GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

2022

10831

LIFE SCIENCES

PAPER 1

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TIME: **2½ hours**

MARKS: **150**

17 pages



X05

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions in the ANSWER BOOK.
2. Start the answer to EACH question on a NEW page.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Present your answers according to the instructions of each question.
5. ALL drawings must be done in pencil and labels in blue or black ink.
6. Draw diagrams, flow charts or tables only when asked to do so.
7. The diagrams in this question paper are NOT necessarily drawn to scale.
8. Do NOT use graph paper.
9. You may use a non-programmable calculator, protractor and a compass, where necessary.
10. Write neatly and legibly.

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SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A – D) next to the question numbers (1.1.1 to 1.1.10) in the answer book, for example 1.1.11 D.

1.1.1 Which gland is involved in regulating the salt balance in the body?

A Pancreas
B Hypothalamus
C Pituitary
D Adrenal

1.1.2 Dendrites always take impulses …

A to the cell body.
B to the receptor.
C to the synapse.
D to the axon.

1.1.3 The largest part of the brain is the …

A cerebrum.
B medulla oblongata.
C cerebellum.
D pons.

1.1.4 Which of the following applies to the level of abscisic acid in seeds which normally germinate in spring?

A It increases from winter to spring.
B It decreases from winter to spring.
C It remains high from winter to spring.
D It remains low from winter to spring.

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1.1.5 Below is a list of characteristics seen at puberty. Study the list and answer the question that follows.

(i) Increased levels of oestrogen and progesterone
More hair in the pubic region and under the armpits
(ii) Muscle mass increases and shoulders become wider.
Larynx enlarges and voice becomes deeper.
(iii) Increased levels of oestrogen and progesterone
More hair in the pubic region and under the armpits
(iv) Muscle mass increases and shoulders become wider.

Which characteristics apply to puberty in males ONLY?

A (i) and (iv)
B (i) and (ii)
C (ii) and (iii)
D (iii) and (iv)

1.1.6 Which of the following is NOT part of the central nervous system?

A Cerebrum
B Medulla oblongata
C Corpus luteum
D Spinal cord

1.1.7 Which part of the autonomic nervous system has a similar effect on the body as adrenalin?



A Somatic
B Peripheral
C Sympathetic
D Parasympathetic

1.1.8 Which of the following represents the correct set of events involved in the secretion and action of ADH (antidiuretic hormone)?

	WATER LEVEL IN THE BLOOD: RELATIVE TO NORMAL	AMOUNT OF ADH PRODUCED: RELATIVE TO NORMAL	AMOUNT OF WATER REABSORBED BY KIDNEYS
A	Increase	Increase	Decrease
B	Increase	Decrease	Increase
C	Decrease	Increase	Increase
D	Decrease	Decrease	Decrease

1.1.9 A person experiences a decrease in blood glucose levels. This is because there is …

A an increase in insulin.
B an increase in glucagon.
C no adrenalin being released.
D no growth hormone released.

1.1.10 A hypersecretion of which hormone causes a person to grow abnormally tall?

A TSH
B GH
C LH
D FSH

(10 x 2) **(20)**

1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question numbers (1.2.1 to 1.2.5) in the ANSWER BOOK.

