



LIFE SCIENCES

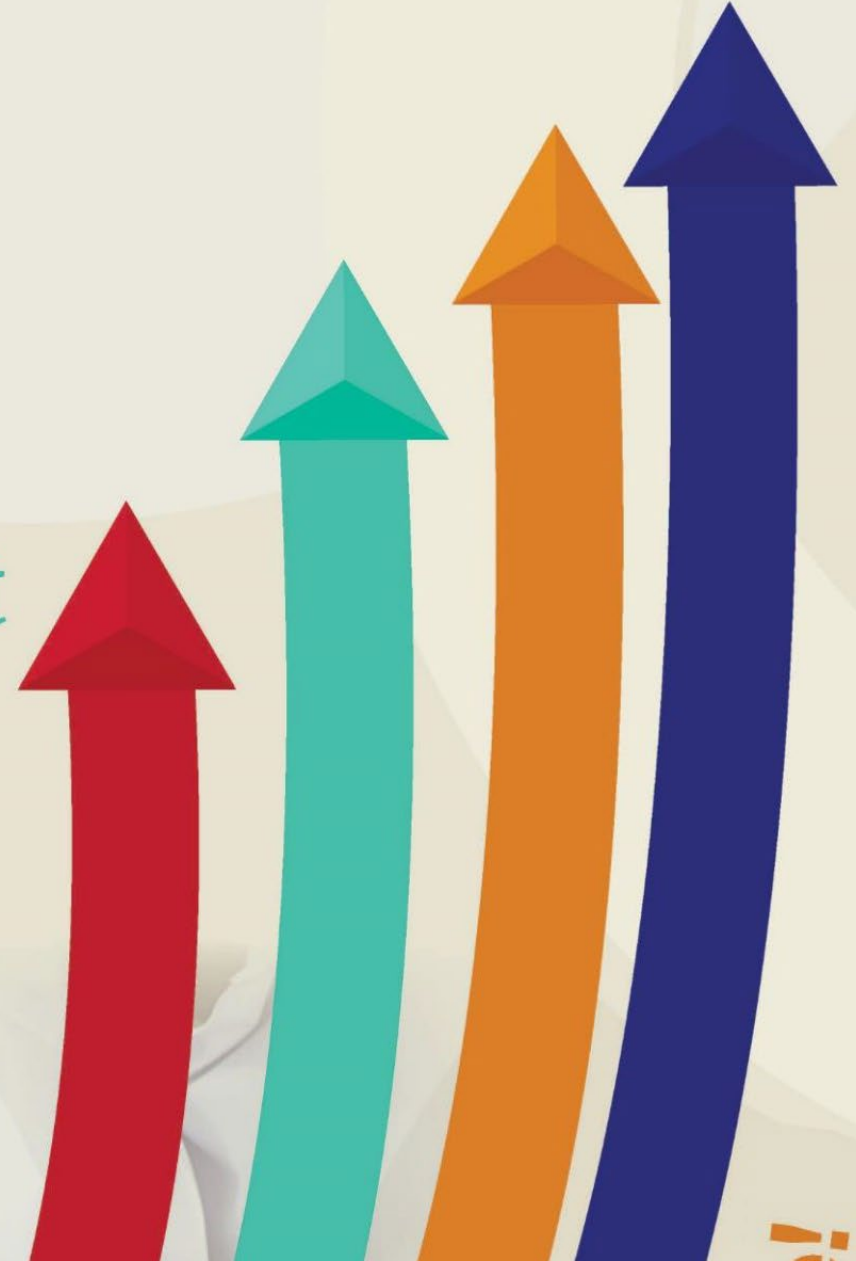
**SUMMARY &
TEACHING TOOL**



2023

Diagnostic Report

Book 1





2023 LIFE SCIENCES NSC PAPER 1

Life Sciences Paper 1

SUMMARY & TEACHING TOOL

Let's work through the paper and look at the problem areas as identified in the 2023 NSC Diagnostic Report.

Commentary from the Diagnostic Report is noted in grey blocks like the one below. Use these to guide discussions.

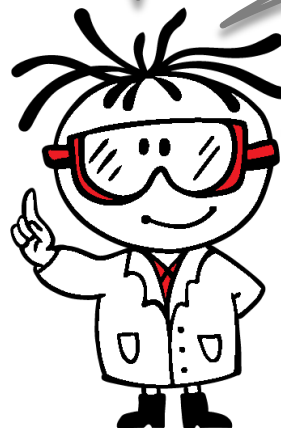
Candidates confused the pupillary mechanism and accommodation.

In some cases, revision or application options will be provided and can be identified by this symbol:



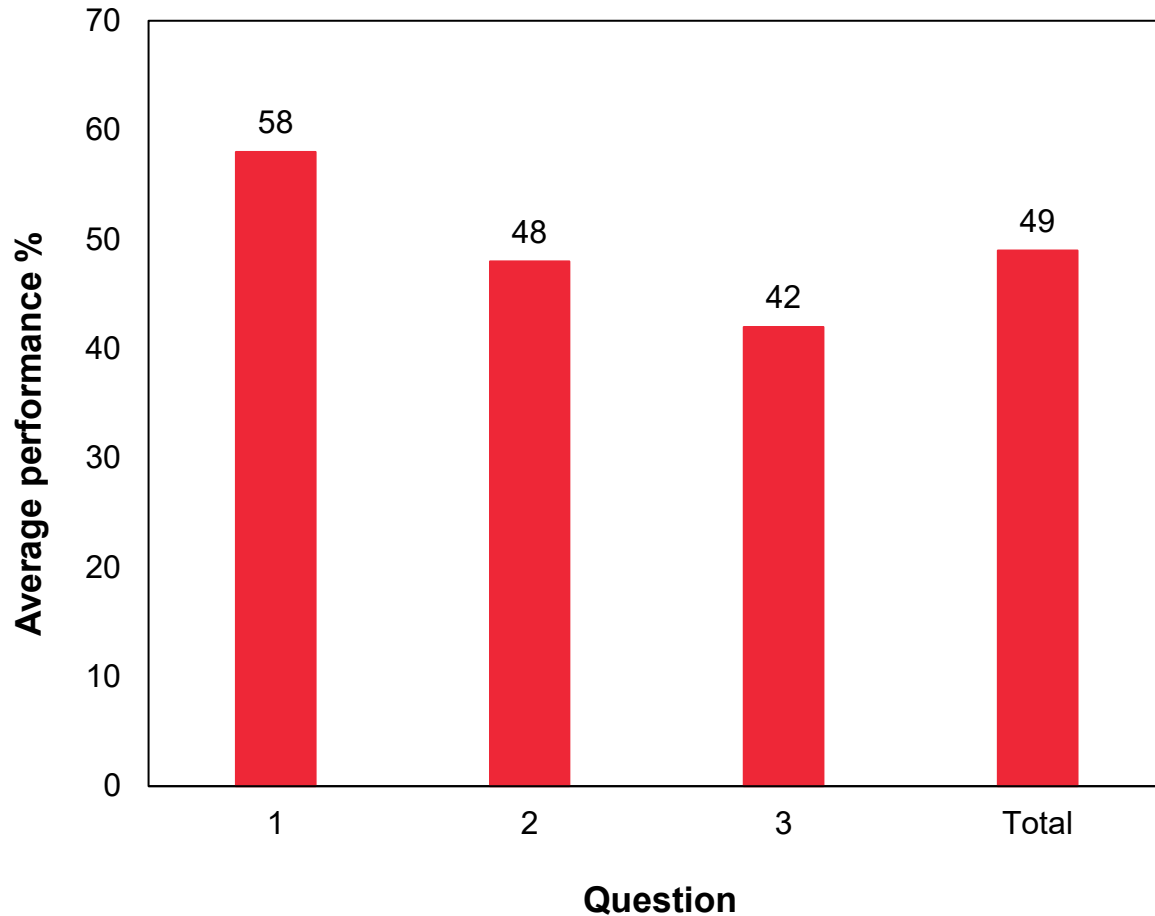
Let's revise this

Click to go to the specific section.



2023 LIFE SCIENCES NSC PAPER 1

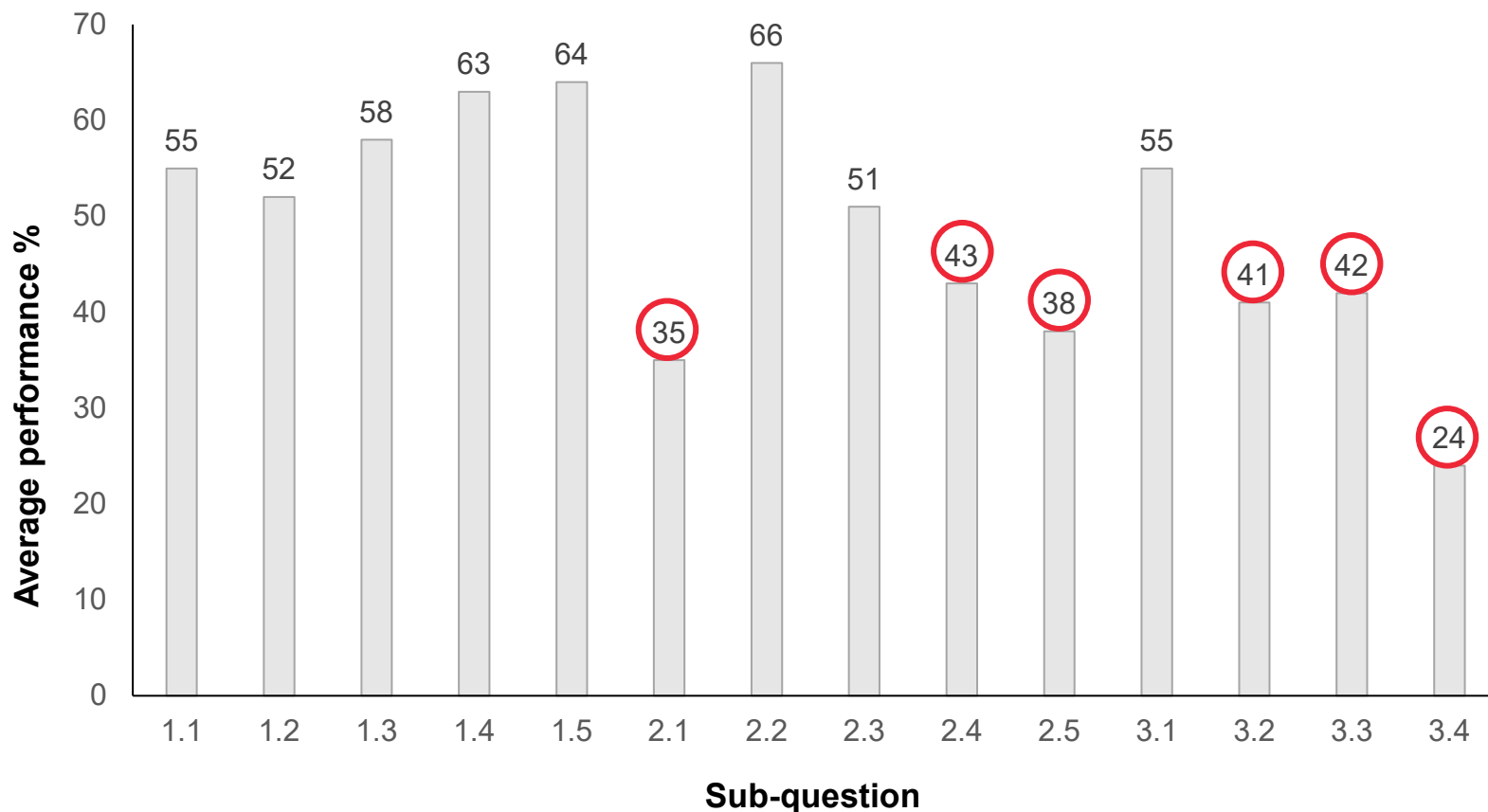
Average performance **per question**



Question	Topics
1	Multiple choice, Terminology, Matching items, Receptors – The ear, Human reproduction (fertilisation and development of the zygote)
2	Reproductive strategies, Male reproductive system, Female reproductive system (ovarian cysts and hormones), Central nervous system (brain) and Knee-jerk reaction
3	Scientific investigation (Alzheimer's disease), Adrenal gland and Homeostasis (salt and water levels), Exercise and Skin temperature, Scientific investigation (effect of auxins)

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Average performance per sub-question



Problem areas

- 2.1 Reproductive strategies – amplexus
- 2.4 Nervous system – brain injuries
- 2.5 Knee-jerk reaction
- 3.2 Adrenal glands and homeostasis (salt & water levels)
- 3.3 Skin temperature & exercise
- 3.4 Scientific investigation – plant responses to auxin

2023 LIFE SCIENCES NSC PAPER 1

General Comments

! Correct **spelling** is very important

- glucagon✓ vs glucogen ✗
- chorion✓ vs choronic ✗
- blastocyst✓ vs blastocyte ✗

! Emphasise difference between **closely related structures**

- placenta vs chorionic villi
- endometrium vs uterine wall
- vestibular apparatus vs semicircular canals
- hypothalamus vs hypophysis



! Emphasise difference between commonly **confused terms**

- chorion vs choroid
- glucose vs glycogen vs glucagon
- ureter vs urethra



! **Scientific investigations** still require attention

- do not give generic answers, e.g. a large sample size was used
- give specific information for the investigation provided, e.g. a large sample of 150 volunteers/participants was used

! Note **how many items are asked** for in a question

- if only ONE item is asked for, only the first ONE will be marked
- make sure you are most certain of your first answer in such a case

SECTION A – Multiple Choice

1.1.1 Which ONE of the following parts controls the amount of light entering the eye by influencing the size of the pupil?

- A Sclera
- B Cornea
- C Retina
- D Iris

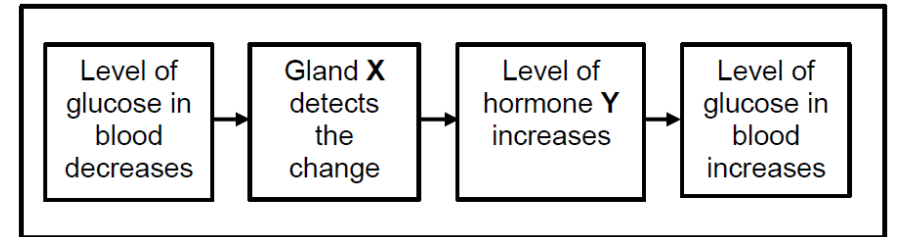
*Grade 12 Life Sciences
Part 1 p. 58 (2022 ed.)*

1.1.2 The function of the umbilical vein is to transport ...

- A carbon dioxide from the foetus to the mother.
- B nutrients from the foetus to the mother.
- C carbon dioxide from the mother to the foetus.
- D nutrients from the mother to the foetus.

*Grade 12 Life Sciences
Part 1 p. 26 (2022 ed.)*

1.1.3 The diagram below represents the events that occur during the homeostatic control of blood glucose.



Which ONE of the following represents gland X and hormone Y?

	Gland X	Hormone Y
A	Pancreas	Glucagon
B	Pituitary	Glucagon
C	Pancreas	Insulin
D	Pituitary	Insulin

*Grade 12 Life Sciences
Part 1 p. 74 (2022 ed.)*

SECTION A – Multiple Choice

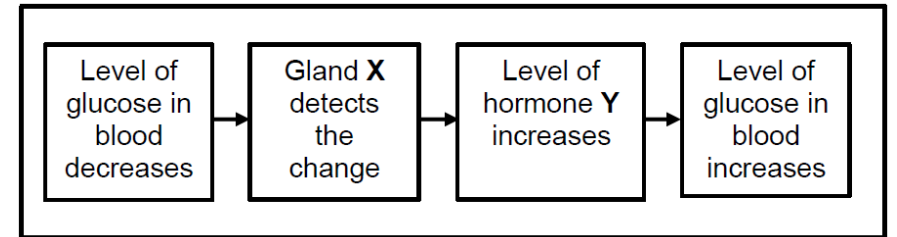
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	Gland X	Hormone Y
<input checked="" type="radio"/> A	Pancreas	Glucagon
B	Pituitary	Glucagon
C	Pancreas	Insulin
D	Pituitary	Insulin

SECTION A – Multiple Choice

1.1.4 Which ONE of the following is CORRECT regarding the homeostatic control of the carbon dioxide concentration in the blood?

- A The lungs have receptors.
- B High oxygen levels is the stimulus.
- C Breathing muscles are the effectors.
- D The process is controlled by the cerebrum.

*Grade 12 Life Sciences
Part 1 p. 80 (2022 ed.)*

1.1.5 The plant hormones that can be used to kill broad-leaved weeds are ...

- A abscisic acid only.
- B abscisic acid and gibberellins.
- C auxins only.
- D abscisic acid and auxins.

*Grade 12 Life Sciences
Part 1 p. 95 (2022 ed.)*

1.1.6 A girl looking at a car moving away from her is able to focus on the letters on the number plate.

Which ONE of the following changes occurred in her eyes?

- A The suspensory ligaments slackened.
- B The ciliary muscles relaxed.
- C Light rays were refracted more.
- D The lens became more convex.

*Grade 12 Life Sciences
Part 1 p. 59 (2022 ed.)*

1.1.7 One of the characteristics of a sperm that causes it to move faster is the ...

- A oval-shaped head.
- B haploid nucleus.
- C presence of enzymes in the acrosome.
- D absence of the middle piece.

*Grade 12 Life Sciences
Part 1 p. 17 (2022 ed.)*

SECTION A – Multiple Choice

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- A The lungs have receptors.
- B High oxygen levels is the stimulus.
- C Breathing muscles are the effectors.
- D The process is controlled by the cerebrum.

Candidates were not familiar with breathing muscles as effectors to control CO₂-levels in the blood.

1.1.5 The plant hormones that can be used to kill broad-leaved weeds are ...

- A abscisic acid only.
- B abscisic acid and gibberellins.
- C auxins only.
- D abscisic acid and auxins.

Candidates were not familiar with the role of auxins to kill broad-leaved weeds.

1.1.6 A girl looking at a car moving away from her is able to focus on the letters on the number plate.

Which ONE of the following changes occurred in her eyes?

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1.1.7 One of the characteristics of a sperm that causes it to move faster is the ...

- A oval-shaped head.
- B haploid nucleus.
- C presence of enzymes in the acrosome.
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Candidates were not familiar with the term oval-shaped head of the sperm.

SECTION A – Multiple Choice

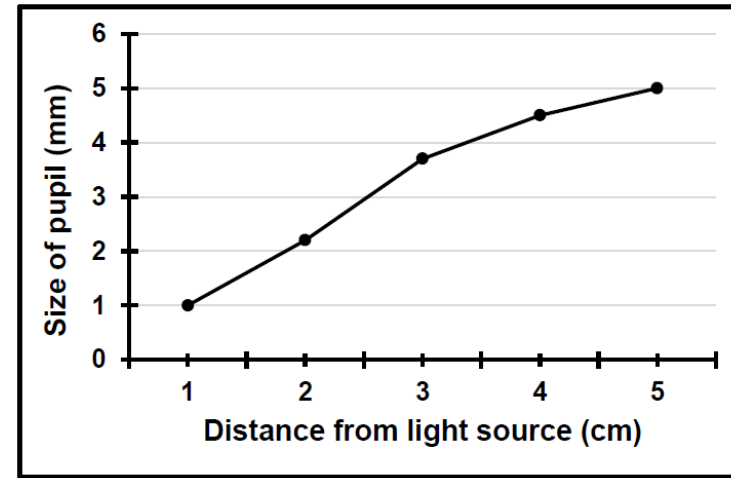
1.1.8 In a person suffering from long-sightedness ...

- A the eyeball is longer than normal.
- B light rays fall behind the retina.
- C light rays are refracted more by the lens.
- D distant objects will appear blurred.

Grade 12 Life Sciences
Part 1 p. 61 (2022 ed.)

1.1.9

The graph below shows the results of an investigation done to determine the effect of light intensity on the size of the pupil.



Grade 12 Life Sciences
Part 1 p. 58 (2022 ed.)

Which ONE of the following statements is a conclusion that can be made from the results?

- A As the distance from the light source increases, the size of the pupil increases.
- B As the distance from the light source decreases, the size of the pupil increases.
- C As the size of the pupil increases, the distance from the light source increases.
- D As the size of the pupil decreases, the distance from the light source increases.

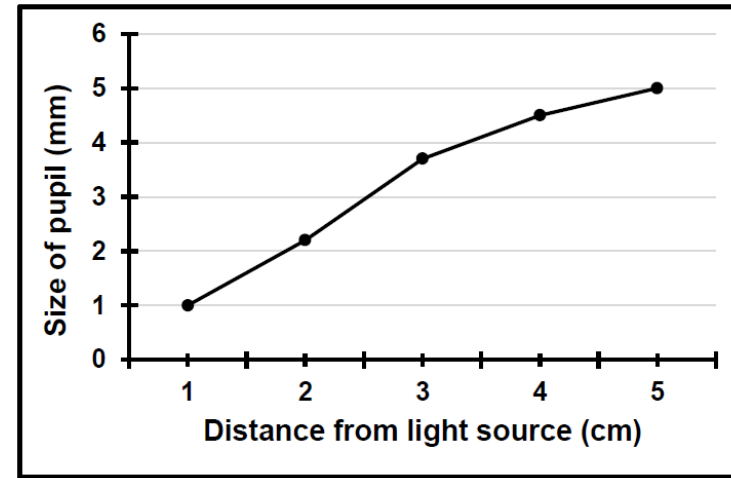


SECTION A – Multiple Choice

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SECTION A – Tricky Multiple Choice

1.1.10

The following is a list of events that occur in the female body:

- (i) Puberty
- (ii) Ovulation
- (iii) Development of the corpus luteum
- (iv) Oogenesis
- (v) Thickening of the endometrium

Which ONE of the following is a combination of events that are influenced by LH (luteinising hormone)?

- A (i), (ii), (iii), (iv) and (v)
- B (ii), (iii), (iv) and (v) only
- C (ii) and (iii) only
- D (iii) only

*Grade 12 Life Sciences
Part 1 p. 15 (2022 ed.)*



SECTION A – Tricky Multiple Choice

1.1.10

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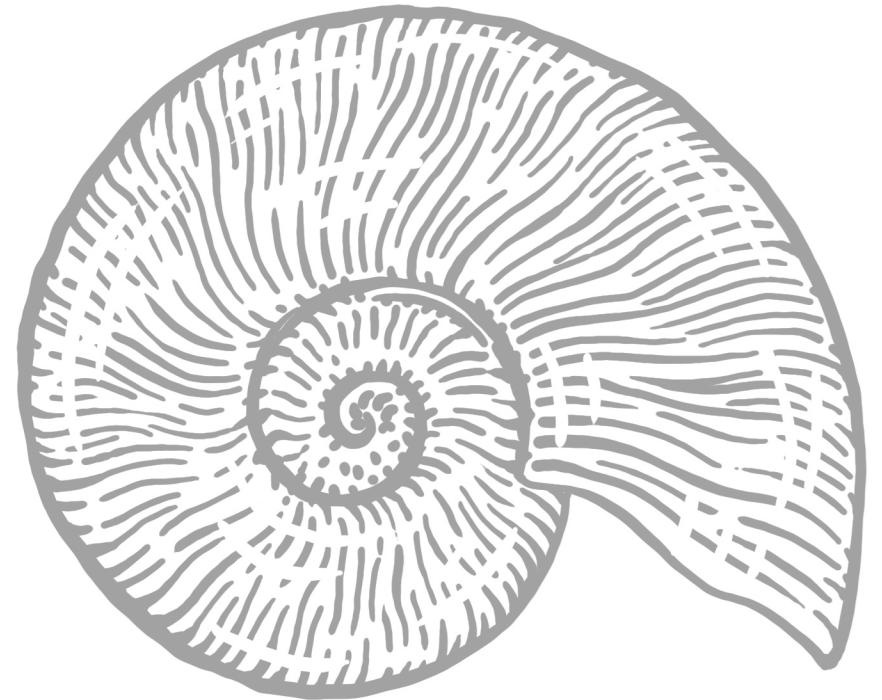
- A (i), (ii), (iii), (iv) and (v)
- B (ii), (iii), (iv) and (v) only
- C (ii) and (iii) only
- D (iii) only



SECTION A – Terminology

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (1.2.1 to 1.2.8) in the ANSWER BOOK.

- 1.2.1 A reproductive strategy where the young receives nutrients through the placenta.
- 1.2.2 The duct that transports semen and urine to the outside of the body.
- 1.2.3 The part of the nervous system that consists of cranial and spinal nerves.
- 1.2.4 The form in which excess glucose is stored in the liver.
- 1.2.5 The structure that serves as a micro-filter during pregnancy.
- 1.2.6 The pigmented layer of the eye that absorbs excess light.
- 1.2.7 The part of a neuron that plays a role in the speed at which a nerve impulse is transmitted.
- 1.2.8 The part of the male reproductive system which temporarily stores sperm until they mature.



SECTION A – Terminology

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- 1.2.7 The part of a neuron that plays a role in the speed at which a nerve impulse is transmitted.
- 1.2.8 The part of the male reproductive system which temporarily stores sperm until they mature.

Memorandum

vivipary ✓

urethra ✓

peripheral ✓ nervous system

glycogen ✓

placenta ✓

choroid ✓

myelin sheath ✓

epididymis ✓

Common misconceptions & Errors

Provided *ureter* ✗

Provided abbreviation *PNS* ✗

Provided *glucogen/glucagon* ✗

Provided *chorionic villi* ✗

Provided *chorion* ✗

Provided only *myelin* ✗

Provided *epidermis* ✗

SECTION A – Item/statement columns

Indicate whether each of the descriptions in COLUMN I apply to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	A process that produces four mature gametes in humans from a single diploid cell	A: Oogenesis B: Spermatogenesis
1.3.2	A defence mechanism that protects plants against herbivores	A: Thorns B: Chemicals
1.3.3	The nerve that transmits impulses from the retina to the brain	A: Optic nerve B: Auditory nerve

Grade 12 Life Sciences Part 1 p. 16 & 18 (2022 ed.)

Grade 12 Life Sciences Part 1 p. 95 (2022 ed.)

Grade 12 Life Sciences Part 1 p. 57 (2022 ed.)



SECTION A – Item/statement columns

Indicate whether each of the descriptions in COLUMN I apply to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.3) in the ANSWER BOOK.

COLUMN I	COLUMN II
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1.3.2 A defence mechanism that protects plants against herbivores	A: Thorns B: Chemicals
1.3.3 The nerve that transmits impulses from the retina to the brain	A: Optic nerve B: Auditory nerve

Memorandum

B only ✓✓

Both A and B ✓✓

A only ✓✓

Common misconceptions & Errors

1.3.1 Many candidates selected 'both' and could not distinguish between the number of mature gametes produced by oogenesis vs spermatogenesis.



Let's revise this

SECTION A – Sense organs

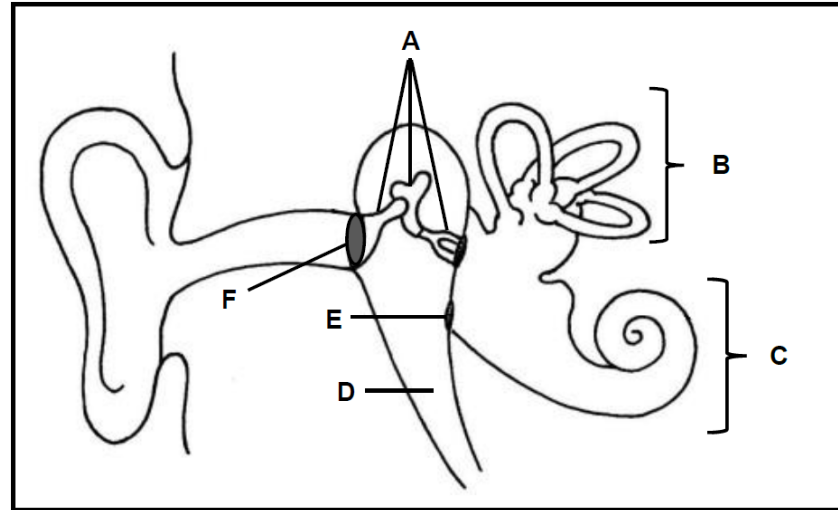
1.4

The diagram represents the human ear.

1.4.1 Identify part:

(a) **B**

(b) **E**



Common misconceptions & Errors

1.4.2 Give the LETTER and NAME of the part that:

(a) is filled with air

(b) Contains the organ of Corti

1.4.3 Give the LETTER of the part:

(a) where grommets are inserted

(b) that amplifies vibrations

SECTION A – Sense organs

1.4

The diagram represents the human ear.

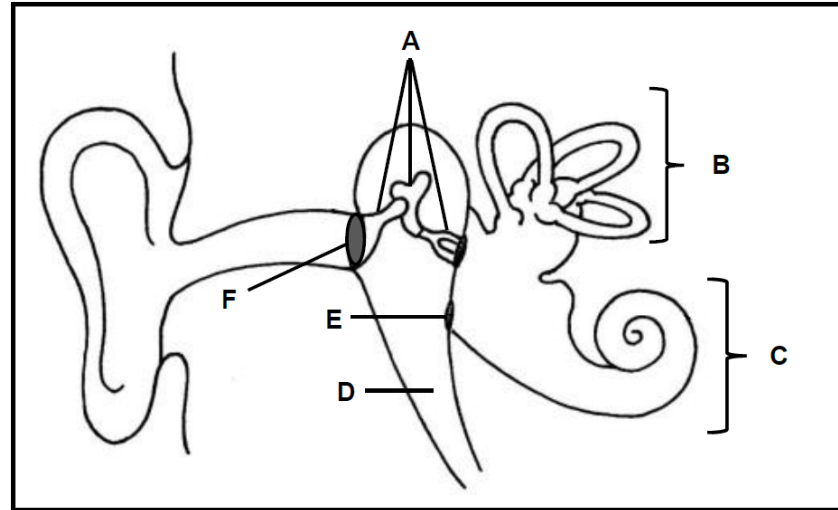
1.4.1 Identify part:

(a) **B**

semicircular canals ✓ (1)

(b) **E**

round window ✓ (1)



1.4.2 Give the LETTER and NAME of the part that:

(a) is filled with air

D ✓ Eustachian tube ✓ (2)

(b) Contains the organ of Corti

C ✓ Cochlea ✓ (2)

1.4.3 Give the LETTER of the part:

(a) where grommets are inserted

F ✓ (1)

(b) that amplifies vibrations

A ✓ (1)

Common misconceptions & Errors

1.4.1 (a) Candidates gave incomplete answers, i.e., *semicircular* instead of *semicircular canals*.

Afrikaans candidates incorrectly wrote *halfmaanvormige sirkels* instead of *halfsirkelvormige kanale*.

1.4.2 Candidates either gave only the NAME or only the LETTER and not both as asked.

(a) Candidates did not know which part of the ear is filled with air.



Let's revise this

SECTION A – Human Reproduction

1.5

The diagram shows events that may take place inside a human female body.

1.5.1 Identify structure:

- (a) **B**
- (b) **D**
- (c) **E**

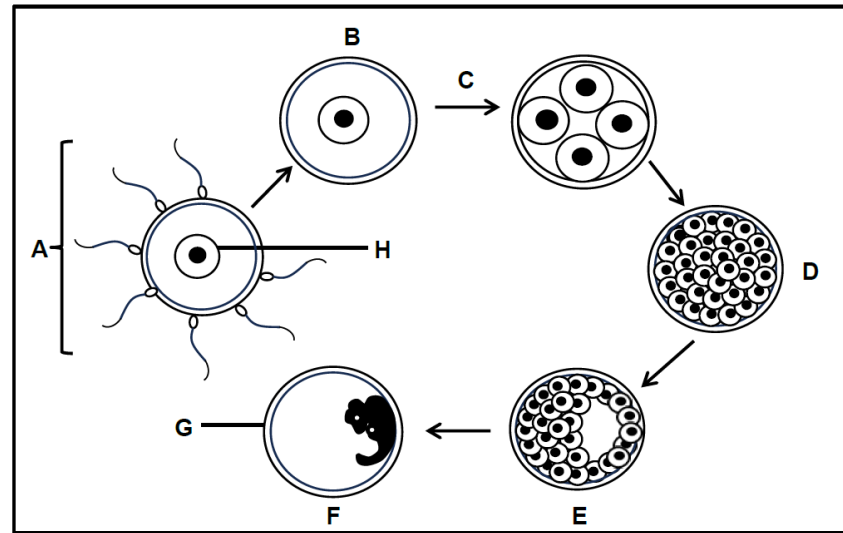
1.5.2 Name the:

- (a) process taking place at **A**
- (b) inner wall of the uterus where structure **E** implants

1.5.3 State the type of cell division that takes place at **C**.

1.5.4 How many chromosomes are normally found in **H**?

1.5.5 Identify the extra-embryonic membrane **G**.



Common misconceptions & Errors

SECTION A – Human Reproduction

1.5

The diagram shows events that may take place inside a human female body.

