



**education**  
**MPUMALANGA PROVINCE**  
**REPUBLIC OF SOUTH AFRICA**

**INSIKAZI CIRCUIT**

**GRADE 12**

**LIFE SCIENCES PRE TRIAL**  
**PAPER ONE**  
**31 AUGUST 2020**

**MARKS: 150**

**TIME: 2h30 minutes**

**This question paper consists 16 of pages.**

**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

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

**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 to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.4 D.

1.1.1 The part of the female reproductive system where fertilisation takes place is called the ...

- A vagina.
- B ovary.
- C Fallopian tube.
- D cervix.

1.1.2 The vibrations on the tympanic membrane are transferred to the ...

- A ossicles and then the oval window.
- B oval window and then the ossicles.
- C ossicles and then the round window.
- D cochlea and then the ossicles.

1.1.3 The nerve impulse in the axon of a sensory neuron is transmitted ...

- A towards the dendrite of the sensory neuron.
- B towards the cell body of the sensory neuron.
- C away from the effector organ.
- D away from the cell body.

1.1.4 Which ONE of the following are functions of adrenalin?

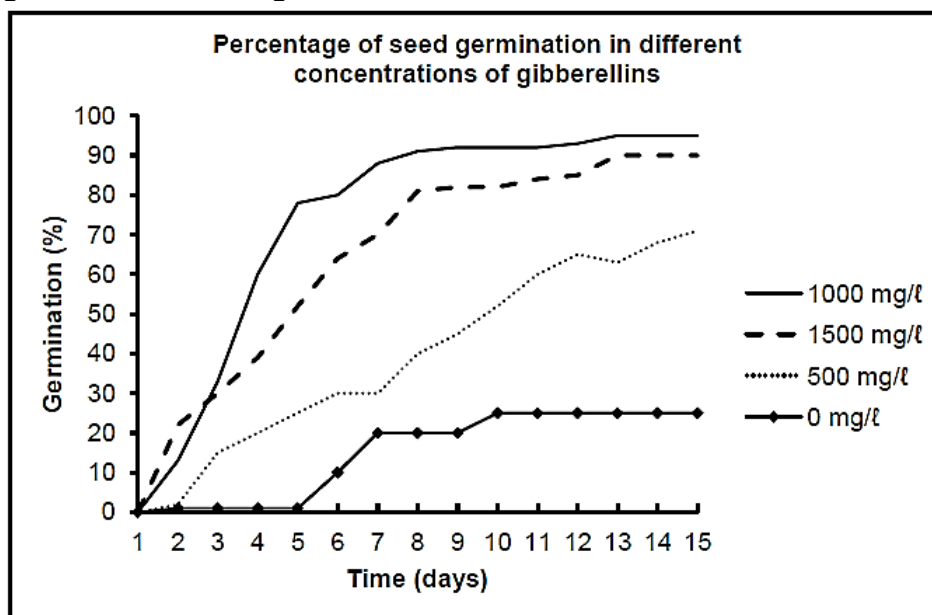
- A Influences the pupil size and controls the amount of water lost by the body through the kidneys.
- B Increases the blood sugar level and blood pressure.
- C Decreases metabolic rate and blood sugar level.
- D Affects growth and increases muscle tone.

1.1.5 Which part of the ear converts pressure waves into nerve impulses?

- A Auditory nerve
- B Organ of Corti
- C Eustachian tube
- D Auditory canal

- 1.1.6 During periods when the temperature is low, ...
- A the thyroxin levels are expected to be low.
  - B sweating increases.
  - C the blood vessels to the skin dilate.
  - D the ADH levels are expected to be low.
- 1.1.7 Which ONE of the following male reproductive structures serve as a temporary storage for sperms?
- A Vas deference
  - B Seminal vesicle
  - C Epididymis
  - D Penis
- 1.1.8 When a person runs a race, sweating helps to ...
- A regulate the amount of salts in the body.
  - B control the amount of glucose in the body.
  - C cool the body through evaporation.
  - D regulate the amount of water in the body.
- 1.1.9 A gardener removes the apical buds from a rose bush in her garden regularly. As a result the rose bush will ...
- A produce more lateral branches.
  - B grow taller.
  - C remain the same size.
  - D produce fewer roses.

- 1.1.10 The graph below shows the effect of different concentrations of gibberellins on the germination of seeds.



[Adapted from *HortScience* 44(3)]

One possible conclusion drawn from the results shown above, is that the ...

- A gibberellin concentration has no effect on the germination of the seeds.
- B highest percentage of seed germination occurs at a gibberellin concentration of 1 500 mg/l.
- C highest percentage of seed germination occurs at a gibberellin concentration of 1 000 mg/l.
- D lowest percentage of seed germination occurs at a gibberellin concentration of 1000 mg/l.

