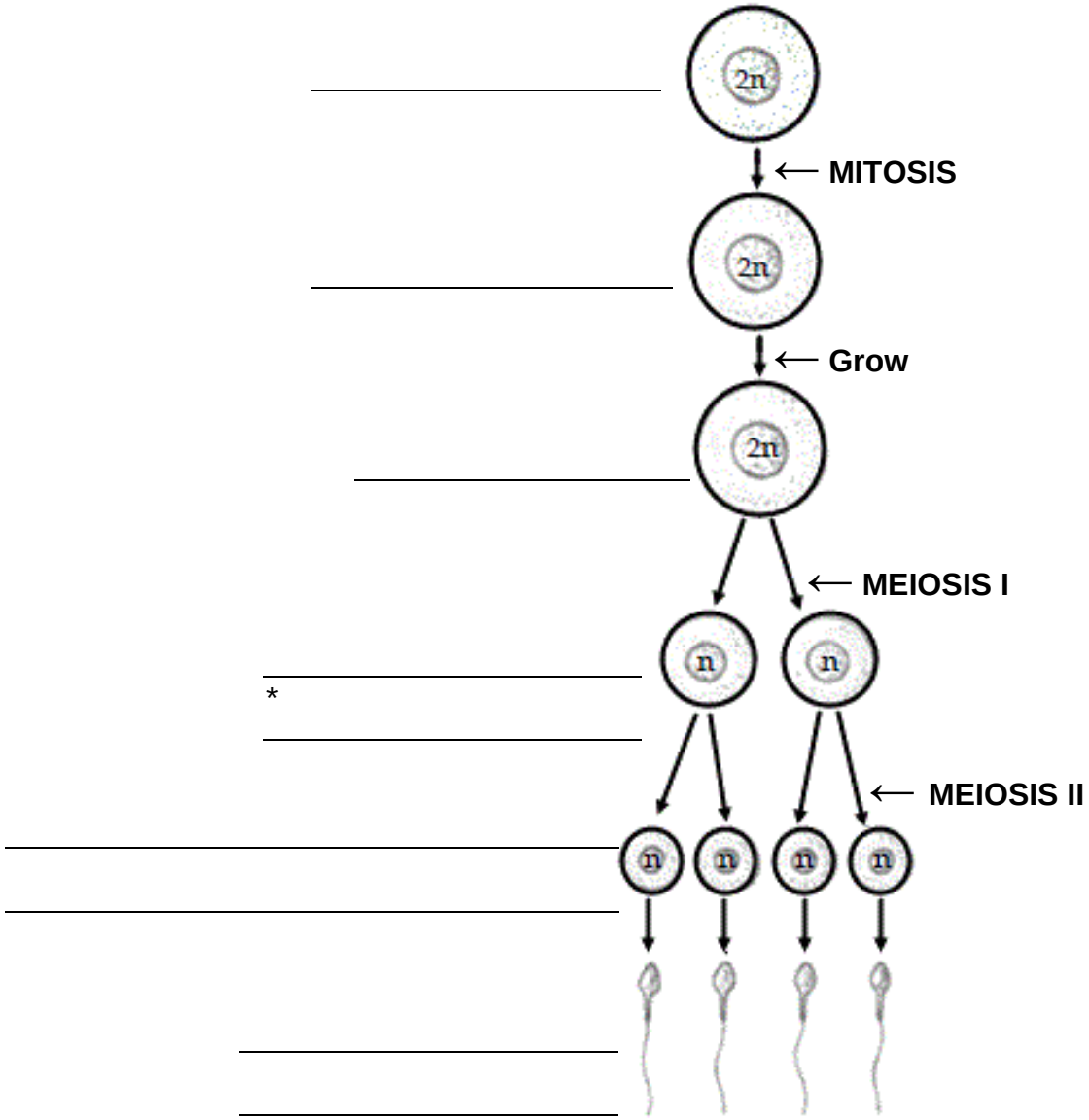
If you did not receive 80 % for the Self-Activity, consider working through the content again.

Day 6 **Date:** _____

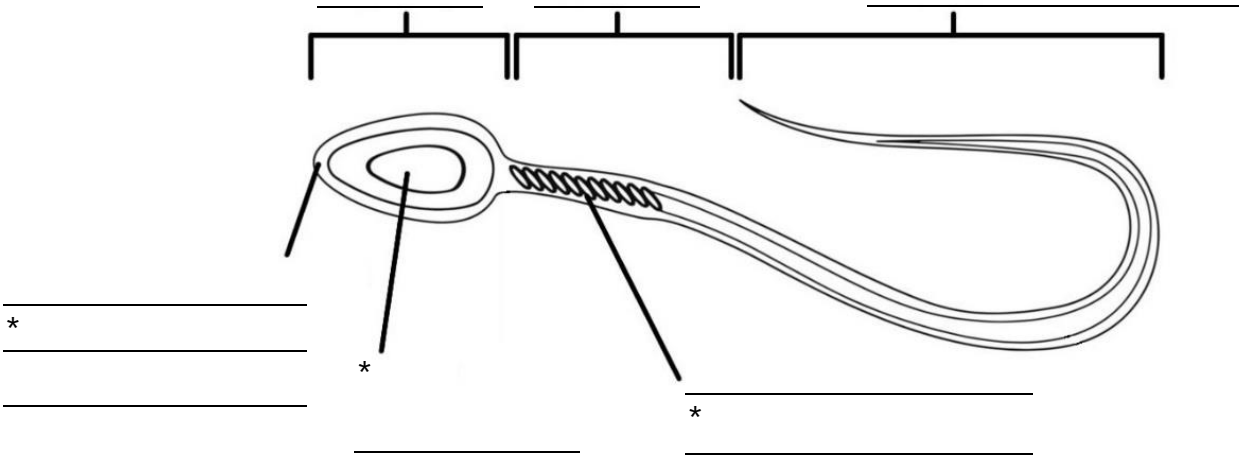
⌦ Complete page 11 and 12 using Teacher's Guidelines slide 20 to 21.

