basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2023

MARKS: 150

TIME: 2½ hours

This question paper consists of 15 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, tables 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 answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.

1.1.1 Diabetes mellitus is caused by an …

A oversecretion of glucagon.
B undersecretion of glucagon.
C oversecretion of insulin.
D undersecretion of insulin.

1.1.2 Receptors that are stimulated by the low water levels in the blood are located in the …

A renal tubules.
B hypothalamus.
C pituitary gland.
D carotid artery.

1.1.3 The myelin sheath on a nerve cell …

A provides electrical insulation.
B transports impulses towards the cell body.
C receives impulses from the axon.
D converts stimuli into impulses.

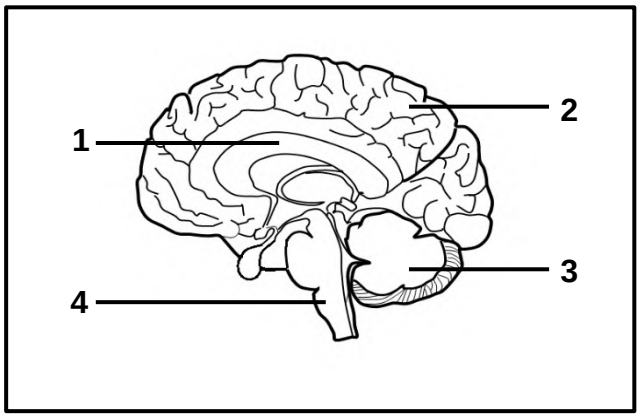
1.1.4 The structure where sperms are temporarily stored is the …

A testis.
B epididymis.
C vas deferens.
D penis.

1.1.5 Which ONE of the following is a function of the amniotic fluid?

A Provides nutrition to the foetus
B Protects the foetus against mechanical injury
C Supplies oxygen to the foetus
D Removes the metabolic waste from the foetus

QUESTIONS 1.1.6 AND 1.1.7 ARE BASED ON THE DIAGRAM OF THE BRAIN BELOW.



1.1.6 Which ONE of the following represents the corpus callosum?

A 1
B 2
C 3
D 4

1.1.7 Which ONE of the following is the function of part **3**?

A Controls voluntary movements
B Controls involuntary actions
C Coordinates voluntary movements
D Controls all sensations

1.1.8 The placenta is formed by the …

A amniotic fluid and amnion.
B chorionic villi and endometrium.
C amnion and endometrium.
D amniotic fluid and chorionic villi.

1.1.9 An oversecretion of the hormone produced by the thyroid gland may result in a person …

A gaining weight, because of an increased metabolic rate.
B gaining weight, because of a decreased metabolic rate.
C losing weight, because of an increased metabolic rate.
D losing weight, because of a decreased metabolic rate.

1.1.10 The table below shows the average testosterone levels of males of different age groups.

Group	Age (years)	Average testosterone level (n/M)
I	0–10	less than 5
II	11–15	15
III	16–20	19

Which ONE of the following is an explanation for the difference in testosterone levels between the age groups?

Testosterone levels are higher in …

A Group **I** than Group **III** due to the start of puberty.
B Group **II** than Group **I** due to the start of puberty.
C Group **III** than Group **I** because it is needed to inhibit the growth of long bones.
D Group **I** than Group **II** because it is needed to inhibit the growth of long bones. (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 1.2.8) in the ANSWER BOOK.

