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LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION



**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

LIFE SCIENCES – PAPER 1

SEPTEMBER 2022

MARKS: 150

DURATION: 2½ HOURS



ELFSCP1

This question paper consists of 17 pages

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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, flow charts or tables 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 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 to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.
- 1.1.1 If a cell from the human body has 23 chromosomes, it is...
- A. a zygote
 - B. diploid
 - C. a gamete
 - D. a somatic cell
- 1.1.2 Which part of the brain interprets impulses from the retina of the eye?
- A. medulla oblongata
 - B. cerebrum
 - C. cerebellum
 - D. corpus callosum
- 1.1.3 Which ONE of the following is the function of the cerebellum?
- A. Receives and interprets sensory information
 - B. The centre for control of breathing
 - C. The maintenance of equilibrium and balance
 - D. The centre for regulation of body temperature
- 1.1.4 When the tension of the suspensory ligaments in the human eye increases, the...
- A. lens becomes more convex
 - B. eye is focussed for distant vision
 - C. pupil dilates
 - D. lens bulges
- 1.1.5 In humans fertilisation takes place in the...
- A. Fallopian tubes
 - B. vagina
 - C. uterus
 - D. ovary
- 1.1.6 When a person drinks 340ml of water more than the daily quantity, then approximately 340ml more urine should be excreted. If an amount of salt is ingested with water, less urine will be produced. The reason is that:
- A. Salt water is absorbed by the tissues
 - B. The renal tubules will reabsorb less water
 - C. The renal tubules will reabsorb more water
 - D. Less aldosterone will be secreted

1.1.7 The list below shows the stages involved in the negative feedback mechanism:

- (i). Effectors bring about corrective responses
- (ii). A receptor detects a change in the internal environment
- (iii). Factor brought back to normal
- (iv). Hormonal messages are sent to the effectors

Which of the following shows the correct order in which these stages occur?

- A. (ii), (iv), (iii), (i)
- B. (iv), (ii), (iii), (i)
- C. (ii), (iv), (i), (iii)
- D. (iv), (ii), (i), (iii)

1.1.8 The hormone responsible for the development of female secondary sexual characteristics is...?

- A. testosterone
- B. progesterone
- C. oestrogen
- D. FSH

1.1.9 Which ONE of the following occurs as a result of the regular cutting of the apical buds of a tree?

- A. The tree grows shorter
- B. The tree grow towards the source of light
- C. The tree remains the same size
- D. The tree produces more lateral buds

1.1.10 Which ONE of the following structures plays a role in cooling the human body?

- A. Blood capillaries in the skin
- B. Medulla oblongata
- C. Renal tubules
- D. Mammary glands

(10 x 2) (20)