1.5.1 Identify structure:

- (a) **B** **zygote** ✓ (1)
- (b) **D** **morula** ✓ (1)
- (c) **E** **blastocyst/blastula** ✓ (1)

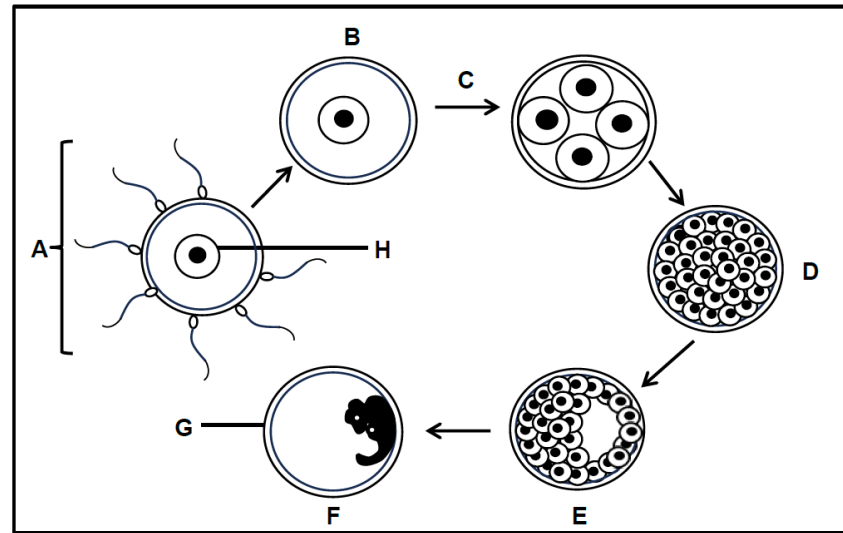
1.5.2 Name the:

- (a) process taking place at **A** **fertilisation** ✓ (1)
- (b) inner wall of the uterus where structure **E** implants **endometrium** ✓ (1)

1.5.3 State the type of cell division that takes place at **C**. **mitosis** ✓ (1)

1.5.4 How many chromosomes are normally found in **H**? **23** ✓ (1)

1.5.5 Identify the extra-embryonic membrane **G**. **chorion** ✓ (1)



Common misconceptions & Errors

1.5.1 (a) Candidates gave the description of **fertilised ovum** (*bevrugte ovum*) instead of the term **zygote** (*sigoot*).

Learners **still confuse** the different events and processes taking place from fertilisation to implantation.

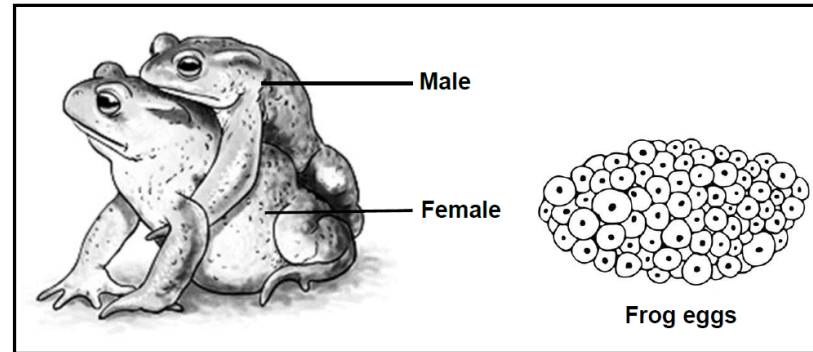
SECTION A – Suggestions for improvement

- ☑ Paper 1 is about human physiology; therefore **diagrams of different structures/organs** are an integral part of this paper.
 - *Structures/organs are **best taught using annotated diagrams**.*
 - **Give diagrams without labels** so that learners can identify the parts and their functions themselves.
- ☑ Learners should be encouraged to **read questions with proper understanding**. There may be subtle differences that alter the response required, e.g.
 - *Q1.3.1 The process that produces four mature gametes in humans from a single diploid cell can only be spermatogenesis, and not oogenesis where only one mature ovum with three polar bodies is formed.*
- ☑ Only supply **ONE answer to multiple choice**, **terminology** and **items and statement** questions.
- ☑ **Biological terminology** can only be mastered through **practice after each section is taught**.

SECTION B – Reproduction in other Vertebrates

2.1

In some frog species, during mating, the male climbs onto the back of the female and grasps her with his front legs. During this time, the female will release about 6 000 ova, while the male releases sperm onto them. This mating behaviour is called amplexus.



Common misconceptions & Errors

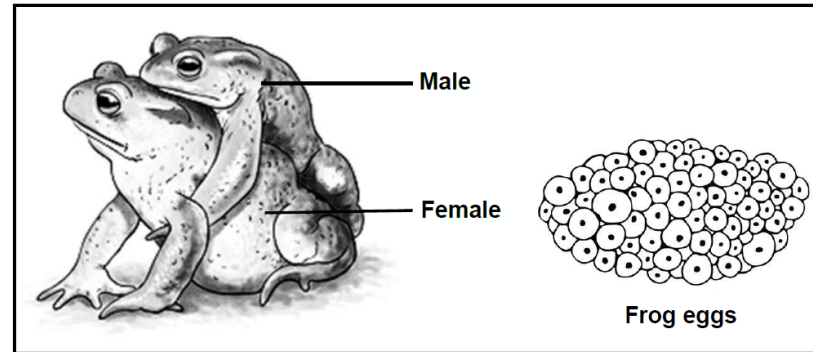
2.1.1 Name the type of fertilisation that occurs during reproduction in frogs.

2.1.2 Explain why the fertilised eggs of these frogs do not survive on land.

SECTION B – Reproduction in other Vertebrates

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2.1.1 Name the type of fertilisation that occurs during reproduction in frogs.

external ✓ fertilisation (1)

2.1.2 Explain why the fertilised eggs of these frogs do not survive on land.

- the eggs will dry out ✓
- because they have no shells ✓ / are not amniotic / have no amnion (2)

Common misconceptions & Errors

2.1.1 Candidates did not read the stem of the question and struggled to identify that the diagram depicted *external fertilisation*.

They could not link the release of many eggs with *external fertilisation*.

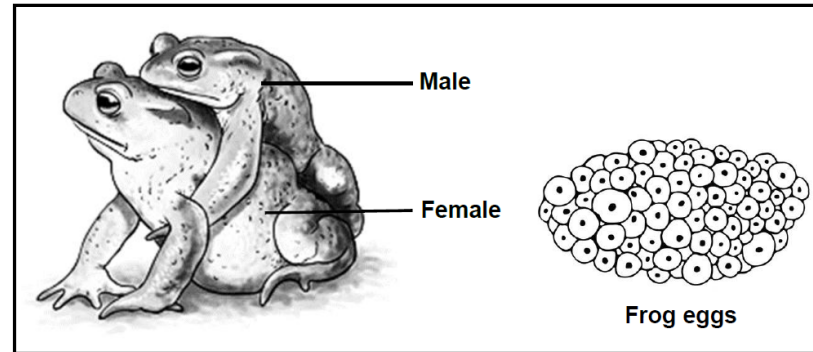
2.1.2 Candidates could not explain, i.e. they only gave the effect (eggs will dry out) and not the cause (no shells).

Also referred to *predation* as a reason, but there would be predation in water as well.

SECTION B – Reproduction in other Vertebrates

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Common misconceptions & Errors

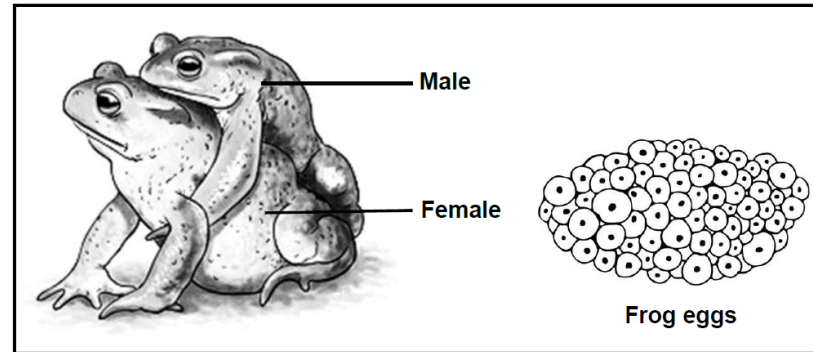
2.1.3 Explain how amplexus increases the chances of fertilisation in frogs.

2.1.4 From the information above, explain ONE other strategy that contributes to the reproductive success of the frog species.

SECTION B – Reproduction in other Vertebrates

2.1

In some frog species, during mating, the male climbs onto the back of the female and grasps her with his front legs. During this time, the female will release about 6 000 ova, while the male releases sperm onto them. This mating behaviour is called amplexus.



2.1.3 Explain how amplexus increases the chances of fertilisation in frogs.

- The male and female bodies are in close contact ✓
- so that sperm can be released directly onto the ova ✓ OR
- Many / up to 6 000 ova are released ✓
- since fertilisation is external ✓

(any 1 x 2)

2.1.4 From the information above, explain ONE other strategy that contributes to the reproductive success of the frog species.

- Many / up to 6 000 ova are released ✓
- since fertilisation is external ✓ / increasing the chance that some will be fertilised OR
- The male and female bodies are in close contact ✓
- so that sperm can be released directly onto the ova ✓

(any 1 x 2)

Common misconceptions & Errors

2.1.3 & 2.1.4 Candidates could not present responses in a cause-and-effect way.

Confused concepts *increasing chances of fertilisation* in Q 2.1.3 with *reproductive success* in Q 2.1.4.

SECTION B – Human reproduction

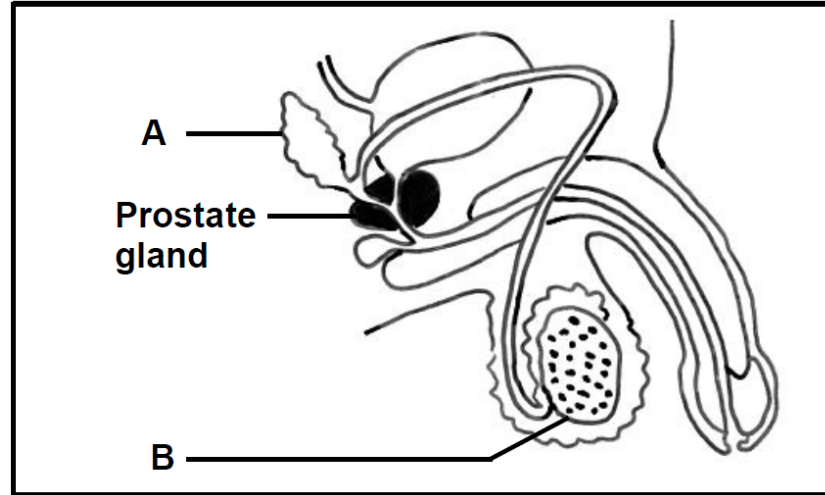
2.2

The diagram represents the male reproductive system.

2.2.1 Name:

(a) part **A**

(b) the hormone secreted by **B**



Common misconceptions & Errors

2.2.2 Explain ONE function of the fluid secreted by the prostate gland during reproduction.

SECTION B – Human reproduction

2.2

The diagram represents the male reproductive system.

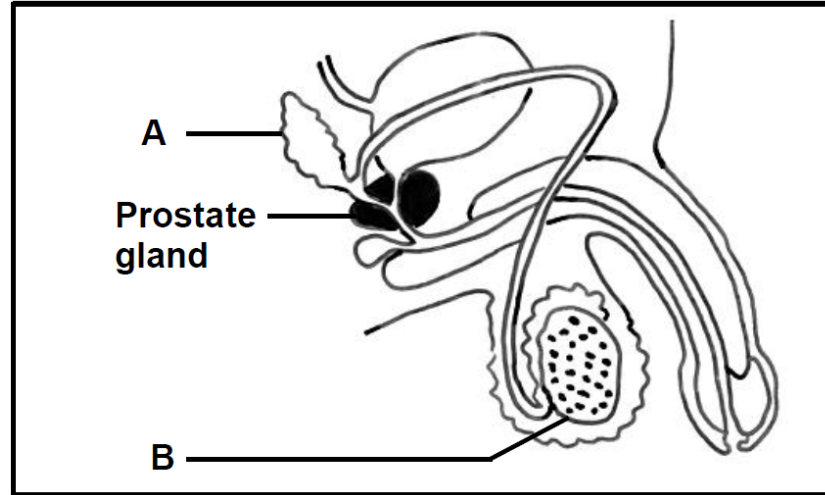
2.2.1 Name:

(a) part A

seminal vesicle ✓ (1)

(b) the hormone secreted by B

testosterone ✓ (1)



Common misconceptions & Errors

2.2.2 Candidates **only described the function** of the prostate fluid, e.g. *neutralises the acidity in the vagina*, **without stating WHY** it is able to do so, i.e. *is an alkaline fluid*.

2.2.2 Explain ONE function of the fluid secreted by the prostate gland during reproduction.

- It is alkaline ✓
- to neutralise the acidic conditions of the vagina ✓
- It contains mucus ✓ / provides a medium
- to facilitate the movement of sperm ✓
- It contains nutrients ✓
- to supply the sperm with energy ✓

(first 1 x 2)

SECTION B – Human reproduction

2.2

2.2.3 Prostate cancer is one of the most common types of cancer among men. The table below shows the number of men per 100 000 men of different age groups that were diagnosed with prostate cancer in a certain country over a period of 14 years.

AGE GROUP	NUMBER OF PROSTATE CANCER CASES (PER 100 000 MEN)
<49	5
50–54	135
55–59	288
60–64	488
65–69	720
70–74	764
75–79	693
>80	473

- (a) According to the table, which age group of men is most likely to develop prostate cancer?
- (b) Draw a histogram to represent the data for men from the age group 60–64 to the age group 75–79

Common misconceptions & Errors

SECTION B – Human reproduction

2.2

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>80	473

(a) According to the table, which age group of men is most likely to develop prostate cancer?

(70 – 74) ✓ (1)

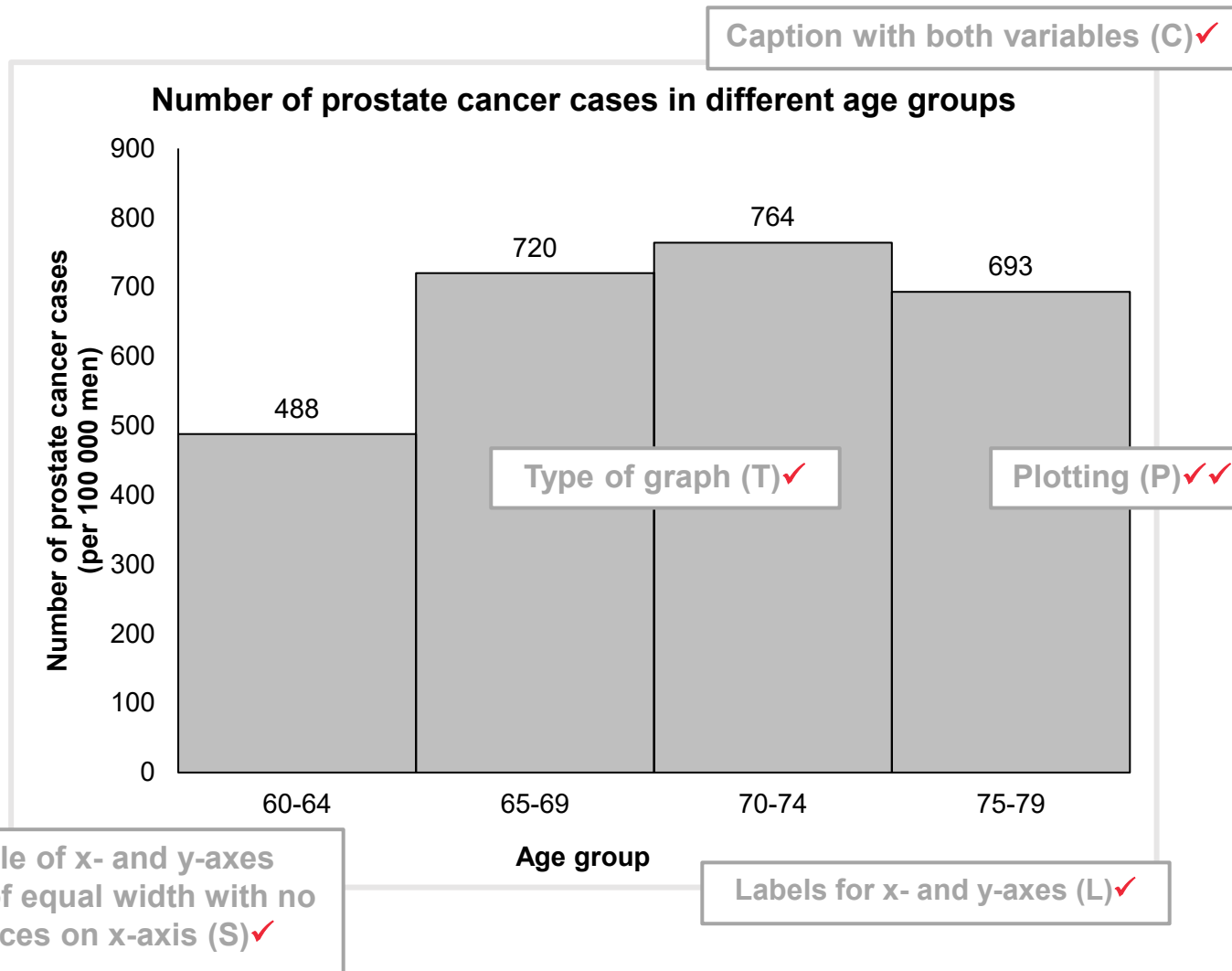
(b) Draw a histogram to represent the data for men from the age group 60–64 to the age group 75–79.

next page

Common misconceptions & Errors

SECTION B – Human reproduction

- 2.2 2.2.3 (b) Draw a histogram to represent the data for men from the age group 60–64 to the age group 75–79.



Common misconceptions & Errors

- 2.2.3 (b) Candidates lost marks due to:
- drawing a bar graph instead of a histogram
 - graph caption only containing one variable
 - drew more ranges of age groups than required in the question
 - y-axis label not having a unit
 - incorrect plotting
 - inconsistent drawing of the bars (different widths)

SECTION B – Human reproduction

2.3

Read the extract.

OVARIAN CYSTS IN FEMALES

Ovarian cysts are fluid-filled structures that develop inside the ovaries of some women. The two most common types of cysts in women of reproductive age are follicular cysts and corpus luteum cysts.

Follicular cysts develop when a Graafian follicle fails to rupture and release the ovum. The follicle continues to grow because of continued hormonal stimulation.

A corpus luteum cyst develops when the corpus luteum does not degenerate, even when a person is not pregnant.

Women often show no symptoms and the cysts disappear, but in rare cases ovarian cysts keep on increasing in size. A very large cyst can cause intense pain and may rupture, leading to internal bleeding. Such cysts will require surgical removal.

Common misconceptions & Errors

2.3.1 From the extract, give:

- (a) TWO structures in the ovary that may develop cysts

- (b) TWO symptoms associated with very large cysts

SECTION B – Human reproduction

2.3

Read the extract.

OVARIAN CYSTS IN FEMALES

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Common misconceptions & Errors

2.3.1 From the extract, give:

(a) TWO structures in the ovary that may develop cysts

- (Graafian) follicle ✓ and
- Corpus luteum ✓ (first 2)

(b) TWO symptoms associated with very large cysts

- (Intense) pain ✓
- Internal bleeding ✓ (first 2)

SECTION B – Human reproduction

2.3

2.3.2 Name the hormone:

- (a) responsible for the growth of the follicle under normal conditions.

- (b) that will be high in concentration in the blood of women where follicular cysts develop.

OVARIAN CYSTS IN FEMALES

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Common misconceptions & Errors

2.3.3 Give a reason for your answer in QUESTION 2.3.2(b).

SECTION B – Human reproduction

2.3

2.3.2 Name the hormone:

- (a) responsible for the growth of the follicle under normal conditions.

FSH ✓ (1)

- (b) that will be high in concentration in the blood of women where follicular cysts develop.

oestrogen ✓ OR LH ✓ OR FSH ✓ (1)

OVARIAN CYSTS IN FEMALES

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Common misconceptions & Errors

2.3.3 Candidates:

- could not explain why the hormone was high
- could not link the correct hormone to the explanation
- confused the functions of different hormones

2.3.3 Give a reason for your answer in QUESTION 2.3.2(b).

- The Graafian follicle keeps on producing oestrogen ✓ / fails to rupture
OR

- The increased secretion of oestrogen stimulates the secretion of LH ✓
OR

- Excess production of FSH can cause the failure to ovulate ✓ / Graafian follicle to rupture

(any 1)

SECTION B – Human reproduction

2.3

2.3.4 Explain why a woman will not be able to fall pregnant if she has a corpus luteum cyst that does not disappear.

OVARIAN CYSTS IN FEMALES

Ovarian cysts are fluid-filled structures that develop inside the ovaries of some women. The two most common types of cysts in women of reproductive age are follicular cysts and corpus luteum cysts.

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Common misconceptions & Errors

SECTION B – Human reproduction

2.3

2.3.4 Explain why a woman will not be able to fall pregnant if she has a corpus luteum cyst that does not disappear.

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- the corpus luteum does not degenerate ✓ and
- keeps on secreting progesterone ✓
- this will inhibit the pituitary gland ✓
- from secreting FSH ✓
- therefore no follicle will develop ✓ and
- no ovulation ✓ will take place

(any 5)

Common misconceptions & Errors

2.3.4 Candidates could not make the connection to the negative feedback mechanism between progesterone and FSH. They did not understand that *the corpus luteum cyst would prevent the corpus luteum from degenerating* thereby continuing to produce progesterone that would inhibit the pituitary's secretion of FSH and LH.



Let's revise this

SECTION B – Nervous System

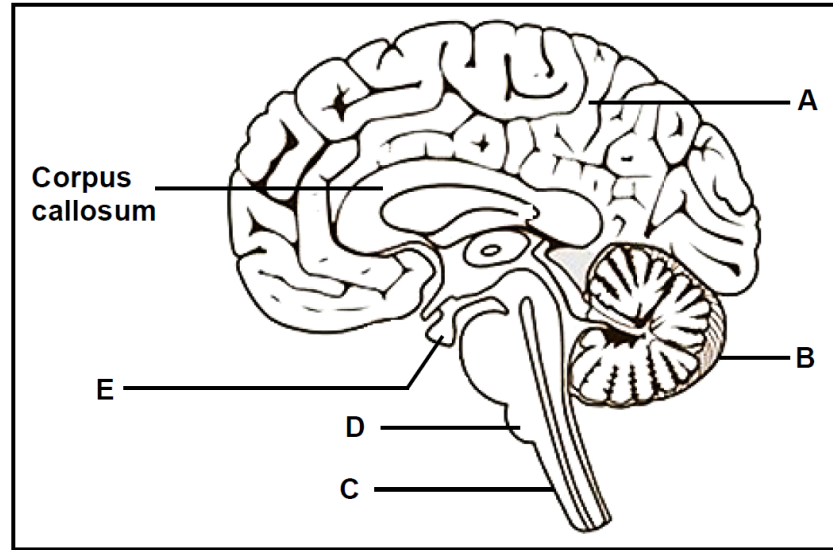
2.4

The diagram represents part of the central nervous system of a human.

2.4.1 Identify:

(a) part **C**

(b) gland **E**



Common misconceptions & Errors

2.4.2 Give the LETTER of the part that controls voluntary actions.

2.4.3 Describe the location of the corpus callosum.

SECTION B – Nervous System

2.4

The diagram represents part of the central nervous system of a human.

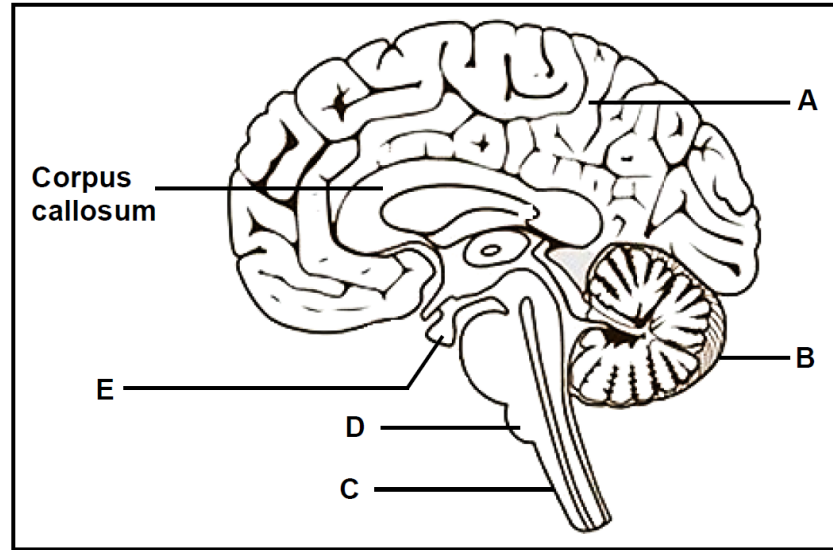
2.4.1 Identify:

(a) part C

spinal cord ✓ (1)

(b) gland E

pituitary gland ✓/
hypophysis (1)



2.4.2 Give the LETTER of the part that controls voluntary actions.

A ✓ (1)

2.4.3 Describe the location of the corpus callosum.

Between the two hemispheres of the cerebrum ✓✓ (2)

Common misconceptions & Errors

2.4.3 Candidates failed to obtain marks as their descriptions were not complete. They looked at the diagram to explain where they saw the corpus callosum, e.g. *underneath the cerebrum* ✗.

Incorrectly wrote that it joined the two hemispheres of the *brain* instead of the two hemispheres of the *cerebrum* (the cerebellum also has two hemispheres and is part of the brain).

SECTION B – Nervous System

2.4

The diagram represents part of the central nervous system of a human.

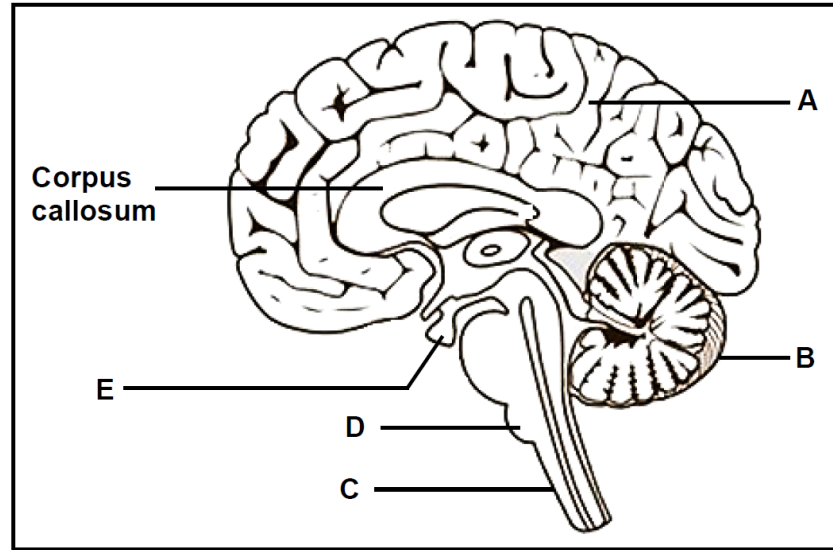
2.4.4 A learner suffered a brain injury during a rugby match. He could still breathe properly but he experienced occasional loss of memory and balance.

Explain why:

(a) the learner could still breathe properly

(b) it is possible that the injury affected part **B**

(c) the hearing of the learner could also be affected because of the injury



Common misconceptions & Errors

SECTION B – Nervous System

2.4

The diagram represents part of the central nervous system of a human.

2.4.4 A learner suffered a brain injury during a rugby match. He could still breathe properly but he experienced occasional loss of memory and balance.

Explain why:

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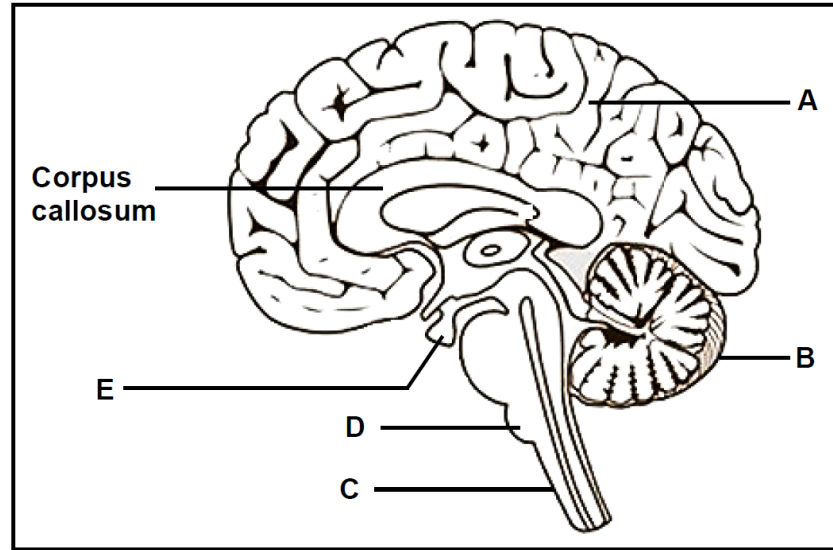
- Part D / medulla oblongata which controls breathing ✓
- was not injured ✓ (2)

(b) it is possible that the injury affected part B

- The learner (occasionally) lost balance ✓
- due to no coordination of voluntary movements ✓ by part B (2)

(c) the hearing of the learner could also be affected because of the injury

- The loss of memory indicates a possible injury to part A ✓ / the cerebrum
- which is also responsible for hearing ✓ / (interpretation of) sound (2)



Common misconceptions & Errors

2.4.4 posed a great challenge. Candidates gave generic functions of the parts of the brain rather than applying their knowledge to link the function of the affected part of the brain with what the learner in the scenario was experiencing.

Some candidates incorrectly referred to the function of the cerebellum as *controlling balance* instead of *coordinating voluntary muscle movement*, therefore controlling balance.

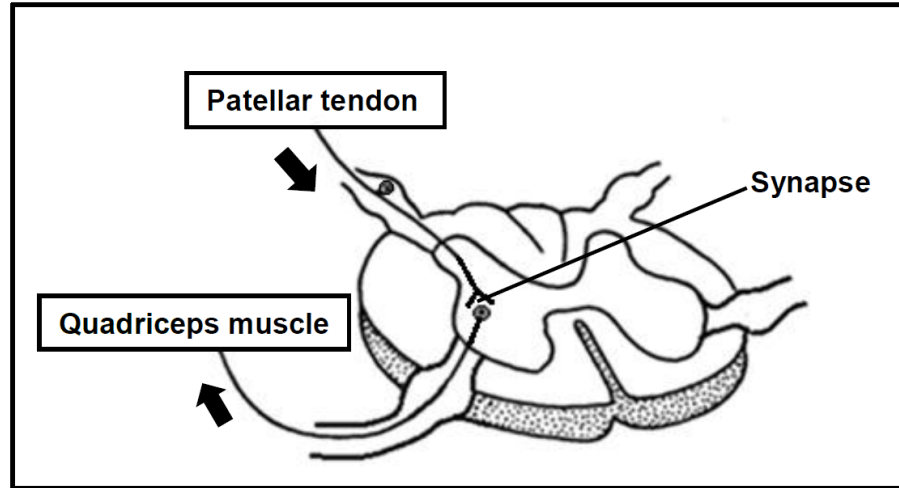


SECTION B – Nervous System

2.5

The efficiency and speed of the knee-jerk reaction is very important for balance and movement. The stimulation of the patellar tendon, just below the knee cap (patella), causes the contraction and relaxation of the quadriceps muscle in the upper leg.

The diagram represents the reflex arc for the knee-jerk reaction containing only ONE synapse. The arrows indicate the transmission of nerve impulses.



Common misconceptions & Errors

2.5.1 What is a *reflex action*?

2.5.2 State:

- (a) ONE reason why a synapse is significant

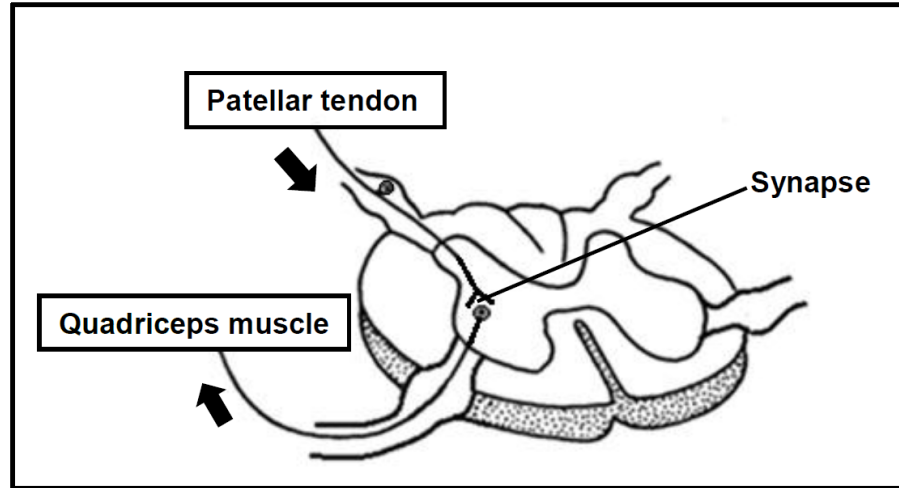
- (b) the importance of the knee-jerk reaction

SECTION B – Nervous System

2.5

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The diagram represents the reflex arc for the knee-jerk reaction containing only ONE synapse. The arrows indicate the transmission of nerve impulses.