1.2.1 The process of maintaining a constant internal environment in the human body

1.2.2 The organelles found in large quantities in the neck region of a sperm cell

1.2.3 The disease characterised by the degeneration of brain tissue, leading to memory loss

1.2.4 The layer in the eye that is richly supplied with blood vessels

1.2.5 The type of development in birds in which the young is born fully developed and able to move and feed itself

1.2.6 Groups of cells in the pancreas that secrete insulin and glucagon

1.2.7 The structure in the sperm that contains enzymes to dissolve the outer layer of the ovum

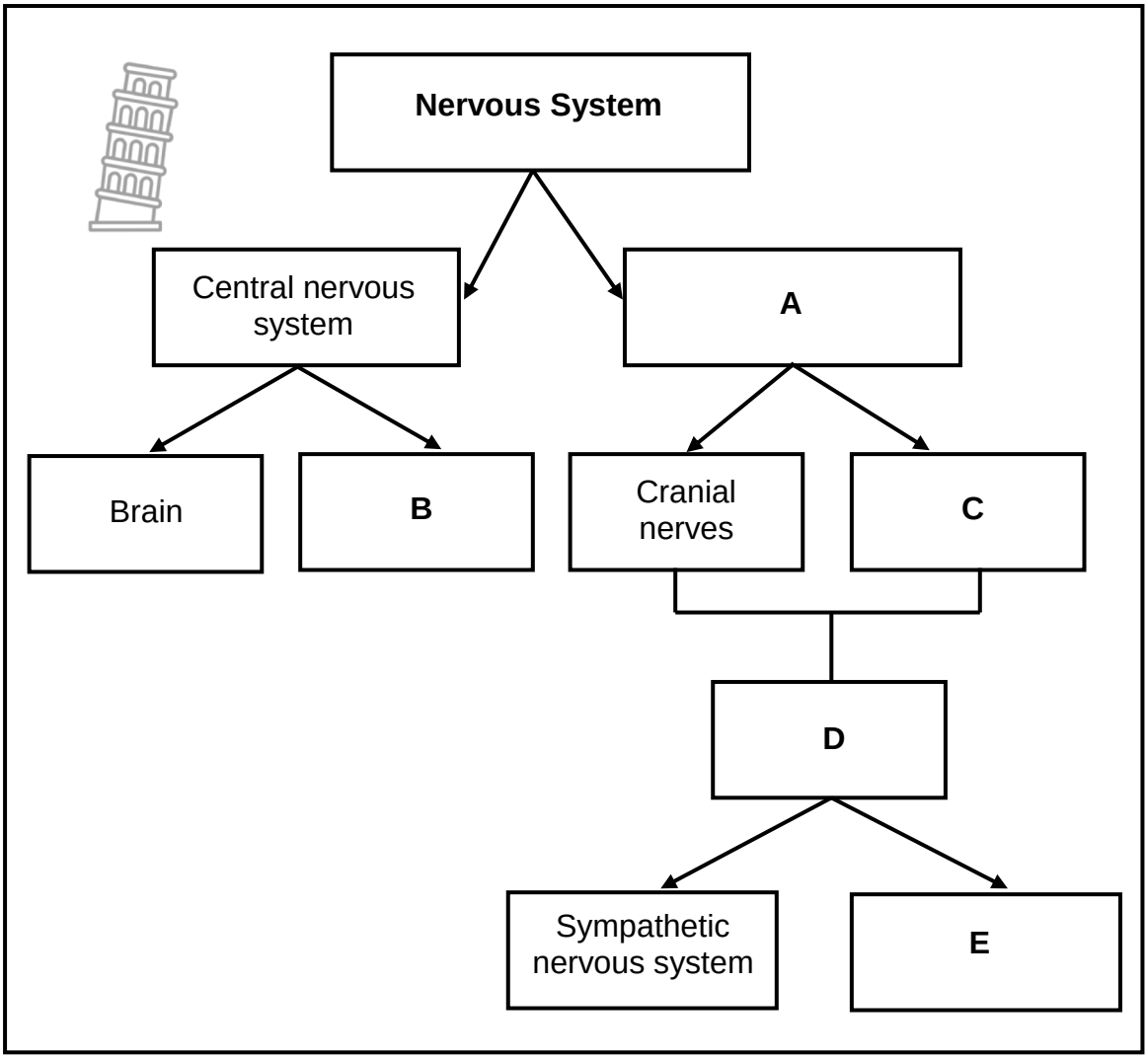
1.2.8 A blood vessel that transports carbon dioxide from the foetus to the placenta (8 x 1) **(8)**

1.3 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 numbers (1.3.1 to 1.3.3) in the ANSWER BOOK.

COLUMN I		COLUMN II
1.3.1	An extra-embryonic membrane found in the amniotic egg	A: Chorion B: Allantois
1.3.2	A structure in the ear that absorbs excess pressure waves from the cochlea	A: Pinna B: Auditory canal
1.3.3	A structure that transports semen out of the body	A: Scrotum B: Urethra

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

1.4 The flow diagram below represents the components of the nervous system.



1.4.1 Identify the component of the nervous system represented by:

(a) **A** (1)

(b) **D** (1)

1.4.2 Name the type of nerves found at **C**. (1)

1.4.3 Give the LETTER and NAME of the component that slows down the heart rate when an emergency situation has passed. (2)