5 Gametogenesis

Spermatogenesis

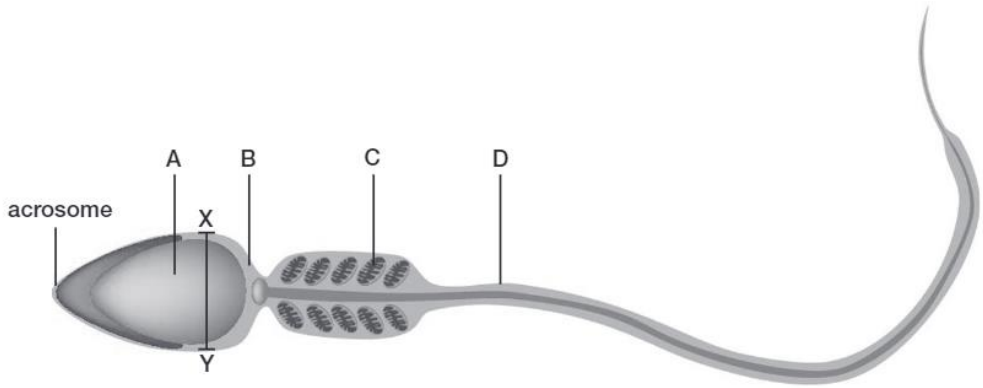


Structure of spermatozoa



⌦ Complete Self-Activity 6.

Self-Activity 6: Use the diagram of a sperm cell below to answer the questions that follow. The diagram has been magnified 4 000×. The structure and position of the acrosome is not so distinctly indicated on this diagram, which is often the case. The acrosome is a sac that covers the anterior two thirds of the head of the sperm cell. Therefore it is not inside the sperm cell..



1. Provide labels for A–D. (4)

A – _____ B – _____

C – _____ D – _____

2. Give the function of the acrosome. (4)

_____

_____

3. How are the functions of structures C and D linked? (3)

_____

4. Which genetic material does structure A contribute towards the zygote? (1) _____

5. Calculate the diameter of structure B as indicated by X–Y. (6) Convert the answer to µm. (1 000 µm = 1 mm)

_____

_____

_____

_____

_____

Answer to Self-Activity 6 will be shared the morning of Day 7 on the group.

END OF DAY 6

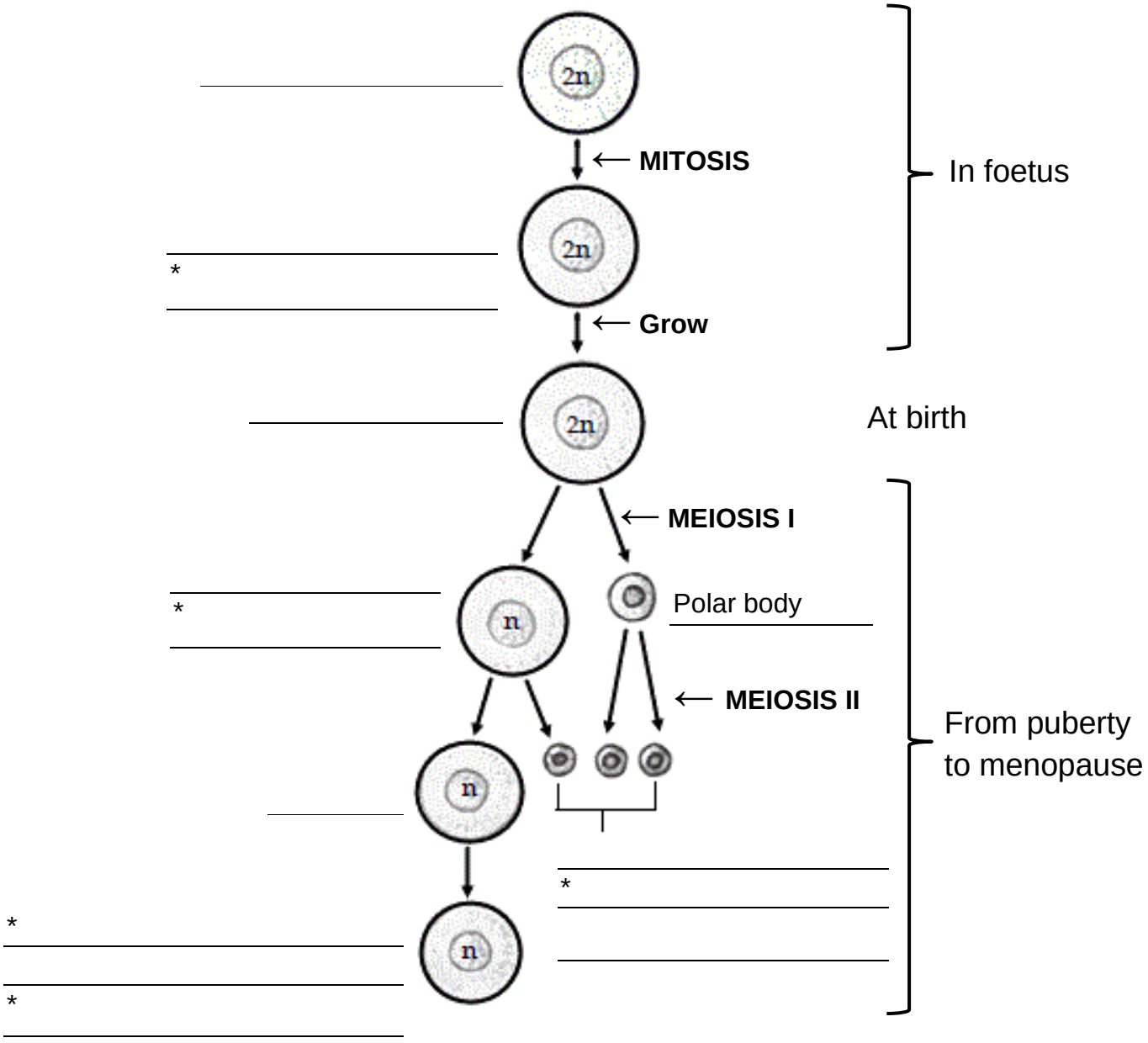
How do you feel about the work from Day 6?  or 

If you did not receive 80 % for the Self-Activity, consider working through the content again.