(10×2)

(20)

1.2 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 That part of the nervous system which consists of cranial and spinal nerves
- 1.2.2 The growth of a plant in response to gravity
- 1.2.3 An organ in the human body that functions as an exocrine and an endocrine gland
- 1.2.4 The fluid that protects the foetus from dehydration
- 1.2.5 The hormone secreted by the pituitary gland that controls the thyroxin levels in the blood
- 1.2.6 The hormone that stimulates milk production for breastfeeding in humans
- 1.2.7 The connecting tube between the middle ear and the pharynx
- 1.2.8 A type of reproduction in humans where the foetus develops inside the uterus

(8)

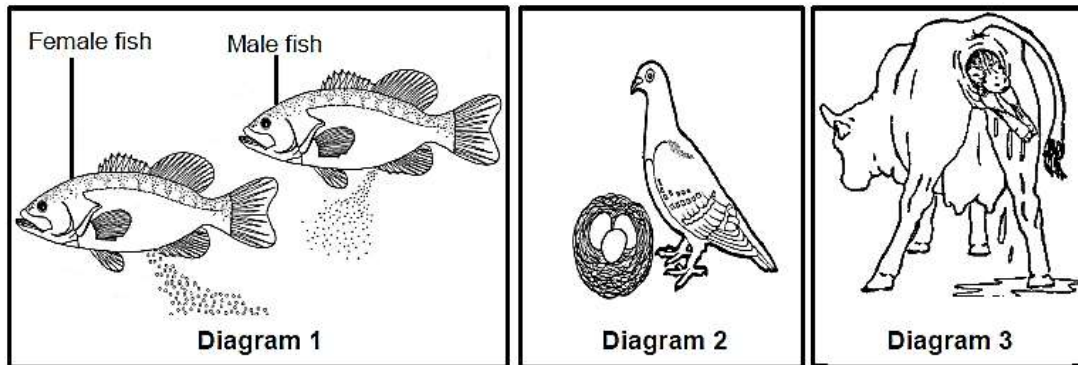
1.3 Indicate whether each of the statements in COLUMN I applies to **A only**, **B only**, **both A and B** or **none** of the items in COLUMN II. Write **A only**, **B only**, **both A and B**, or **none** next to the question number (1.3.1 to 1.3.3) in the ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 Hormone secreted by the pituitary gland	A Aldosterone B Growth hormone
1.3.2 Presence of umbilical cord	A Vivipary B Ovipary
1.3.3 The release of ovum from the ovary	A Ovulation B Ovarian cycle
1.3.4 The shedding of the uterine lining which is accompanied by bleeding	A Menstruation B Menstrual cycle

(4×2)

(8)

1.4 The diagrams below represent organisms with different reproductive strategies.



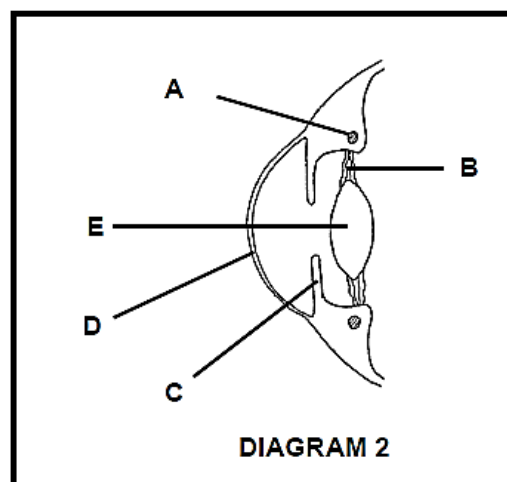
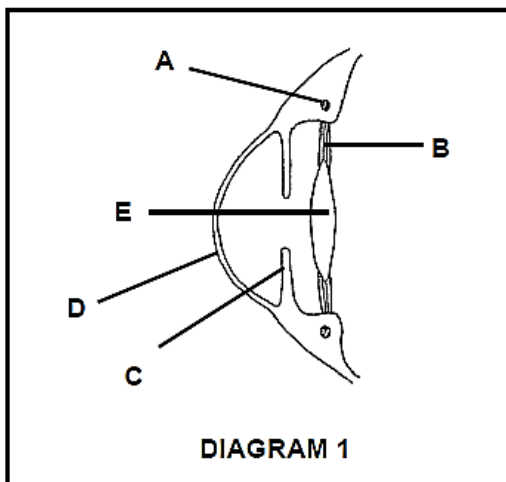
1.4.1 Which diagram(s) (1, 2 or 3) represent(s) organism(s):

- (a) Where external fertilisation takes place (1)
- (b) Where extra-embryonic membranes develop to assist with the protection and nutrition of the embryo (2)
- (c) Which is/are oviparous (2)

1.4.2 Name the type of egg produced by the organism represented in Diagram 2.

(1)  
(6)

1.5 Each diagram below represents parts of the human eye.



1.5.1 Give the LETTER and NAME of the part that:

- (a) Contracts to change the shape of the lens (2)
- (b) Controls the amount of light that enters the eye (2)
- (c) Is protected by the conjunctiva (2)