1.4.4 Name the nerve cells that make up nervous tissue. (1)

1.4.5 State TWO ways in which the brain is protected. (2)
(8)

1.5 The diagrams below show parts of the middle and inner ear.

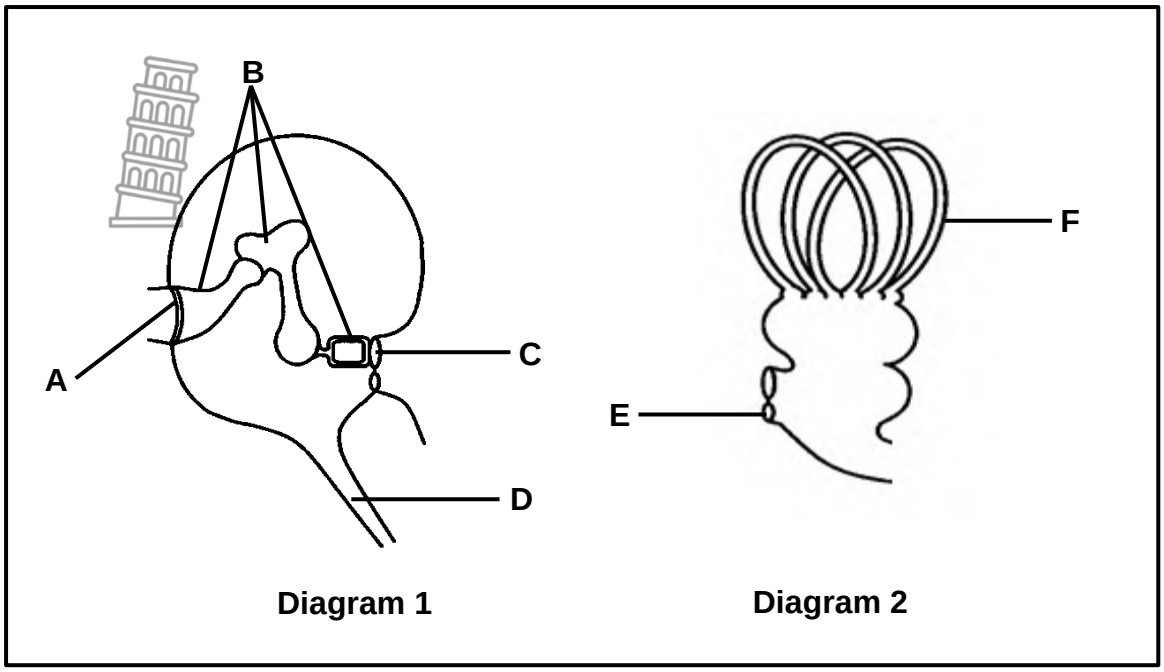


Diagram 1 **Diagram 2**

1.5.1 Identify part **F**. (1)

1.5.2 Give the collective term for bones **B**. (1)

1.5.3 Give the LETTER and NAME of the structure that:

(a) Equalises pressure between the outer and middle ear (2)

(b) Creates pressure waves in the inner ear (2)

1.5.4 Name the receptors that are stimulated by a change in the:

(a) Position of the head (1)

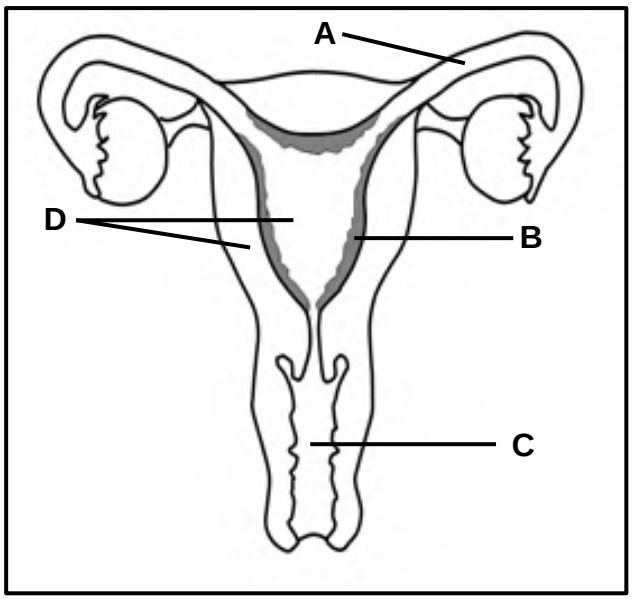
(b) Direction and speed of movement of the head (1)
(8)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents the female reproductive system.



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

2.1.2 Name the process that takes place in part **A** that leads to zygote formation. (1)

2.1.3 Describe the process named in QUESTION 2.1.2. (1)

2.1.4 Describe the development of the zygote until implantation occurs. (4)

2.1.5 Explain TWO ways in which part **D** is structurally suited for gestation. (4)

2.1.6 Describe how the secretion of the prostate gland provides protection for the sperm from the conditions in part **C**. (2)
(13)

2.2 Read the extract below.

PLASTIC LINKED TO FEMALE INFERTILITY

Several studies indicate that bisphenol A (BPA), a chemical used in the production of many household plastic products, may be linked to female infertility (inability to get pregnant naturally and to deliver a healthy baby). BPA can be ingested or absorbed through the skin when using plastic products.

BPA seems to interfere with the normal secretion of FSH by the pituitary gland and is linked to abnormal menstrual cycles and reduced implantation rates. These studies also show a link between high BPA levels and a decrease in the development and maturation of ovarian follicles.