1.2.1 Tubular structure containing blood vessels which connects a foetus to the placenta

1.2.2 Glands which release hormones into the bloodstream

1.2.3 Type of neurons that joins sensory and motor neurons

1.2.4 Fluid around the brain and spinal cord that aids in protection

1.2.5 Part of a neuron which contains the nucleus

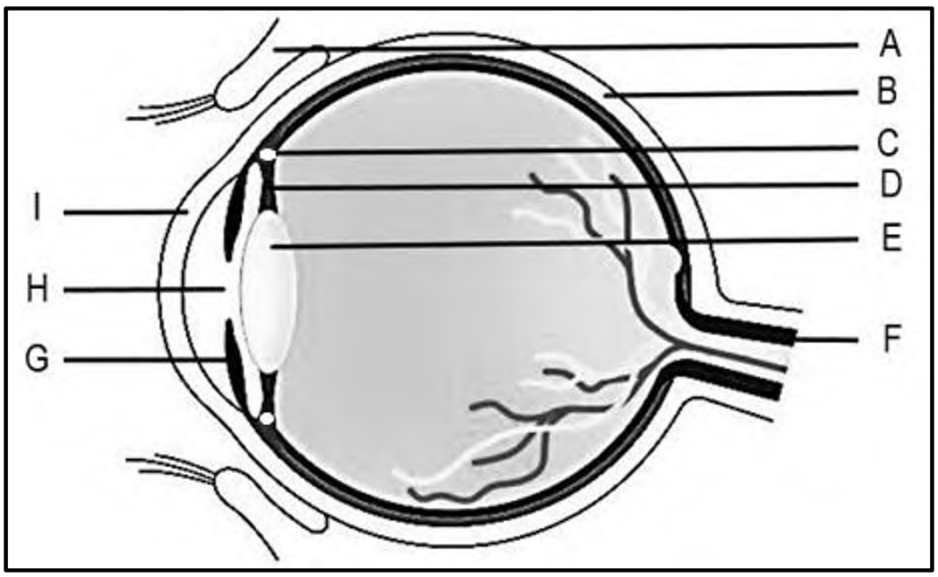
(5 x 1) **(5)**

1.3 Indicate whether each of the statements in COLUMN I applies 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 numbers (1.3.1 to 1.3.3) in the ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 Plant defence mechanism	A Thorns B Chemicals
1.3.2 Function of the nervous system	A React to stimuli B Coordinate activities
1.3.3 The placenta originates from this part	A Chorion B Endometrium

(3 x 2) **(6)**

1.4 The diagram below represents parts of the human eye.



1.4.1 Identify the structures labelled **B, G** and **I** respectively. (3)

1.4.2 Give the LETTER and NAME of the part which:

(a) Increases in diameter during a fight or flight reaction (2)

(b) Is a bundle containing many sensory neurons (2)

(c) Prevents dust from entering the eye (2)

1.4.3 State the change that each of the following structures will undergo, when a person focuses on a near object:

(a) Part **C** (1)

(b) Part **D** (1)

(c) Part **E** (1)

1.4.4 State ONE treatment for each of the following:

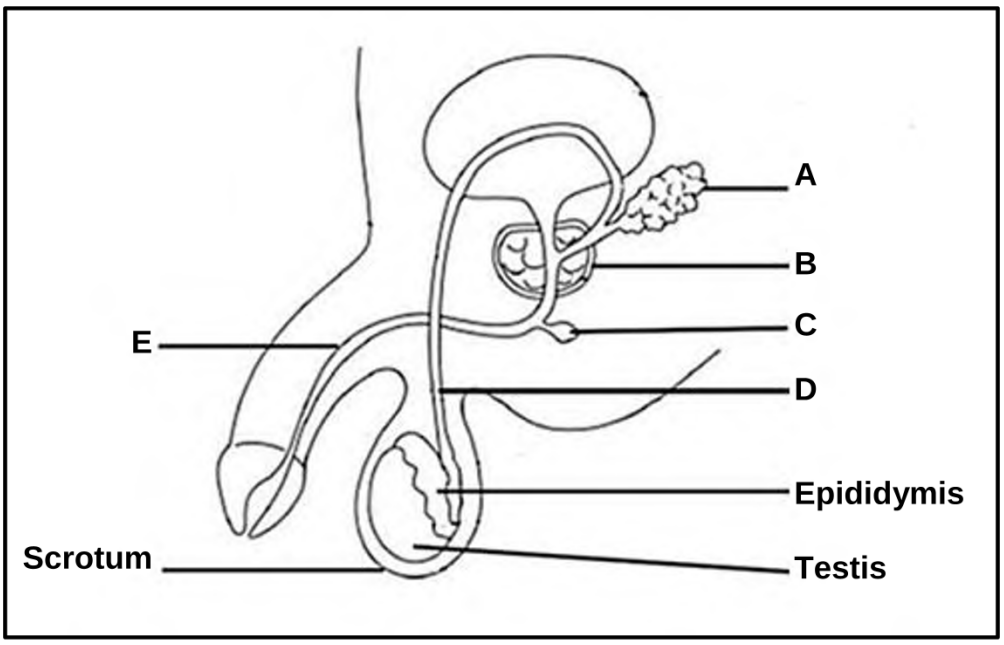
(a) Short-sightedness (1)

(b) Cataracts (1)

(14)

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1.5 The diagram below represents the male human reproductive system.