1.5.2 Study DIAGRAM 1 and DIAGRAM 2. What process is responsible for the change in the shape of the part E? (1)

1.5.3 Which diagram (1 or 2) represents the state of the eye when a person is reading a book? (1)

**(8)**

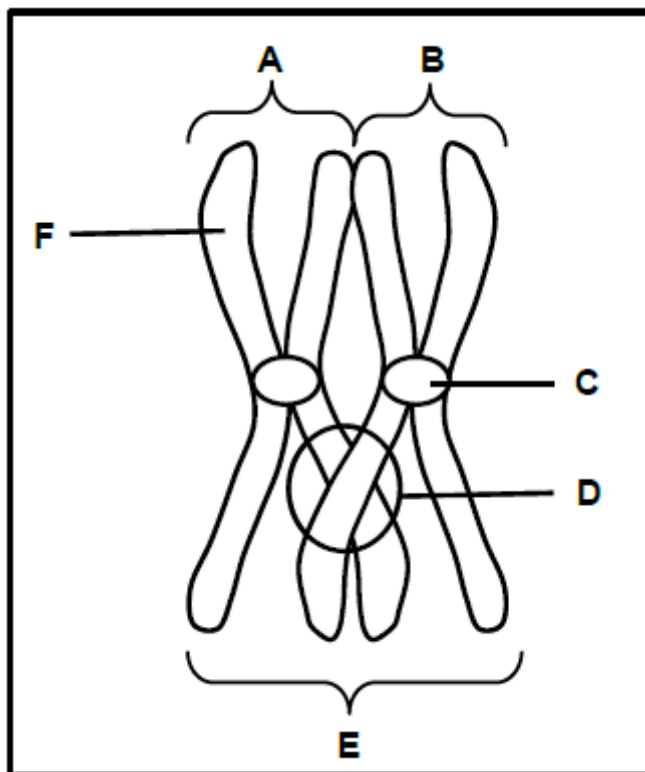
**TOTAL SECTION A: 50**



**SECTION B**

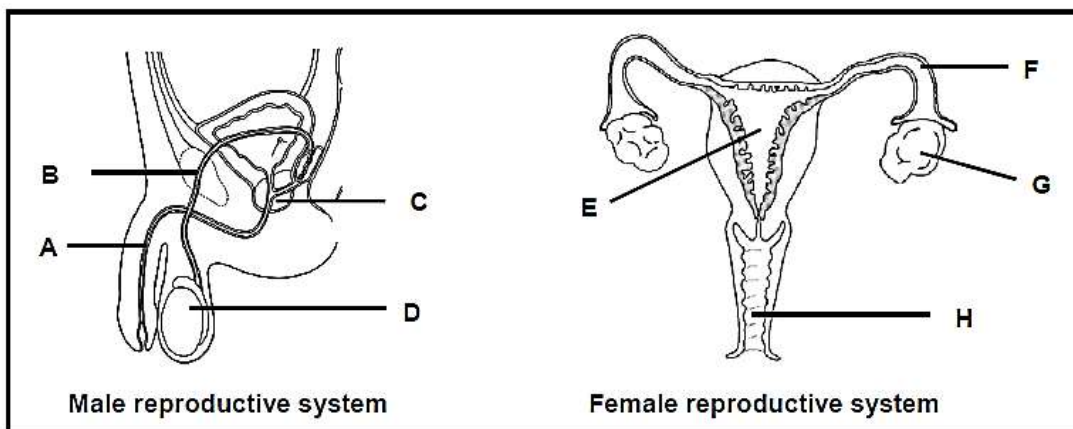
**QUESTION 2**

2.1 Study the diagram below.



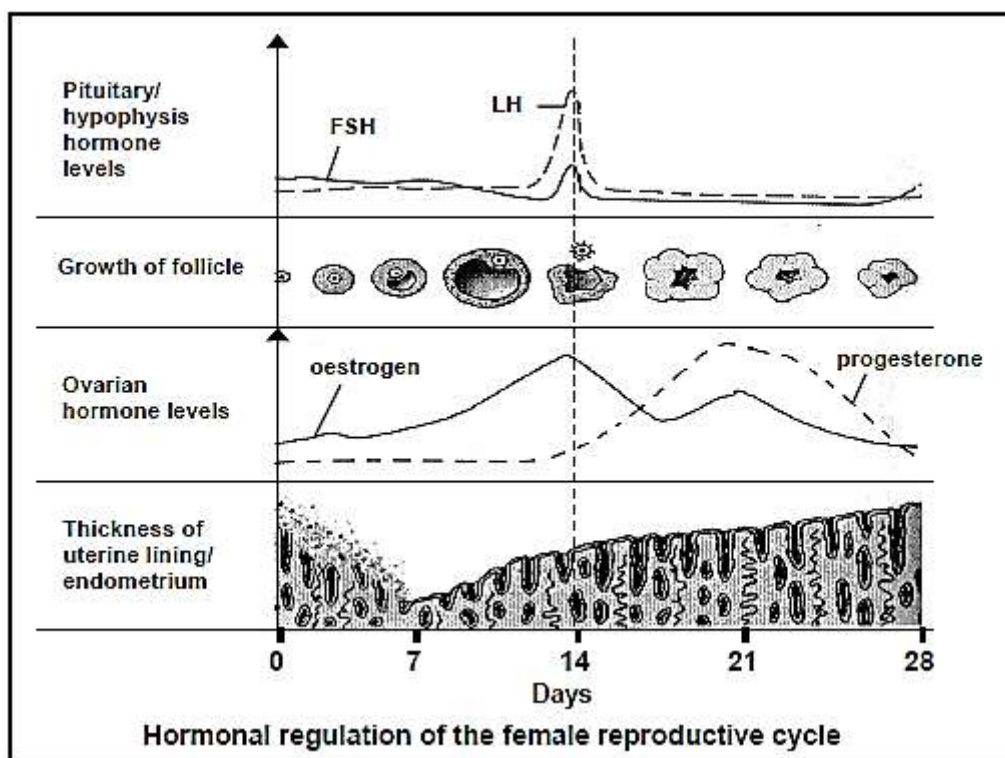
- 2.1.1 Identify part:
- (a) C (1)
  - (b) D (1)
  - (c) E (1)
  - (d) F (1)
- 2.1.2 Name TWO ways in which structures A and B are similar to one another. (2)
- 2.1.3 Describe the process that occurs at D. (5)
- 2.1.4 A certain species has 42 chromosomes in its muscle cells. Give the number of chromosomes in each:
- (a) of its sperm cells (1)
  - (b) of its skin cells (1)
  - (c) ova of its female counterpart (1)
- (14)**