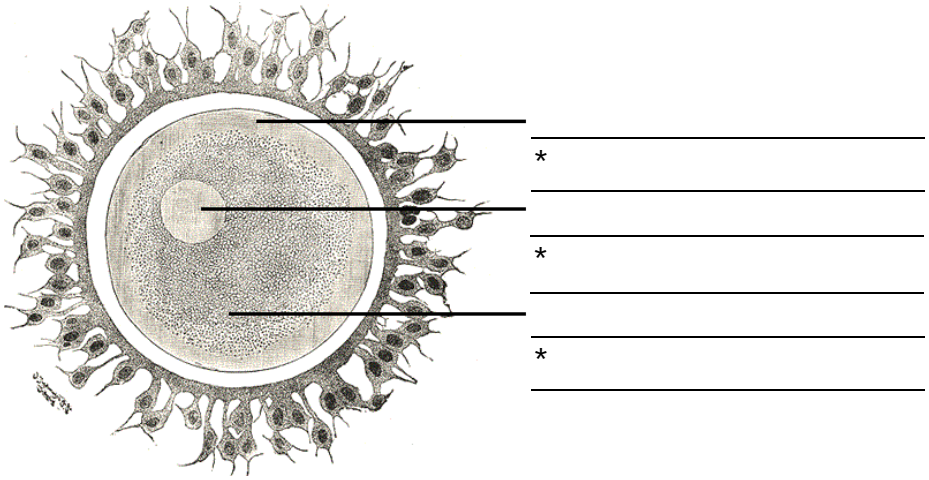
Day 7 **Date:** _____

⌦ Complete page 14 and 15 using Teacher's Guidelines slide 23 to 24.

Oogenesis



Structure of ovum



⌦ **Complete Self-Activity 7.**

Self-Activity 7:

1. Describe the process of oogenesis as it occurs in the ovary. (5)

_____

_____

_____

2. Draw a fully labelled diagram of an ovum. (5)

Answer to Self-Activity 7 will be shared the morning of Day 8 on the group.

END OF DAY 7

How do you feel about the work from Day 7? 😊 or ☹

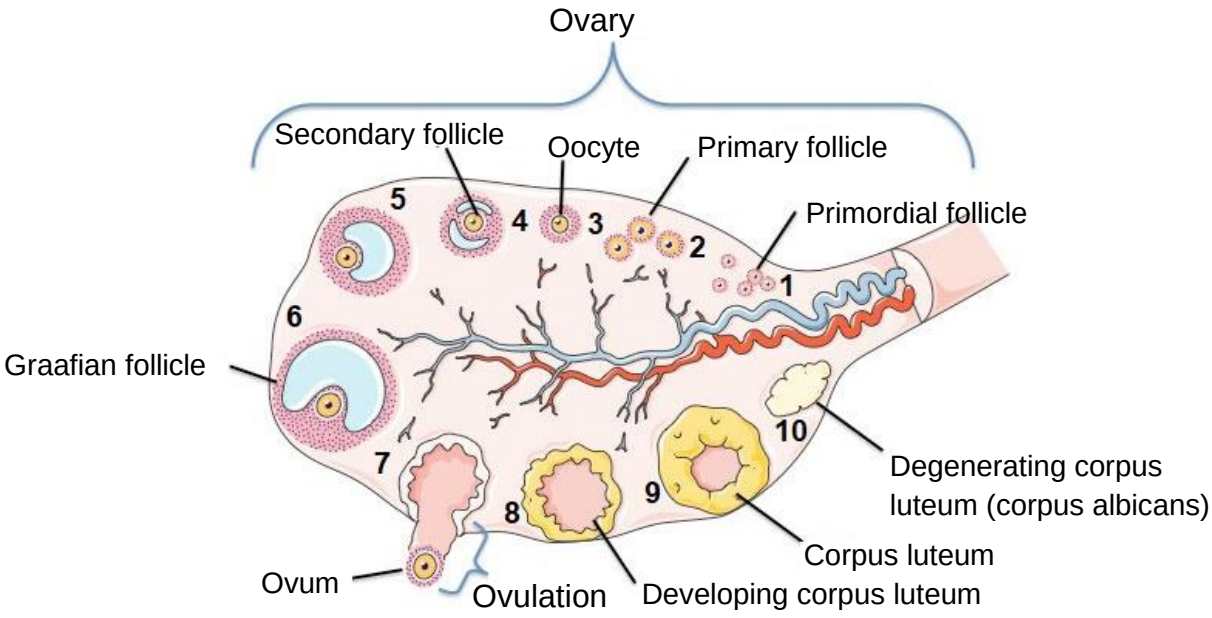
If you did not receive 80 % for the Self-Activity, consider working through the content again.

Day 8 **Date:** _____

⌦ Complete page 16 to 17 using Teacher's Guidelines slide 27 to 28.

6 Menstrual cycle

* Changes that occur in uterus and ovary for the purpose of sexual reproduction
* Starts at puberty and ends at menopause
* Ovarian cycle



- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
  * _____
  * _____
- _____

* Uterine Cycle (Menstrual cycle)

- _____

- _____

  * _____

- _____

- _____

- _____

  * _____

⌦ Complete Self-Activity 8.

Self-Activity 8: Give the correct descriptions for the following biological terms. (11)

Oogenesis	
Vas deferens	
Implantation	
Blastocyst	
Testosterone	
Oestrogen	
Fertilization	
Spermatogenesis	
Puberty	
Luteinising hormone	
Zygote	

Use slide 30 of the Teacher's Guidelines to mark Self-Activity 8.