1.5.1 Give the LETTERS of ALL the structures that are involved in each of the following:

(a) Production of the fluid part of semen (1)

(b) Transportation passageway of sperm and semen (1)

1.5.2 Name each of the following:

(a) Gland **B** (1)

(b) The hormone produced by the testes, that brings about the development of male secondary sexual characteristics (1)

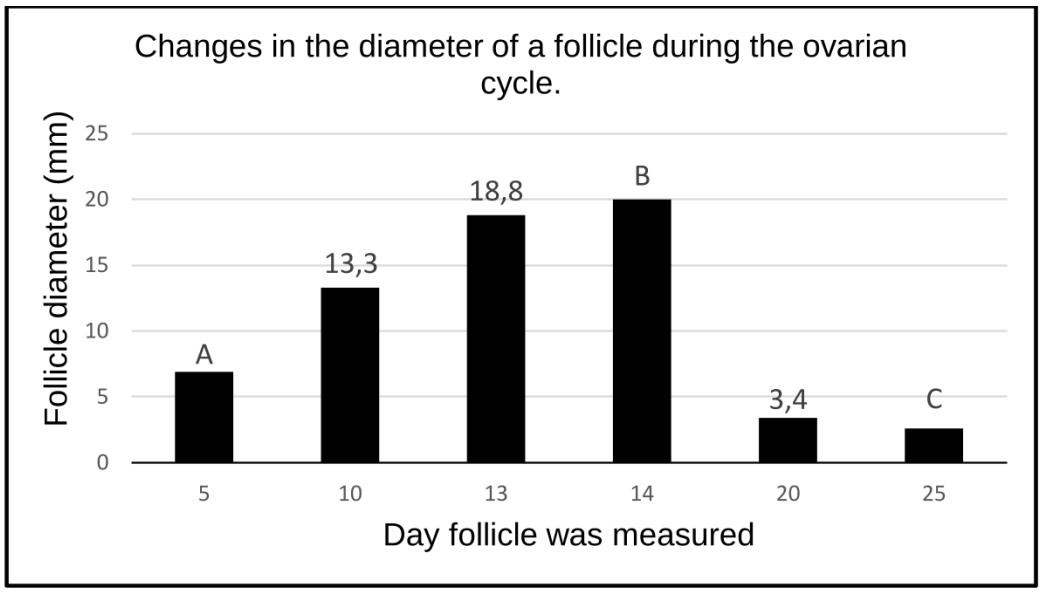
1.5.3 Name the environmental factor to which the scrotum adjusts, to ensure optimum sperm production. (1)
(5)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The graph below shows changes in the diameter of a follicle during the first 25 days of the ovarian cycle.

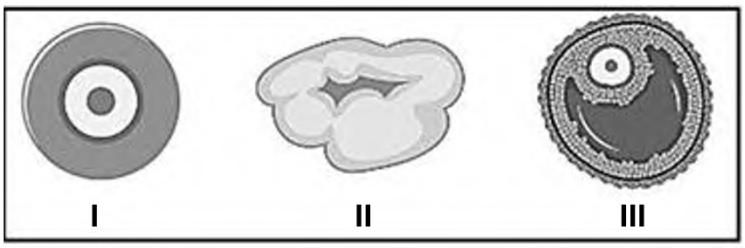


2.1.1 Give the diameter of the follicle on day 14. (1)

2.1.2 Calculate the percentage increase in follicle diameter from day 10 to 13. Show ALL workings. (3)

Questions 2.1.3 to 2.1.5 are based on the following information.