2.2.1 State ONE function of FSH. (1)

2.2.2 Name ONE other hormone in females that is secreted by the pituitary gland during the menstrual cycle. (1)

2.2.3 Explain how an undersecretion of the hormone in QUESTION 2.2.2 may lead to infertility. (2)

2.2.4 Explain why a decrease in the maturation of ovarian follicles may lead to reduced implantation rates. (5)
(9)

2.3 Describe the process of *spermatogenesis*. **(4)**

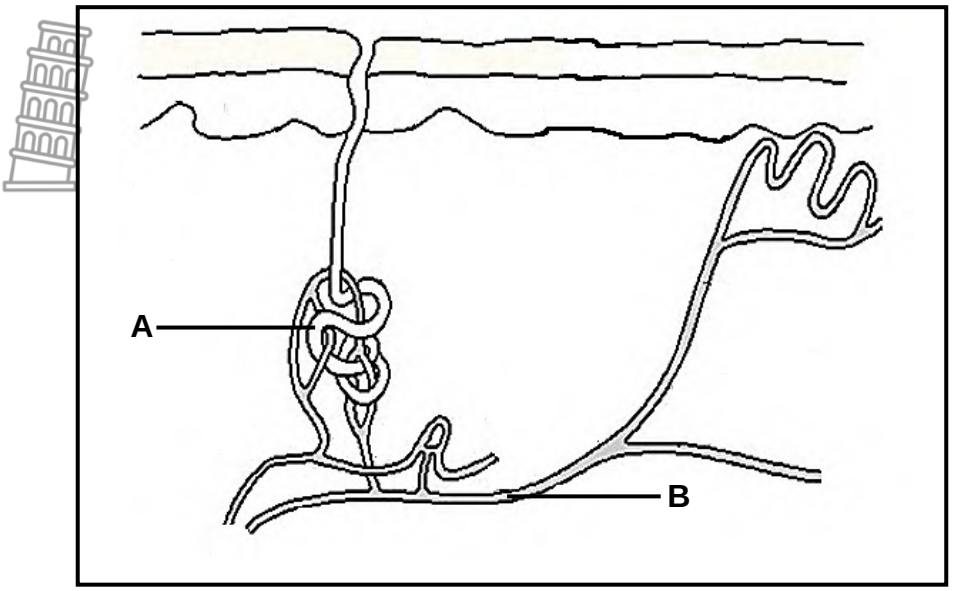
2.4 Frogs can survive in water and on land. Most frogs, however, need water for reproduction. During the breeding season, male and female frogs release millions of gametes into the water.

2.4.1 Name the type of fertilisation described above. (1)

2.4.2 Explain why millions of gametes are released. (3)

2.4.3 State why the reproduction in frogs is an example of ovipary. (1)
(5)

2.5 The diagram below shows parts of the skin that are involved in thermoregulation.



2.5.1 Give TWO reasons why part **A** is classified as an exocrine gland. (2)

2.5.2 Describe the role of skin receptors in thermoregulation. (2)

2.5.3 Explain why structure **B** dilates on a hot day. (2)
(6)

2.6 Workers in some factories are constantly exposed to loud noise for long periods. This can destroy the hair cells in the organ of Corti and damage the auditory nerve, resulting in hearing loss.

A survey was conducted in a developing country from 2014 to 2018, to establish the number of factory workers who suffered from hearing loss.

The results are shown in the table below.

Year	Number of factory workers with hearing loss
2014	85 000
2015	100 000
2016	115 000
2017	120 000
2018	130 000

2.6.1 Name the structure in the ear where the organ of Corti is located. (1)

2.6.2 Calculate the percentage increase in the number of factory workers with hearing loss between 2014 and 2018. Show ALL workings. (3)

2.6.3 Suggest ONE reason for the increase in the number of factory workers with hearing loss caused by exposure to loud noise in this country. (1)