END OF DAY 8

How do you feel about the work from Day 8?  or 

If you did not receive 100 % for the Self-Activity, consider working through the content again.

Day 9 **Date:** _____

⌦ Complete page 17 to 18 using Teacher's Guidelines slide 31 to 32.

Hormonal control of menstrual cycle

- Follicle stimulating hormone (FSH)

*

*

*

- Oestrogen

*

*

- Luteinising hormone (LH)

*

*

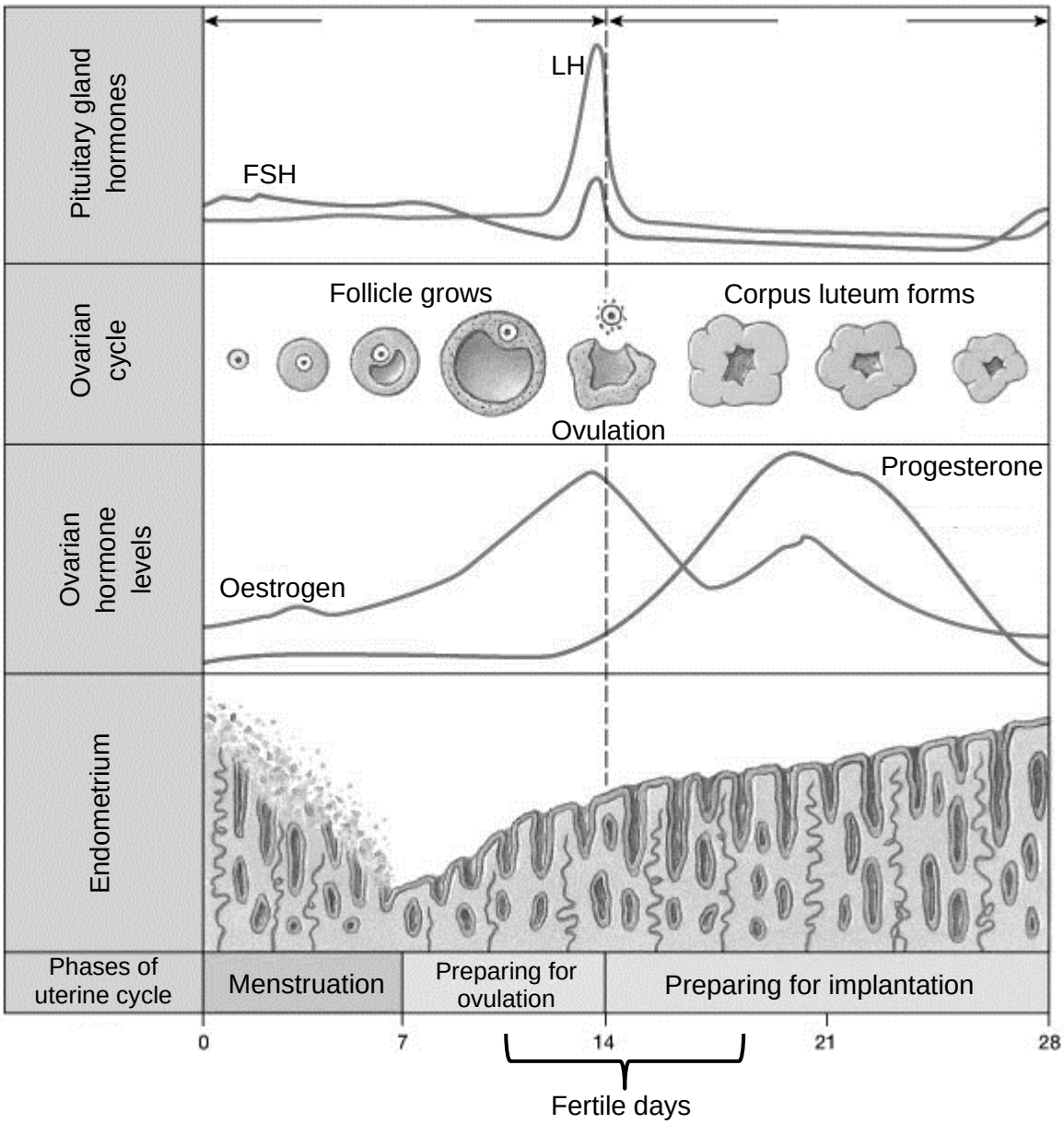
*

- Progesterone

*

*TWO options

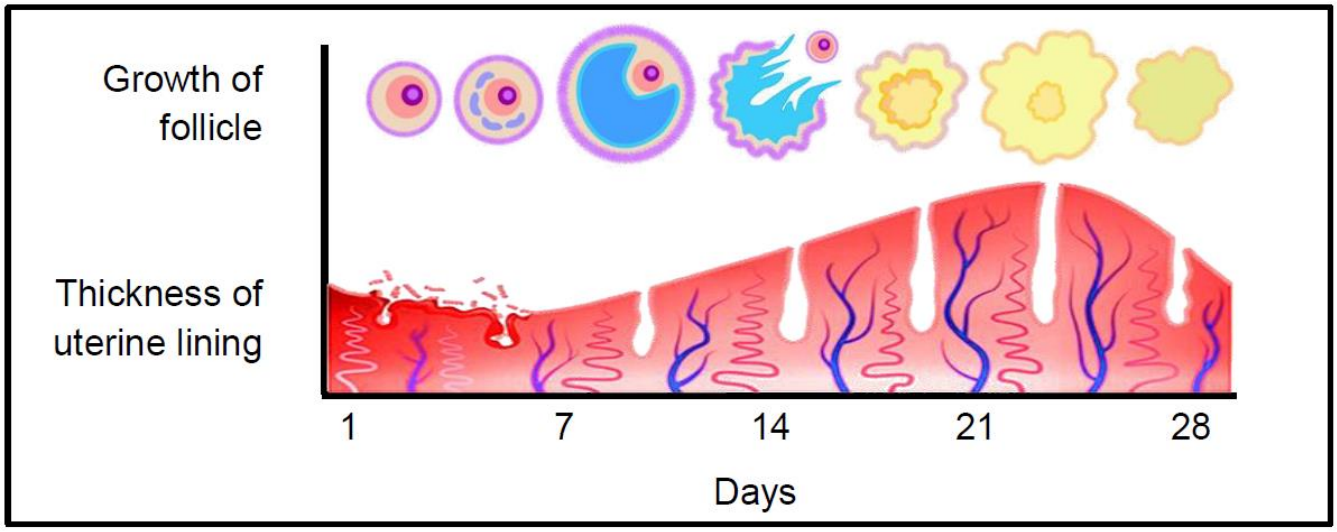
- Not pregnant:
  - ●
  - ●
  - ●
  - ●
  - ●
  - ●
- Pregnant:
  - ▪
  - ▪
  - ▪
  - ▪