The images below show three different stages (primary follicle, Graafian follicle and the corpus luteum) in a follicle's development during the ovarian cycle. The follicles below are not in the correct order. The appearance of a follicle and diameter of the follicle change during the ovarian cycle, depending on which day in the ovarian cycle it is viewed. Use the graph above and the images below to answer Questions 2.1.3 to 2.1.5.

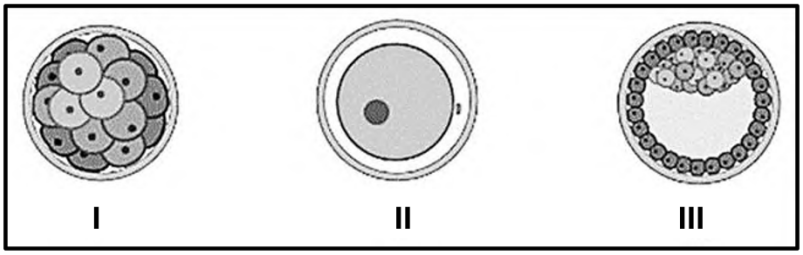


2.1.3 Name the follicles labelled **II** and **III**. (2)

2.1.4 Match each of the follicles labelled **I, II** and **III** to their corresponding bar **A, B** or **C** on the graph, e.g., **D** matches **IV**. (3)

2.1.5 If the change in follicle diameter seen after day 14 continues to day 28, explain how it will affect a woman's uterine cycle. (3)
(12)

2.2 The diagrams below show structures at different stages of development after fertilization in a human female.

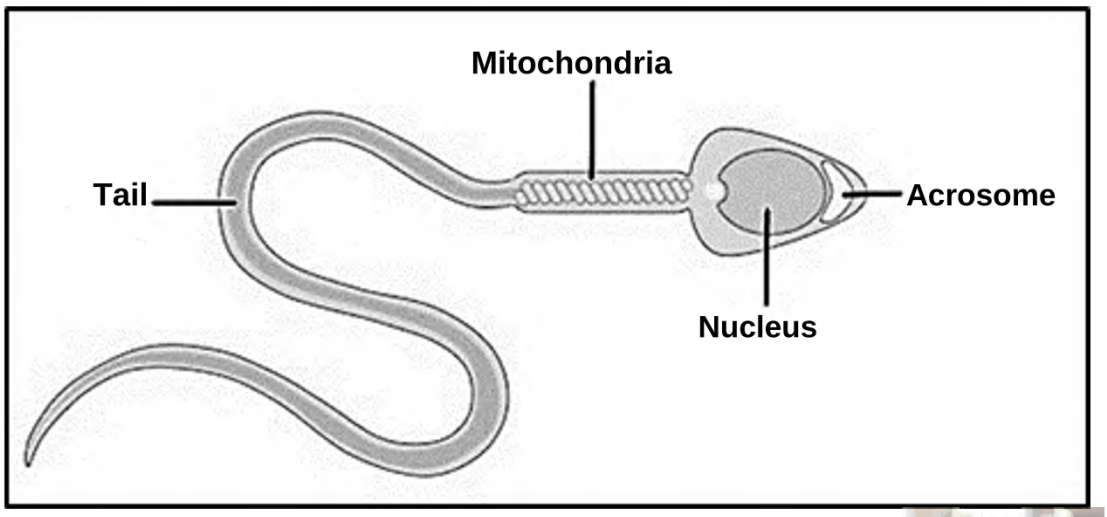


2.2.1 Identify the structures in the diagrams labelled **I** and **III**. (2)

2.2.2 Describe how the cell in diagram **II** was formed. (3)

2.2.3 Draw a basic labelled diagram of the female reproductive system viewed from the front and indicate on the diagram where each of the structures above may by located, by using only the numbers **I, II** and **III.** (5)
(10)

2.3 The diagram below shows a sperm cell.



2.3.1 State how the following structures are suited to assist the sperm cell to perform its function:

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(a) The mitochondria (2)