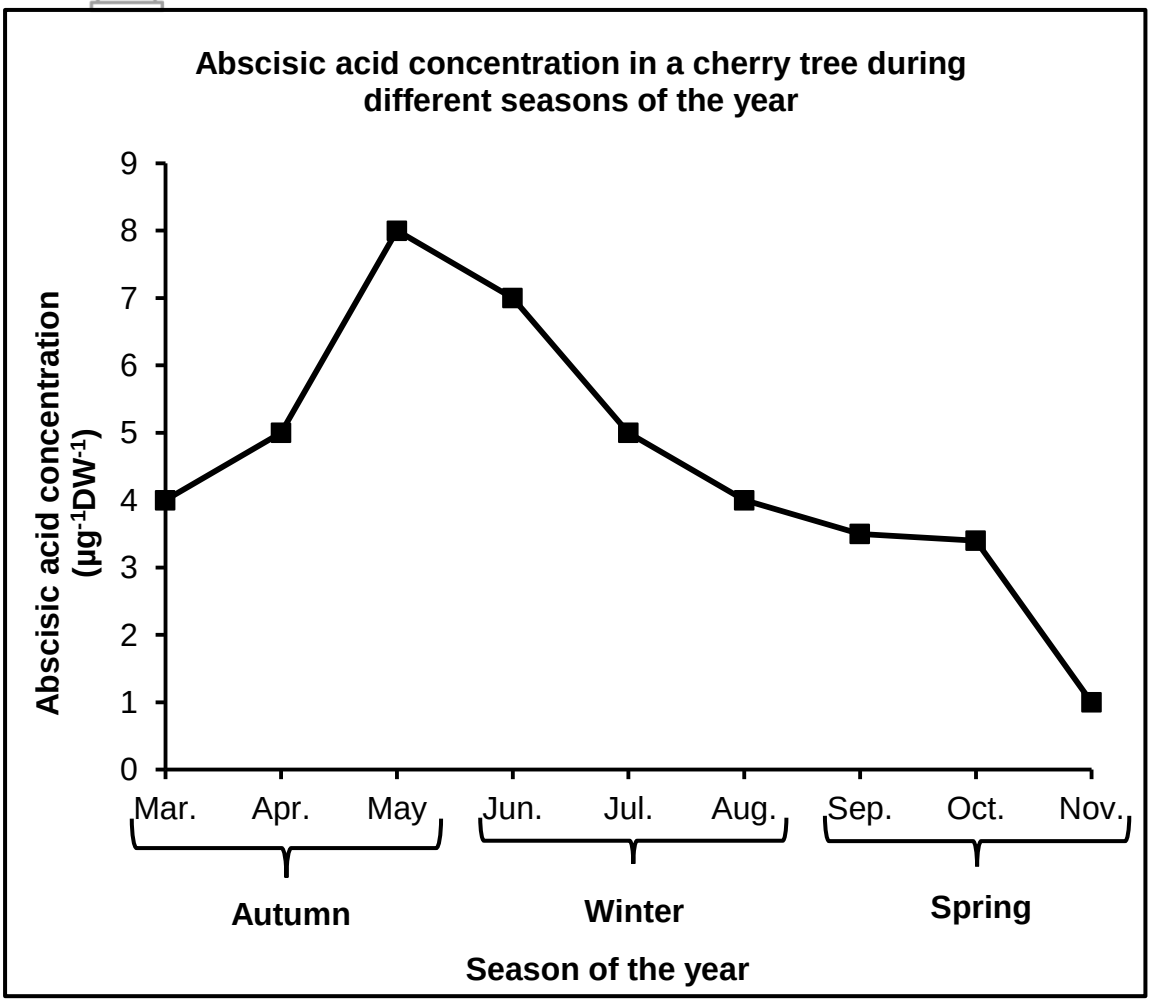
2.6.4 Explain why damage to the auditory nerve may result in hearing loss. (2)

2.6.5 Draw a bar graph to represent the data in the table. (6)
(13)
[50]

QUESTION 3

3.1 The graph below shows the concentration of abscisic acid in a cherry tree during different seasons of the year.

This tree species loses all its leaves in autumn and goes into a state of dormancy during the winter months.



3.1.1 During which month was the abscisic acid concentration the lowest? (1)

3.1.2 Explain the trend of the graph from March to May. (3)

3.1.3 Suggest ONE reason for the dormancy in cherry trees during the winter months. (2)
(6)

3.2 Geotropism refers to the movement of a part of a plant in response to gravity. This tropism is controlled by auxins.

3.2.1 Describe the role of auxins in roots. (3)

3.2.2 When a plant is placed horizontally, with light coming from all directions, the auxins will accumulate on the lower side of both the stem and the roots.

Explain the difference in the response of the stem and the roots after a few days. (4)
(7)

3.3 Hyperaldosteronism is a disorder caused by the oversecretion of aldosterone and has been linked to high blood pressure in humans.

Scientists investigated the influence of increased aldosterone levels on blood pressure.

The procedure was done as follows:

- 1 688 healthy volunteers, aged 55, participated in the investigation.
- The participants' blood pressure was measured and recorded before the start of the investigation.
- The participants were injected with a dose of aldosterone in the morning and their blood pressure was measured every hour for 12 hours.
- This procedure was followed over four days for each individual and the average blood pressure was calculated.
- All participants followed the same diet during the period of the investigation.

3.3.1 Name the gland that secretes aldosterone. (1)

3.3.2 Identify the:

(a) Independent variable (1)

(b) Dependent variable (1)