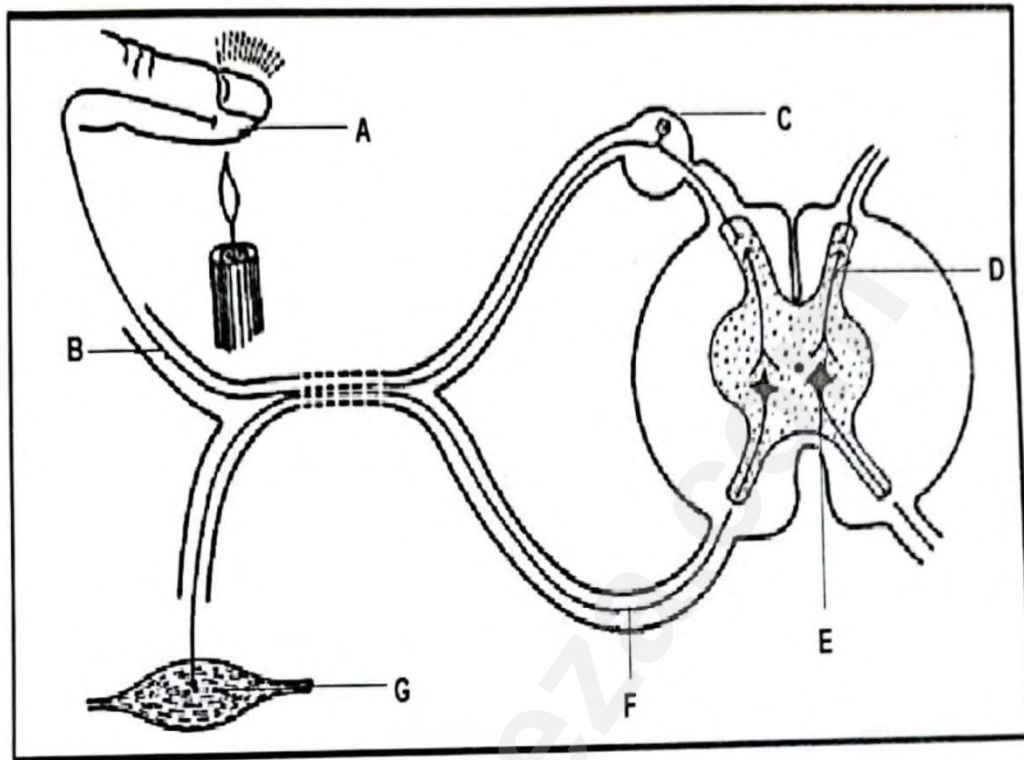
- 1.2 Give the correct **biological term** for each of the following description
Write only the term next to the question numbers (1.2.1 to 1.2.10) in the ANSWER BOOK.
- 1.2.1 The unpaired gland in the male reproductive system that secretes an alkaline fluid
- 1.2.2 Membranes that surround and protect the brain and spinal cord
- 1.2.3 The hormone that prepares the body for an emergency by increasing the heart rate and the breathing rate
- 1.2.4 The structure in the sperm cell that contains enzymes to digest the outer layer of the ovum
- 1.2.5 The structure in the ear that absorbs excess vibrations to prevent echoes
- 1.2.6 An embryo consisting of a hollow ball of cells
- 1.2.7 Specialised cells that receive the stimulus of light and convert it to an impulse
- 1.2.8 The ability to see with both eyes where each eye produces a slightly different image of the same object and allows one to judge distance
- 1.2.9 The breaking of the inner lining of the uterus that is accompanied by bleeding
- 1.2.10 The process whereby diploid cells in the testes give rise to sperm cells
(10 x 1) (10)
- 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 Secreted by the corpus luteum	A. Oestrogen B. Progesterone
1.3.2 A brain disorder that causes memory loss	A. Alzheimer's disease B. Astigmatism
1.3.3 Causes the conversion of glucose to glycogen	A. TSH B. Aldosterone

(3x2) (6)