Common misconceptions & Errors

2.5.1 What is a *reflex action*?

- a rapid involuntary/automatic response ✓
- to a stimulus ✓

(2)

2.5.2 State:

(a) ONE reason why a synapse is significant

Ensures that the impulse is transmitted in one direction ✓

(first 1)

(b) the importance of the knee-jerk reaction

It is important for balance ✓/movement

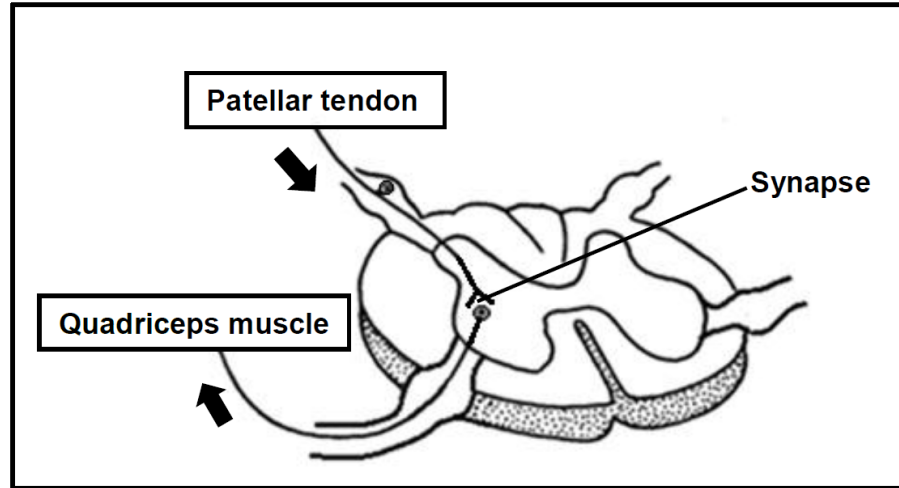
(1)

SECTION B – Nervous System

2.5

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Common misconceptions & Errors

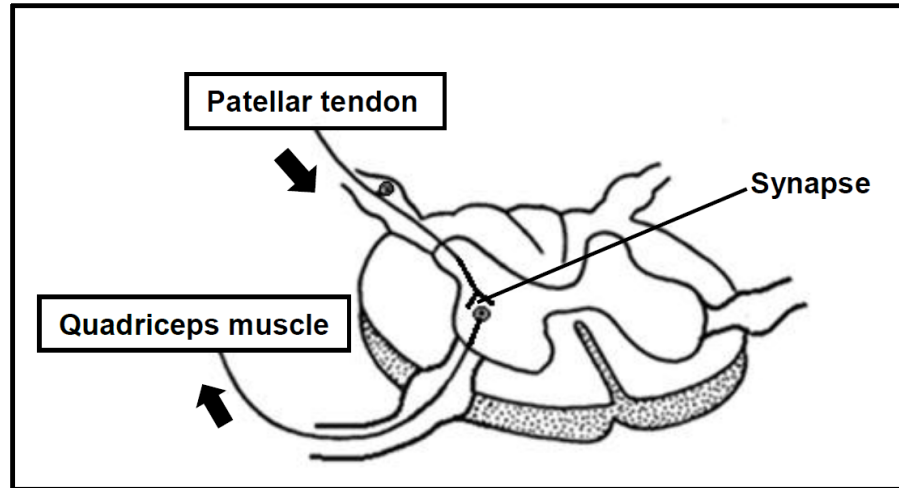
2.5.3 Describe the pathway of the impulse in this reflex arc to bring about the knee-jerk reaction.

SECTION B – Nervous System

2.5

The efficiency and speed of the knee-jerk reaction is very important for balance and movement. The stimulation of the patellar tendon, just below the knee cap (patella), causes the contraction and relaxation of the quadriceps muscle in the upper leg.

The diagram represents the reflex arc for the knee-jerk reaction containing only ONE synapse. The arrows indicate the transmission of nerve impulses.



2.5.3 Describe the pathway of the impulse in this reflex arc to bring about the knee-jerk reaction.

- the impulse is transmitted from the receptors in the patellar tendon ✓
- through the
- sensory neuron ✓ and the
- synapse ✓ to the
- motor neuron ✓ and to the
- quadriceps ✓ muscle

(correct sequence is required)

(5)

Common misconceptions & Errors

2.5.3 Candidates did not read the question with understanding, i.e., to describe the pathway of the impulse in this *specific reflex arc* and not a *general reflex arc*.

The knee-jerk has no interneuron (see pic), so they lost marks for incorrect sequence if they included an interneuron.

They were also required to state the location of the receptor (patellar tendon) and the specific effector (quadriceps muscle).

SECTION B QUESTION 2 – Suggestions for improvement

- ☑ Paper 1 is about human physiology; therefore **diagrams of different structures/organs** are an integral part of this paper.
 - *Structures/organs are **best taught using annotated diagrams**.*
 - **Give diagrams without labels** so that learners can identify the parts and their functions themselves.
- ☑ Teach learners the **skill of drawing different graphs** and the criteria used to assess each graph.
- ☑ **Diagrams** encountered in the examination **may differ slightly from** the ones encountered in the **classroom** – be context specific in answers.



SECTION B – Nervous system

3.1

Read the extract.

3.1.1 State ONE change in the nerve tissue of the brain that can cause Alzheimer's disease.

3.1.2 From the extract, state:

(a) ONE symptom of Alzheimer's disease

(b) a genetic risk factor

(c) TWO functions of the hippocampus

ALZHEIMER'S DISEASE AND EXERCISE

Age and family history are the known risk factors for Alzheimer's disease. The most common symptom of Alzheimer's disease is a worsening ability to remember new information.

Regular exercise may help to reduce the risk of developing Alzheimer's disease because it can improve blood flow to the brain and help to maintain the volume of the hippocampus. The hippocampus is located deep inside the cerebrum and plays a major role in learning ability and orientation.

Scientists conducted an investigation to determine if regular exercise reduces the risk of Alzheimer's disease in humans.

They:

- Used 37 female participants between the ages of 65 and 75 in an exercise programme
- Used participants that did not show symptoms of Alzheimer's disease at the start of the investigation
- Conducted the investigation three times a week for three months

The results showed an improvement in higher-order thinking abilities and an increased blood flow to the cerebrum.

Common misconceptions & Errors

SECTION B – Nervous system

3.1

Read the extract.

3.1.1 State ONE change in the nerve tissue of the brain that can cause Alzheimer's disease.

- Degeneration✓/wasting away of nerve tissue OR
- Plaque/proteins formed around the nerve tissue✓ (first 1)

3.1.2 From the extract, state:

(a) ONE symptom of Alzheimer's disease

Worsening ability to remember new information✓ (first 1)

(b) a genetic risk factor family history✓ (1)

(c) TWO functions of the hippocampus

- learning ability✓
- orientation✓ (first 2)

ALZHEIMER'S DISEASE AND EXERCISE

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Common misconceptions & Errors

3.1.1 Candidates confused *Alzheimer's disease* with *Multiple Sclerosis*.

Alzheimer's = degeneration of nerve tissue of the brain
Multiple sclerosis = degeneration of myelin sheath of the motor neurons

3.1.2 (a) Candidates paraphrased instead of quoting a segment directly from the extract.

3.1.2 (b) Candidates provided *age* as a genetic risk factor.

SECTION B – Nervous system

3.1

Read the extract.

3.1.3 Name TWO factors that were considered when selecting the participants for this investigation.

ALZHEIMER'S DISEASE AND EXERCISE

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3.1.4 State TWO ways in which the scientists improved the reliability of their results.

Common misconceptions & Errors

SECTION B – Nervous system

3.1

Read the extract.

3.1.3 Name TWO factors that were considered when selecting the participants for this investigation.

They:

- were all females✓ / considered gender
- were between the ages of 65 and 75✓ / considered age
- did not show symptoms of Alzheimer's disease✓

(first 2)

3.1.4 State TWO ways in which the scientists improved the reliability of their results.

They:

- used 37 participants✓
- conducted the investigation three times a week✓
- conducted the investigation for three months✓

(first 2)

ALZHEIMER'S DISEASE AND EXERCISE

Age and family history are the known risk factors for Alzheimer's disease. The most common symptom of Alzheimer's disease is a worsening ability to remember new information.

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Scientists conducted an investigation to determine if regular exercise reduces the risk of Alzheimer's disease in humans.

They:

- Used 37 female participants between the ages of 65 and 75 in an exercise programme
- Used participants that did not show symptoms of Alzheimer's disease at the start of the investigation
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The results showed an improvement in higher-order thinking abilities and an increased blood flow to the cerebrum.

Common misconceptions & Errors

3.1.3 & 3.1.4 Candidates gave generic answers when they were meant to be specific for *this investigation*:

- 37 females were used and not just 'a large sample size'
- the investigation was repeated 3 times per week for 3 months and not just 'repeated the investigation'

SECTION B – Nervous system

3.1

Read the extract.

3.1.5 Explain why this investigation cannot be used to conclude that exercise reduces the risk of getting Alzheimer's disease.

ALZHEIMER'S DISEASE AND EXERCISE

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- Used participants that did not show symptoms of Alzheimer's disease at the start of the investigation
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3.1.6 From the extract, explain why it is expected that regular exercise can reduce the risk of Alzheimer's disease.

Common misconceptions & Errors

SECTION B – Nervous system

3.1

Read the extract.

3.1.5 Explain why this investigation cannot be used to conclude that exercise reduces the risk of getting Alzheimer's disease.

- Investigation did not establish the relationship between exercise and development of Alzheimer's disease ✓
- since no changes in the nervous tissue were measured ✓ / period was short OR
- There was no control group ✓
- to show that it is the exercise that improves blood flow ✓ / higher-order thinking abilities OR
- People who did not show symptoms of Alzheimer's disease were used ✓
- therefore, results do not show prevention of development of Alzheimer's disease ✓ (any 1 x 2)

3.1.6 From the extract, explain why it is expected that regular exercise can reduce the risk of Alzheimer's disease.

- exercise can improve blood flow to the brain ✓ and
- it can maintain the volume of the hippocampus ✓ which will
- prevent a decrease in higher-order thinking ✓ / cognitive abilities / learning abilities

(3)

ALZHEIMER'S DISEASE AND EXERCISE

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The results showed an improvement in higher-order thinking abilities and an increased blood flow to the cerebrum.

Common misconceptions & Errors

3.1.5 Candidates found it difficult to analyse why the investigation did not provide enough information to write a conclusion.

They did not understand the role of a control in an investigation.

SECTION B – Endocrine System & Homeostasis

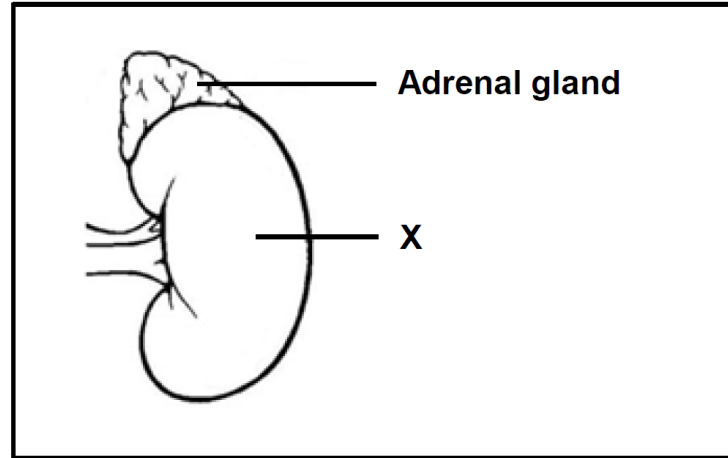
3.2

The diagram shows the location of the adrenal gland in the human body.

3.2.1 Identify:

(a) organ **X**

(b) the system to which the adrenal gland belongs



Common misconceptions & Errors

3.2.2 State TWO characteristics of the type of glands that belongs to the system identified in QUESTION 3.2.1(b).

SECTION B – Endocrine System & Homeostasis

3.2

The diagram shows the location of the adrenal gland in the human body.

3.2.1 Identify:

(a) organ X

kidney ✓ (1)

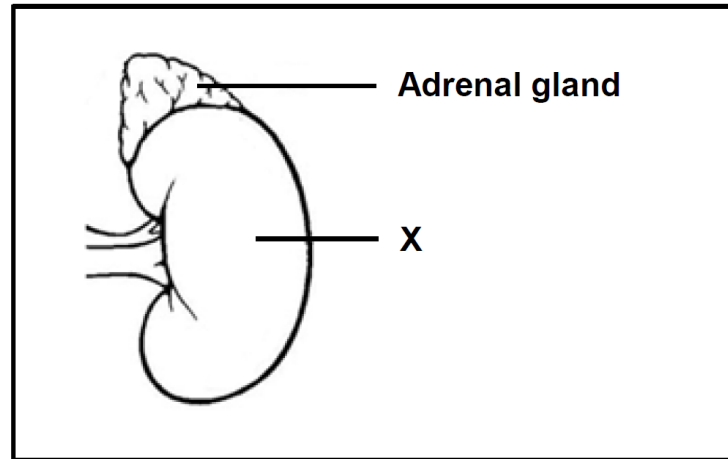
(b) the system to which the adrenal gland belongs

endocrine ✓ system (1)

3.2.2 State TWO characteristics of the type of glands that belongs to the system identified in QUESTION 3.2.1(b).

- it releases hormones ✓

- directly into the blood ✓ / and it is ductless (first 2)



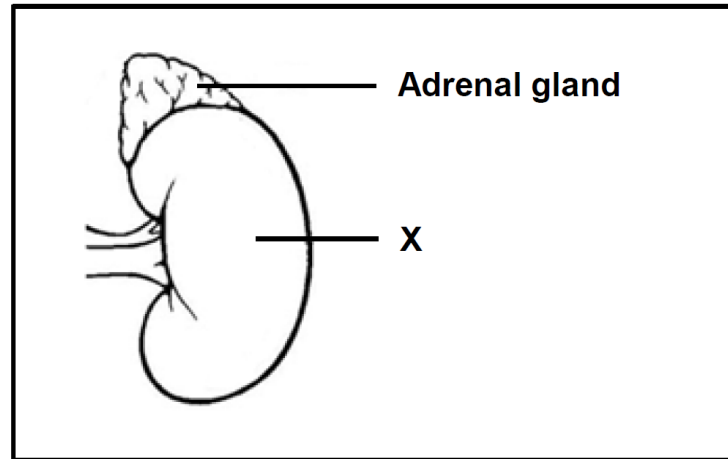
Common misconceptions & Errors

SECTION B – Endocrine System & Homeostasis

3.2

The diagram shows the location of the adrenal gland in the human body.

3.2.3 Describe the interaction between the adrenal gland and organ **X** in maintaining homeostasis when salt levels in the blood are low.



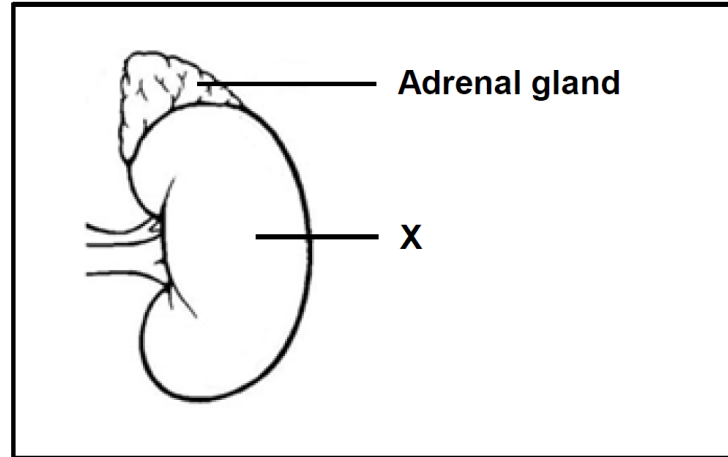
3.2.4 Explain the effect that a secretion of the pituitary gland will have on organ **X** when a person experiences dehydration.

Common misconceptions & Errors

SECTION B – Endocrine System & Homeostasis

3.2

The diagram shows the location of the adrenal gland in the human body.



3.2.3 Describe the interaction between the adrenal gland and organ X in maintaining homeostasis when salt levels in the blood are low.

- low salt levels are detected by receptor cells ✓ in the kidney
- adrenal glands are stimulated ✓ to secrete
- more aldosterone ✓
- which stimulates the renal tubules ✓
- to be more permeable to salt ✓
- this increases the reabsorption of salt ✓ and
- the salt levels in the blood increase ✓ / return back to normal (any 5)

3.2.4 Explain the effect that a secretion of the pituitary gland will have on organ X when a person experiences dehydration.

- the secretion of ADH ✓
- will increase ✓
- which will increase the permeability ✓
- of the renal tubules ✓ in X
- so that more water is reabsorbed ✓ from the filtrate (5)

Common misconceptions & Errors

3.2.3 and 3.2.4 Candidates could not associate *aldosterone* with the homeostasis of the *salt levels* and *ADH* with *osmoregulation*.

Many candidates left out the key words such as *more*, *increases*, *reabsorbed* and *in the blood* when explaining homeostasis.

Candidates were not credited if they stated that *salt concentration increases in the body*.

Many candidates confused the terms, *reabsorption* and *absorption*.

▶ Let's revise this

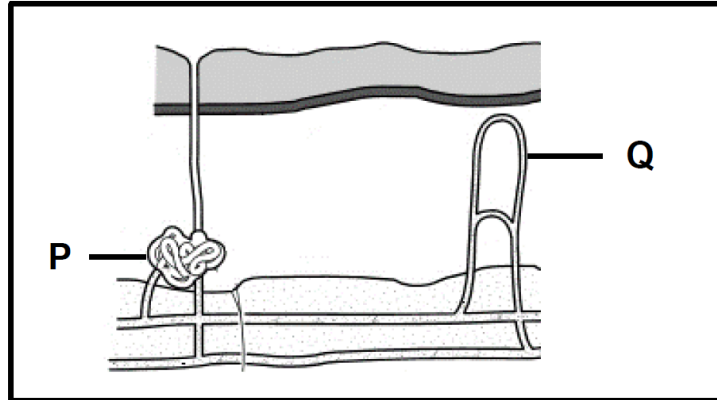
SECTION B – Homeostasis

3.3

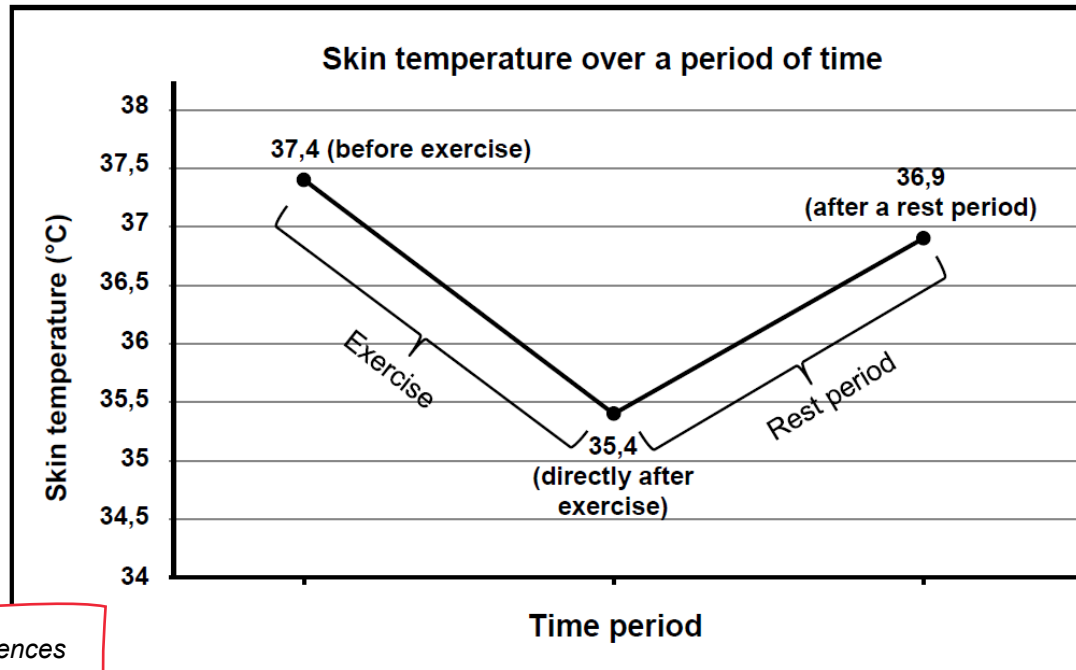
A twelve-year-old boy participated in physical exercise for 45 minutes, followed by a 15-minute rest period. The skin temperature of the boy was measured and the results were recorded.

The diagram represents the skin of the boy before exercise.

The graph below shows the changes in skin temperature over a period of time.



Common misconceptions & Errors



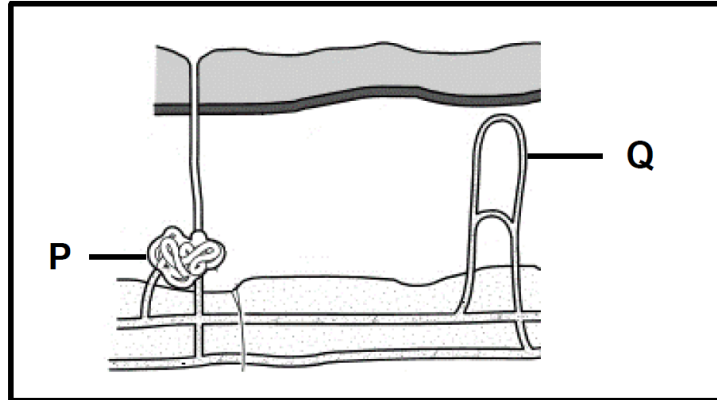
SECTION B – Homeostasis

3.3

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Common misconceptions & Errors

3.3.1 Name the:

- (a) Homeostatic mechanism that brings about the change in skin temperature
- (b) Part of the brain that is responsible for the mechanism named in QUESTION 3.3.1(a)

3.3.2 From the diagram, identify the following parts:

- (a) **P**
- (b) **Q**

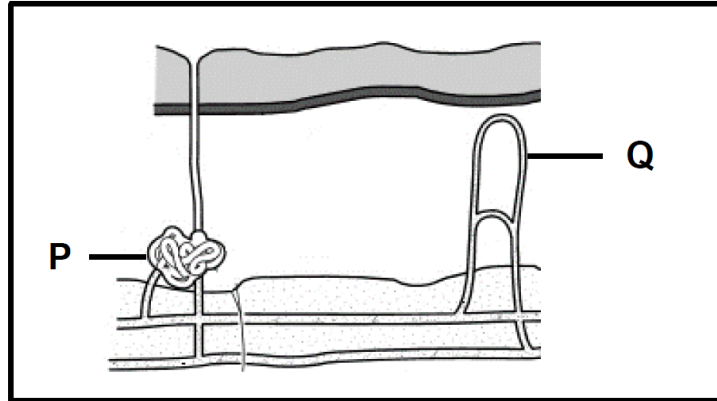
SECTION B – Homeostasis

3.3

A twelve-year-old boy participated in physical exercise for 45 minutes, followed by a 15-minute rest period. The skin temperature of the boy was measured and the results were recorded.

The diagram represents the skin of the boy before exercise.

The graph below shows the changes in skin temperature over a period of time.



Common misconceptions & Errors

3.3.1 (a) Candidates incorrectly referred to *thermoregulation* as *temperature regulation*.

3.3.1 Name the:

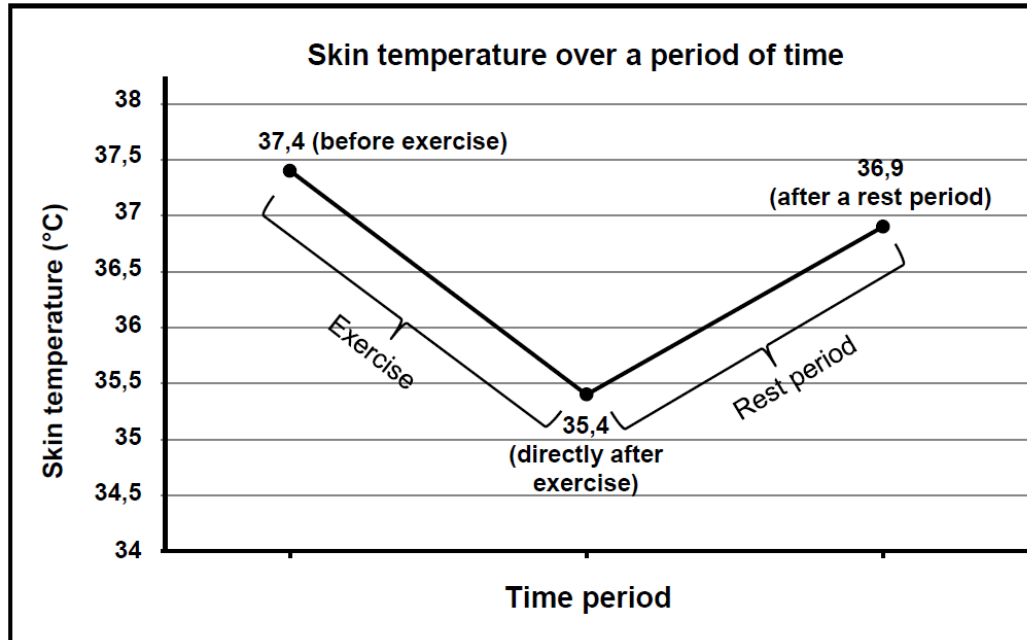
- (a) Homeostatic mechanism that brings about the change in skin temperature
thermoregulation ✓ (1)
- (b) Part of the brain that is responsible for the mechanism named in QUESTION 3.3.1(a)
hypothalamus ✓ (1)

3.3.2 From the diagram, identify the following parts:

- (a) **P** **sweat gland** ✓ (1)
- (b) **Q** **capillary** ✓/blood vessel (1)

SECTION B – Homeostasis

3.3

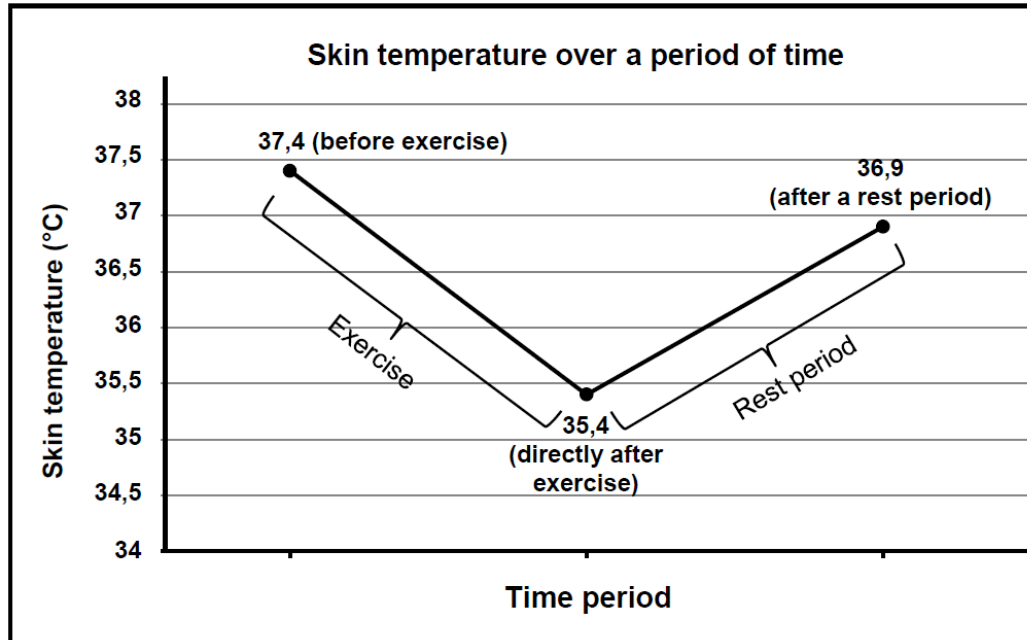


Common misconceptions & Errors

3.3.3 Calculate the percentage decrease in the average skin temperature of the boy before and directly after exercise. Show ALL working.

SECTION B – Homeostasis

3.3



3.3.3 Calculate the percentage decrease in the average skin temperature of the boy before and directly after exercise. Show ALL working.

$$\frac{(37,4 - 35,4)}{37,4} \times 100 = 5,35\% \quad (3)$$

Common misconceptions & Errors

3.3.3 Candidates did not know the formula for percentage decrease:

$$\frac{\text{initial value} - \text{final value}}{\text{initial value}} \times 100$$

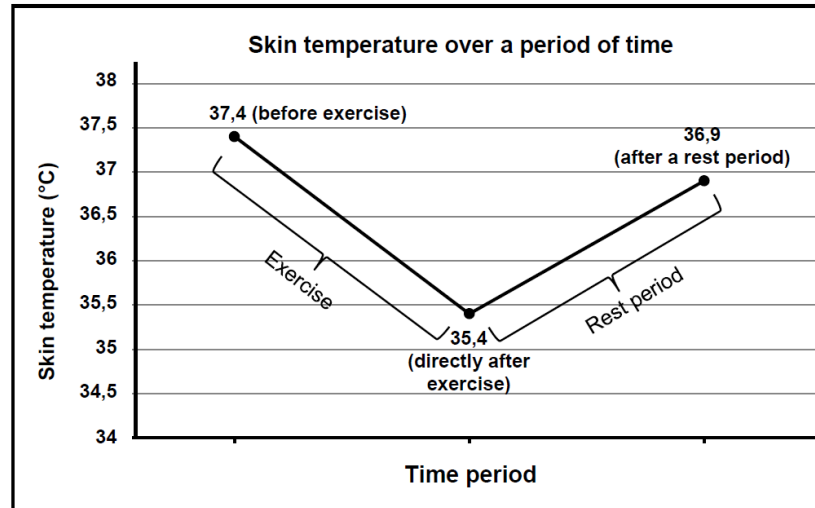
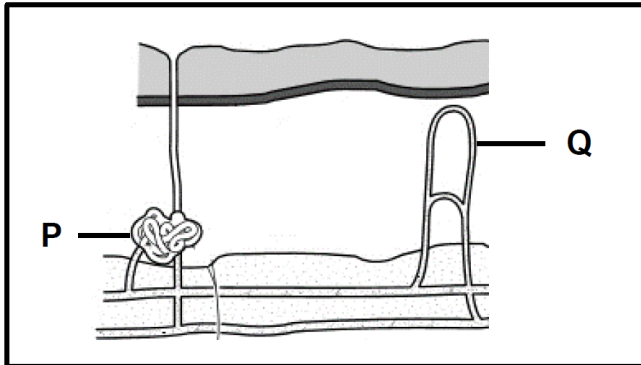
Candidates could not round of correctly, e.g.: 5,347

- whole number = 5
- one decimal = 5,3
- two decimals = 5,35

SECTION B – Homeostasis

3.3

3.3.4 Explain the roles of part **P** and **Q** in the change in skin temperature from before exercise to directly after exercise.



Common misconceptions & Errors

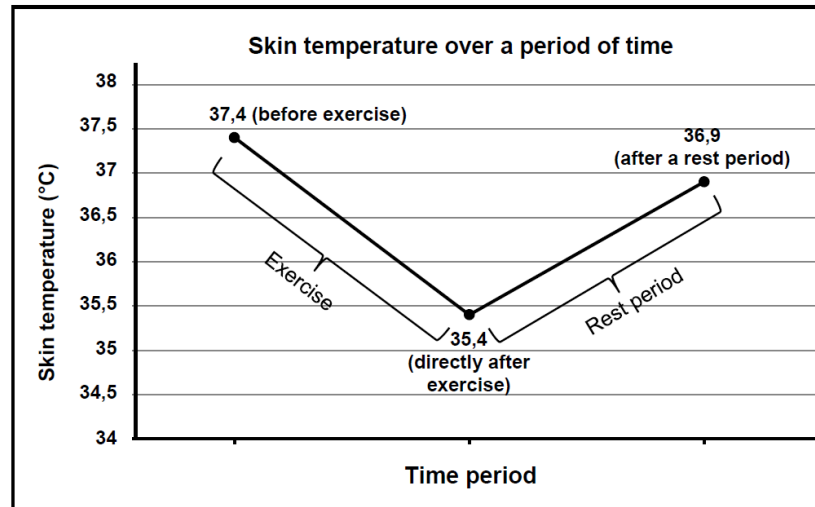
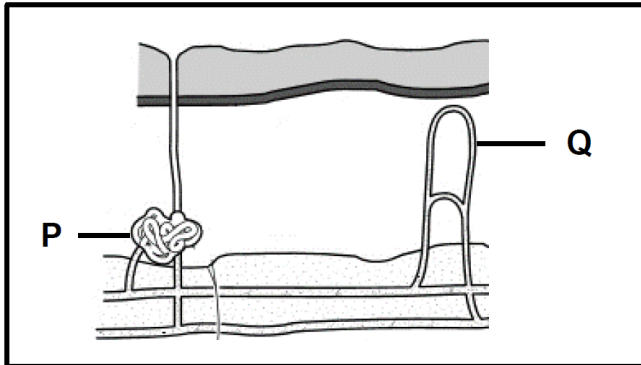
SECTION B – Homeostasis

3.3

3.3.4 Explain the roles of part P and Q in the change in skin temperature from before exercise to directly after exercise.

- skin temperature decreased ✓ / lowers from 37,4 °C to 35,4 °C
- because part Q dilated ✓ / vasodilated
- causing more blood to flow to the (surface of the) skin ✓ and
- part P became (more) active ✓ / produced more sweat
- causing more heat to be lost ✓ to the environment
- through evaporation ✓ / radiation / convection

(6)



Common misconceptions & Errors

3.3.4 Candidates did not read the question with understanding, i.e. before exercise to directly after exercise means the lowering of skin temperature (see graph).

Many explained what happened to body temperature before and after exercise. They, therefore, wrote that before exercise vasoconstriction took place and after exercise vasodilation took place.

No marks were awarded if they wrote both accounts as this was a higher-order question which required them to analyse the graph and explain what caused the decrease in skin temperature during exercise.