- Role of oestrogen
  - Responsible for secondary sexual characteristics in females during puberty
  - Repairs and build up endometrium
  - Increase motility of fallopian tubes to propel ovum towards uterus
  - High levels stimulate secretion of LH
- Role of progesterone
  - Promotes further thickening of endometrium
  - Prepares endometrium for implantation
  - Maintains thickening of endometrium during gestation

⌦ Complete Self-Activity 9.

Self-Activity 9: The diagram shows some of the changes that may take place during the menstrual cycle.



1. The menstrual cycle is controlled by hormones. Name one hormone that will increase in level between days 2 and 10. (1)

_____

2. Give one observable reason for your answer to question 1. (2)

_____

_____

_____

3. Explain what evidence there is in the diagram to indicate that no fertilisation took place? (3)

_____

_____

Answer to Self-Activity 9 will be shared the morning of Day 10 on the group.

END OF DAY 9

How do you feel about the work from Day 9? ☺ or ☹

If you did not receive 80 % for the Self-Activity, consider working through the content again.

Day 10 **Date**: _____

⌦ **Complete page 21 using Teacher's Guidelines slide 36 to 37.**

Negative feedback mechanism

Day 11 **Date**: _____

⌦ **Complete page 22 and 23 using Teacher's Guidelines slide 38 to 40.**

7 Fertilisation and development of zygote to blastocyst

* Copulation

  -

* Fertilisation

  -

Process (occurs in Fallopian tube)

*

*

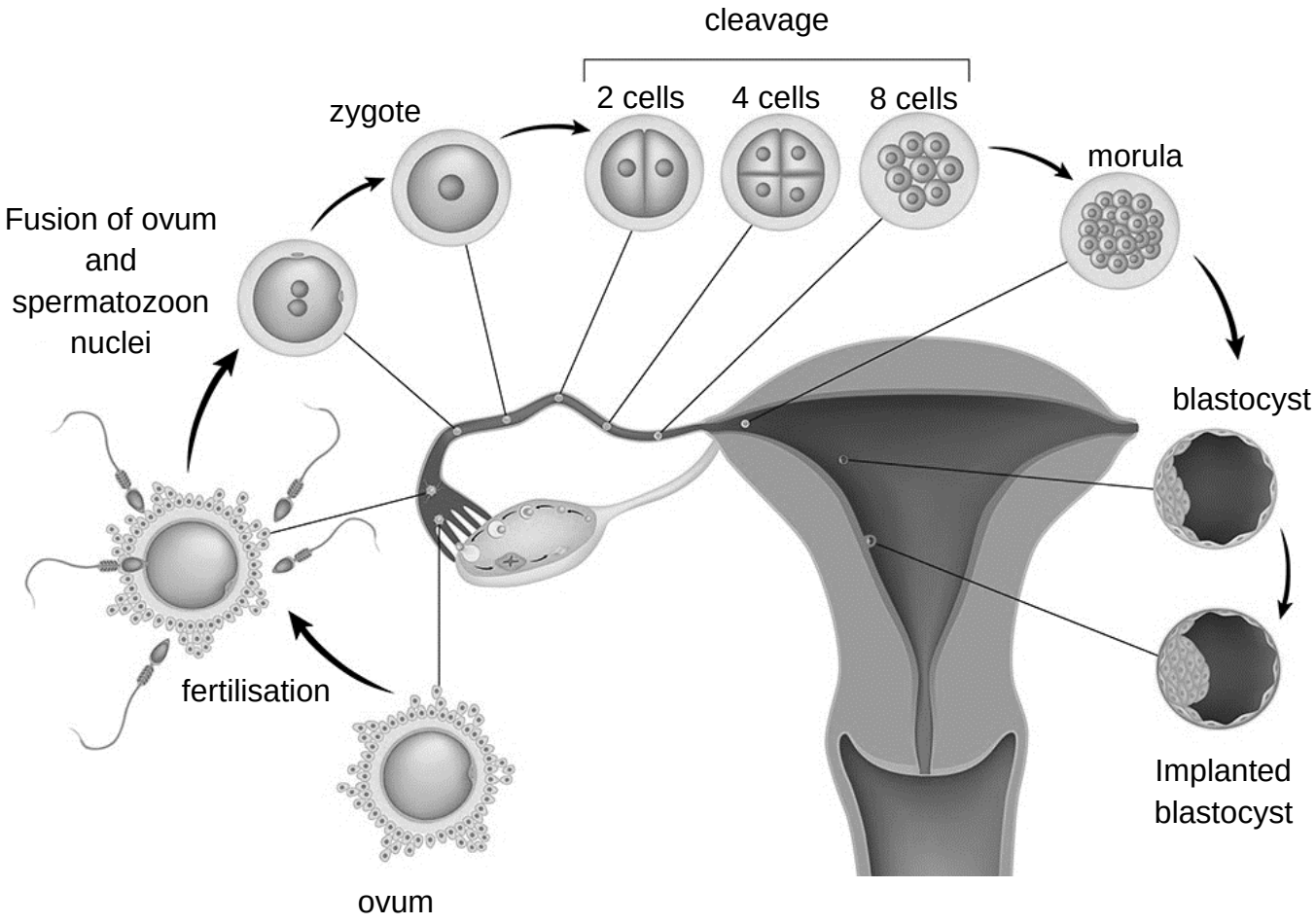
*

*

*

*

Development of zygote



* After fertilisation diploid zygote forms undergoes repeated mitosis
* Forms solid mass of cells = morula
* Further mitosis a ball of cells with fluid filled cavity forms
* Known as blastula (blastocyst)
* Becomes attached to uterine wall