- 2.2 Study the diagrams below showing the male and female reproductive systems.



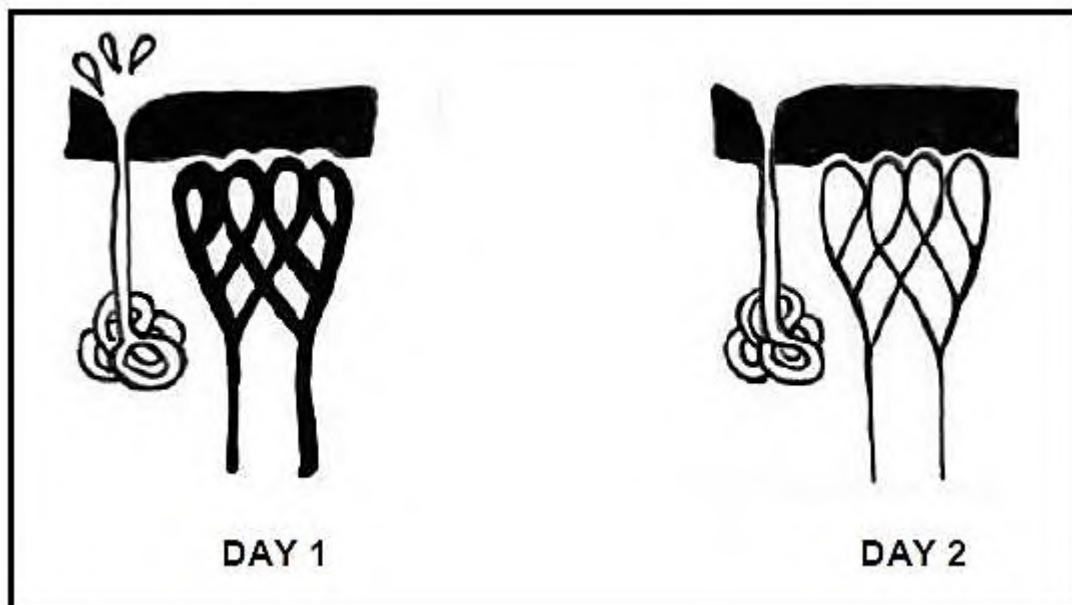
- 2.2.1 Identify parts A, B, C, E, F and G respectively. (6)
- 2.2.2 State ONE function of each of the following:
- (a) The fluid produced by part C (1)
- (b) Part E (1)
- 2.2.3 Give the LETTER ONLY of the organ where meiosis takes place in the:
- (a) Male reproductive system (1)
- (b) Female reproductive system (1)
- 2.2.4 Name the type of gametogenesis that takes place in the:
- (a) Male reproductive system (1)
- (b) Female reproductive system (1)
- 2.2.5 State TWO functions of part H. (2)
- 2.2.6 Explain why it is necessary for part D to be 'outside' the body in males. (3)
- (17)**

2.3 Study the graph below of a menstrual cycle and the influence of the different hormones on it.



- 2.3.1 On which day does ovulation take place? (1)
  - 2.3.2 Between which days does menstruation take place? (1)
  - 2.3.3 State ONE function of FSH during the menstrual cycle. (1)
  - 2.3.4 State two functions of LH. (2)
  - 2.3.5 Describe the functional relationship between progesterone and FSH. (2)
  - 2.3.6 Did fertilisation take place within the 28-day cycle illustrated in the graph? (1)
  - 2.3.7 Give TWO reasons for your answer to QUESTION 2.3.6. (2)
- (10)**

- 2.4 The diagram below shows a section through the human skin on two different days.



- 2.4.1 Give TWO visible reasons why on DAY 1, the environmental temperature will probably be above 30°C. (2)
- 2.4.2 A sports scientist wanted to find out how much water is lost by the human skin at different times of the day. The following results were obtained from measuring the average volume of water secreted by 40 healthy participants on a day similar to DAY 1.