SECTION B – Scientific Investigation Plant Hormones

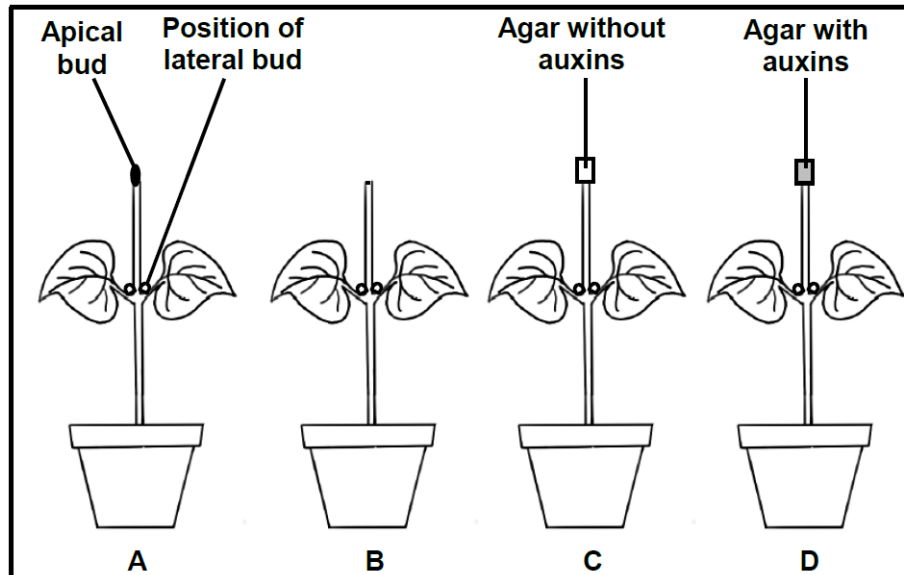
3.4 An investigation was done to determine the effect of auxins on the growth of lateral branches. (The elongation of lateral buds results in the growth of lateral branches.) The procedure was as follows:

- Four potted plants (**A**, **B**, **C** and **D**) of the same species were used.
- Plant **A** was left untreated.
- The apical bud of plant **B** was removed.
- The apical bud of plant **C** was removed and replaced with agar jelly (a jelly-like substance through which other substances can diffuse).
- The apical bud of plant **D** was removed and replaced with agar jelly containing auxins.
- The plants were exposed to the same environmental conditions.
- The length of the lateral buds of each plant was measured at the beginning of the investigation and again after three weeks.

The diagram shows the setup of the investigation at the beginning.

The results are shown in the table below.

Plant	Length of the lateral buds (mm)	
	At the beginning	After three weeks
A	7,0	7,3
B	6,9	10,4
C	7,2	10,3
D	7,1	7,2



Common misconceptions & Errors

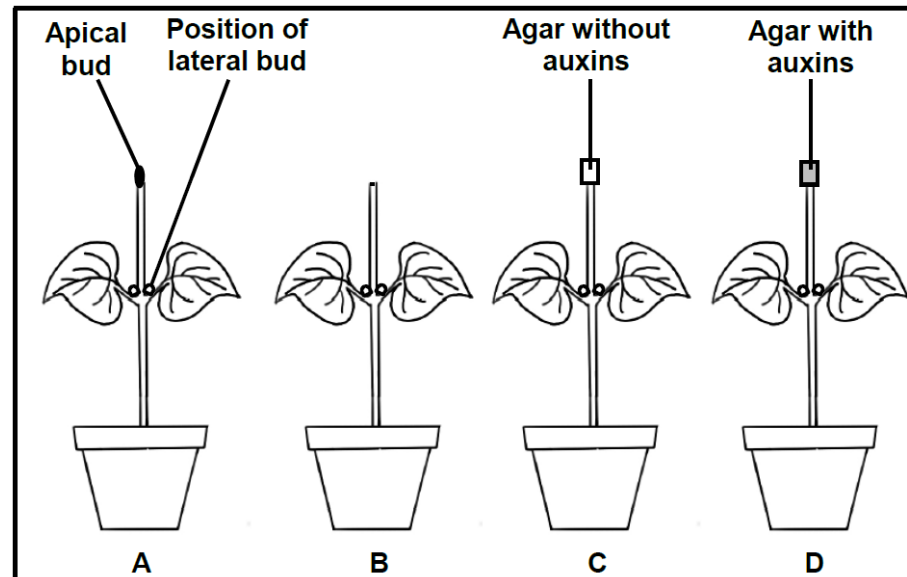
SECTION B – Scientific Investigation Plant Hormones

3.4 An investigation was done to determine the effect of auxins on the growth of lateral branches. (The elongation of lateral buds results in the growth of lateral branches.)

3.4.1 For this investigation, state the:

(a) independent variable

(b) dependent variable



3.4.2 Explain why all the plants were exposed to the same environmental conditions.

Plant	Length of the lateral buds (mm)	
	At the beginning	After three weeks
A	7,0	7,3
B	6,9	10,4
C	7,2	10,3
D	7,1	7,2

Common misconceptions & Errors

SECTION B – Scientific Investigation Plant Hormones

3.4 An investigation was done to determine the effect of auxins on the growth of lateral branches. (The elongation of lateral buds results in the growth of lateral branches.)

3.4.1 For this investigation, state the:

(a) independent variable

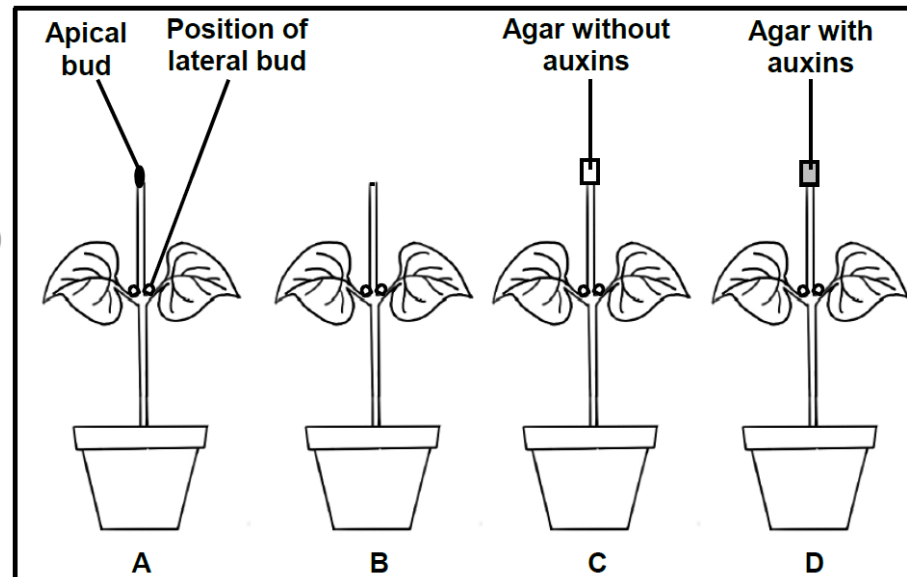
(presence/absence of) auxins ✓ (1)

(b) dependent variable

growth of lateral branches ✓ (1)

3.4.2 Explain why all the plants were exposed to the same environmental conditions.

- to ensure that the results are caused only by the presence of auxins ✓ which
- increases the validity ✓ of the investigation (2)



Plant	Length of the lateral buds (mm)	
	At the beginning	After three weeks
A	7,0	7,3
B	6,9	10,4
C	7,2	10,3
D	7,1	7,2

Common misconceptions & Errors

3.4.1 (a) Candidates wrote *the effect of auxins*. This is *incorrect* as the effect of auxin is the growth of lateral branches, i.e. what was being measured / the dependent variable.

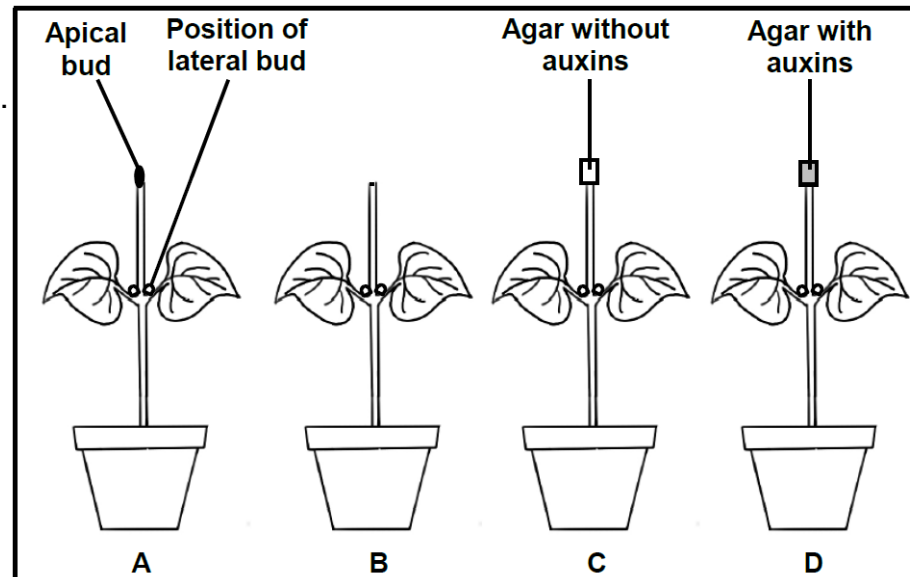
3.4.2 Candidates *confused reliability with validity*.

SECTION B – Scientific Investigation Plant Hormones

3.4 An investigation was done to determine the effect of auxins on the growth of lateral branches. (The elongation of lateral buds results in the growth of lateral branches.)

3.4.3 Explain why agar without auxins was used in plant C.

3.4.4 State a conclusion for this investigation.



Plant	Length of the lateral buds (mm)	
	At the beginning	After three weeks
A	7,0	7,3
B	6,9	10,4
C	7,2	10,3
D	7,1	7,2

Grade 12 Life Sciences
Part 1 p. iii - viii (2022 ed.)

Common misconceptions & Errors

SECTION B – Scientific Investigation Plant Hormones

3.4 An investigation was done to determine the effect of auxins on the growth of lateral branches. (The elongation of lateral buds results in the growth of lateral branches.)

3.4.3 Explain why agar without auxins was used in plant C.

- it acts as a control ✓
- to show that the results of Plant D ✓
- are caused by the (presence of) auxins ✓
- and not the agar jelly ✓ (any 3)

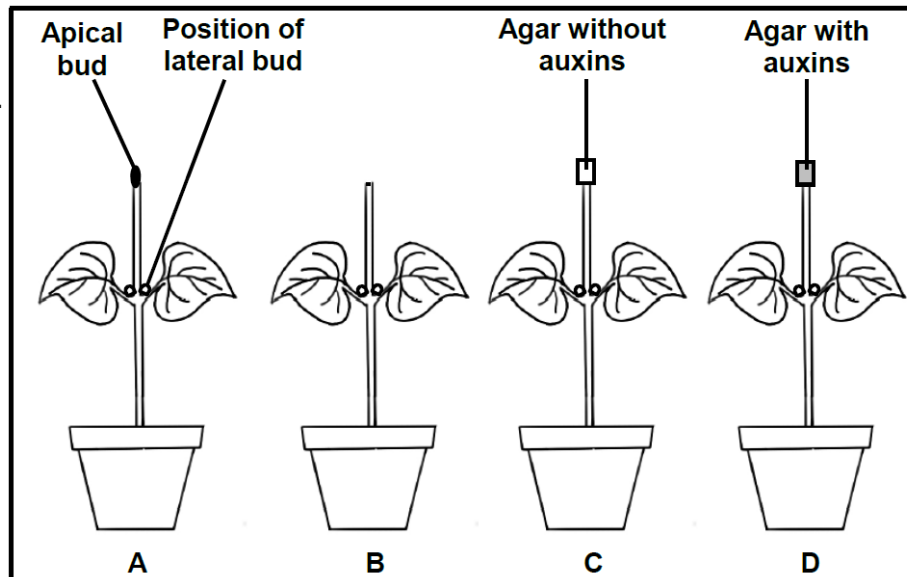
3.4.4 State a conclusion for this investigation.

The presence of auxins slows the growth of lateral branches ✓✓

OR

The absence of auxins stimulates the growth of lateral branches ✓✓

(2)



Plant	Length of the lateral buds (mm)	
	At the beginning	After three weeks
A	7,0	7,3
B	6,9	10,4
C	7,2	10,3
D	7,1	7,2


Common misconceptions & Errors

3.4.3 Candidates could not identify the setup as the *control* and could not explain its purpose.


3.4.4 Candidates wrote the *aim* instead of using the aim to formulate a *conclusion*.

SECTION B QUESTION 3 – Suggestions for improvement

- ☑ Make sure learners know ALL the functions of auxins in plants. Expose learners to the practical design of the various hormone experiments with auxins.

- ☑ Place more emphasis on scientific investigations and their design.  *Let's revise this*
 - Learners should be **taught the value of each design element** and **how it contributes to a valid investigation**.

- ☑ Understand that homeostatic control in the body occurs when that factor is high or low and not when everything is within normal range in blood.

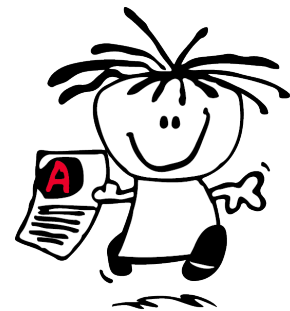
- ☑ Calculations form an integral part of data interpretation and analysis.  *Let's revise this*

Learners must be able to do simple calculations.

SECTION B QUESTION 3 – Suggestions for improvement

- ☑ Teachers should make an effort to pronounce terms correctly. Learners often spell the words as they hear them. Learners should practice writing out terminology.
- ☑ Open-ended questions should be asked in both formal and informal tasks for learners to understand that when opinions are requested, these should be relevant.
- ☑ Increase exposure to questions involving lengthy texts, to practice reading with understanding and constructing precise responses.
- ☑ Read the stem of the question, as this provides guidance on the responses expected from the information given.

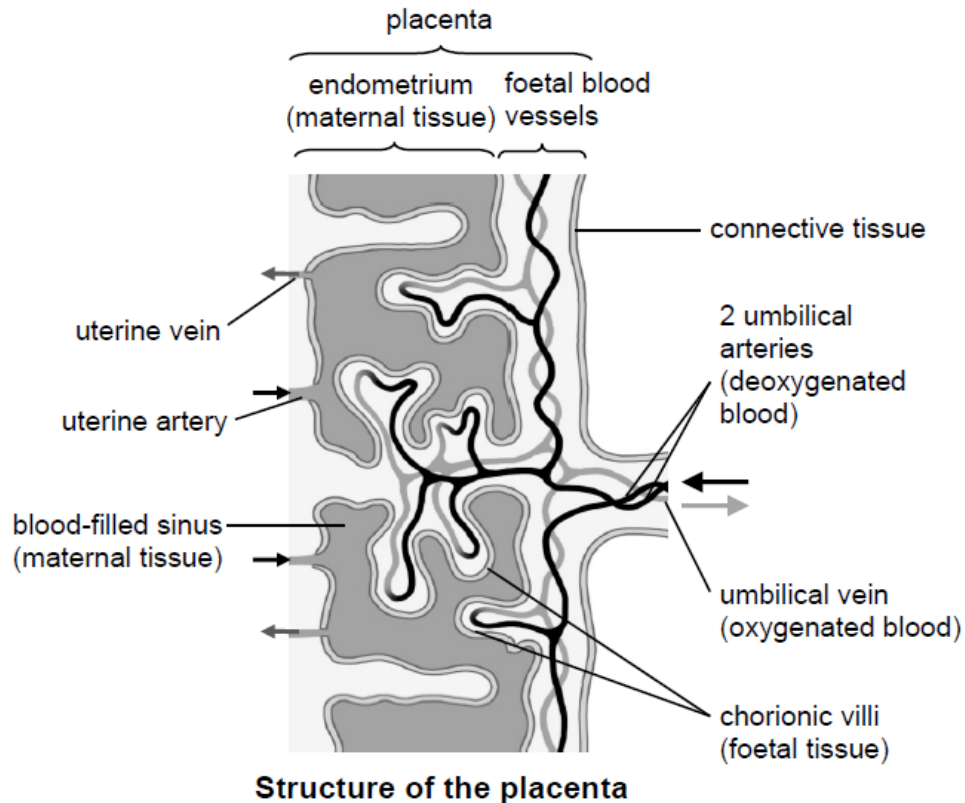
END



THE
ANSWER
SERIES *Your Key to Exam Success*

CLOSELY RELATED STRUCTURES

Extract from *The Answer Series*
Grade 12 Life Sciences Part 1
(2022 ed.) p. 25 & 26



Placenta vs Chorionic Villi

- ✓ Both are **found/embedded into** the **endometrium** during embryonic/foetal development.
- ✓ The **chorion** (outermost extra-embryonic membrane) develops **finger-like projections** called **chorionic villi** that grow **into** the **endometrium**.
- ✓ Most of the villi disappear, but where the chorion is attached to the endometrium, the villi enlarge and become more vascular (develop more blood vessels) to form the foetal tissue of the placenta.
- ✓ The **chorionic villi, together with** the **maternal** and **embryonic tissue**, form the **placenta**.
- ✓ Therefore, the **chorionic villi** are a **part of the placenta**.

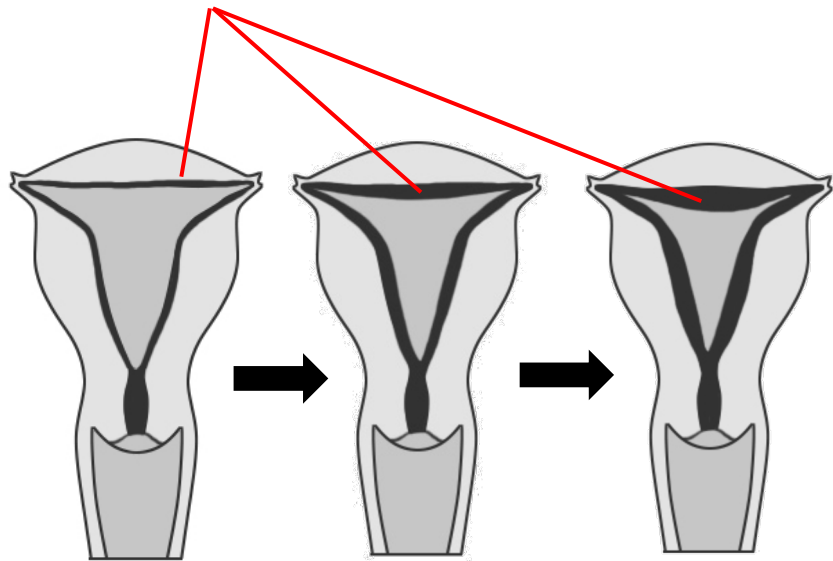
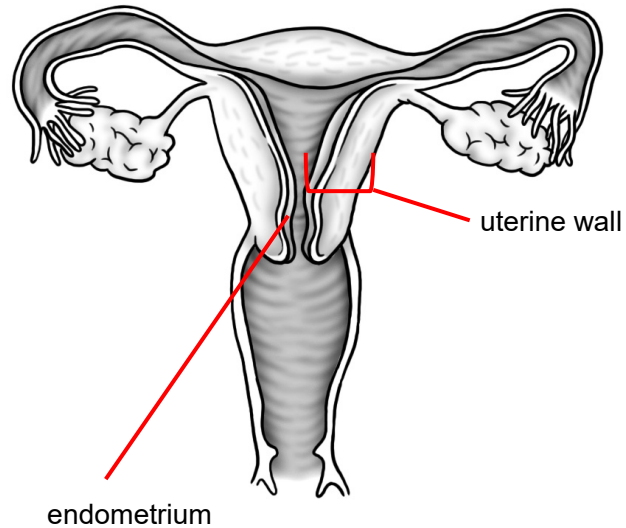


Continue learning – endometrium vs uterine wall



CLOSELY RELATED STRUCTURES

Extract from *The Answer Series*
Grade 12 Life Sciences Part 1
(2022 ed.) p. 14



Endometrium vs Uterine wall

- ✓ Both are **found in the uterus** of the **female reproductive system**.
- ✓ The uterine wall consists of three layers, i.e. an **outer serous layer** (membranous), a **muscular layer** of smooth, involuntary muscle and the **endometrium** (mucous membrane) that lines the uterus on the inside.
- ✓ The endometrium is also referred to as the **uterine lining**, i.e. the inner lining of the uterine wall.
- ✓ Every month, the endometrium (lining of the uterus) **goes through cyclical changes** where it **thickens** by becoming more vascular and glandular in preparation for the implantation of the fertilised ovum.
- ✓ If no fertilisation of the ovum occurs, the endometrium is expelled during menstruation.
- ✓ Therefore, the **endometrium** is a **part of the uterine wall**.

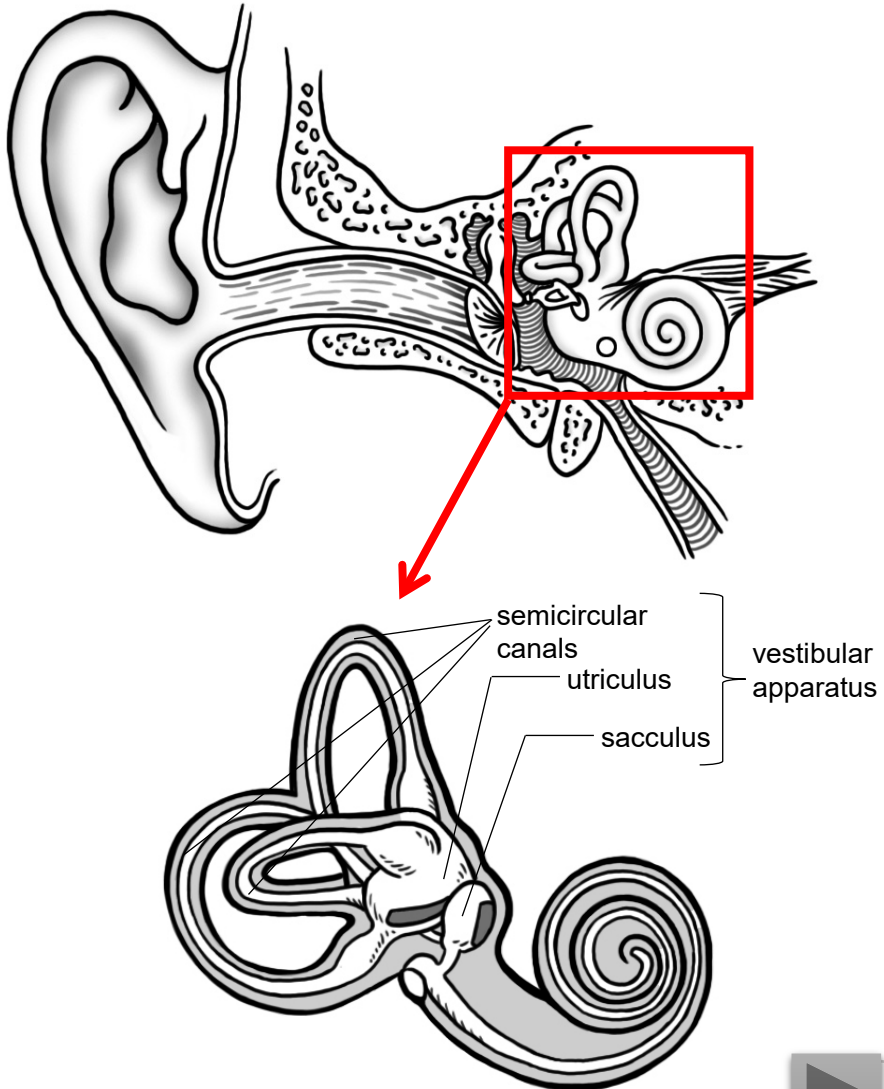


Continue learning – vestibular apparatus
vs semicircular canals



CLOSELY RELATED STRUCTURES

Extract from *The Answer Series*
Grade 12 Life Sciences Part 1
(2022 ed.) p. 64



Vestibular Apparatus vs Semicircular canals

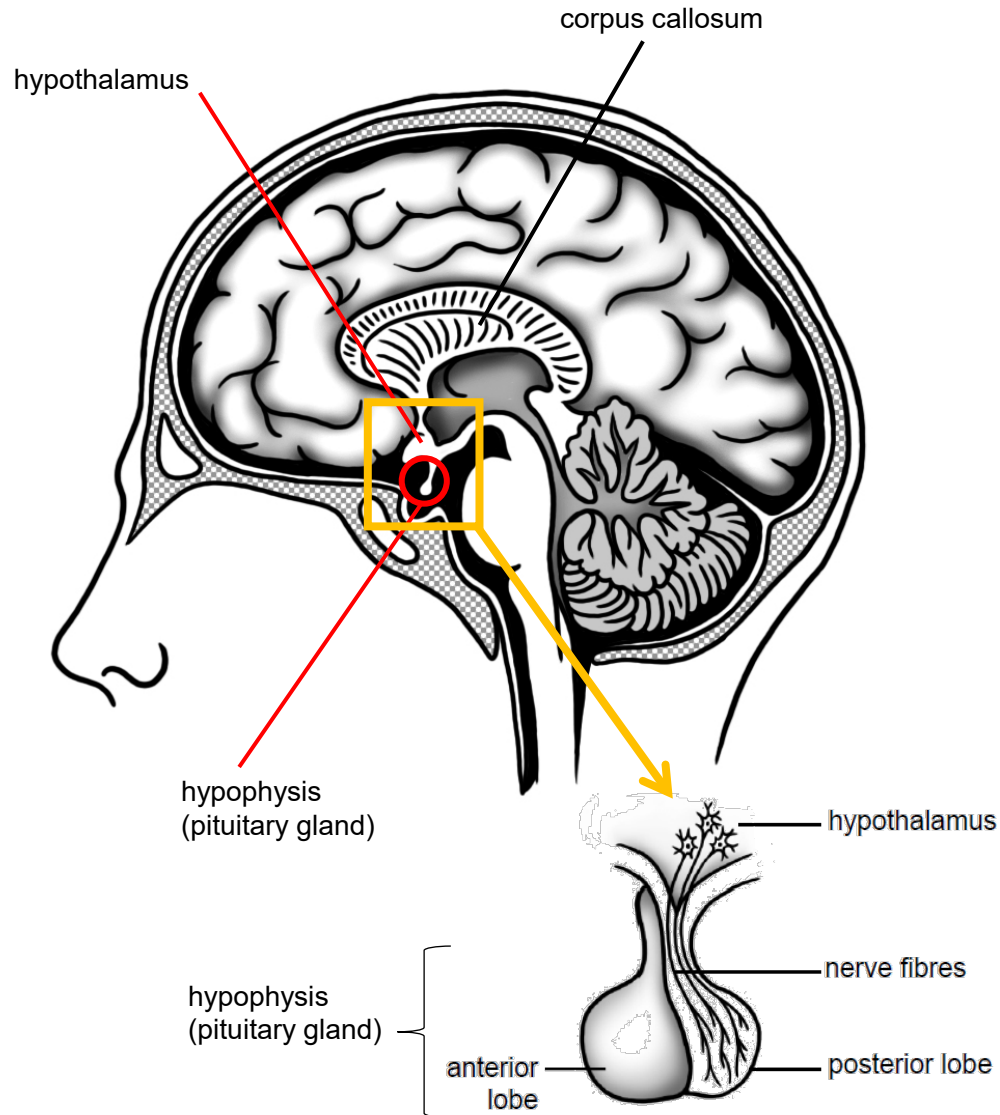
- ✓ Both are **found** in the **inner ear**.
- ✓ The vestibular apparatus plays a role in the **maintenance of balance**.
- ✓ It consists of two membranous sacs, the **utricle** and **sacculus**, as well as three **semicircular canals**.
 - The **utricle** and **sacculus** respond to changes in the **position of the head with respect to gravity**.
 - The **semicircular canals** respond to changes in the **speed and/or direction of movement of the head**.
- ✓ Therefore, the **semicircular canals** are a **part of** the **vestibular apparatus**.



Continue learning – hypothalamus vs hypophysis



CLOSELY RELATED STRUCTURES



Hypothalamus vs Hypophysis

- ✓ Both are **found** in the **brain**.
- ✓ The **hypothalamus** is an area of the brain located **just below** the **corpus callosum**.
 - **Controls** the functions of **the hypophysis**.
 - **Contains osmoreceptors** to pick up on changes in water content of the blood.
 - **Produces ADH** and **stores it in** the **hypophysis**.
 - Contains the **heat regulation centre** that responds to impulses from thermoreceptors in the skin.
 - **Sends** nerve **impulses to** the **blood vessels in** the **skin** to cause vasodilation/vasoconstriction depending on temperature.
- ✓ The **hypophysis** (also called the pituitary gland) is located **at the base of the brain**, attached to the hypothalamus by a short stalk.
 - Consists of two lobes (anterior and posterior) that secrete different hormones.
 - Secretes **TSH, Growth Hormone, FSH, LH, Prolactin** and **ADH**.
 - Most of these **hormones affect the functioning of other endocrine glands** in the body and therefore the hypophysis is sometimes referred to as the 'master gland'.

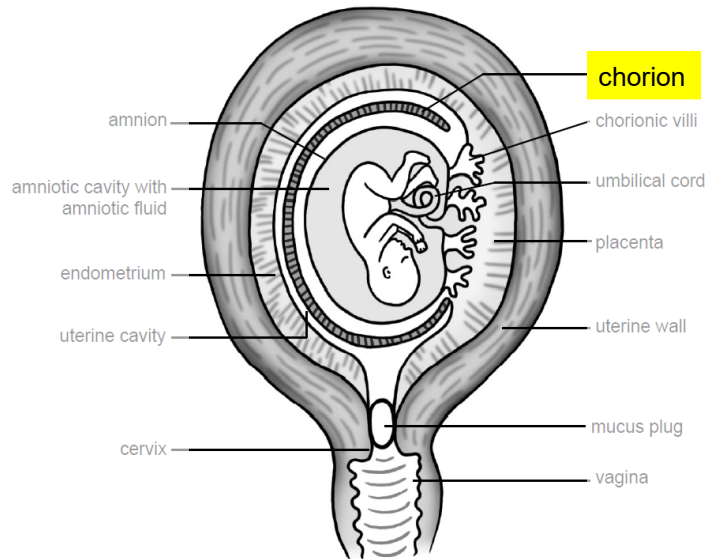
Extract from *The Answer Series*
Grade 12 Life Sciences Part 1
(2022 ed.) p. 39, 71, 86



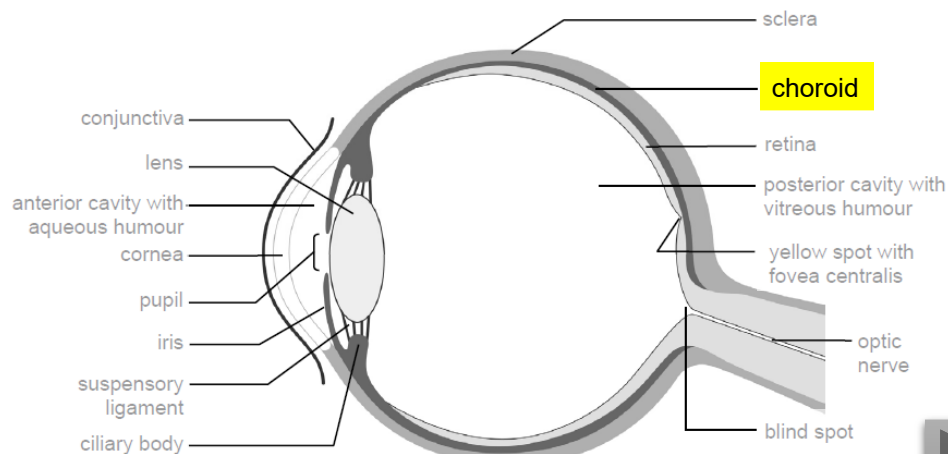
THE
ANSWER
SERIES Your Key to Exam Success

COMMONLY CONFUSED TERMS – chorion and choroid

Extracts from *The Answer Series*
Grade 12 Life Sciences Part 1
(2022 ed.) p. 25 & 55



Developing foetus enclosed by embryonic membranes (amnion and chorion)



Internal structure of the eye

Chorion

- ✓ The outermost extra-embryonic membrane surrounding the embryo.
- ✓ The chorion develops finger-like projections called chorionic villi that grow into the endometrium during implantation.

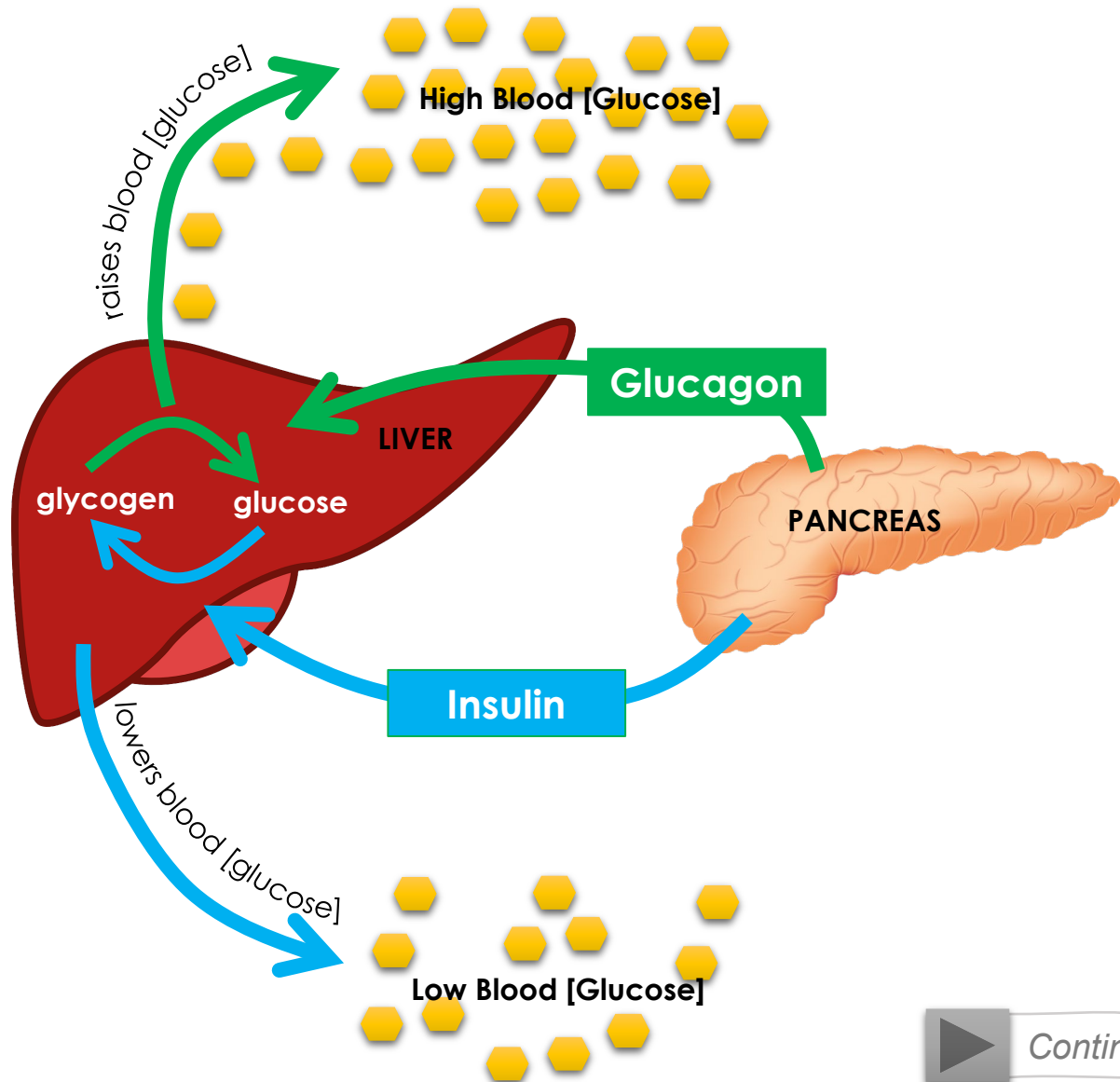
Choroid

- ✓ A thin, darkly pigmented, vascular layer in the eye.
- ✓ The pigment absorbs excess light rays to prevent internal reflection in the eye.
- ✓ The blood vessels supply oxygen and nutrients to the cells and remove waste products.