3.3.3 Give TWO reasons why the results of the investigation may be considered reliable. (2)

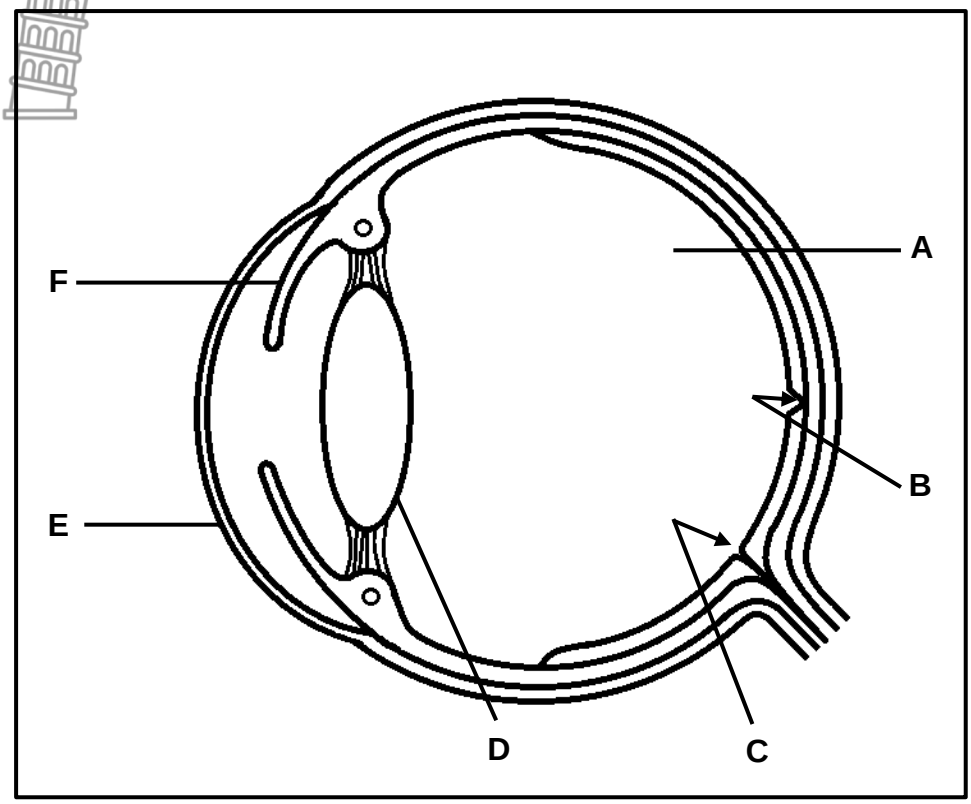
3.3.4 Explain TWO reasons why it was important for the participants to follow the same diet during the investigation. (4)

3.3.5 Explain why the participants' blood pressure was measured before the start of the investigation. (2)

3.3.6 Explain why the levels of salt in the urine of participants is expected to decrease after being injected with aldosterone. (3)
(14)

3.4 Describe how the secretion of adrenalin causes increased energy production in an emergency situation. **(8)**

3.5 The diagram below represents the human eye.



3.5.1 Identify structure **F**. (1)

3.5.2 State TWO functions of fluid **A**. (2)

3.5.3 Describe the structural difference between area **B** and area **C**. (2)

3.5.4 Name the visual defect that occurs when the curvature of part **E** is uneven. (1)

3.5.5 Explain how the sight of a person will be affected if cataracts developed in part **D**. (3)

3.5.6 Describe the process of accommodation that takes place when an object is less than 6 metres away from the eye. (6)
(15)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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LIFE SCIENCES P1

2023

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 9 pages.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES

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 a part of it is required**
   Read all and credit the relevant part.

4. **If comparisons are asked for but descriptions are given**
   Accept if the 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 are incorrect, do not credit. If sequence and links become correct again, resume credit.

9. **Non-recognised abbreviations**
   Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation but credit the rest of the 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 recognisable, accept the answer, provided it does not mean something else in Life Sciences or if it is out of context.

13. **If common names are given in terminology**
    Accept, provided it was accepted at the national memo discussion meeting.

14. **If only the letter is asked for but only the name is given (and vice versa)**
    Do not 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 appear(s) 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.

19. **Changes to the memorandum**
No changes must be made to the memoranda without consulting the provincial internal moderator who in turn will consult with the national internal moderator (and the Umalusi moderators where necessary).

20. **Official memoranda**
Only memoranda bearing the signatures of the national internal moderator and the Umalusi moderators and distributed by the National Department of Basic Education via the provinces must be used.

SECTION A

QUESTION 1

1.1	1.1.1	D✓✓		
	1.1.2	B✓✓		
	1.1.3	A✓✓		
	1.1.4	B✓✓		
	1.1.5	B✓✓		
	1.1.6	A✓✓		
	1.1.7	C✓✓		
	1.1.8	B✓✓		
	1.1.9	C✓✓		
	1.1.10	B✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Homeostasis✓		
	1.2.2	Mitochondria✓		
	1.2.3	Alzheimer's✓ disease /dementia		
	1.2.4	Choroid✓		
	1.2.5	Precocial✓ development		
	1.2.6	Islets of Langerhans✓		
	1.2.7	Acrosome✓		
	1.2.8	Umbilical artery✓	(8 x 1)	**(8)**
1.3	1.3.1	Both A and B✓✓		
	1.3.2	None✓✓		
	1.3.3	B only✓✓	(3 x 2)	**(6)**
1.4	1.4.1	(a) Peripheral✓ nervous system		(1)
		(b) Autonomic nervous system✓		(1)
	1.4.2	Spinal✓ nerves		(1)
	1.4.3	E✓ - Parasympathetic nervous system✓		(2)
	1.4.4	Neurons✓		(1)
	1.4.5	- Meninges✓ - Cranium✓/bone tissue - Cerebrospinal fluid✓ **(Mark first TWO only)**	Any	(2) **(8)**
1.5	1.5.1	Semi-circular canals✓		(1)
	1.5.2	Ossicles✓		(1)
	1.5.3	(a) D✓ - Eustachian tube✓		(2)
		(b) C✓ - Oval window✓		(2)
	1.5.4	(a) Maculae✓		(1)
		(b) Cristae✓		(1) **(8)**