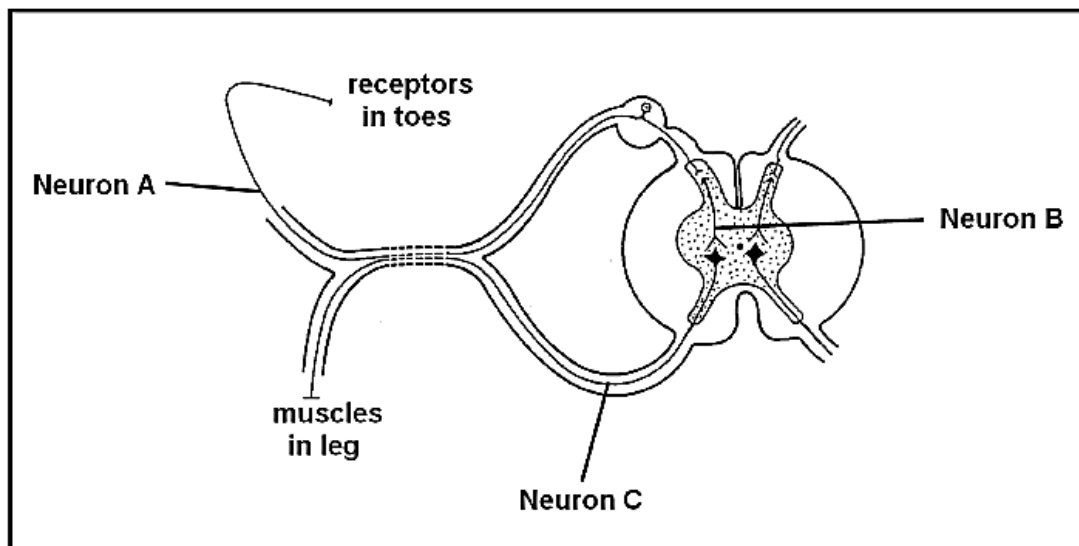
Time of day	Average water loss (ml/hour)
09:00–10:00	180
10:00–11:00	340
11:00–12:00	620
12:00–13:00	940
13:00–14:00	990
14:00–15:00	970
15:00–16:00	810

[Adapted from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2267797/>]

- (a) What time of the day did the participants lose the most water? (1)
- (b) Draw a histogram of the results in the table. (6)
- (9)

**QUESTION 3**

- 3.1 Study the diagram below of a section through a human spinal cord and the neurons involved in a reflex arc.



- 3.1.1 Define a reflex action. (2)
- 3.1.2 Identify neurons A, B and C. (3)
- 3.1.3 Write down only the LETTER of the neuron (A or C) which is probably damaged if a person:
- (a) Can feel the stimulus but cannot respond (1)
  - (b) Is able to walk but cannot detect any stimulus (1)
- 3.1.4 Explain the significance of the reflex action in humans. (2)
- (9)**

3.2 An investigation was done to determine the effect of different amounts of thyroxin on body weight in rats.

The procedure was as follows:

- 45 healthy female rats of the same species were used.
- They were divided into three groups of 15 each (Groups A, B and C).
- Their average body weight was determined and recorded.
- Group A was injected daily with methimazole which inhibits the production of thyroxin in rats.
- Group B was injected daily with DL-thyroxin which stimulates the production of more thyroxin than under normal conditions in rats.
- Group C was given no treatment.
- All three groups were exposed to the conditions above for 2 months.
- The average body weights of all the groups were determined weekly.

3.2.1 In the investigation identify the:

(a) Independent variable (1)

(b) Dependent variable (1)

3.2.2 State THREE factors that were kept constant during the investigation. (3)

3.2.3 Which group of rats (A, B or C) would be expected to gain the most weight? (1)

3.2.4 Explain your answer to QUESTION 3.2.3. (3)

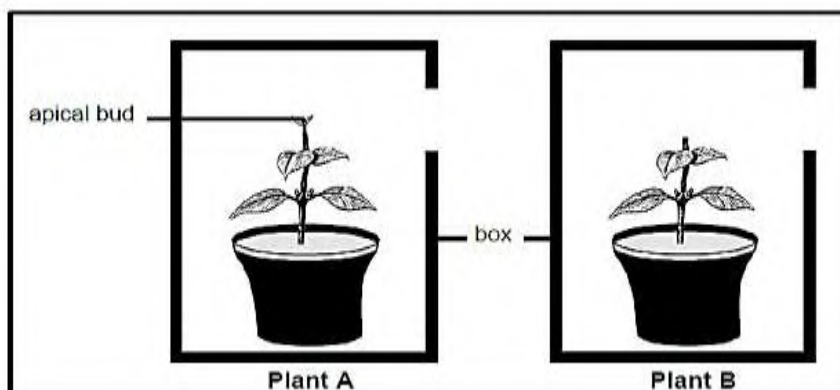
3.2.5 In which group of rats (A, B or C) would the levels of TSH in the blood be low? (1)

3.2.6 Explain your answer to QUESTION 3.2.5. (2)

**(12)**

3.3 The diagram below shows two plants (A and B) at the start of an investigation. The plants were treated in the following ways:

- No changes were made to plant A.
- The apical bud of plant B was removed.
- Each plant was covered with a box with a single opening, as shown in the diagram, and placed in a lit room.