1.4 The diagram below represents a reflex arc

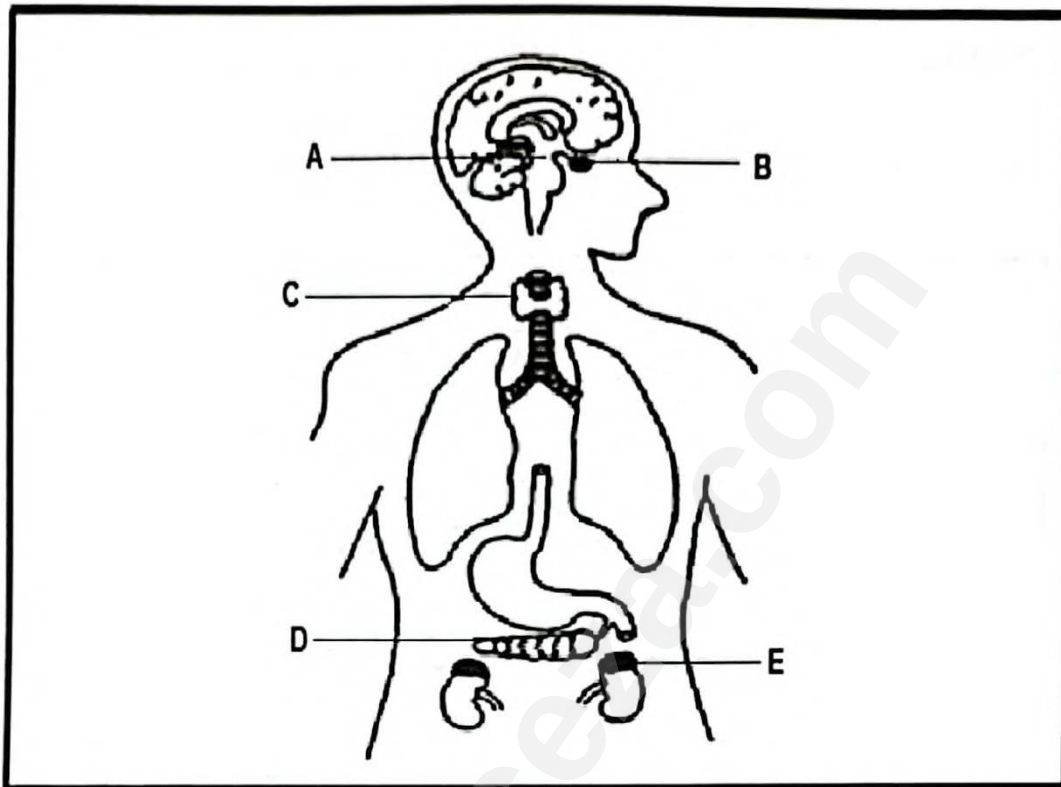


1.4.1 Give the LETTER and the NAME of the part that:

- (a) Transmits impulses to the central nervous system (2)
- (b) Is probably damaged if a person is able to detect the stimulus, but cannot respond. (2)
- (c) Responds to the original stimulus (2)

1.4.2 State if the nerve impulse travels from **A** to **G** or from **G** to **A** (1)
(7)

1.5 The diagram below shows some structures in the human body



1.5.1 Identify part:

(a) A (1)

(b) E (1)

1.5.2 Give the LETTER and NAME of the structure that:

(a) Controls the secretions of other endocrine glands (2)

(b) Secretes a hormone that regulates metabolic rate (2)

1.5.3 Name the condition where gland labelled C enlarges due to a deficiency in iodine

(1)

(7)

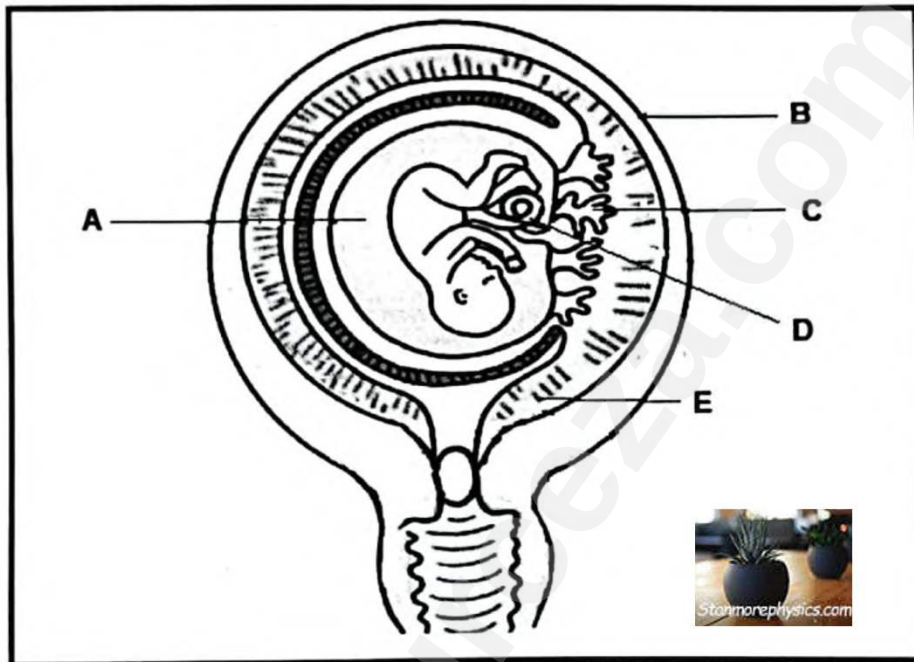
TOTAL SECTION A:

50

SECTION B

QUESTION 2

2.1 The diagram below represents the developing foetus in the female's body.



2.1.1 Identify the parts labelled:

(a) D (1)

(b) E (1)

2.1.2 Name TWO substances present in high concentrations in the artery found in structure D. (2)

2.1.3 State THREE functions of the fluid labelled A. (3)

2.1.4 Explain how the part labelled B is structurally suited to perform its function during the process of birth. (2)

2.1.5 Name TWO systems in the baby's body that take over the functions of C once the baby is born (2)
(11)

2.2 Explain the consequence on human reproduction if a male wears tight-fitting underwear all the time (3)

2.3 Some females use an ovulation monitor so that they can be aware of the days when they are fertile. These monitors measure the level of hormones in the blood

(a) Why would females want to know when they are fertile? (1)

(b) Explain which hormone is likely to be monitored by the ovulation monitor (3)
(4)

2.4 Grade 12 learners investigated the effects of two plant growth substances, Gibberellins and Auxins on apical dominance. The apical buds of nine pea plants of the same species, age and height were removed. These plants were then divided into three groups. In each group the cut surface of the remaining shoot (growing stem) of the pea plants was treated in one of the following ways:

Group 1: Coated with a paste containing gibberellins of the same concentration

Group 2: Coated with a paste containing auxins of the same concentration

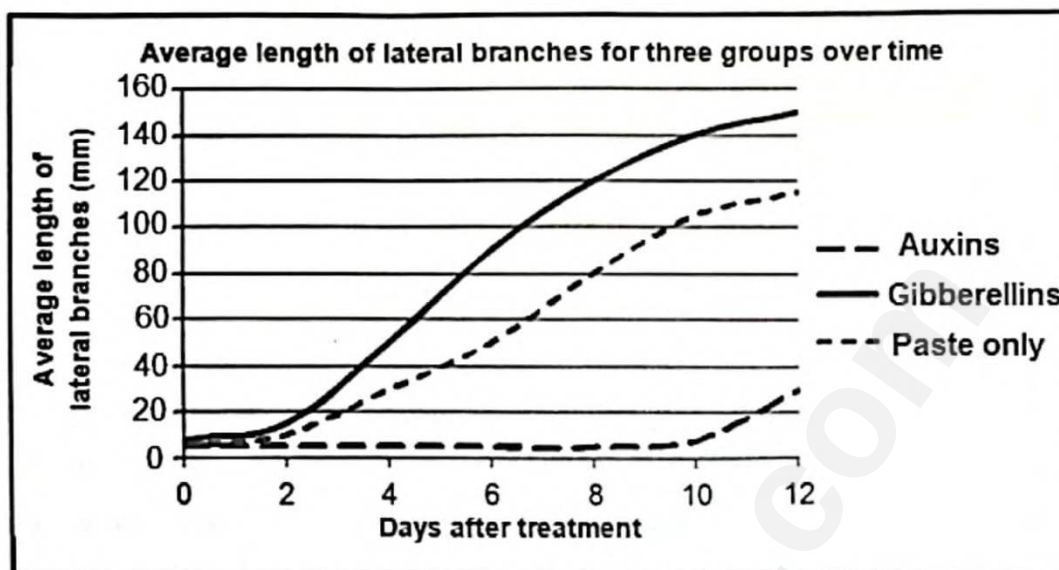
Group 3: Coated with a paste only (containing no plant growth hormones)

The hormones diffuse into the plant until no more hormones remain in the paste

The treated plants were all grown under the same conditions in the laboratory.