Continue learning – glucose, glycogen and glucagon

COMMONLY CONFUSED TERMS – glucose, glycogen and glucagon



Glucose

- ✓ A **monosaccharide** (single-ring sugar) that is the most important source of energy to cells.

Glycogen

- ✓ The **storage form** of excess **glucose**.
- ✓ Occurs in the **liver** and **skeletal muscles** of humans and other animals.
- ✓ When energy is needed glycogen is converted into glucose.

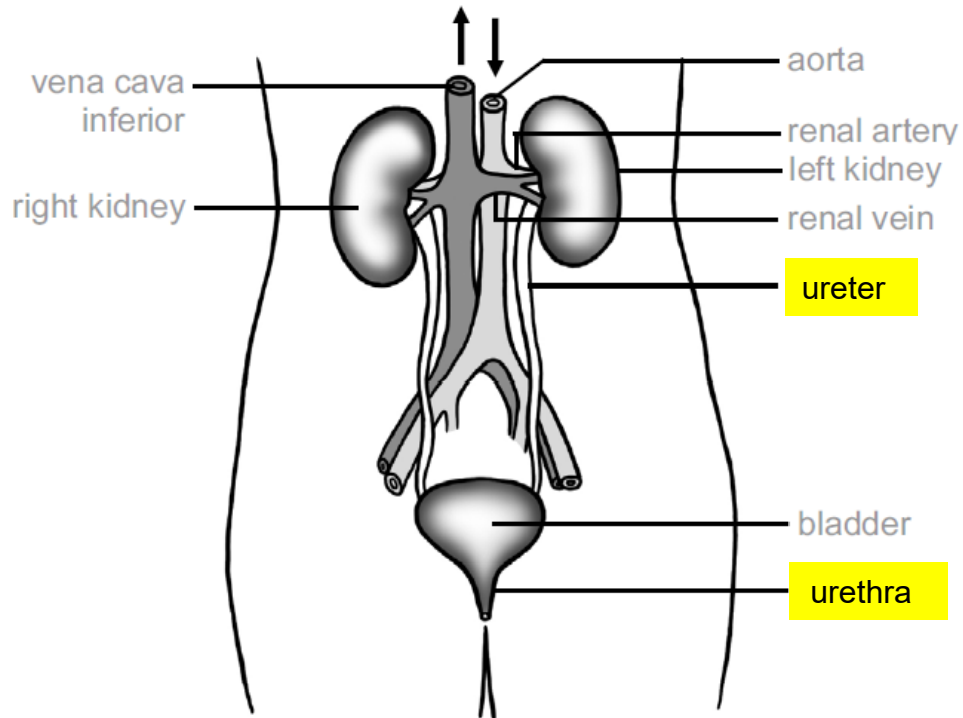
Glucagon

- ✓ A **hormone** released by the pancreas (alpha cells) when the blood glucose levels are LOW.
- ✓ Triggers the **conversion of glycogen into glucose** in the liver → increases the concentration of glucose in the blood.

▶ Continue learning – ureter and urethra

COMMONLY CONFUSED TERMS – ureter and urethra

Extract from *The Answer Series*
Grade 11 Life Sciences p. 2.43



Ureter

- ✓ Tube that **transports urine from the kidneys to the bladder**.
- ✓ One connected to each kidney, i.e. there are 2 ureters.

Urethra

- ✓ Tube that **transports urine from the bladder to the outside** during urination.
- ✓ Only one urethra runs from the bladder to the outside.

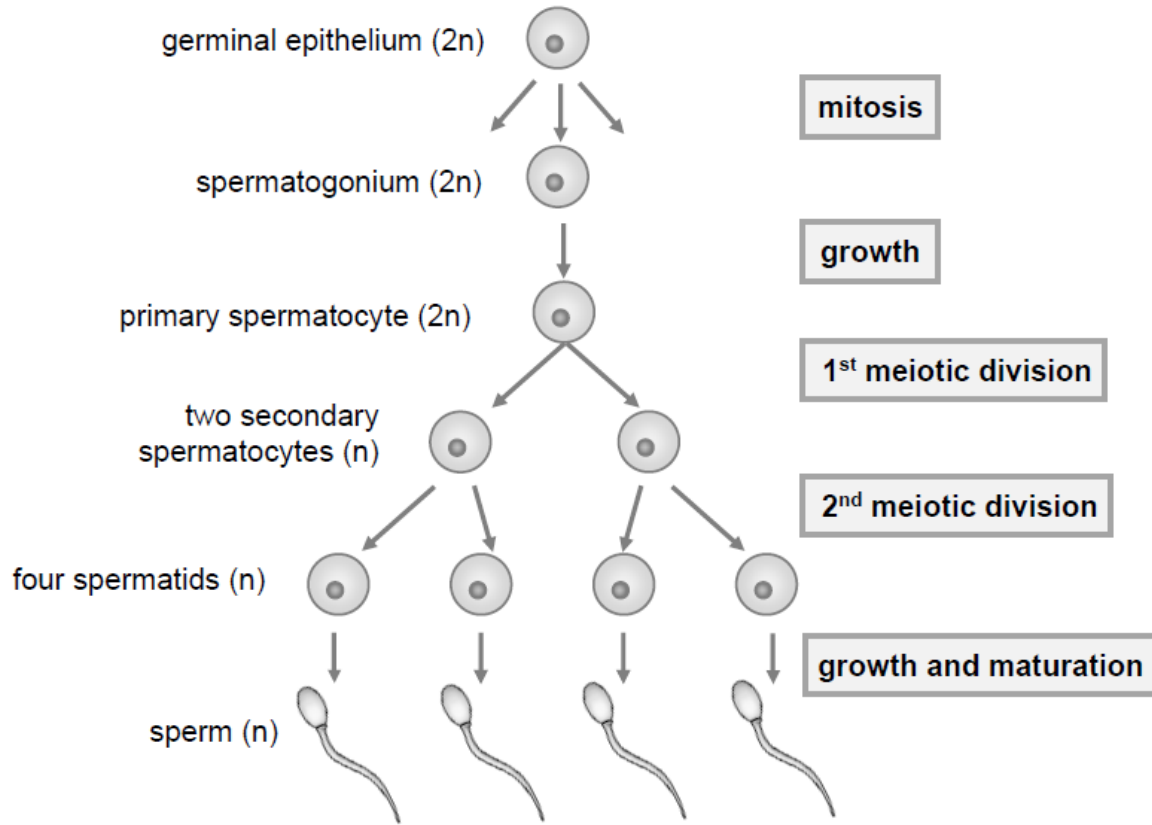


HINT

urete**R** = carries urine towa**R**ds the bladder.
urethr**A** = carries urine **A**way from the bladder.

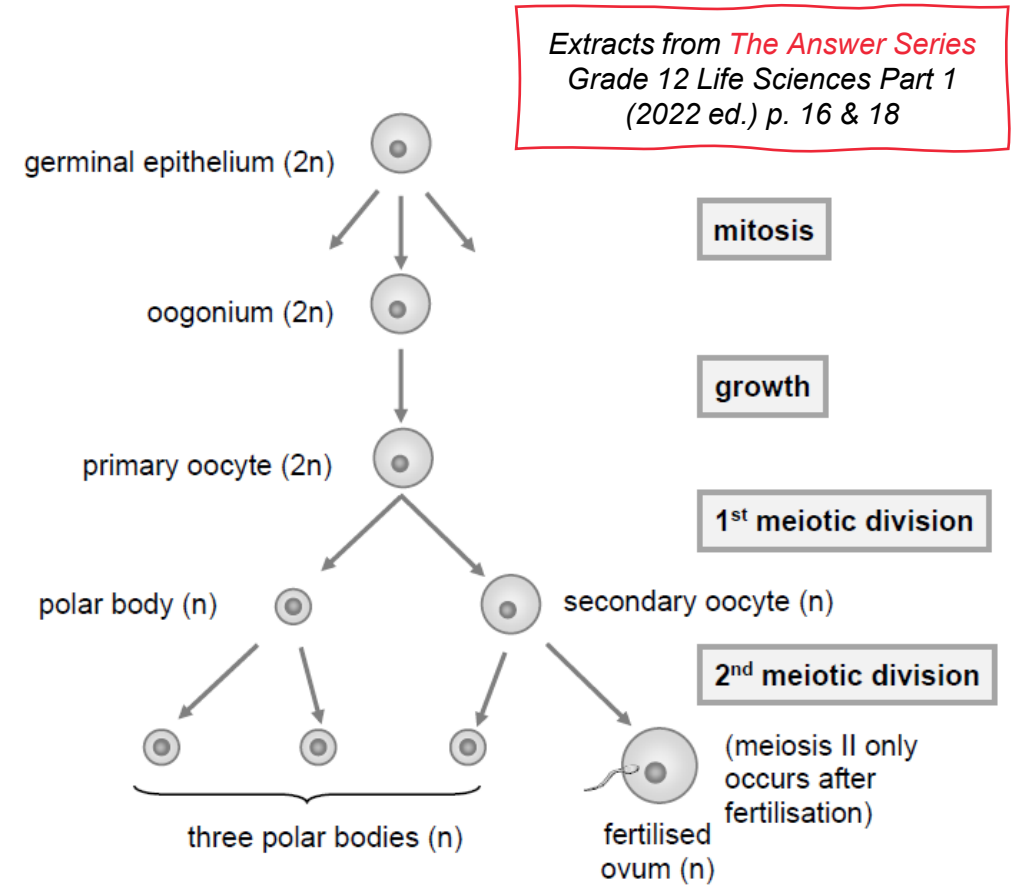


SPERMATOGENESIS VS OOGENESIS



Diagrammatic representation of spermatogenesis

in the foetus
at birth
from puberty to menopause



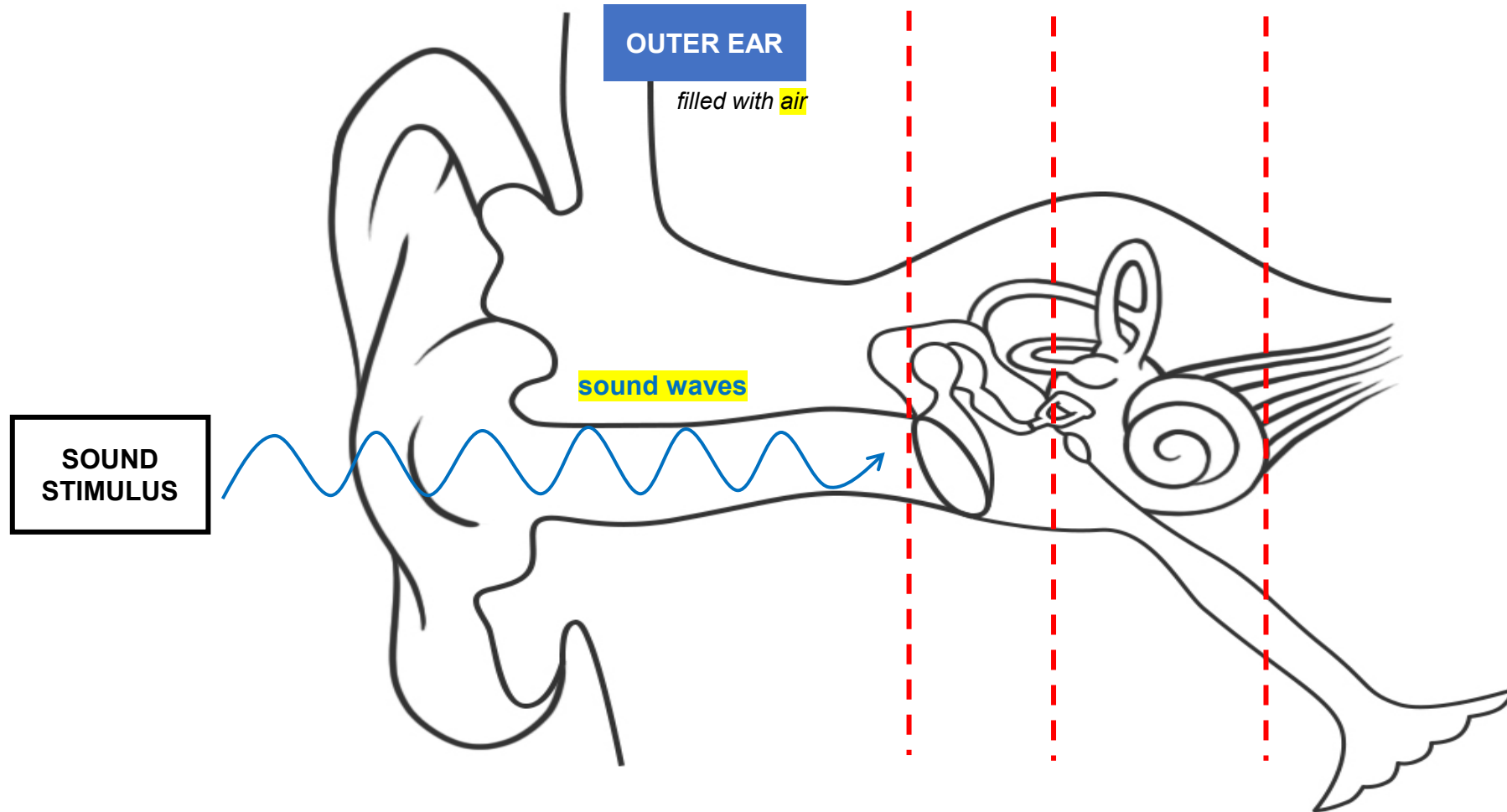
Extracts from *The Answer Series*
Grade 12 Life Sciences Part 1
(2022 ed.) p. 16 & 18

Diagrammatic representation of oogenesis



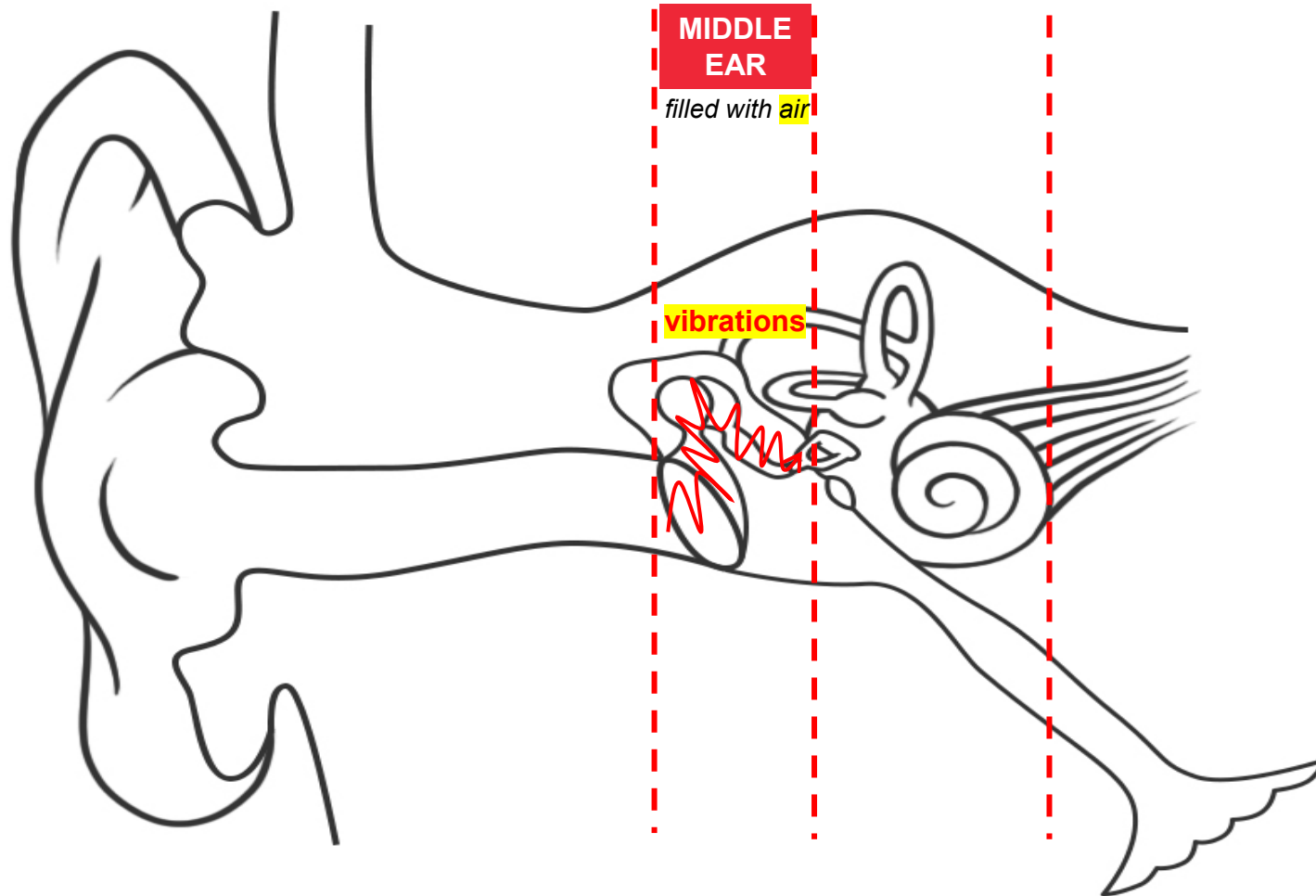
SECTIONS OF THE EAR

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Grade 12 Life Sciences Part 1
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 Continue learning

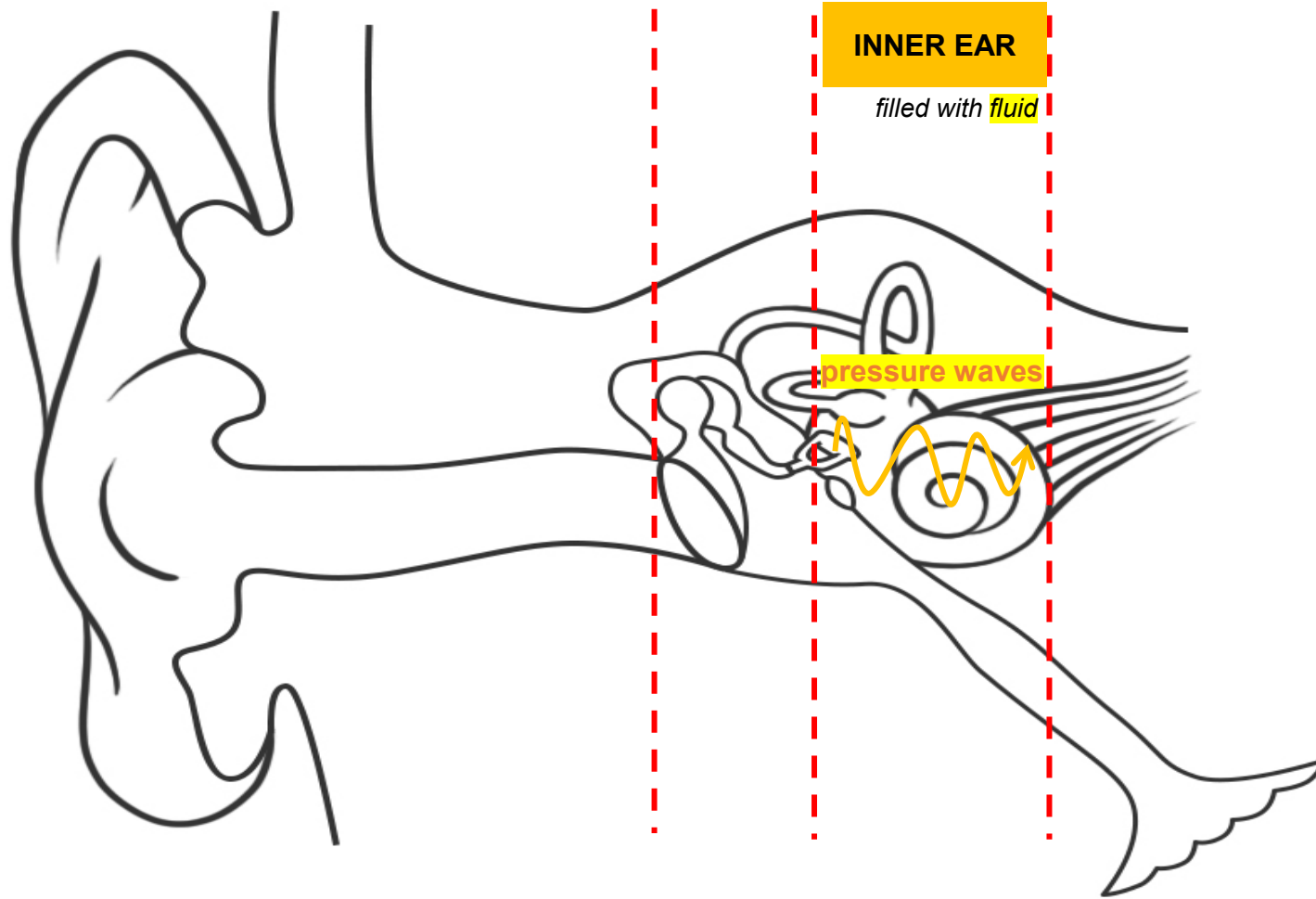
SECTIONS OF THE EAR



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 Continue learning

SECTIONS OF THE EAR

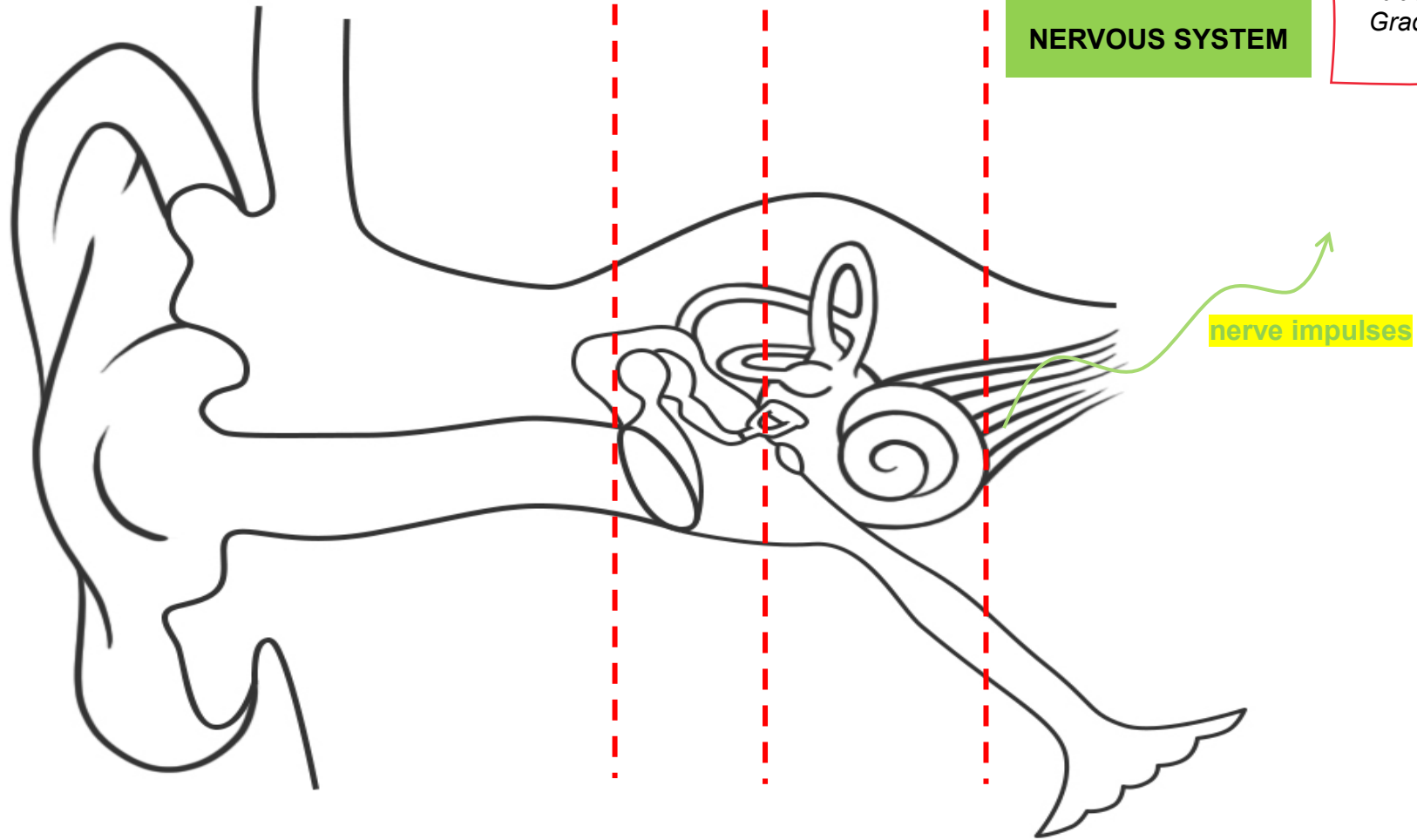


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Continue learning

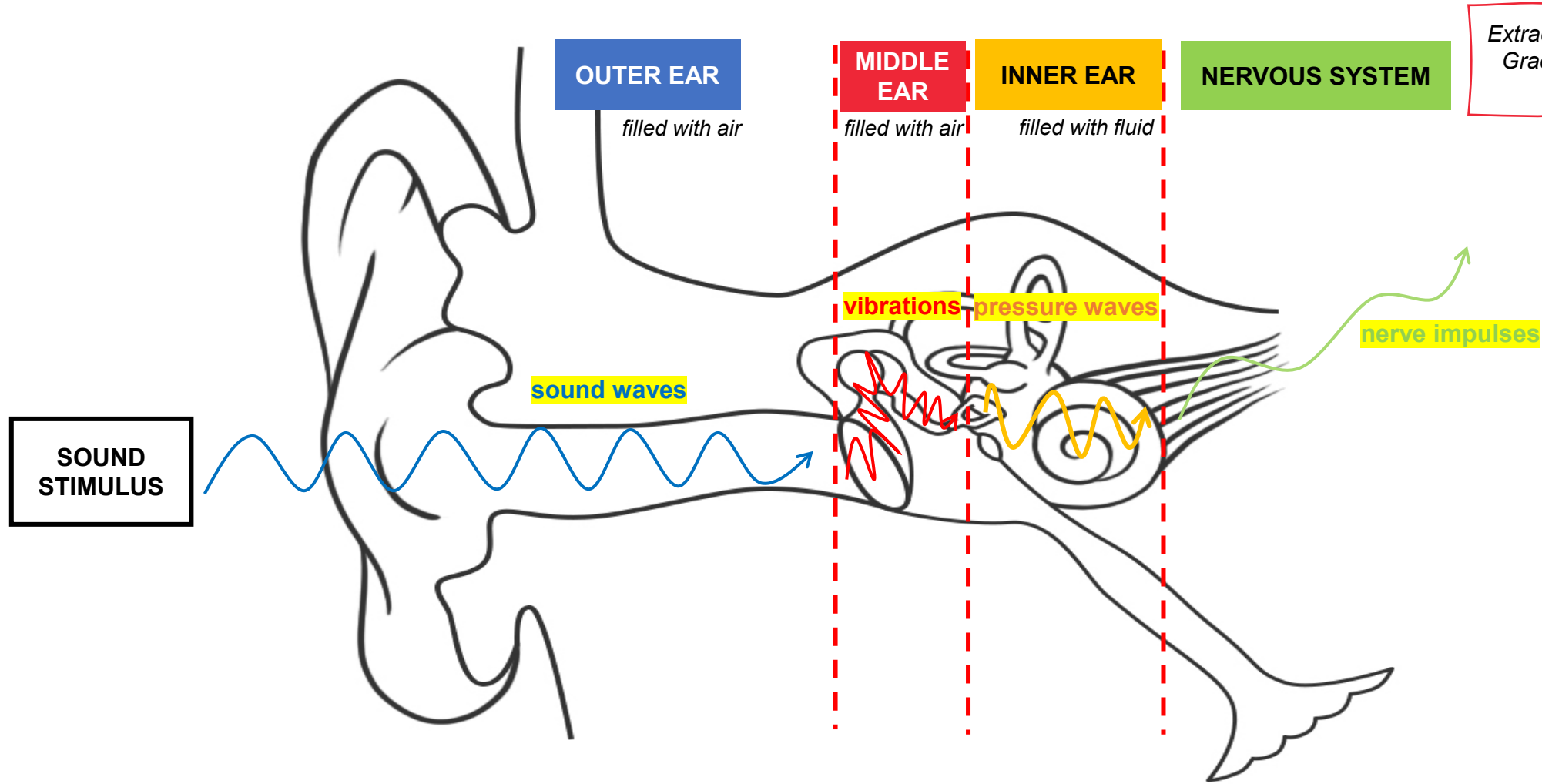
SECTIONS OF THE EAR



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▶ Continue learning

SECTIONS OF THE EAR

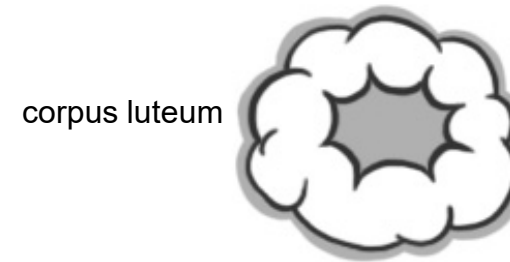
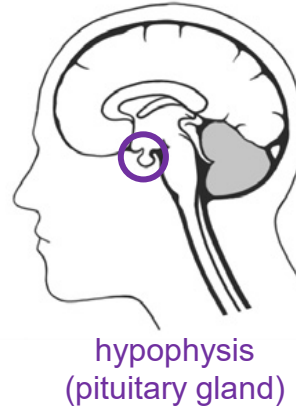


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NEGATIVE FEEDBACK – reproductive hormones

Extracts from *The Answer Series*
Grade 12 Life Sciences Part 1
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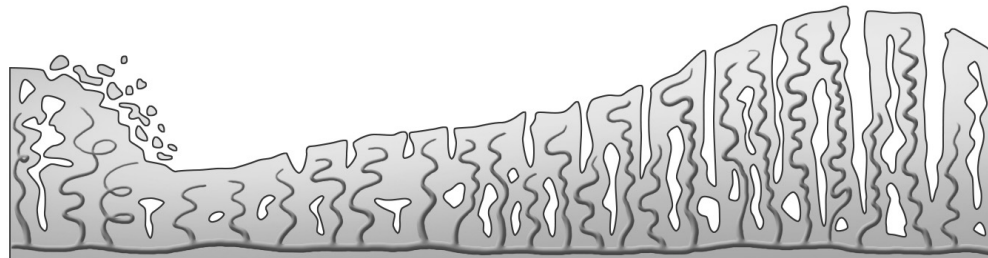