3.3.1 State the role of the boxes in the investigation. (1)

3.3.2 Name the hormone that is removed by cutting off the apical bud from plant B. (1)

3.3.3 Tabulate TWO differences between plants A and B you would expect after two weeks. (5)

3.3.4 The diagram below shows plant B seven days after being sprayed with gibberellins. (2)



Explain the effect that the gibberellins had on the plant by referring to the changes observed in the diagram. (9)

**TOTAL SECTION B: 80**

**SECTION C****QUESTION 3**

A ball was hit 50 m high during a day-night cricket match. Amla ran very fast to position himself under the ball and caught it against the bright flood light.

Describe the changes that occurred in Amla's eyes while he focused on the ball as it reached his hands and describe the changes that occurred when he looked at the bright light. Also describe how he would maintain his balance if he were to fall as he caught the ball.

Content: (17)  
Synthesis: (3)  
**(20)**

**NOTE:** NO marks will be awarded for answers in the form of flow charts or diagrams.

**TOTAL SECTION C: 20**  
**GRAND TOTAL: 100**





# education

DEPARTMENT: EDUCATION  
MPUMALANGA PROVINCE

**INSIKAZI CIRCUIT**

**GRADE 12**

**LIFE SCIENCES PRE TRIAL PAPER 1**

**2020**

**MARKING GUIDELINES**

**MARKS: 150**

**TIME: 2h30 MINUTES**

**This memorandum consists of 8 pages.**

**PRINCIPLES RELATED TO MARKING LIFE SCIENCES 2011**

1. **If more information than marks allocated is given**  
Stop marking when maximum marks is reached and put a wavy line and 'max' in the right hand margin.
2. **If, for example, three reasons are required and five are given**  
Mark the first three irrespective of whether all or some are correct/incorrect.
3. **If whole process is given when only part of it is required**  
Read all and credit relevant part.
4. **If comparisons are asked for and descriptions are given**  
Accept if differences / similarities are clear.
5. **If tabulation is required but paragraphs are given**  
Candidates will lose marks for not tabulating.
6. **If diagrams are given with annotations when descriptions are required**  
Candidates will lose marks
7. **If flow charts are given instead of descriptions**  
Candidates will lose marks.
8. **If sequence is muddled and links do not make sense**  
Where sequence and links are correct, credit. Where sequence and links is incorrect, do not credit. If sequence and links becomes correct again, resume credit.
9. **Non-recognized abbreviations**  
Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation but credit the rest of answer if correct.
10. **Wrong numbering**  
If answer fits into the correct sequence of questions but the wrong number is given, it is acceptable.
11. **If language used changes the intended meaning**  
Do not accept.
12. **Spelling errors**  
If recognizable accept provided it does not mean something else in Life Sciences or if it is out of context.
13. **If common names given in terminology**  
Accept provided it was accepted at the National memo discussion meeting.
14. **If only letter is asked for and only name is given (and vice versa)**  
No credit
15. **If units are not given in measurements**  
Candidates will lose marks. Memorandum will allocate marks for units separately
16. Be sensitive to the **sense of an answer, which may be stated in a different way.**
17. **Caption**  
All illustrations (diagrams, graphs, tables, etc.) must have a caption
18. **Code-switching of official languages (terms and concepts)**  
A single word or two that appears in any official language other than the learners' assessment language used to the greatest extent in his/her answers should be credited, if it is correct. A marker that is proficient in the relevant official language should be consulted. This is applicable to all official languages

**SECTION A**

**QUESTION 1**

1.1	1.1.1	C✓✓		
	1.1.2	A✓✓		
	1.1.3	D✓✓		
	1.1.4	B✓✓		
	1.1.5	B✓✓		
	1.1.6	D✓✓		
	1.1.7	C✓✓		
	1.1.8	C✓✓		
	1.1.9	A✓✓		
	1.1.10	C✓✓		
			(10 x 2)	<b>(20)</b>
1.2	1.2.1	Peripheral✓		
	1.2.2	Geotropism✓		
	1.2.3	Pancreas✓		
	1.2.4	Amniotic✓		
	1.2.5	TSH✓		
	1.2.6	Prolactin✓		
	1.2.7	Eustachian tube ✓		
	1.2.8	Vivipary✓		
			(8x1)	<b>(8)</b>
1.3	1.3.1	B only✓✓		
	1.3.2	A only✓✓		
	1.3.3	A only ✓✓		
	1.3.4	A only ✓✓		
			(4x2)	<b>(8)</b>
1.4	1.4.1	(a) Diagram 1✓		(1)
		(b) Diagram 2✓ and Diagram 3✓		(2)
		(C) Diagram 1✓ and Diagram 2✓		(2)
	1.4.2	Amniotic✓ egg		(1)
				<b>(6)</b>
1.5	1.5.1	(a) A✓ - ciliary muscle✓		(2)
		(b) C✓ - iris✓		(2)
		(C) D✓ - cornea✓		(2)
	1.5.2	Accommodation✓		(1)
	1.5.3	Diagram 2✓		(1)
				<b>(8)</b>