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1.1 Endometrium✓ (1)

2.1.2 Fertilisation✓ (1)

2.1.3 The (nucleus of the) sperm fuses with (the nucleus of) the ovum✓ (1)

2.1.4
- Zygote divides by mitosis✓
- to form a (solid) ball of cells✓
- called the morula✓
- which develops into a hollow ball of cells✓
- called the blastula✓/blastocyst Any (4)

2.1.5
- It is muscular✓
  to protect the foetus from mechanical injury✓/to allow for parturition/birth
- It is flexible✓/can expand
  to accommodate the growing foetus✓
- It is hollow✓
  to accommodate the growing foetus✓
- The thickened endometrium✓
  allows for implantation✓ /survival of the embryo

(Mark first TWO only) Any (2 x 2) (4)

2.1.6
- The secretion is alkaline✓ which
- neutralises the acidic conditions✓ of the vagina (2)

(13)

2.2 2.2.1
- Stimulates the development of ovarian follicles✓
- Initiates puberty✓ Any (1)

(Mark first ONE only)

2.2.2 - LH✓/Luteinising Hormone (1)

2.2.3
- LH stimulates ovulation✓
- therefore, ovulation will not take place✓
- There will be no ovum to fertilise✓ Any (2)

2.2.4
- A Graafian follicle is not formed✓
- Since the Graafian follicle secretes oestrogen✓
- oestrogen levels will be reduced✓ therefore
- the endometrium will not develop✓/ thicken
- and no implantation can take place✓

OR

- There is no ovum produced✓/a Graafian follicle is not formed
- Ovulation does not occur✓
- No fertilisation✓ occurs and
- a zygote is not formed✓
- and no implantation can take place✓ (5)

(9)

2.3
- Under the influence of testosterone✓
- diploid cells✓/germinal epithelium cells
- in the seminiferous tubules✓of the testis
- undergo meiosis✓ to form
- haploid sperm✓ Any **(4)**

2.4 2.4.1 External✓ fertilisation (1)

2.4.2
- To increase the chances of fertilisation✓
- since the gametes may be lost✓/not reach one another due to predation✓/water currents

OR

- To produce more zygotes✓/offspring
- since many will be lost✓
- because they are preyed on✓/washed away/dry out (3)

2.4.3 The embryos develop inside an egg, outside the female's body✓ (1)
(5)

2.5 2.5.1
- It has a duct✓
- The secretion is released externally✓/not released into blood
- It secretes sweat✓/It does not secrete a hormone Any (2)

(Mark first TWO only)

2.5.2
- They receive stimuli✓ from the environment
- and convert them to nerve impulses✓ (2)

2.5.3
- More blood flows to the surface of the skin✓ to allow more heat to be lost✓

OR

- More blood flows to the sweat glands✓ to increase the production of sweat✓ (2)

(6)

2.6 2.6.1 Cochlea✓ (1)

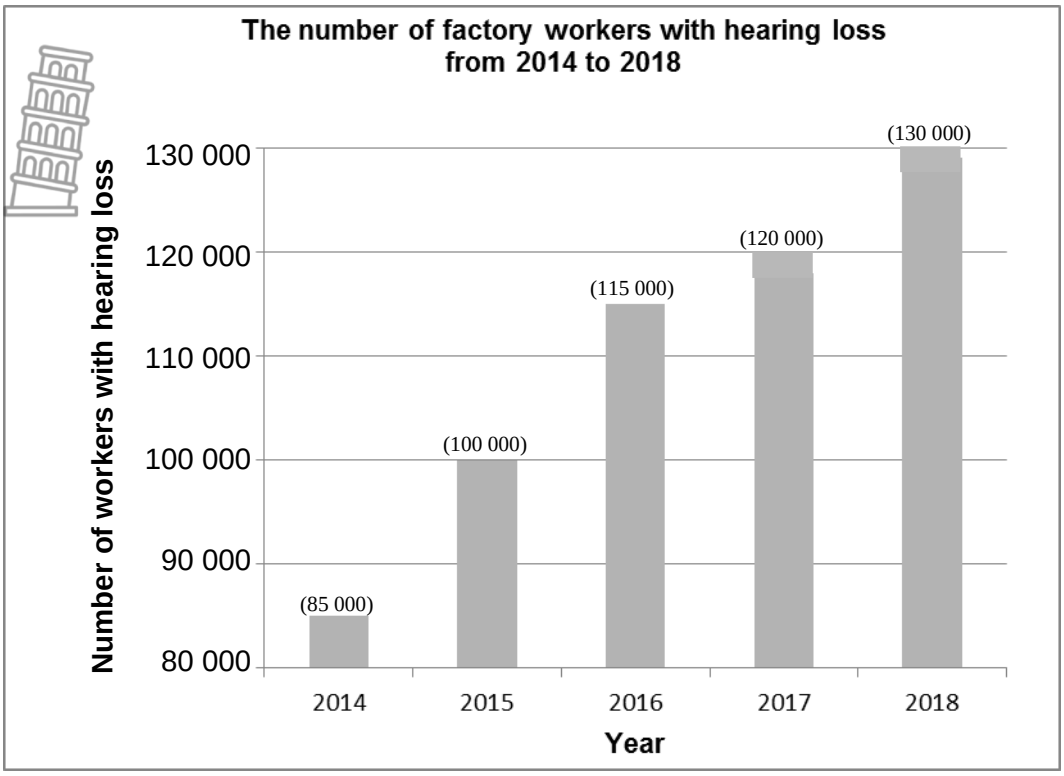
2.6.2 $\left[\frac{(130\ 000 - 85\ 000)}{85\ 000}\right]$✓ x 100✓ = 52,94✓% (3)