KEY

releases →

stimulates →

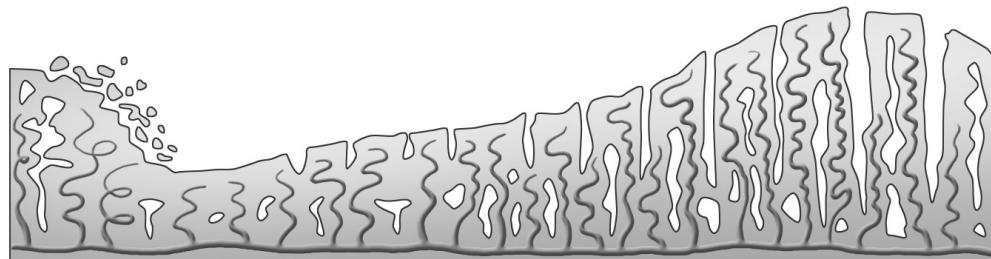
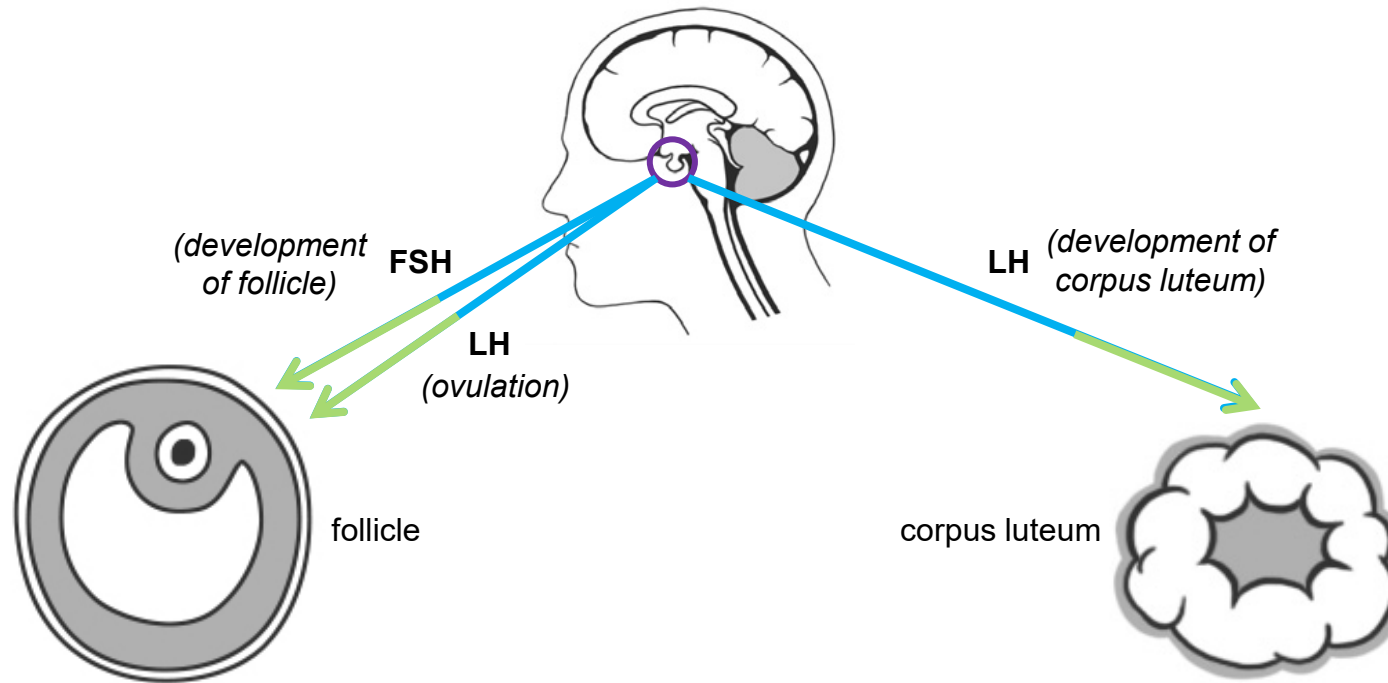
inhibits →



▶ Continue learning

NEGATIVE FEEDBACK – reproductive hormones

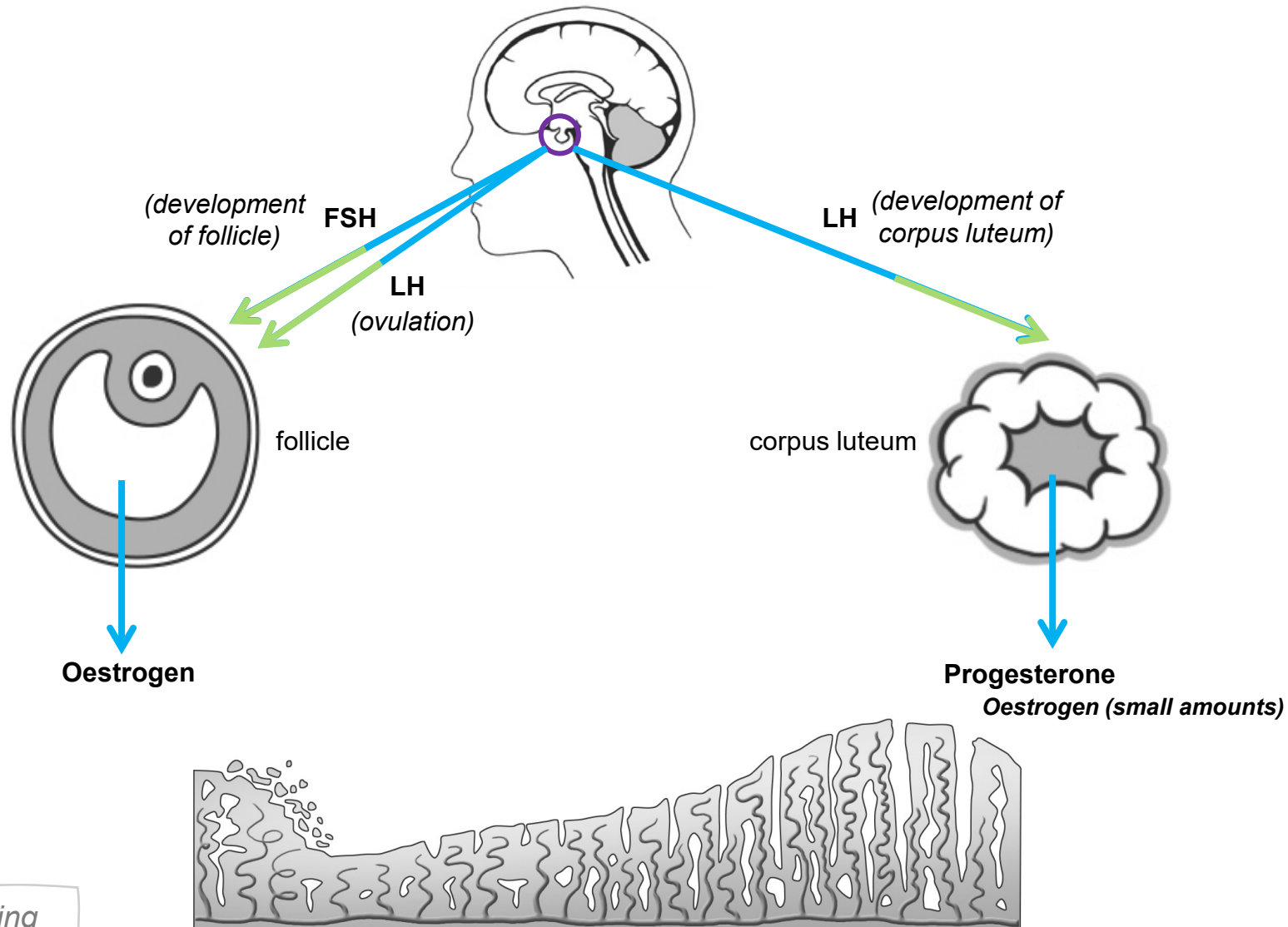
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▶ Continue learning

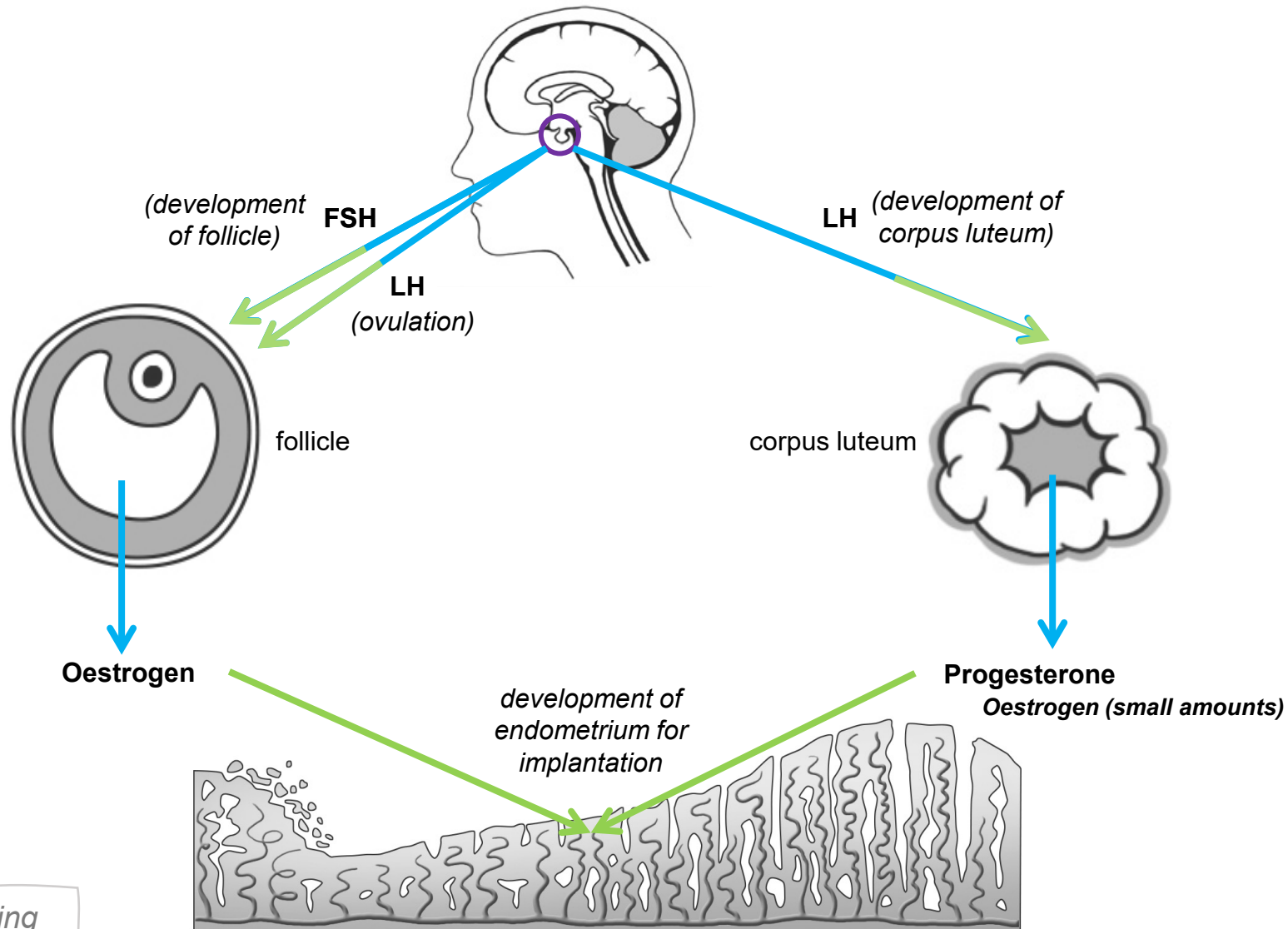
NEGATIVE FEEDBACK – reproductive hormones

Extracts from *The Answer Series*
Grade 12 Life Sciences Part 1
(2022 ed.) p. 23



NEGATIVE FEEDBACK – reproductive hormones

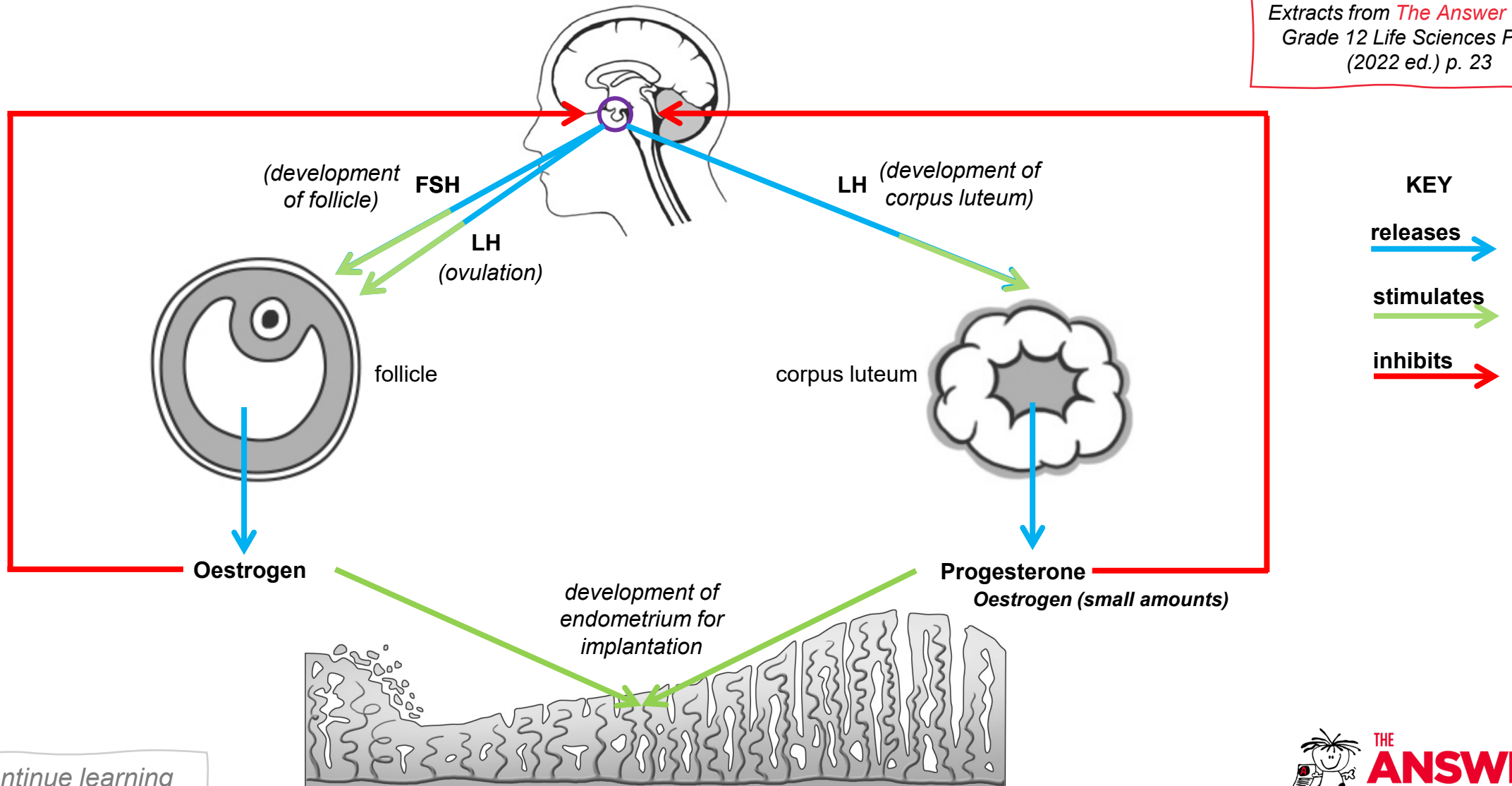
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▶ Continue learning

NEGATIVE FEEDBACK – reproductive hormones

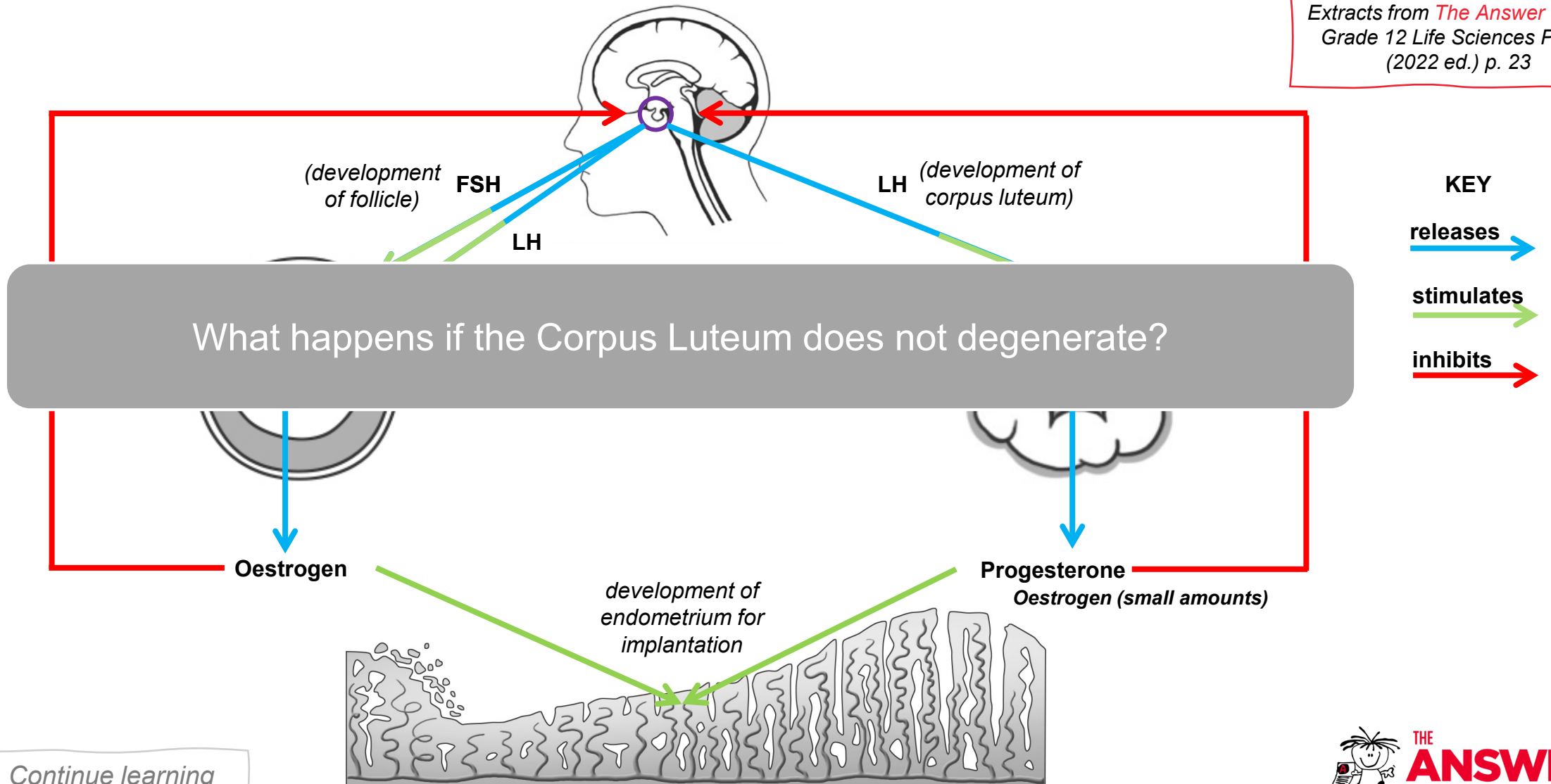
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▶ Continue learning

NEGATIVE FEEDBACK – reproductive hormones

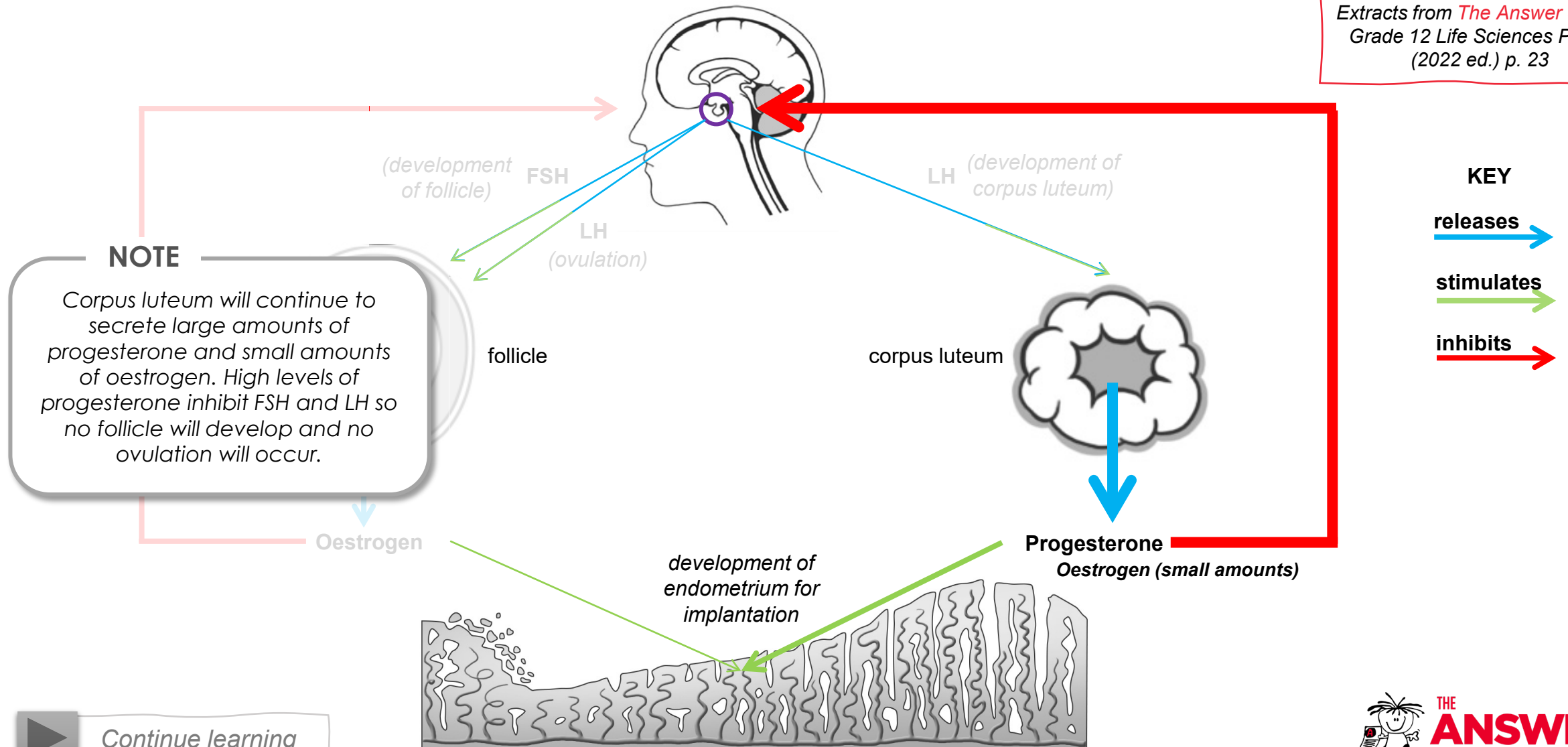
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▶ Continue learning

NEGATIVE FEEDBACK – reproductive hormones

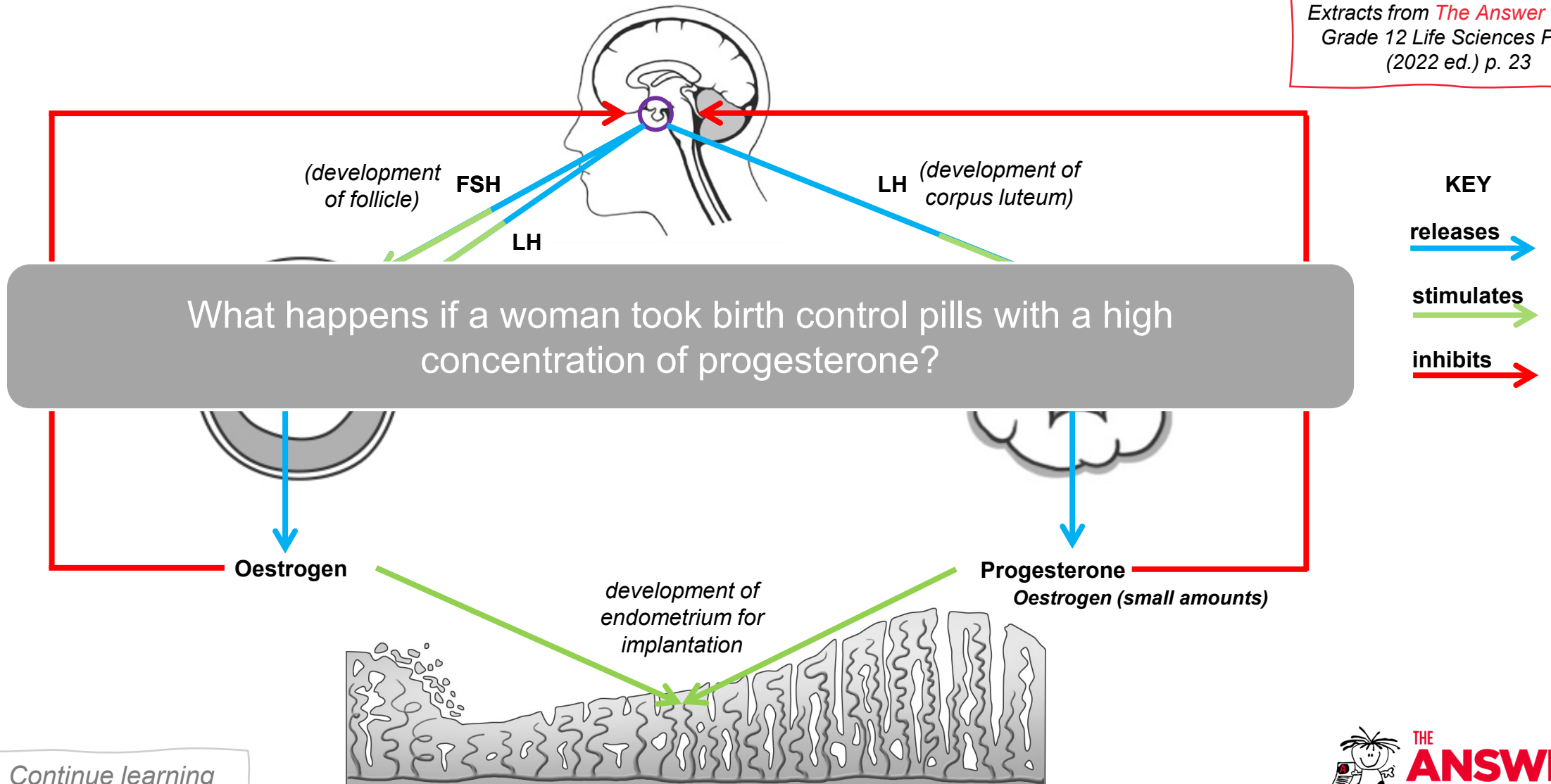
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▶ Continue learning

NEGATIVE FEEDBACK – reproductive hormones

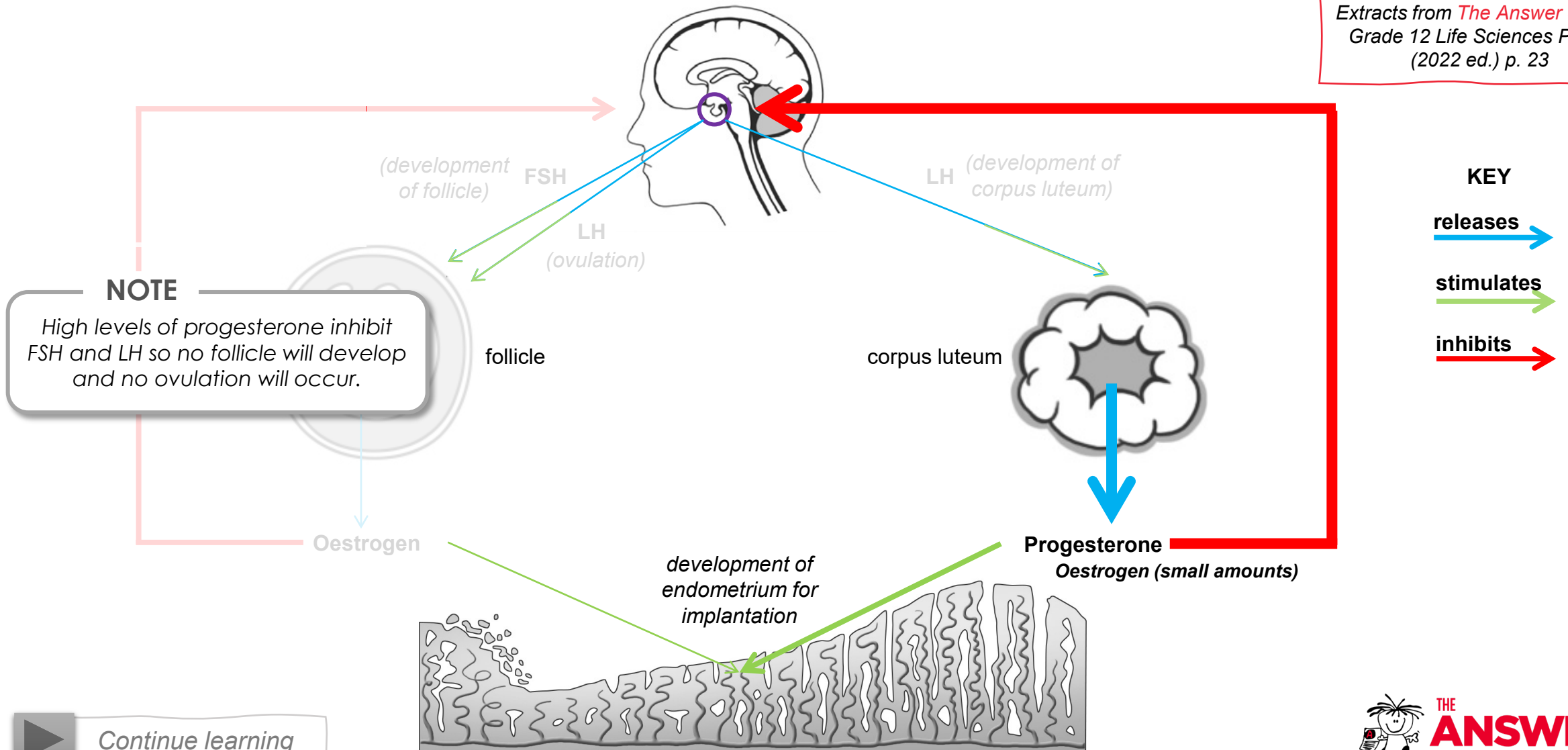
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▶ Continue learning

NEGATIVE FEEDBACK – reproductive hormones

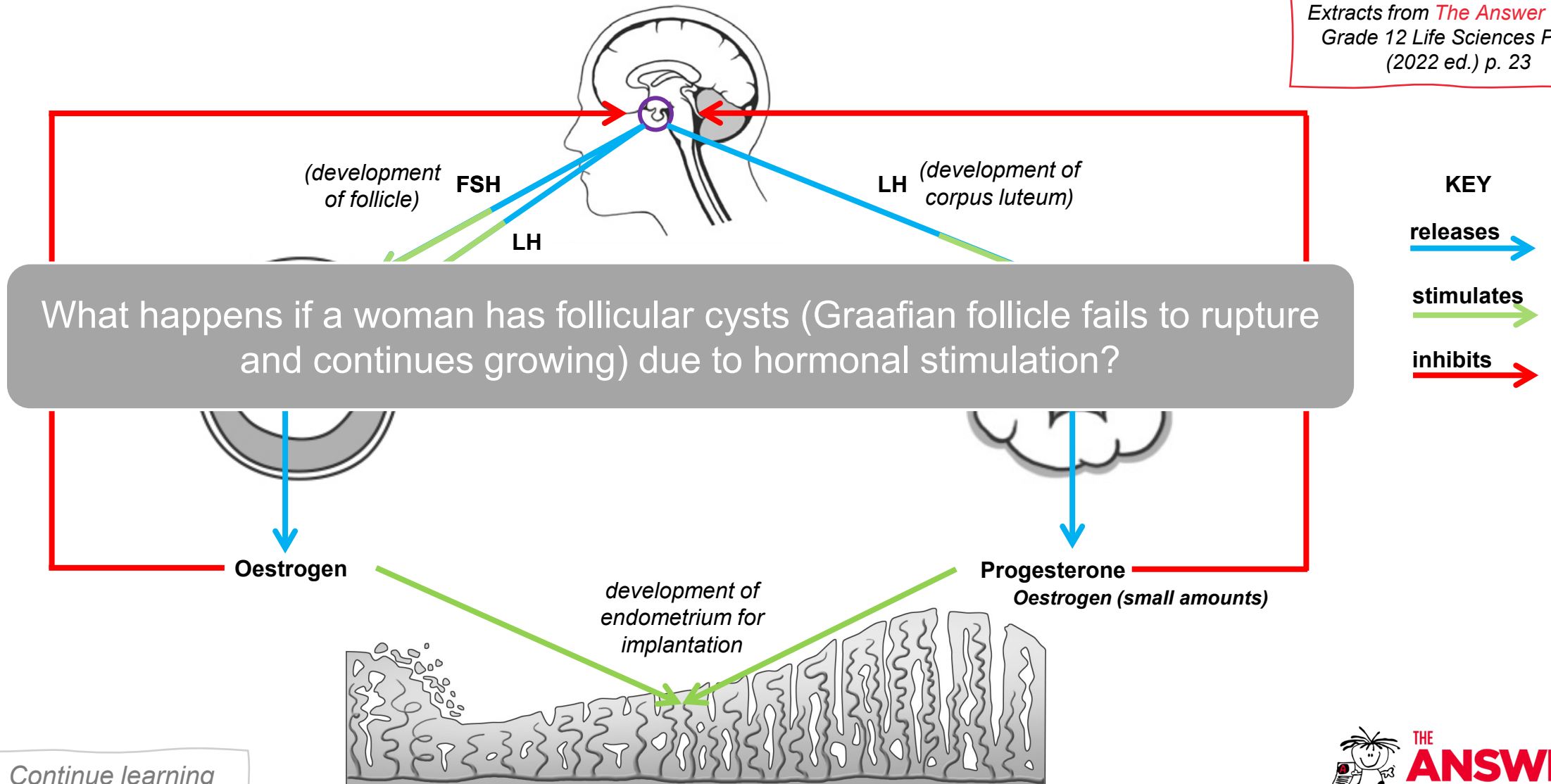
Extracts from *The Answer Series*
Grade 12 Life Sciences Part 1
(2022 ed.) p. 23



▶ Continue learning

NEGATIVE FEEDBACK – reproductive hormones

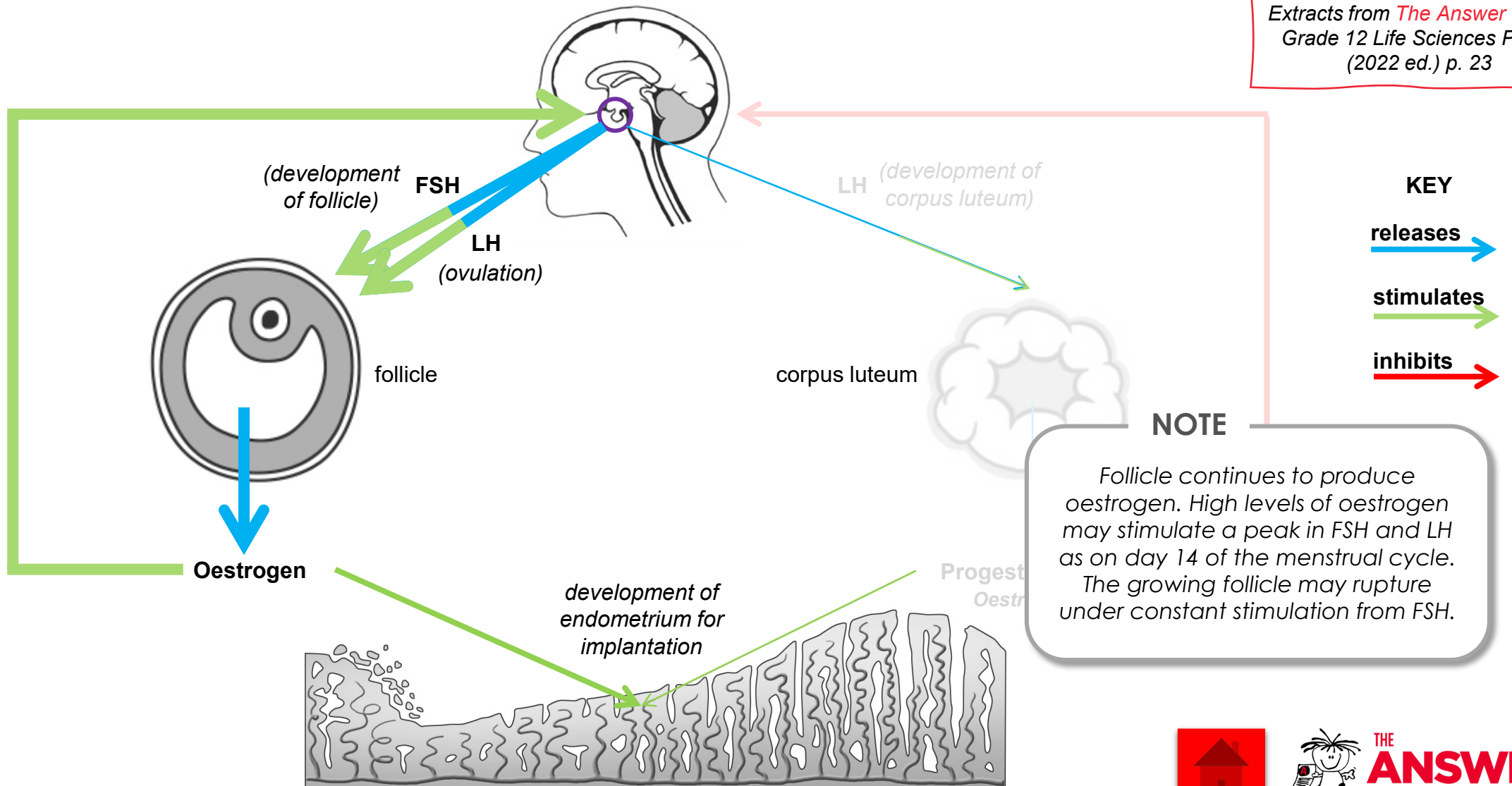
Extracts from *The Answer Series*
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▶ Continue learning

NEGATIVE FEEDBACK – reproductive hormones

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NEGATIVE FEEDBACK – linking function to disease state

Extracts from *The Answer Series*
Grade 12 Life Sciences Part 1
(2022 ed.) p. 39 - 42

- Conducts impulses between the two **hemispheres** of the cerebrum.
- Forms a **bridge of communication** between the hemispheres to coordinate processes.