**Question 1: [25]**

**TOTAL SECTION A: [25]**

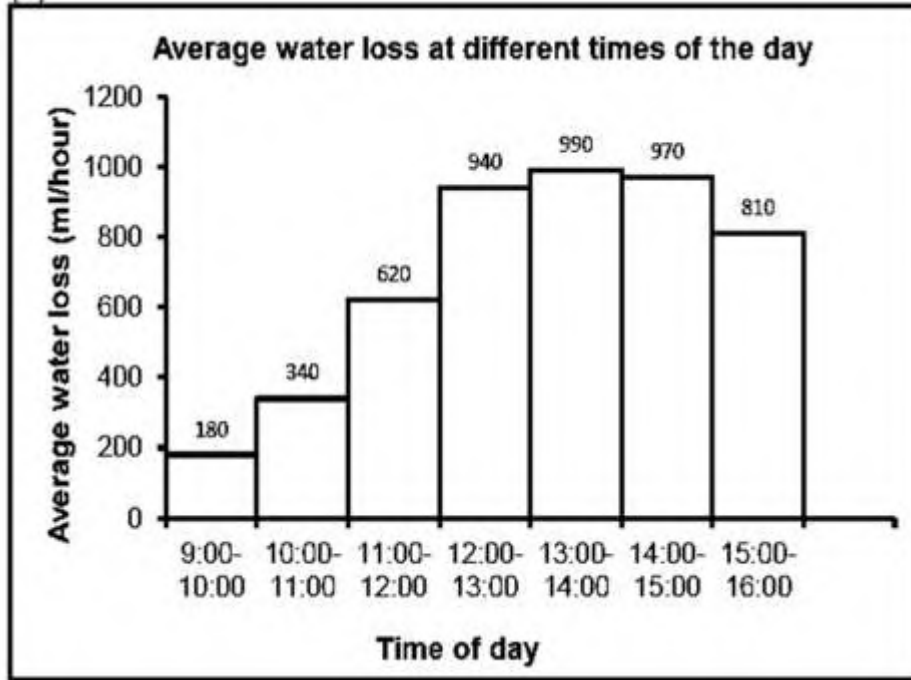
**SECTION B****QUESTION 2**

- 2.1 2.1.1 (a) Centromere✓ (1)  
 (b) Chiasma✓/chiasmata (1)  
 (c) Homologous chromosomes✓ /-chromosome pair/bivalent (1)  
 (d) Chromatid✓/sister chromatid (1)
- 2.1.2 - Similar shape✓/similar centromeres  
 - size✓ and  
 - genetic composition✓  
**(Mark first TWO only)** (Any 2) (2)
- 2.1.3 -in prophase 1✓  
 - Non-sister chromatids/one chromatid in each homologous chromosome pair✓  
 - touch✓/overlap  
 - at a point called the chiasma✓  
 - DNA/genetic material is crossed over ✓/swopped at the chiasma (5)
- 2.1.4 (a) 21✓ (1)  
 (b) 42✓ (1)  
 (c) 21✓ (1)  
**[14]**
- 2.2 2.2.1 A- Urethra✓ (1)  
 B- Vas deferens✓/sperm duct (1)  
 C- Prostate gland✓ (1)  
 E- Uterus✓ (1)  
 F- Fallopian tube✓/oviduct (1)  
 G- Ovary✓ (1)
- 2.2.2 (a) - Protects the sperm cell against the acidic environment of the vagina✓  
 - Increases the motility of the sperm✓  
 - Provides nutrients✓  
**(Mark first ONE only)** Any (1)
- (b) - Place for foetus to develop ✓  
 - Maintain pregnancy✓  
 - Assist in childbirth✓  
 - Implantation✓ of blastula  
 - Protects the foetus✓/prevents infections(mucus plug forms by cervix)  
 - Passage for sperm cells✓between vagina and fallopian tubes  
**(Mark first ONE only)** Any (1)

	2.2.3	(a) D✓ (b) G✓	(1) (1)
	2.2.4	(a) Spermatogenesis✓ (b) Oogenesis✓	(1) (1)
	2.2.5	- Serves as a birth canal✓ - Allows for passage of blood/ endometrial lining/amniotic fluid/placenta - Facilitates sexual intercourse ✓/receives semen - Secretes acid which prevents infections✓ <b>(Mark first TWO only)</b>	Any (2)
	2.2.6	- To keep the testes at a temperature that is lower✓ than body temperature✓/optimum temperature for sperm production - which is necessary for the production of healthy sperm✓/so that healthy sperms can survive	(3) <b>[17]</b>
2.3	2.3.1	Day 14✓/15	(1)
	2.3.2	Day 0–6✓/day 0–7	(1)
	2.3.3	Stimulates follicle✓/ovum development in the ovary/secretion of oestrogen	(1)
	2.3.4	- stimulates the bursting of the Graafian follicle to release the ovum✓/stimulates ovulation - stimulates the conversion of the Graafian follicle into the corpus luteum ✓	(2)
	2.3.5	An increase in progesterone level✓ inhibits the release of FSH✓ <b>OR</b> FSH stimulates the development of the ovum✓ and progesterone prepares for implantation ✓when this ovum is fertilised	(2)
	2.3.6	No✓	(1)
	2.3.7	- Corpus luteum has degenerated✓ - Progesterone level has decreased✓ - FSH level starts to rise✓ - LH level decreases✓ <b>(Mark first TWO only)</b>	Any (2) <b>[10]</b>