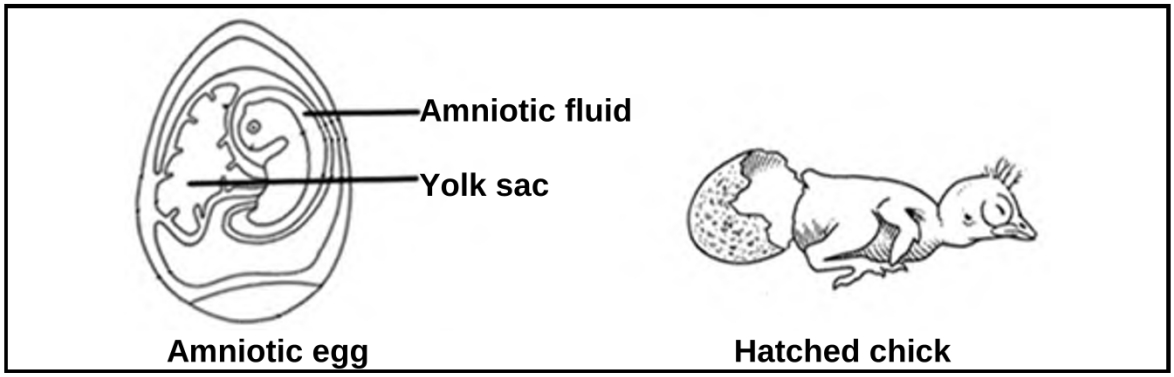
(b) The acrosome (2)

2.3.2

Sperm cells and ova are produced by gametogenesis. This happens when diploid cells undergo meiosis to produce haploid cells.

Tabulate TWO differences between gametogenesis in males and females, not mentioned in the text above. (5)
(9)

2.4 The diagrams below show the internal structures of an amniotic egg after fertilization, as well as the chick that hatched from the egg.



2.4.1 Name the type of fertilization that has taken place. (1)

2.4.2 State the type of reproductive strategy which is shown by the development of an embryo within an amniotic egg. (1)

2.4.3 Identify the type of development that the hatched chick shows. (1)

2.4.4 Give TWO functions of the amniotic fluid. (2)

2.4.5 Explain how the size of the yolk sac affects the development of the chick in the diagram. (3)
(8)

2.5 Read the passage below and answer the questions that follow.

The physiological impact of a hunger strike

During normal metabolism the body breaks down complex carbohydrates into simple sugars such as glucose, which serves as fuel for the trillions of cells that make up the human body.

After eight hours of hunger strike, the body begins to slow its metabolism (the rate at which it consumes energy). The heart pumps slower and the body produces less heat. When the blood glucose levels have been depleted, the body begins to convert stored carbohydrates into glucose to generate energy through respiration. This will only last for a short period of time. Later, the body will need to use fat and muscle proteins to produce glucose.

2.5.1 Name the hormone that regulates the body's normal metabolism. (1)

2.5.2 Using the text above, give TWO specific functions of the hormone mentioned in QUESTION 2.5.1. (2)

2.5.3 Provide ONE alternative source of energy that the body uses when all carbohydrate reserves have been depleted. (1)

2.5.4 Name the stored carbohydrate which can be converted into glucose. (1)

2.5.5 Describe how the body of a hunger-striking person would convert stored carbohydrates into glucose. (6)

(11)

[50]

QUESTION 3

3.1 Researchers at the University of Cape Town have used the novel Infrared Thermal Technology (ITT), a technique with high sensitivity and digital accuracy, to measure the heat released by the human skin under different environmental temperature conditions. The results are shown in the table below.