Corpus callosum

Hypophysis

Medulla oblongata

Spinal cord

Cerebrum

Cerebellum

- **Voluntary actions** originate here
- Receives and **interprets impulses from sense organs** to produce sensations of sight, sound, smell, taste and touch.
- **Higher mental functions**, e.g. memory, intelligence, planning, etc. are located here.

- Transmits **impulses between the spinal cord and brain**.
- Controls **rate and depth of breathing**.
- Controls **heartbeat**.

- Provides a **pathway for nerve impulses to and from the brain**.
- Initiates **reflex actions** to protect the body.

- **Coordinates all voluntary actions** to make smooth and precise movement possible.
- Controls muscle tone to **maintain balance** and posture.



Continue learning

NEGATIVE FEEDBACK – linking function to disease state

Extracts from *The Answer Series*
Grade 12 Life Sciences Part 1
(2022 ed.) p. 39 - 42

- Conducts impulses between the two **hemispheres** of the cerebrum.
- Forms a **bridge of communication** between the hemispheres to coordinate processes.



Cerebrum

- **Voluntary actions** originate here
- Receives and **interprets impulses from sense organs** to produce sensations of sight, taste and touch.
- Controls **reflex actions**, e.g. breathing, digestion, planning, etc.

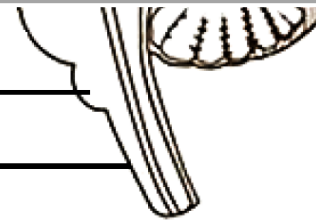
What would happen if a person suffered a spinal cord injury?

Hypophysis

Medulla oblongata

Spinal cord

Cerebellum



- Transmits **impulses between the spinal cord and brain.**
- Controls **rate and depth of breathing.**
- Controls **heartbeat.**

- Provides a **pathway for nerve impulses to and from the brain.**
- Initiates **reflex actions** to protect the body.

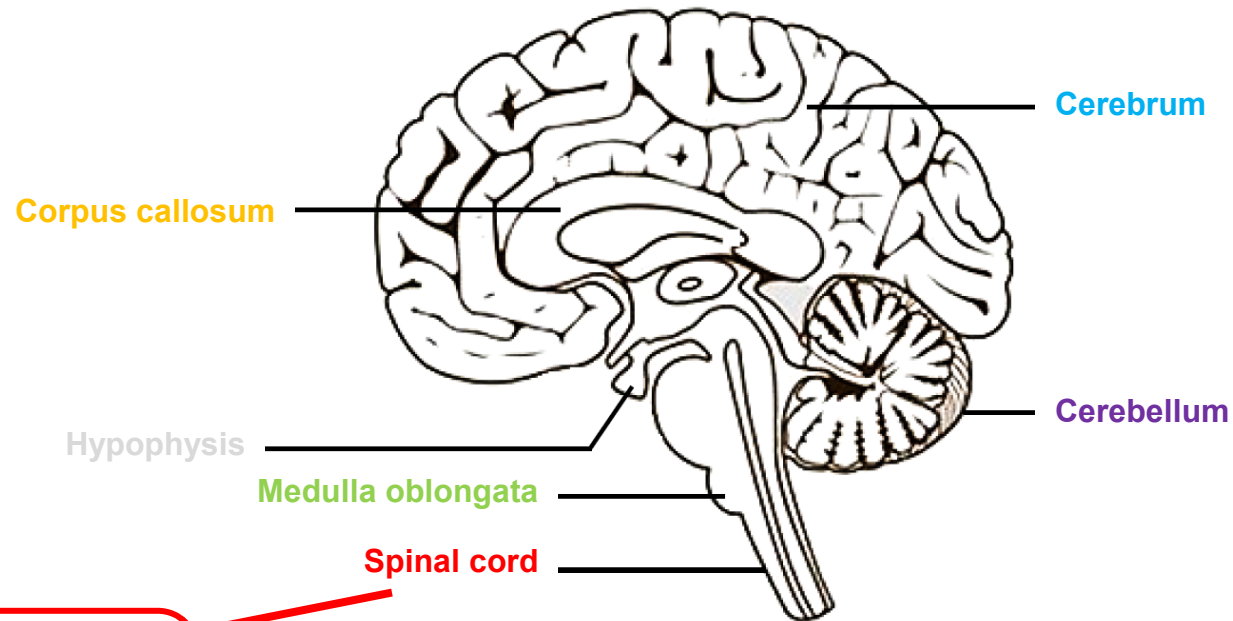
- **Coordinates all voluntary actions** to make smooth and precise movement possible.
- Controls muscle tone to **maintain balance** and posture.



Continue learning

NEGATIVE FEEDBACK – linking function to disease state

Extracts from *The Answer Series*
Grade 12 Life Sciences Part 1
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- Provides a **pathway for nerve impulses to and from the brain.**
- Initiates **reflex actions** to protect the body.

Rework the function in case of injury, e.g. :

- **Pathway for nerve impulses** to and from the brain would be **damaged** – could lead to **paralysis** (depending on where damage occurred) **and/or death** due to nerve impulses from vital organs not reaching the brain.
- Important **reflex actions would not take place** to protect the body / **injury could occur.**



Continue learning

NEGATIVE FEEDBACK – linking function to disease state

Extracts from *The Answer Series*
Grade 12 Life Sciences Part 1
(2022 ed.) p. 39 - 42

- Conducts impulses between the two **hemispheres** of the cerebrum.
- Forms a **bridge of communication** between the hemispheres to coordinate processes.



Cerebrum

- **Voluntary actions** originate here
- Receives and **interprets impulses from sense organs** to produce sensations of sight, taste and touch.
- Controls **higher functions**, e.g. decision-making, planning, etc.

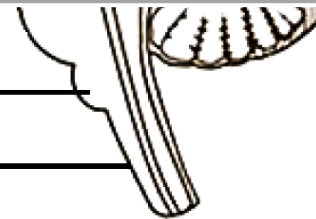
Why would damage to the medulla oblongata most likely lead to death?

Hypophysis

Medulla oblongata

Spinal cord

Cerebellum



- Transmits **impulses between the spinal cord and brain**.
- Controls **rate and depth of breathing**.
- Controls **heartbeat**.

- Provides a **pathway for nerve impulses to and from the brain**.
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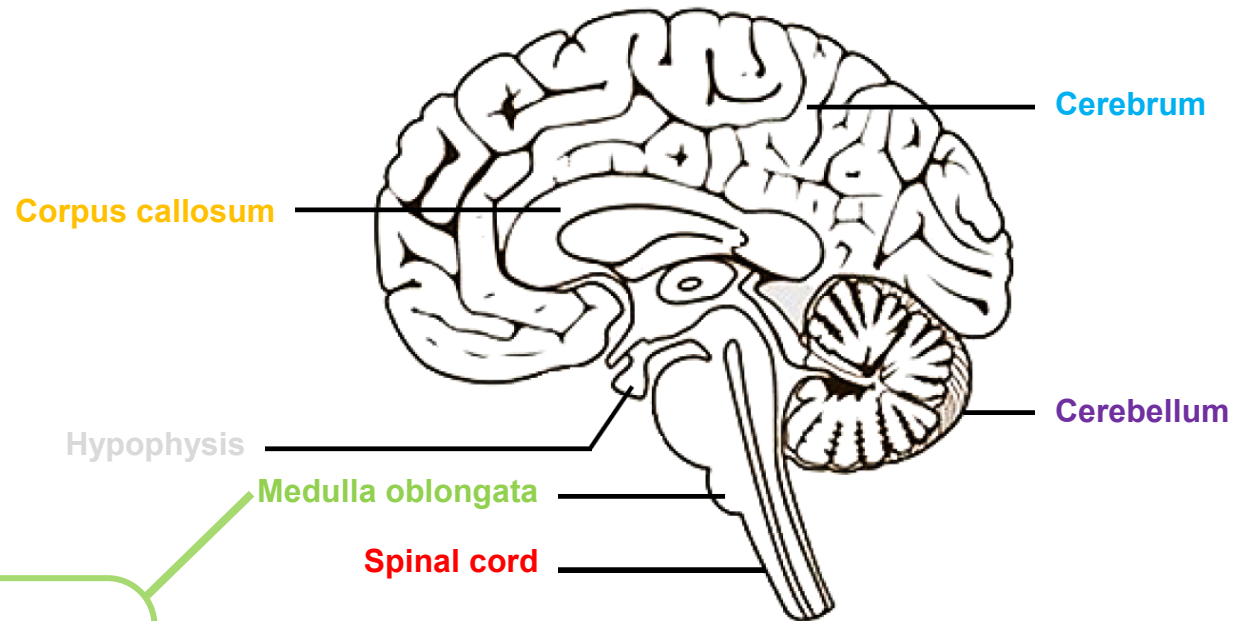
- **Coordinates all voluntary actions** to make smooth and precise movement possible.
- Controls muscle tone to **maintain balance** and posture.



Continue learning

NEGATIVE FEEDBACK – linking function to disease state

Extracts from *The Answer Series*
Grade 12 Life Sciences Part 1
(2022 ed.) p. 39 - 42



- Transmits **impulses** between the **spinal cord** and brain.
- Controls **rate and depth of breathing**.
- Controls **heartbeat**.

Rework the function in case of injury, e.g. :

- The control of **vital processes** like breathing and heart rate **would not occur** / Person would stop breathing / Heart would stop beating.



Continue learning

NEGATIVE FEEDBACK – linking function to disease state

- Conducts impulses between the two **hemispheres** of the cerebrum.
- Forms a **bridge of communication** between the hemispheres to coordinate processes.

Extracts from *The Answer Series*
Grade 12 Life Sciences Part 1
(2022 ed.) p. 39 - 42



A person suffered an accident. He had trouble remembering information like his home address and was off-balance. His sense of smell was also gone, and his left hand would not let go of a pen even when asked repeatedly to do so.

Which areas of the brain are most likely affected/damaged. Give reasons.

- Transmits impulses between the **spinal cord and brain**.
- Controls **rate and depth of breathing**.
- Controls **heartbeat**.

- Provides a **pathway for nerve impulses to and from the brain**.
- Initiates **reflex actions** to protect the body.

- Controls **voluntary actions** to make smooth and precise movement possible.
- Controls muscle tone to **maintain balance** and posture.

Voluntary actions originate here. The brain interprets signals from sense organs to control functions of sight, hearing, taste and touch. It also controls reflex actions, e.g. sneezing, coughing, balance, planning, etc.



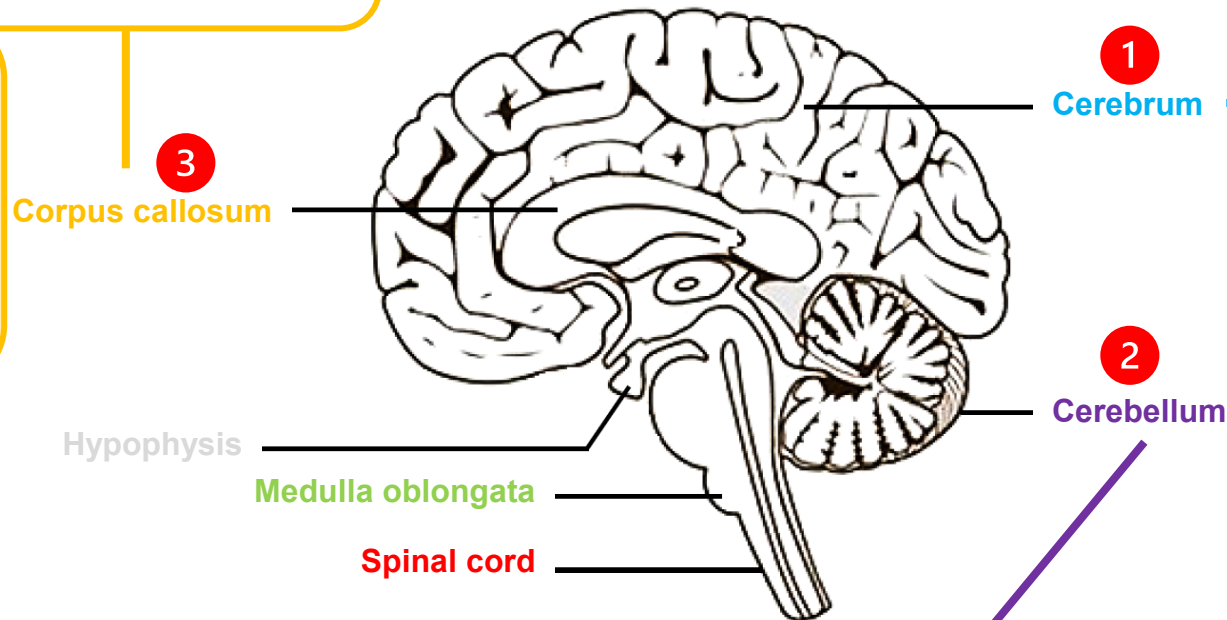
Continue learning

NEGATIVE FEEDBACK – linking function to disease state

Extracts from *The Answer Series*
Grade 12 Life Sciences Part 1
(2022 ed.) p. 39 - 42

- **Conducts impulses between** the two **hemispheres** of the cerebrum.
- Forms a **bridge of communication** between the hemispheres to coordinate processes.

Damage results in **impulses not being conducted effectively** between the hemispheres so there is a **lack of communication to co-ordinate processes**, e.g. letting go of the pen



- **Voluntary actions** originate here
- Receives and **interprets impulses from sense organs** to produce sensations of sight, sound, smell, taste and touch.
- **Higher mental functions**, e.g. memory, intelligence, planning, etc. are located here.

- Damage results in **loss of sensations** like smell.
- Damage results in **loss of higher order functions** like memory.

- **Coordinates all voluntary actions** to make smooth and precise movement possible.
- Controls muscle tone to **maintain balance** and posture.

- Damage results in **loss of balance**.
- Damage results in **loss of coordinating voluntary actions**, e.g. letting go of the pen.



HOMEOSTASIS - ADH



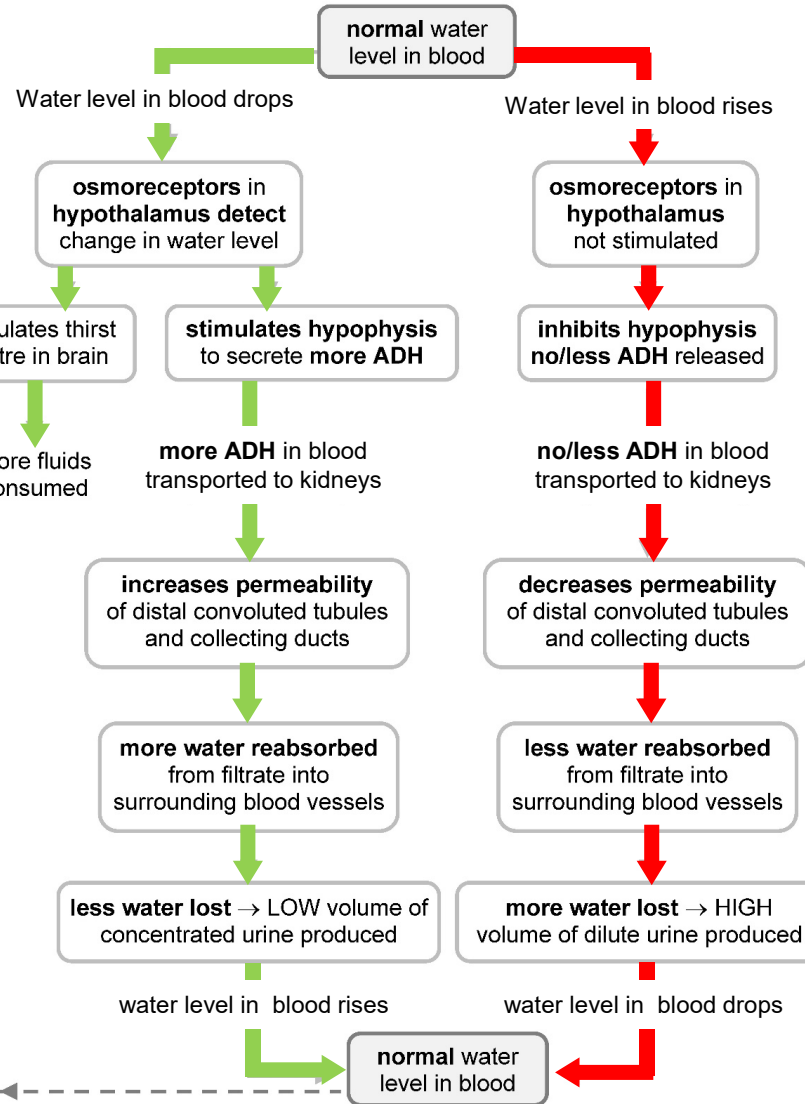
HINT

ADH = H_2O = released by Hypophysis

STIMULATES

negative feedback

return to normal is detected by receptors and corrective response is switched off



Negative feedback mechanism in regulation of water balance of the blood

REMEMBER

Absorb = the first time a substance is moved into the blood, e.g. after digestion

Reabsorb = the second time a substance is moved into the blood, e.g. after filtration in the kidney

INHIBITS

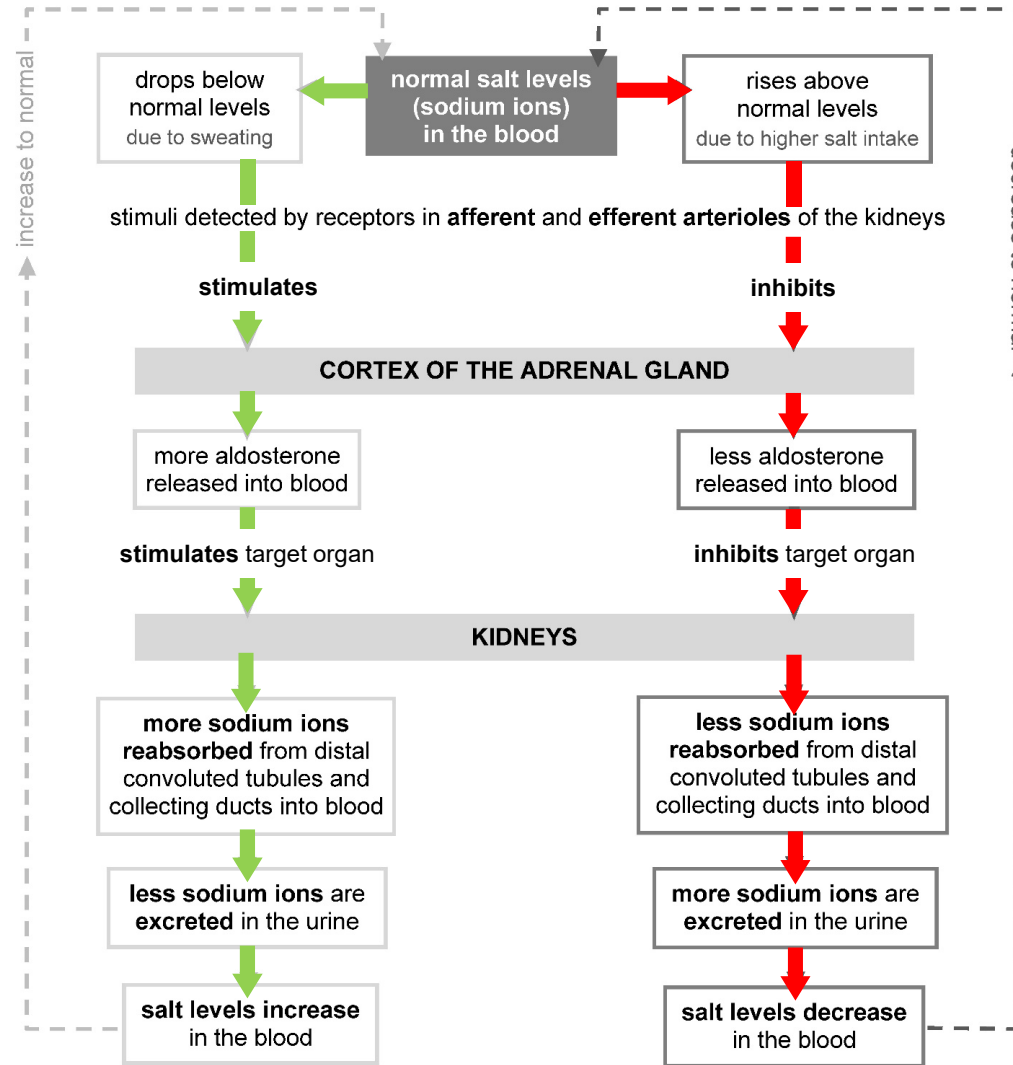
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Grade 12 Life Sciences Part 1
(2022 ed.) p. 81 & 82

HOMEOSTASIS - Aldosterone



HINT

aldosterone = salt =
released by **adrenal gland**



Functioning of aldosterone in the regulation of the salt concentration in the blood

REMEMBER

Absorb = the first time a substance is moved into the blood, e.g. after digestion

Reabsorb = the second time a substance is moved into the blood, e.g. after filtration in the kidney



Extracts from *The Answer Series*
Grade 12 Life Sciences Part 1
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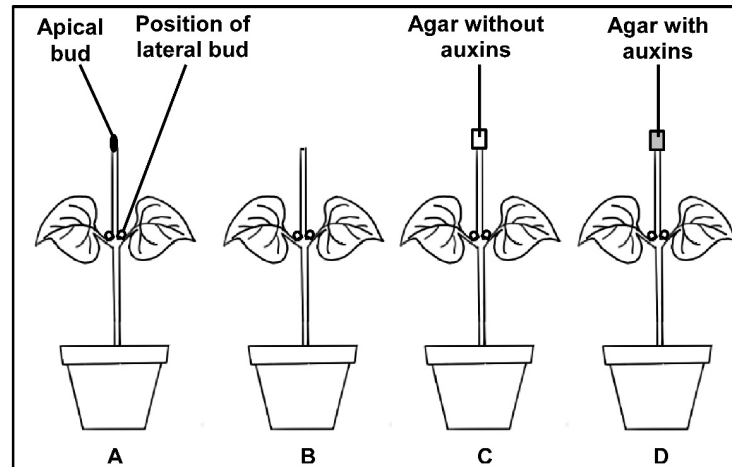
SCIENTIFIC INVESTIGATIONS - Components

3.4 An investigation was done to determine the effect of auxins on the growth of lateral branches. (The elongation of lateral buds results in the growth of lateral branches.)

The procedure was as follows:

- Four potted plants (**A**, **B**, **C** and **D**) of the same species were used.
- Plant **A** was left untreated.
- The apical bud of plant **B** was removed.
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The diagram below shows the setup of the investigation at the beginning.



The results are shown in the table below.

Plant	Length of the lateral buds (mm)	
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Aim of the investigation

Look for a 'TO' i.e. 'to determine...', 'to investigate...', 'to compare...' The aim will contain both variables and can be used for the hypothesis, variables and conclusion. **be careful of exceptions*

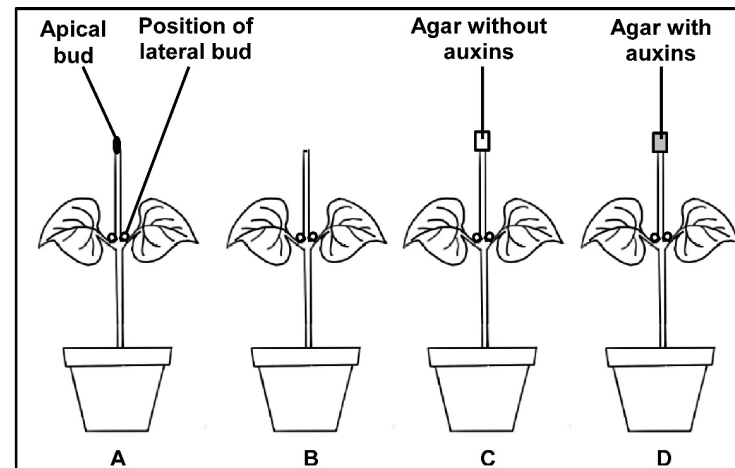
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Dependent variable

the variable that is **measured**

Independent variable

the variable that is **manipulated**

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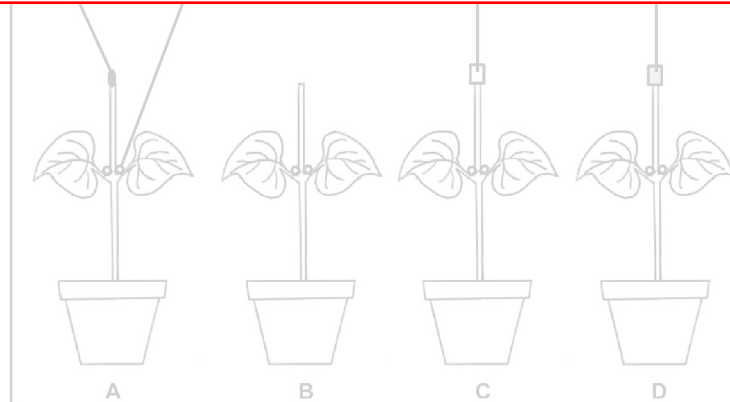
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the variable that is **measured**

To determine the effect of auxins on the growth of lateral branches



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 Continue learning



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SCIENTIFIC INVESTIGATIONS - Components

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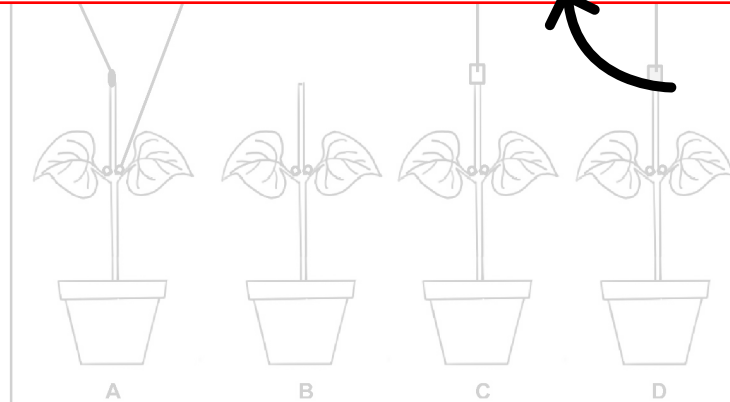
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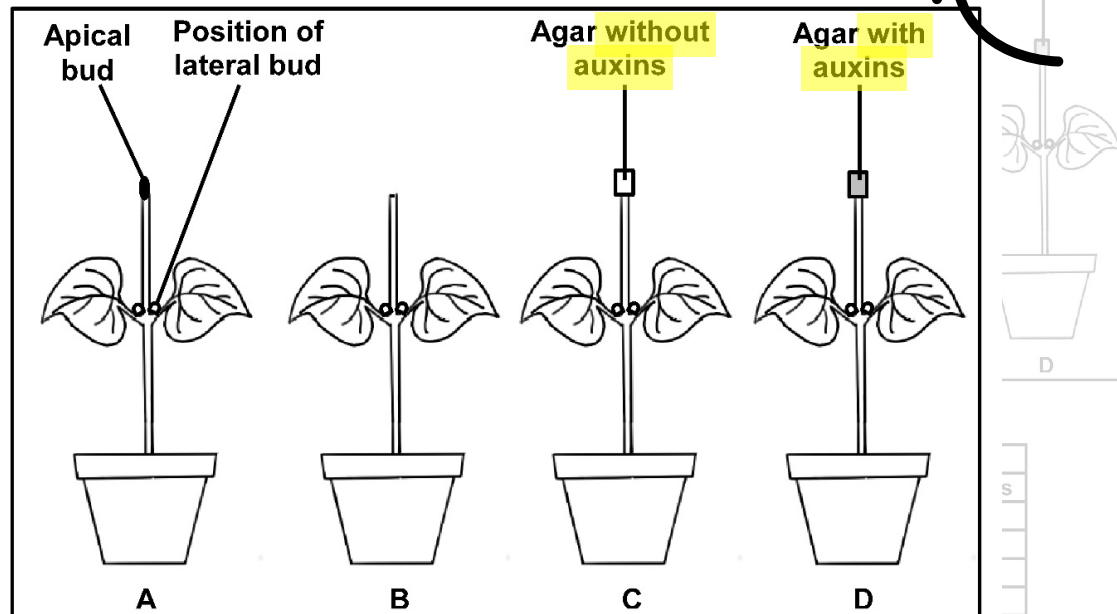
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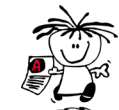
Independent variable

the variable that is **manipulated**

i.e. the presence or absence of auxin (look at what was manipulated in the setup)



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SCIENTIFIC INVESTIGATIONS - Components

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Dependent variable

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To determine the **effect of auxins** on the growth of lateral branches

Independent variable

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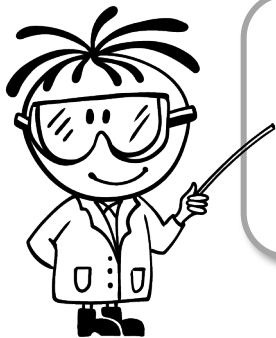
i.e. the presence or absence of auxin (look at what was manipulated in the setup)

NOTE

What was measured? – The effect of the auxins

How was it measured? – By observing the growth of lateral branches

Watch out for 'effect of' as this indirectly refers to the dependent variable. Look at the setup for what was manipulated regarding the auxins.