8. Implantation, gestation and role of placenta

* Implantation
  - Blastocyst attaches to uterine wall (day 10 after fertilisation)
* Corpus luteum continue to produce oestrogen and progesterone
  - Stimulated by hormone released by blastocyst
* Oestrogen and progesterone prevents menstruation, therefore endometrium stays intact.

Gestation
- Period of development of the embryo within uterus
- Approximately 280 days

END OF DAY 11

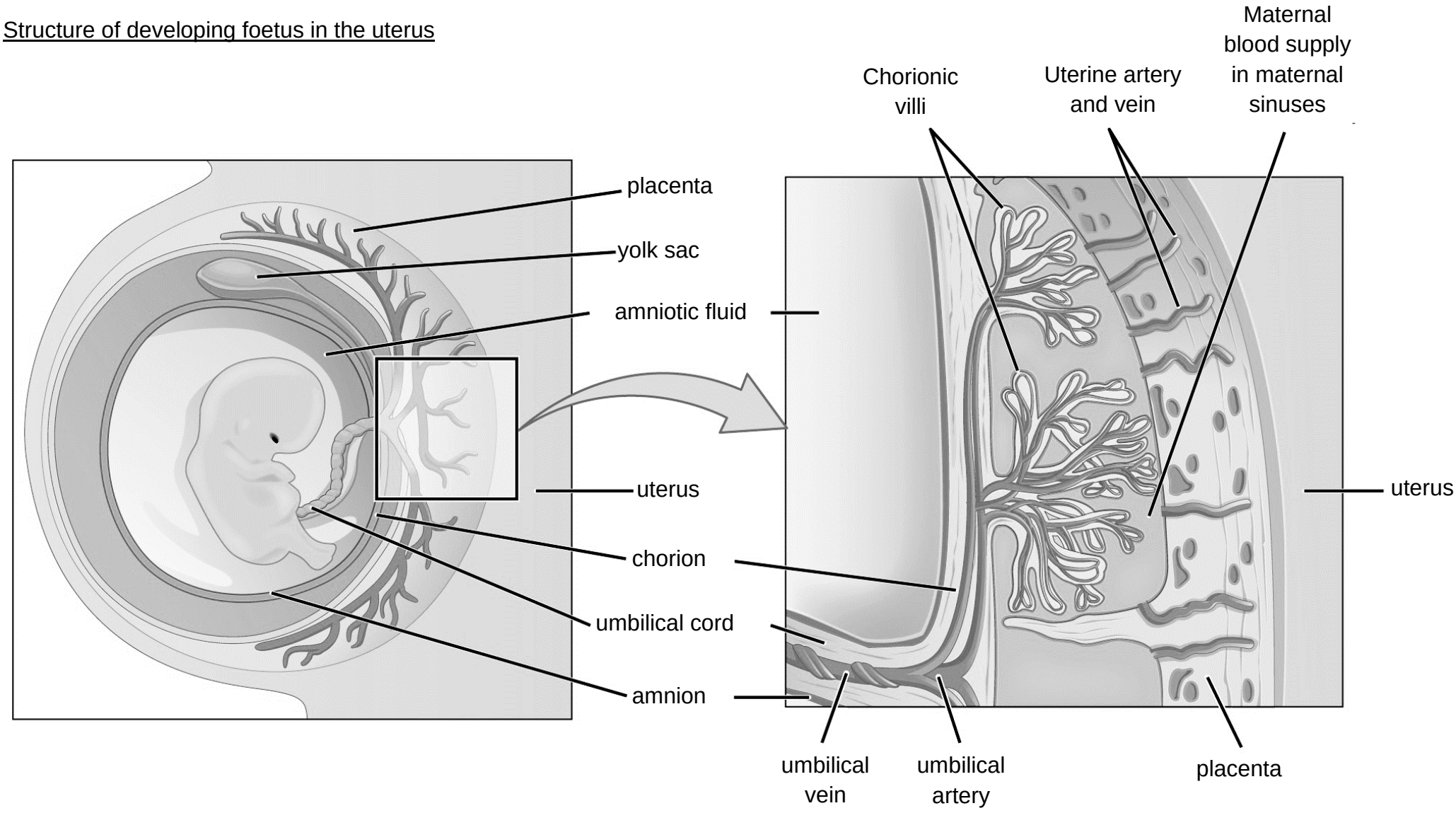
How do you feel about the work from Day 11?  or 

If you are unsure about the content, consider working through the content again.

Day 11 **Date:** _____

⌦ **Complete page 24 using Teacher's Guidelines slide 42.**

Structure of developing foetus in the uterus



Structure of developing foetus

Functions:

Chorion

* Outermost membrane and forms chorionic villi
* invade endometrium and allow the transfer of nutrients from maternal blood to foetal blood.