- 2.4 2.4.1 - Diameter of blood vessels is wider ✓ / vasodilation occurred  
 - More blood to the skin ✓  
 - More / visible sweat secretion ✓  
 (Mark first TWO only) (Any 2) (2)

- 2.4.2 (a) (13:00 - 14:00) ✓ (1)  
 (b)



**Criteria for marking the graph**

Title of the graph (both variables)	(C)	1
Histogram is drawn (no spaces)	(T)	1
Correct labels and units for X- and Y-axes (L)		1
Appropriate scale for both axes	(S)	1
Plotting of the graph	(P)	1 to 5 bars drawn correctly: 1
		All 6 bars drawn correctly: 2

**NOTE:**

If the wrong type of graph is drawn, marks will be lost for:

- Correct type of graph ✓
- Appropriate scale ✓

(6)

[9]

**QUESTION 3**

- 3.1 3.1.1 Rapid✓, automatic response✓ to a stimulus (2)
- 3.1.2 A – Sensory neuron✓/Afferent neuron (3)
- B – Interneuron✓/connector neuron/association neuron/relay neuron
- C – Motor neuron✓/Efferent neuron
- 3.1.3 (a) C✓ (1)
- (b) A✓ (1)
- 3.1.4 Protects✓ the human body against further damage✓ (2)
- [9]**
- 
- 3.2 3.2.1 (a) Amount of thyroxin✓ (1)
- (b) Body weight✓ (1)
- 3.2.2 - Same number of rats in each group✓
- All rats were of the same species✓
- All groups were investigated for the same period of time✓
- All rats were the same gender✓
- All groups were weighed after the same interval✓
- (Mark first THREE only) (Any 3) (3)
- 3.2.3 Group A✓ (1)
- 3.2.4 - Low thyroxin levels✓
- will lead to low metabolic rate✓
- Therefore the energy from the diet is used very slowly✓
- and more organic compounds are stored✓ (Any 3) (3)
- 3.2.5 Group B✓ (1)
- 3.2.6 - These rats have high levels of thyroxin in their blood✓
- therefore pituitary gland will not be stimulated✓ to secrete TSH (2)
- [12]**

- 3.3 3.3.1 To ensure unilateral light✓/the plant receives light from one direction only (1)
- 3.3.2 Auxins✓/IAA/indole acetic acid (1)
- 3.3.3 Differences between plants A and B after two weeks

T✓

Plant A	Plant B
The stem of the plant will bend towards the light✓	The stem of the plant will remain straight✓/will not bend towards the light
Does not have lateral branches✓/only lower lateral branches will start to grow	All the lateral branches will grow✓ along the whole stem
The plant will be taller✓	The plant will be shorter✓

**(Mark first TWO only)**

1 table (T) + (2 x 2)

(5)

- 3.3.4 - The gibberellins cause the stem/plant to grow longer✓/taller  
- because gibberellins stimulate the elongation/growth of the internodes✓ (2)

**[9]**

**TOTAL SECTION B: [80]**

**SECTION C**

**QUESTION 4**

**Pupillary mechanism ✓**

- The circular muscles of the iris contract. ✓
- The radial muscles relax. ✓
- The pupil constricts. ✓/diameter decreases
- The amount of light entering the eye is reduced. ✓

**(Max 5) (5)**

**Accommodation ✓ for near vision**

- Ciliary muscles contract. ✓
- The suspensory ligaments become slack✓/loose
- The tension on the lens decreases. ✓
- The lens becomes more convex. ✓
- The refractive power of the lens is increased✓/bends more light
- A clear image of the near object is now formed on retina ✓

**(Max 6) (6)**



**Balance is achieved in the following way:**

- The maculae✓
- in the utricle and saccule✓ and
- the cristae✓
- in the semi-circular canals✓ are stimulated
- They generate impulses✓
- which is transmitted through the auditory nerve✓
- to the cerebellum✓ where they are interpreted
- Impulses are transmitted via the motor neuron✓
- to skeletal muscles✓

**(max 6) (6)**  
 Content:  
 Synthesis:

**ASSESSING THE PRESENTATION OF THE ESSAY**

Criterion	Relevance (R)	Logical sequence (L)	Comprehensive (C)	(17)
<b>General</b>	All information provided is relevant to the question.	Ideas are arranged in a logical/cause-effect sequence.	Answered all aspects required by the essay in sufficiently detail.	(3)
<b>In this essay in Q4</b>	All the information provided is relevant to the pupillary mechanism, accommodation for the near vision and balance There is no irrelevant information	Description of pupillary mechanism, accommodation for the near vision and balance discussed in a logical sequence.	At least the following marks should be obtained for: - describing pupillary mechanism (3/5) - describing accommodation for near vision provided (4/6) - Balance and equilibrium (4/6)	
<b>Mark</b>	1	1	1	

**TOTAL SECTION C: 20**  
**GRAND TOTAL: 100**