2.6.3
- More factories✓ were built increase in supply & demand
- More workers✓ were employed
- Extended exposure to loud sounds✓
- Lack of precautionary measures✓ Any (1)

(Mark first ONE only)

2.6.4
- The impulse will not be transmitted to the cerebrum✓
- and will not be interpreted✓ (2)

2.6.5



Criteria for marking graph:

Criteria	Mark allocation
Type: Bar graph is drawn (T)	1
Caption of the graph includes both variables (C)	1
Correct labels on X-axis and Y-axis (L)	1
Correct scale for Y-axis Equal width of bars and spaces (S)	1
Plotting: (P) 1- 4 co-ordinates are plotted correctly All 5 co-ordinates are plotted correctly	1 2

(6)
(13)
[50]

Histogram or line graph drawn
- Lose marks for type of graph and for scale

Transposed axes:
- Can get full credit if axes labels are also swapped and bars are horizontal
- If labels are *not* corresponding, then lose marks for labels and scale
- Check that the plotting is correct for the given labels

QUESTION 3

3.1 3.1.1 November✓ (1)

3.1.2
- The concentration of abscisic acid increases✓
- To stimulate the abscission✓/falling of leaves
- To prepare the tree for dormancy✓ (3)

3.1.3
- Less sunlight✓/ less water/ cold conditions therefore
- Decreased photosynthesis✓/ reduced transpiration/ lower energy demand/ low growth rate Any (1 x 2) (2)

(Mark first ONE only)

(6)

3.2 3.2.1
- Auxins promote the development of roots✓
- It brings about (general) root growth✓ causing their downward✓growth/positive geotropism (3)

3.2.2
- In the stem, the auxins stimulate growth✓ on the lower side causing the stem to grow/bend upwards✓
- In the root, the auxins inhibit growth✓ on the lower side causing the root to grow/bend downwards✓ (4)

(7)

3.3 3.3.1 Adrenal✓ gland (1)

3.3.2 (a) Aldosterone level✓/ increased aldosterone level (1)

(b) Blood pressure✓ (1)

3.3.3
- 1 688 volunteers were used✓
- The procedure was done 4 times for each individual✓ (2)

(Mark first TWO only)

3.3.4
- All factors should be kept constant✓/there should be only one independent variable to ensure the validity✓ of the investigation
- Dietary factors✓/examples can also influence the blood pressure✓ (2 x 2) (4)

(Mark first TWO only)

3.3.5 To compare the blood pressure before and after the administration of aldosterone✓✓ (2)

3.3.6
- The high aldosterone✓ level
- will increase the permeability of the renal tubules✓ for salt
- More salt will be reabsorbed✓ (3)

(14)

3.4
- Adrenalin causes glycogen to be converted to glucose✓ which
- increases the blood glucose level✓
- The breathing muscles are stimulated✓
- to increase the rate and depth of breathing✓
- The heart muscle is stimulated✓
- to pump faster✓
- There is also an increase in blood pressure✓
- increasing the transport of oxygen and glucose✓
- The rate of cellular respiration is increased✓ Any **(8)**

3.5

3.5.1 Iris✓ (1)

3.5.2
- Helps to maintain the shape of the eye✓
- Plays a role in refraction of light✓
- Allows the transmission of light✓
- Prevents desiccation✓ of structures in the eye
- Holds the retina in position✓
- Nourishment✓ of the eye
- Prevents mechanical injury✓ in the eye (2)

Any
(Mark first TWO only)

3.5.3
- Area B contains (a high concentration of) photoreceptors✓/ cones (2)
- Area C contains no photoreceptors✓/ no rods & cones

3.5.4 (1)
Astigmatism✓

3.5.5
- Because the lens will become cloudy✓/opaque
- no/less light will enter the eye✓ (3)
- causing no sight ✓/weak sight

3.5.6
- The ciliary muscle contracts✓
- The ciliary body moves closer to the lens✓
- The suspensory ligaments slacken✓
- Tension on the lens decreases✓
- The lens becomes more convex✓/rounded
- Light rays are refracted more✓ (6)
- To focus the light on the retina✓ Any **(15)**

[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150