Amnion

found on the inside of the chorion and forms a cavity called the amniotic cavity

* The amniotic cavity is filled with a fluid called the amniotic fluid.
* Amniotic fluid function:
  - It acts as a shock absorber, thus protecting the embryo from mechanical injury.
  - It prevents the foetus from drying out.
  - Maintains a temperature range with a very small change (small range) for the embryo.
  - Allows for the free movement of the foetus

Umbilical chord

* Attaches the embryo to the placenta through the umbilical cord.
* A hollow rope like tube.
* Umbilical blood vessels are found within the umbilical cord.
  - Umbilical artery carries deoxygenated blood with nitrogenous waste from the foetus to the placenta
  - Umbilical vein carries blood rich in oxygen and food from the placenta to the foetus.

Placenta

* Made up of the chronic villi and the uterine tissue in which the villi are embedded
* Function
  - Attaches the foetus to mother.
  - Allows for the diffusion of dissolved food, as well as oxygen from mother to foetus.
  - Allows for the diffusion of nitrogenous waste from the foetus to the mother.
  - Allows for the diffusion of the carbon dioxide from the foetus to the mother.
  - Secretes its own progesterone after 12 weeks of pregnancy.
* Role
  - maternal sinuses develops (blood filled spaces)
  - chronic villi extend into these sinuses.
  - chronic villi are bathe by the blood in the maternal sinuses.
  - blood of the mother and the foetus are in close contact with each other.
  - But the blood is separated by the walls of the chronic villi (no direct contact between the mother's blood and the foetus's blood).

Contraception

Table 4.1 a) to d) Various contraceptive methods

a) Chemical methods	Combination pill	Contraceptive injection	Spermicides
How it works	Contains oestrogen and progesterone. This prevents ovulation, prevents implantation of ovum, and thickens cervical mucus.	Single injection of progesterone (thickens cervical mucus, inhibits ovulation), lasts three months	Contains a chemical substance that immobilises and kills the sperm before they are able to swim into the uterus. Best used in conjunction with a barrier method of contraception

b) Barrier methods	Female condom	Male condom	IUD (Intrauterine device) or coil	Diaphragm
How it works	Polyurethane pouch fitted into vagina before sex	Latex sheath covering penis	Small 'T'-shaped device, containing either copper or progesterone, is inserted into the uterus	A cervical barrier-type of birth control. It is a soft latex or silicone dome.

c) Surgical methods (surgical methods)	Vasectomy	Tubal ligation
How it works	During a minor operation, the vas deferens (sperm ducts) are cut, blocked or sealed. This prevents sperm from reaching the seminal fluid (semen). No sperm will be in the semen.	The Fallopian tubes are cut, tied or blocked to permanently prevent pregnancy. It prevents sperm from travelling up the Fallopian tubes to the egg. Fertilisation cannot occur.

d) Natural methods	Withdrawal	Rhythm
How it works	This is the practice of withdrawing the penis from the vagina and away from a woman's external genitals before ejaculation to prevent pregnancy.	Abstain from sex during the time when the woman is fertile

END OF DAY 12

How do you feel about the work from Day 12?  or 

If you are unsure about the content, consider working through the content again.

Day 13 **Date:** _____

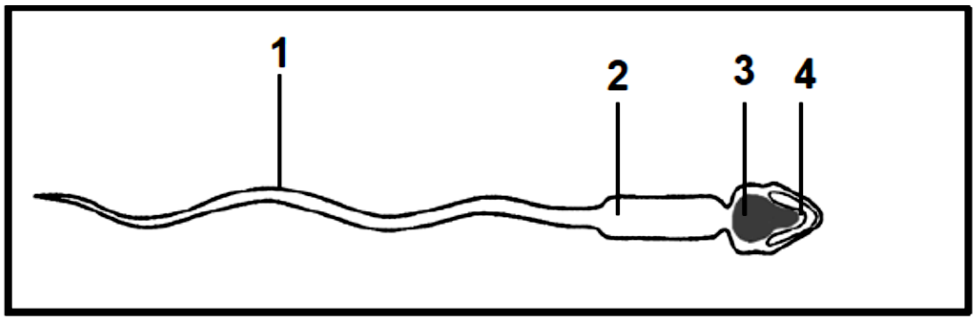
⌦ **Complete Self-Activity 10**

Self-Activity 10: Questions from previous Grade 12 NSC Examinations (Feb 2017).

1.1.1 After sperm cells have been produced in humans, they are stored in the … until maturation.

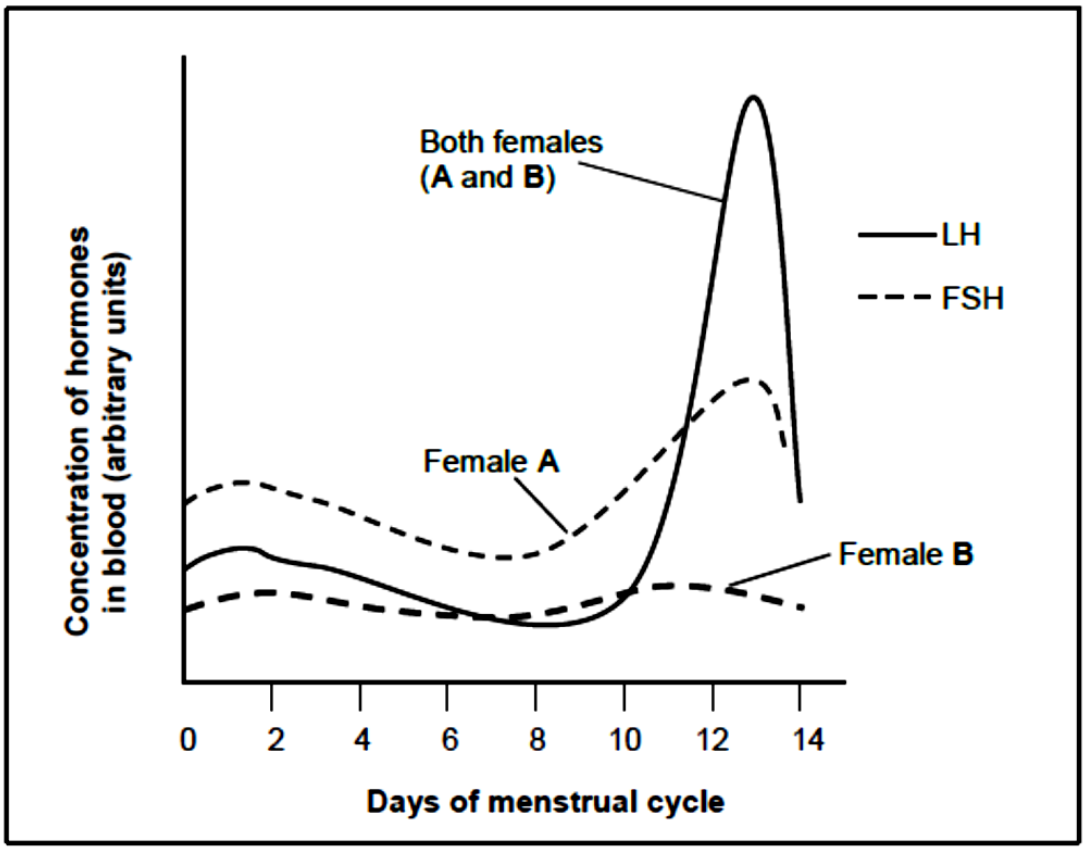
A penis
B urethra
C epididymis
D seminal vesicles