A B C D

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SCIENTIFIC INVESTIGATIONS - Components

Procedure

Detailed steps regarding how the experiment was conducted. Valuable information given includes:

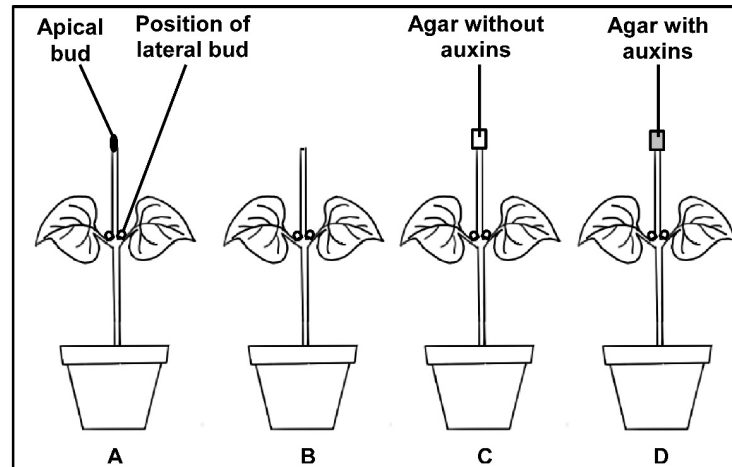
- Sample size
- Duration
- Constant variables
- How measurements were taken

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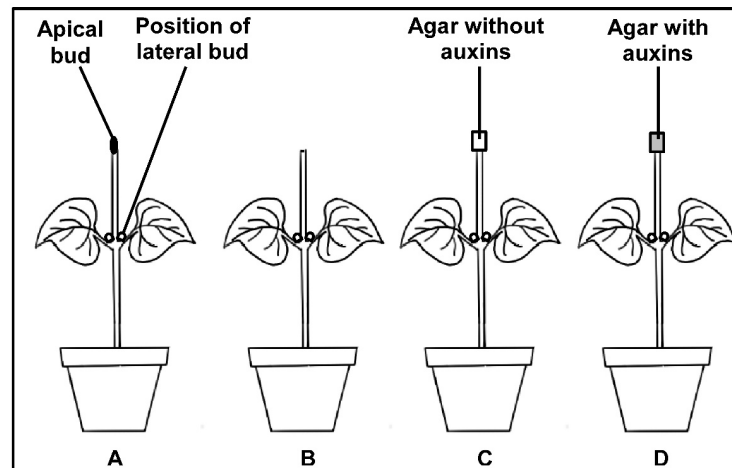
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Dependent variable

the variable that is **measured**

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the variable that is **manipulated**

Constant variables

Factors that have been kept the same. This ensures that the investigation is valid.

IMPORTANT: These factors are the ones explicitly mentioned, but there could be other factors that **should have been** kept constant but are not given in the question.

SCIENTIFIC INVESTIGATIONS - Components

Procedure

Detailed steps regarding how the experiment was conducted. Valuable information given includes:

- Sample size
- Duration
- Constant variables
- How measurements were taken

Results

Can be given in table, graph or paragraph form. Look for a relationship or trend between the two variables.

***Be careful of using the results to extract the variables.**

Sometimes the results (table/graph) indicate how the dependent variable was measured and not exactly what the dependent variable is, e.g.

Aim says: **growth** of lateral buds
Results table says: **length** of lateral buds

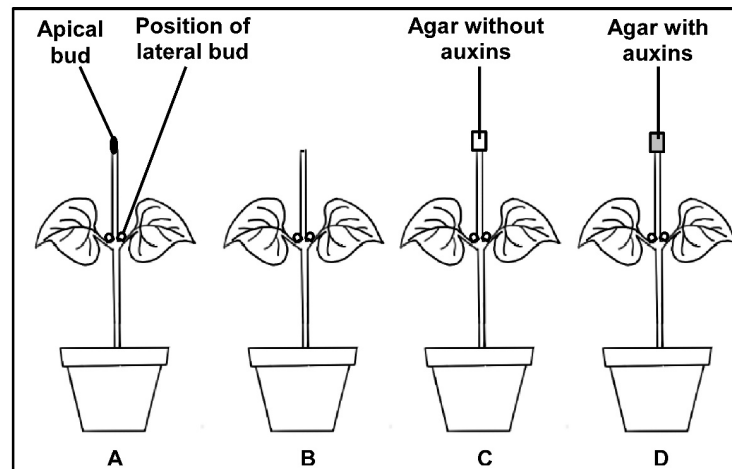
Rather use the AIM of the investigation to extract the variables.

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SCIENTIFIC INVESTIGATIONS - Components

Drawing a conclusion

Look at the results and the aim. **Alter the wording of the aim to show the relationship** between the variables:

Results

Pots B and C (no auxin) showed much more growth of lateral branches.

Pots A and D (with auxin) showed much less growth of lateral branches.

Aim

To determine the effect of **auxins** on the **growth of lateral branches**.

Conclusion ('So what is the effect of auxins on the growth of lateral branches?')

The absence of auxins increase/stimulate the **growth of lateral branches**.

OR

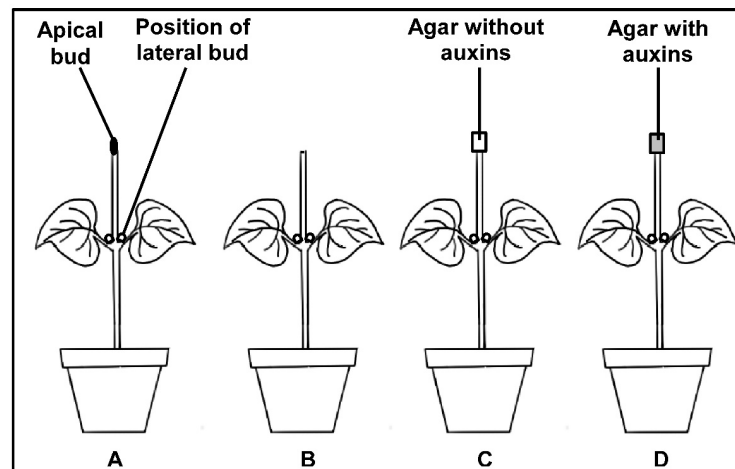
The presence of auxins decrease/inhibit/slow the **growth of lateral branches**.

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NOTE

State an **explicit conclusion** and **do not use words** like 'directly proportional' or 'indirectly/inversely proportional' in Life Sciences!



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SCIENTIFIC INVESTIGATIONS - Components

Validity

Are your conclusions/data/observations valid ('correct') because you ensured that NOTHING BUT auxins could have influenced the investigation?

What about the species of plant? – No, this was kept constant (✓Valid)

What about the environmental conditions? – No, this was kept constant (✓Valid)

What about the time frame? – No, this was kept constant (✓Valid)

Therefore, we can safely say that only the presence/absence of auxins could have affected the growth of the lateral branches.

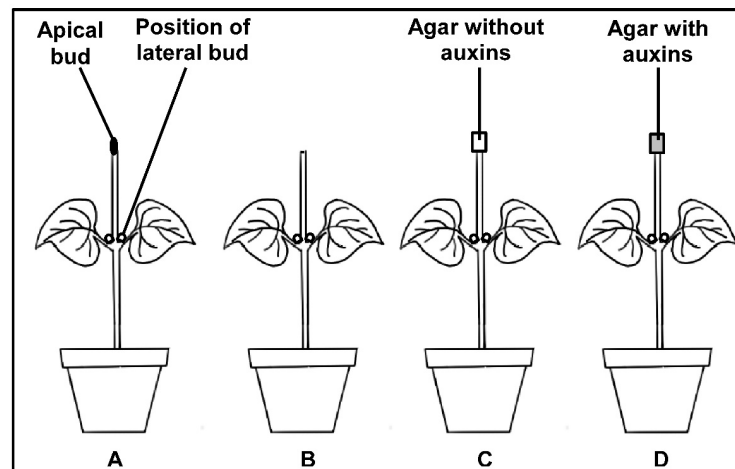
Remember the **V** in **V**alidity for ensuring there are enough constant **V**ariables.

3.4 An investigation was done to determine the effect of auxins on the growth of lateral branches. (The elongation of lateral buds results in the growth of lateral branches.)

The procedure was as follows:

- Four potted plants (**A, B, C** and **D**) of the **same species** were used.
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- The apical bud of plant **C** was removed and replaced with agar jelly (a jelly-like substance through which other substances can diffuse).
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- The plants were exposed to the **same environmental conditions**.
- The length of the lateral buds of each plant was **measured at the beginning of the investigation and again after three weeks**.

The diagram below shows the setup of the investigation at the beginning.



The results are shown in the table below.

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Reliability

When the investigation is repeated by someone else or the sample size is increased, will the results remain the same? Can we trust your conclusions/data/observations?

Was a large enough sample used? – Maybe not, could have used more plants (✗Reliable)

Was the investigation repeated? – Not really (✗Reliable)

Were multiple measurements of the dependent variable taken? – Not really, only at the beginning and after 3 weeks (✗Reliable)

Therefore, we can say that this investigation was not very reliable and may not provide the same results time after time.

Remember the **R** in **R**eliability for **R**epet the investigation, **R**aise the sample size, take more **R**eadings and **R**andom sampling.



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SCIENTIFIC INVESTIGATIONS - Components

Control Setup

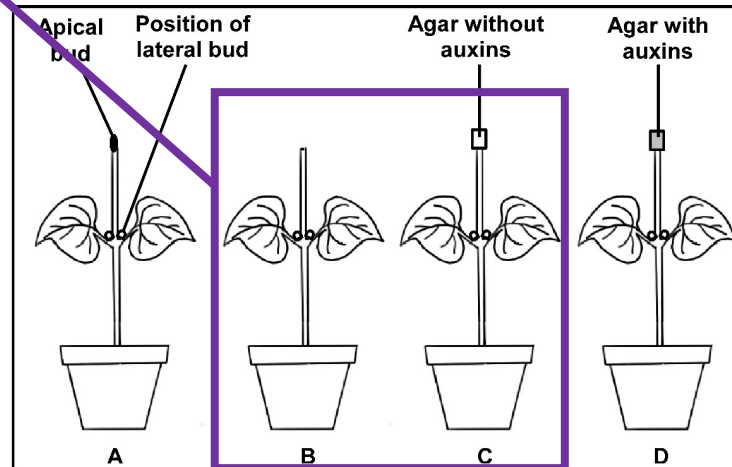
- The setup where the **independent variable is absent**, i.e. there are NO AUXINS.
- The purpose of a control is to **provide a comparison with the experiment results**.
- It **confirms** that the **independent variable caused the results** (dependent variable) and not an unknown factor.

3.4 An investigation was done to determine the effect of auxins on the growth of lateral branches. (The elongation of lateral buds results in the growth of lateral branches.)

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In this investigation

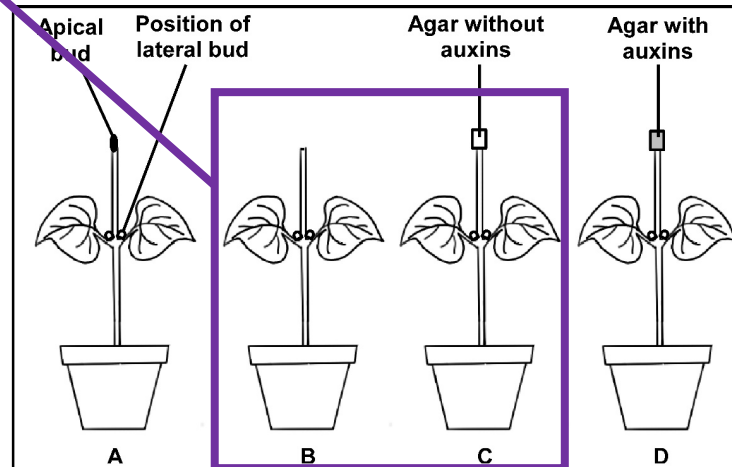
There are technically two control setups, depending on what you are investigating.

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There are technically two control setups, depending on what you are investigating.

Setup **A** and **B** are testing *whether auxins are produced in the apical bud*.

Setup **B** is the **control for Setup A**:

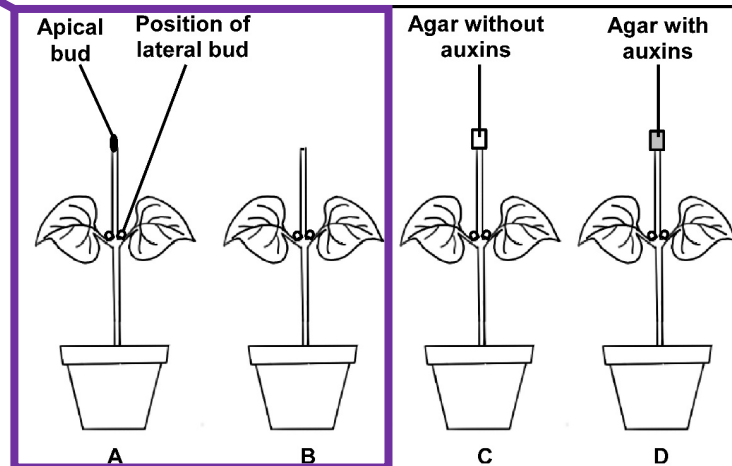
- Setup **A** – apical bud and auxin present
- Setup **B** – no apical bud and no auxin present

3.4 An investigation was done to determine the effect of auxins on the growth of lateral branches. (The elongation of lateral buds results in the growth of lateral branches.)

The procedure was as follows:

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SCIENTIFIC INVESTIGATIONS - Components

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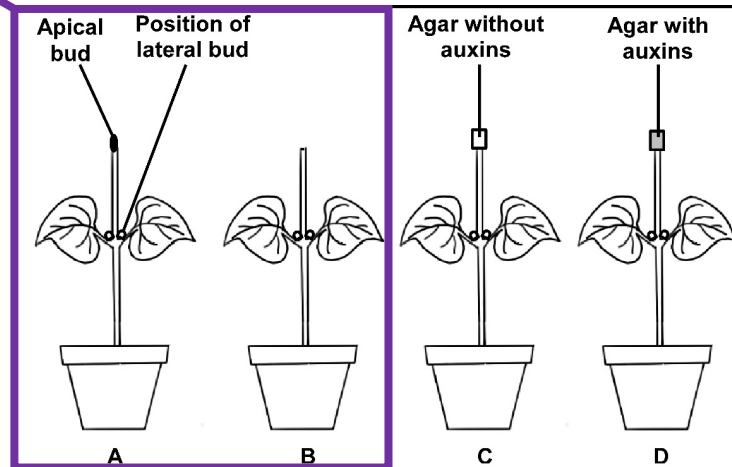
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NOTE

Setup B acts as a control for Setup A because it shows that growth of the lateral branches is reduced/inhibited when the apical bud is present.

Without the apical bud, lateral branches grow (Setup B).

Therefore, it is only the presence of the apical bud (Setup A) that is inhibiting the growth of the lateral branches. Therefore, the apical bud must contain auxins.

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SCIENTIFIC INVESTIGATIONS - Components

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Setup **B** is the **control** for Setup **A**:

- Setup **A** – apical bud and auxin present
- Setup **B** – no apical bud and no auxin present

Setup **C** and **D** are testing *whether auxins affect the growth of lateral branches*.

The apical bud is removed in both setups as we only want to control the availability of auxins externally, via the agar jelly.

Setup **C** is the **control** for Setup **D**:

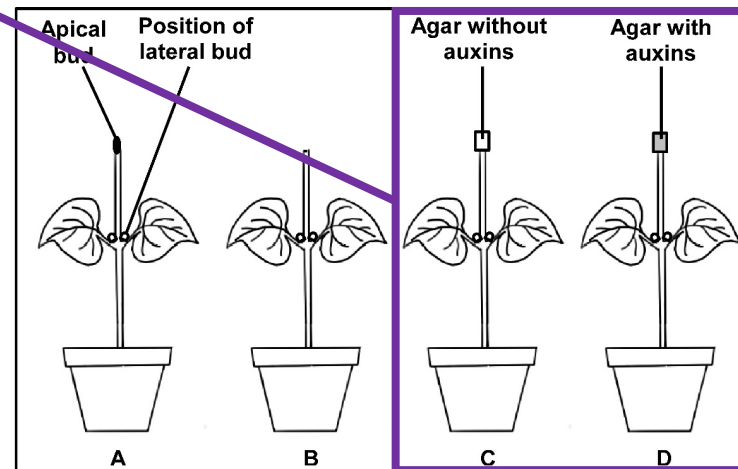
- Setup **C** – agar with no auxins
- Setup **D** – agar with auxins

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SCIENTIFIC INVESTIGATIONS - Components

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Setup **C** is the **control** for Setup **D**:

- Setup **C** – agar with no auxins
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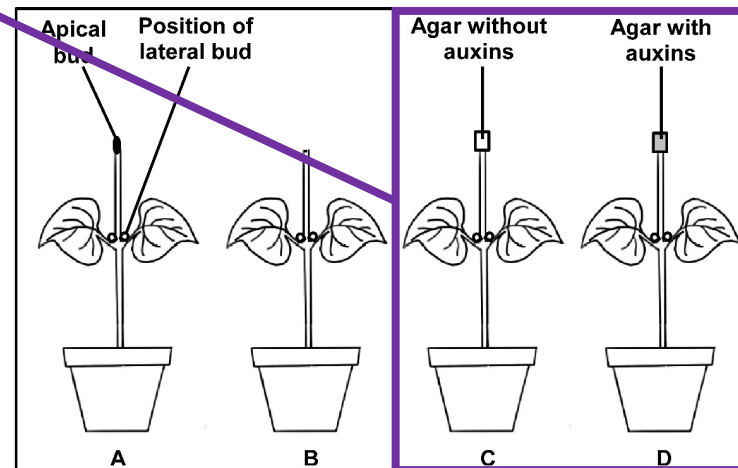
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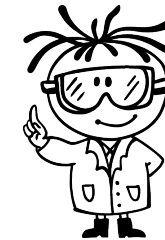
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D	7,1	7,2



NOTE

Setup **C** acts as a control for Setup **D** because it shows that the growth of the lateral branches is inhibited when auxins are present.

The agar jelly itself does not inhibit any growth of the lateral branches.

Therefore, it is only the presence of the auxins (setup **D**) that is inhibiting the growth of the lateral branches.



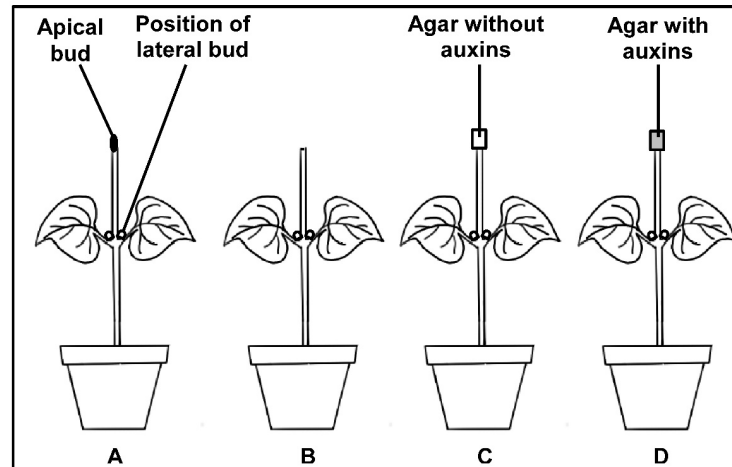
SCIENTIFIC INVESTIGATIONS - Components

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NOTE

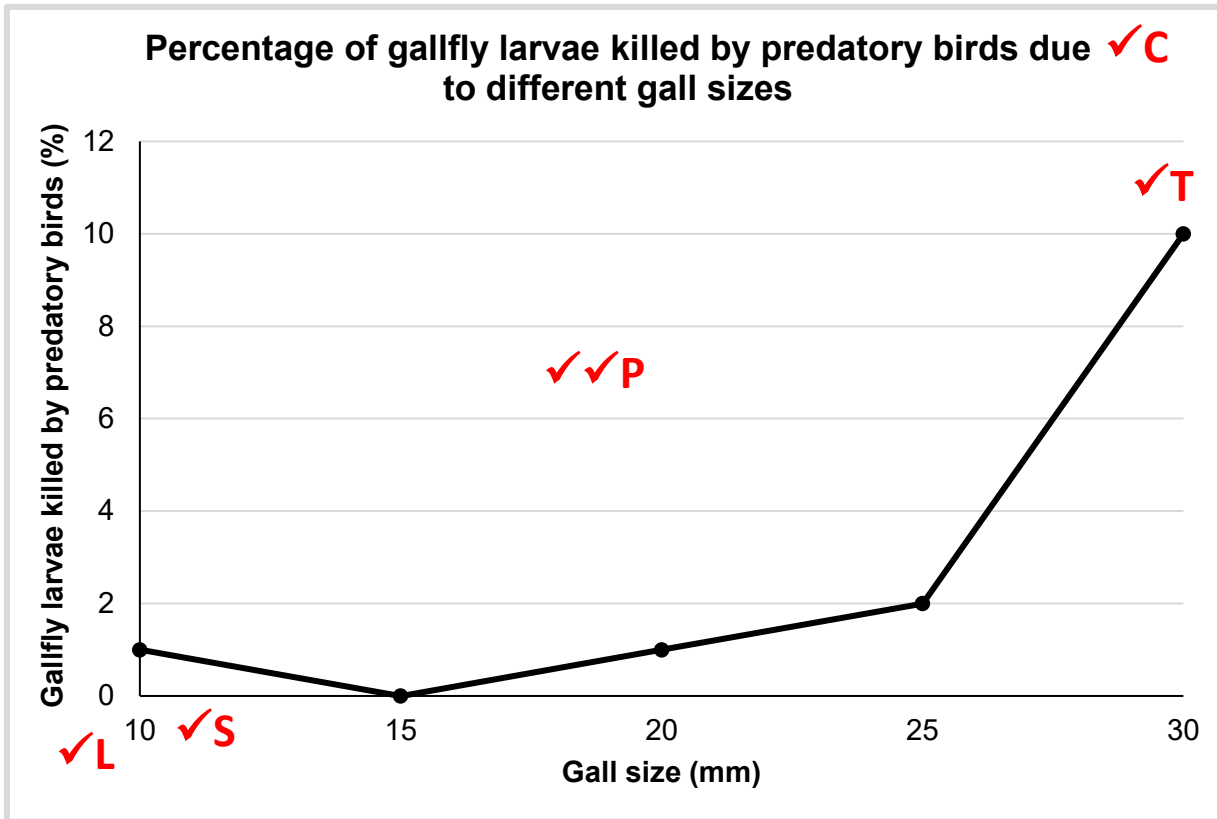
A 'control setup' and a 'baseline' are not the same thing.

A baseline is a measurement taken before the treatment of the independent variable is added.

It also serves to compare the results with, but all setups have a baseline measurement, i.e. the experiment AND the control.



GRAPHING SKILLS – Line graph

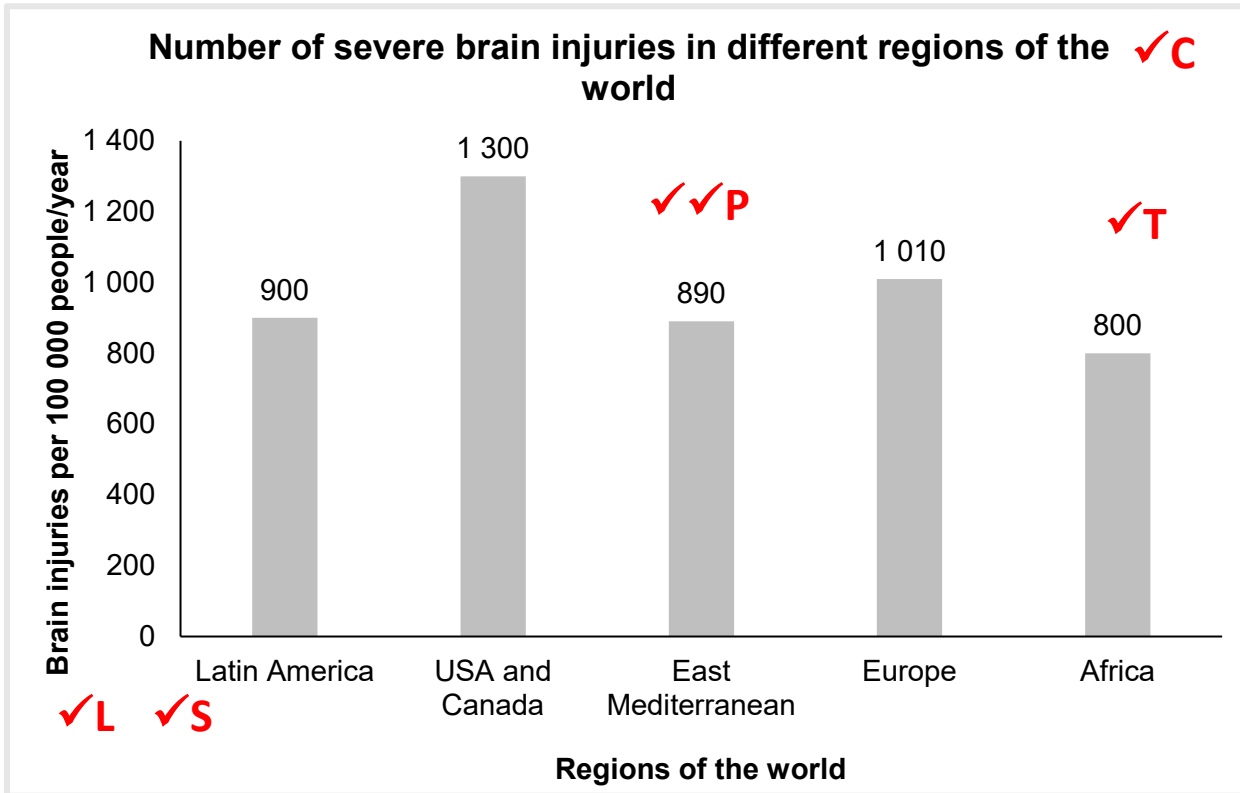


Criteria	Elaboration	Mark
Correct type of graph (T)	Line graph drawn	1
Caption of graph (C)	Both variables included	1
Axes labels (L)	x- and y-axis labelled with units	1
Scale for x- and y-axis (S)	- Equal spacing between intervals for each axis	1
Plotting of co-ordinates (P)	- 1 to 3 coordinates plotted correctly - All 5 required coordinates plotted correctly	1 2



Continue learning Bar graph

GRAPHING SKILLS – Bar graph

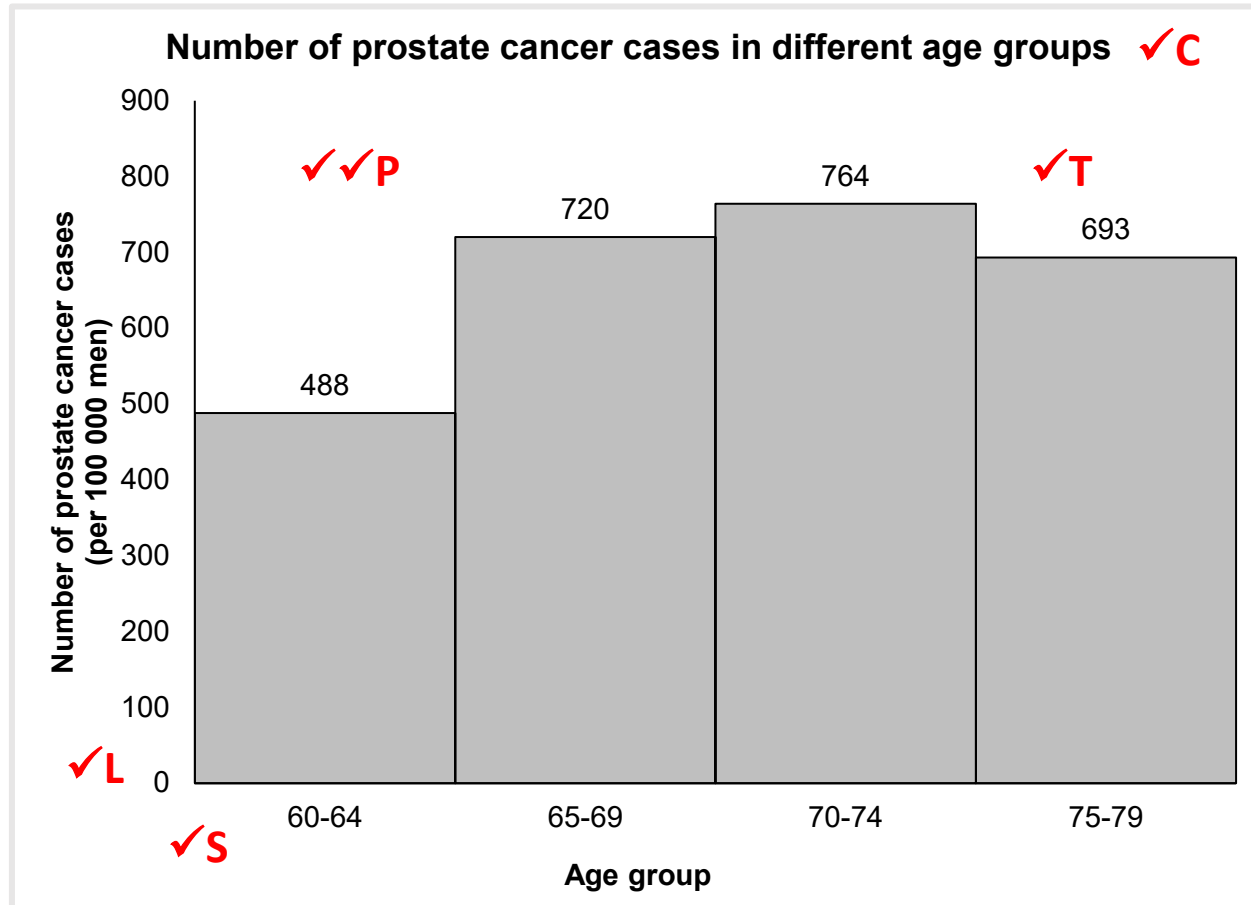


Criteria	Elaboration	Mark
Correct type of graph (T)	Bar graph drawn	1
Caption of graph (C)	Both variables included	1
Axes labels (L)	x- and y-axis labelled with units	1
Scale for x- and y-axis (S)	- Equal space and width of bars for x-axis - Correct scale for y-axis	1
Plotting of co-ordinates (P)	- 1 to 3 coordinates plotted correctly - All 5 required coordinates plotted correctly	1 2



Continue learning Histogram

GRAPHING SKILLS – Histogram



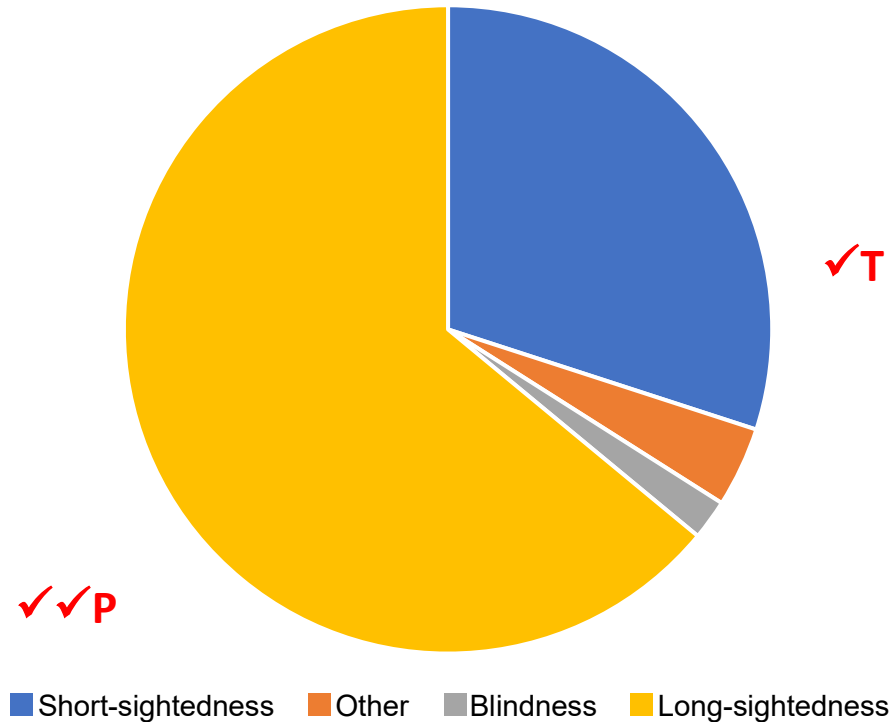
Criteria	Elaboration	Mark
Correct type of graph (T)	Histogram drawn	1
Caption of graph (C)	Both variables included	1
Axes labels (L)	x- and y-axis labelled with units	1
Scale for x- and y-axis (S)	- No spaces and equal width of bars for x-axis - Correct scale for y-axis	1
Plotting of co-ordinates (P)	- 1 to 3 coordinates plotted correctly - All 4 required coordinates plotted correctly	1 2



Continue learning Pie Chart

GRAPHING SKILLS – Pie chart

Percentage of (visually impaired) people suffering from different visual defects ✓H



Calculations:

Blindness: $2/100 \times 360^\circ = 7,2^\circ$
 Short-sightedness: $30/100 \times 360^\circ = 108^\circ$
 Long-sightedness: $64/100 \times 360^\circ = 230,4^\circ$
 Other: $4/100 \times 360^\circ = 14,4^\circ$

✓✓C

Criteria	Elaboration	Mark
Correct type of graph (T)	Pie chart drawn	1
Heading of graph (H)	Both variables included	1
Calculations (C)	Correct calculations to determine the proportions shown	All correct: 2 1 – 3 correct: 1
Proportions of sectors (P) <i>Checked with a prepared transparency</i>	Correct proportions of the labelled sectors	All correct: 2 1 – 2 correct: 1



CALCULATIONS IN LIFE SCIENCES

✓ Calculate the **difference**:

$$\text{final value} - \text{initial value}$$

✓ Calculate the **percentage**:

$$\frac{\text{value given}}{\text{total}} \times 100$$

✓ Calculate the **percentage increase**:

$$\frac{\text{final value} - \text{initial value}}{\text{initial value}} \times 100$$

✓ Calculate the **percentage decrease**:

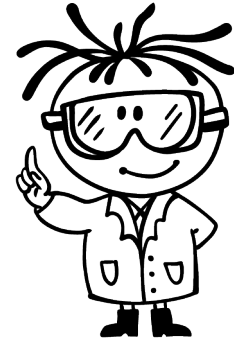
$$\frac{\text{initial value} - \text{final value}}{\text{initial value}} \times 100$$

✓ Calculate the **average**:

$$\frac{\text{sum of all values given (add them up)}}{\text{total number of values given}} \times 100$$

✓ Calculate a **rate**/by **how many times**:

$$\frac{\text{final value}}{\text{initial value}}$$



NOTE

Round off to **two decimals** unless stated otherwise