Temperature (°C)	Average heat released (µJoule/cm^2/min)
16	30
20	50
24	70
28	110
32	160
36	200
40	200
44	200

3.1.1 Give the TERM used to describe the homeostatic control of body temperature. (1)

3.1.2 Describe how the blood vessels of the skin increased the average heat released when the environmental temperature increased from 16 °C to 36 °C. (3)

3.1.3 Explain why sweating plays a more important role in maintaining body temperature, when the environmental temperature increases from 36 °C to 44 °C. (4)



3.1.4 Use the information in the table to plot a line graph. (6)
(14)

3.2 A pot plant was placed onto its side in a dark box. After 2 weeks, the stem started to grow upwards.





3.2.1 Name the environmental factor which is responsible for the stem's upward growth when the pot plant was placed on its side. (1)

3.2.2 Identify the phenomenon which is indicated by the stem's upward growth. (1)

3.2.3 Name the plant hormone which is responsible for the stem's upward growth. (1)

3.2.4 Describe how the distribution of the hormone mentioned in QUESTION 3.2.3 caused the stem to bend in an upward direction. (4)

3.2.5 Explain ONE way in which the stem's upward growth benefits the plant. (2)
(9)

3.3 The human ear plays a vital role in hearing and balance which allows humans to respond to their environment.

3.3.1 Describe the process of hearing. (7)

3.3.2 Explain TWO ways in which the semi-circular canals are structurally suited for their function. (4)
(11)

3.4 One of the symptoms of COVID-19 is the loss of taste. Many patients take a very long time to regain their taste after recovering from COVID-19. A group of learners decided to perform an investigation to compare how the time after infection with the virus influences the amount of taste recovered. They got a number of learners who had recovered from COVID-19 and two learners who had never been infected, to volunteer for the investigation.

They followed the procedure below:

- They produced salt water solutions of different concentrations as described in the table below.

Table 1: Description of how the salt water solutions were produced

Bottle label	**Solution concentration**
Sample A	500 ml water with no addition (pure water)
Sample B	500 ml water with 1 teaspoon of salt
Sample C	500 ml water with 2 teaspoons of salt
Sample D	500 ml water with 3 teaspoons of salt
Sample E	500 ml water with 4 teaspoons of salt

- Pipettes (droppers) were used to place 3 drops of one solution on the tongue of the participants.
- The participants were asked if they could taste the salt.
- After 5 minutes, 3 drops of another solution were placed on the tongues of the participants. They were again asked if they could taste the salt.
- This process was repeated until all of the solutions were tested on each of the participants.
- The solutions were given to volunteers in a random order.

The results of the investigation are captured in the table below. An X was placed in the block if the learner said that they could taste the saltiness.

		Sample				
Name of participant	**Duration since COVID-19 infection**	**A 500 ml water + no salt**	**B 500 ml water + 1 spoon of salt**	**C 500 ml water + 2 spoons of salt**	**D 500 ml water + 3 spoons of salt**	**E 500 ml water + 4 spoons of salt**
Zayzay	2 weeks					X
Kayla	2 weeks					X
Maimoonah	4 weeks				X	X
Mpho	4 weeks				X	X
Jessica	6 weeks			X	X	X
Tumisang	6 weeks			X	X	X
~~Given~~	~~6 weeks~~	~~X~~		~~X~~		
Urwa	8 weeks		X	X	X	X
Katleho	8 weeks		X	X	X	X
Rethabile	Never had		X	X	X	X
Martinus	Never had		X	X	X	X

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NOTE: The learners decided not to consider Given's data in their analysis as they thought he was deliberately (on purpose) giving incorrect answers. They replaced him with Tumisang who also recovered from COVID-19 six weeks ago.

3.4.1 Consider the samples (**A – E**). Which sample had the greatest concentration of salt? (1)

3.4.2 Describe how the nervous system enables a normal person to interpret the taste of a salty liquid (stimulus) when placed on the tongue. (3)

3.4.3 Identify the dependent variable in this investigation. (1)

3.4.4 Identify TWO variables that the learners kept the same. (2)

3.4.5 Describe the general trend shown by the results. (2)

3.4.6 Select the TWO participants that acted as the control in this investigation. (2)

3.4.7 Give a reason for your answer to QUESTION 3.4.6. (1)

3.4.8 Explain how leaving out Given's results, and replacing it with Tumisang's results, affects both the reliability and validity of the investigation. (4)
(16)

[50]

TOTAL SECTION B: 100

TOTAL: 150

END