1.1.2 Which ONE of the following parts in the diagram of a sperm cell contains a haploid number of chromosomes?



A 1
B 2
C 3
D 4

QUESTIONS 1.1.9 AND 1.1.10 REFER TO THE GRAPH BELOW. THE GRAPH SHOWS THE CHANGES IN THE CONCENTRATION OF FEMALE HORMONES (LH AND FSH) IN TWO FEMALES DURING THE FIRST TWO WEEKS OF THE MENSTRUAL CYCLE.



1.1.9 Which female will NOT ovulate on day 14?

A Female **A**, because the FSH levels are high
B Female **A**, because the LH levels are too high on day 13
C Female **B**, because LH inhibits the development of a follicle
D Female **B**, because a follicle did not develop in the ovary

1.1.10 Which ONE of the following statements is CORRECT regarding female **A**?

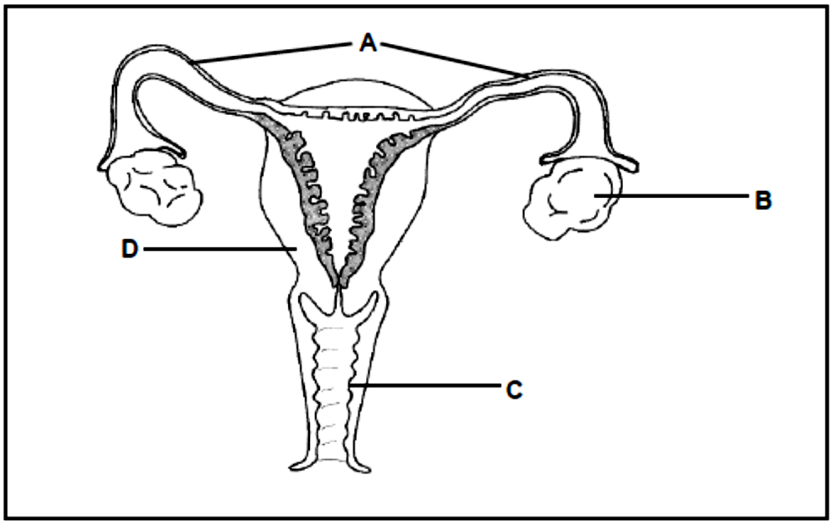
A FSH increases on day 14 because the Graafian follicle is secreting progesterone.
B FSH increases after day 9 as the pituitary gland/hypophysis is secreting progesterone.
C FSH decreases after day 4 to ensure that implantation occurs.
D FSH increases in the first two days to stimulate the development of a follicle. (10 x 2)

1.2.1 The diploid cell formed by the process of fertilisation

1.2.2 A fluid that protects the human embryo against injuries and large-scale temperature changes

1.2.6 A blood vessel in the umbilical cord that transports nutrients to the foetus

2.1 The diagram below represents the human female reproductive system.



2.1.1 Identify part **C**. (1)

2.1.2 State ONE function of part **D**. (1)

2.1.3 Name the hormone secreted by part **B** during the first week of the menstrual cycle. (1)

2.1.4 State how the hormone named in QUESTION 2.1.3 influences part **D**. (1)

2.1.5 During tubal ligation, part **A** is surgically cut or tied.

Explain how this procedure prevents pregnancy. (3)
(7)

2.2 An investigation was carried out to determine the effects of smoking during pregnancy on the baby's birth weight. Babies born weighing 2 499 g or less have a low birth weight.

The table below compares the percentage of babies with a low birth weight born to mothers who smoked with mothers who did not smoke in a certain city in 2009.

BIRTH WEIGHT (GRAMS)	PERCENTAGE OF TOTAL BIRTHS (%) IN 2009	
	MOTHERS WHO SMOKED	MOTHERS WHO DID NOT SMOKE
<1 000	0,7	0,2
1 000–1 499	0,9	0,3
1 500–1 999	2,2	1,1
2 000–2 499	7,1	3,2

[Adapted from www.ainw.gov.au]

2.2.1 Draw a histogram to represent the percentage of births in each weight group born to mothers who smoked. (6)

2.2.2 Why were babies that weighed more than 2 500 g at birth not included in the investigation? (1)

2.2.3 State a general conclusion for the investigation based on the data in the table. (2)

2.2.4 Describe how chemicals from cigarette smoke are able to reach the baby's blood from the mother's blood. (2)
(11)

Answer to Self-Activity 10 will be shared the morning of Day 15 on the group.

END OF DAY 14

How do you feel about the work from Day 14?  or 

If you did not receive 80 % for the Self-Activity, consider working through the content again.

☑ END OF TOPIC 4