The length of the lateral branches of each plant was measured after every two days for a period of 12 days. Measurements were taken at the same time for all treated plants and the average for each group was calculated

The results of the investigation are shown in the graph below



2.4.1 State ONE function of the gibberellins that led to the results obtained in this investigation. (1)

2.4.2 Calculate the difference in the average length of the lateral branches between the plants treated with gibberellins and the plants treated with the paste only on the 8th day after the treatment. Show ALL working. (3)

2.4.3 State TWO ways in which the reliability of the results could be increased. (2)

2.4.4 State TWO factors that should have been kept constant in all the groups. (2)

2.4.5 Use the results to explain the effect of auxins on the growth of lateral branches. (4)

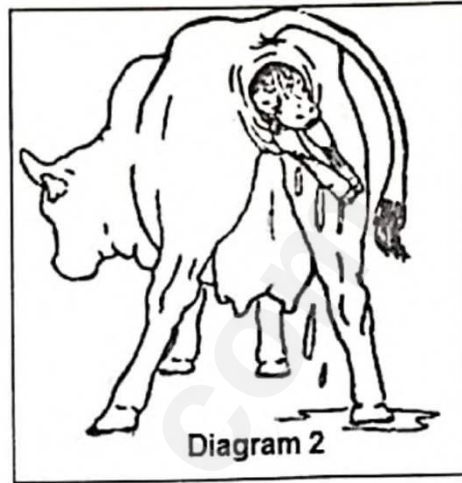
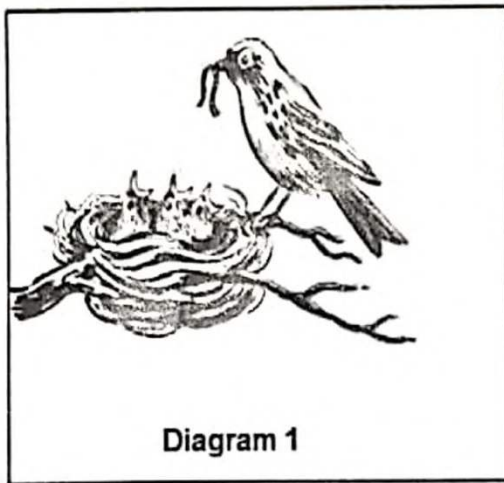
(12)

2.5 Read the following extract on multiple sclerosis

Multiple sclerosis is a disorder that causes inflammation of nervous tissue in any area of the central nervous system (CNS) and affects about 1 in 1600 people in South Africa. The first signs of multiple sclerosis are vision problems, weakness or fatigue, pains and spasms, cognitive problems and problems with bladder control. It is thought that multiple sclerosis is caused by a combination of factors, such as viruses, heredity, the environment and auto-immunity. Auto-immunity is when the body attacks its own nervous tissue. In the case of multiple sclerosis, the myelin sheath of the axons break up and there is inflammation of white matter in the CNS. Drugs are used to treat people with multiple sclerosis, but there is no cure.

- 2.5.1 Name the structures that make up the CNS (2)
- 2.5.2 State TWO functions of the myelin sheath (2)
- 2.5.3 Give TWO possible causes of multiple sclerosis (2)
- 2.5.4 From the extract, name TWO symptoms of multiple sclerosis (2)
- (8)
- 2.6 Describe the structure and functioning of the autonomic nervous system (4)

2.7 The diagram below show different reproductive strategies in animals.



2.7.1 Identify the developmental strategy shown in:

(a) Diagram 1 (1)

(b) Diagram 2 (1)

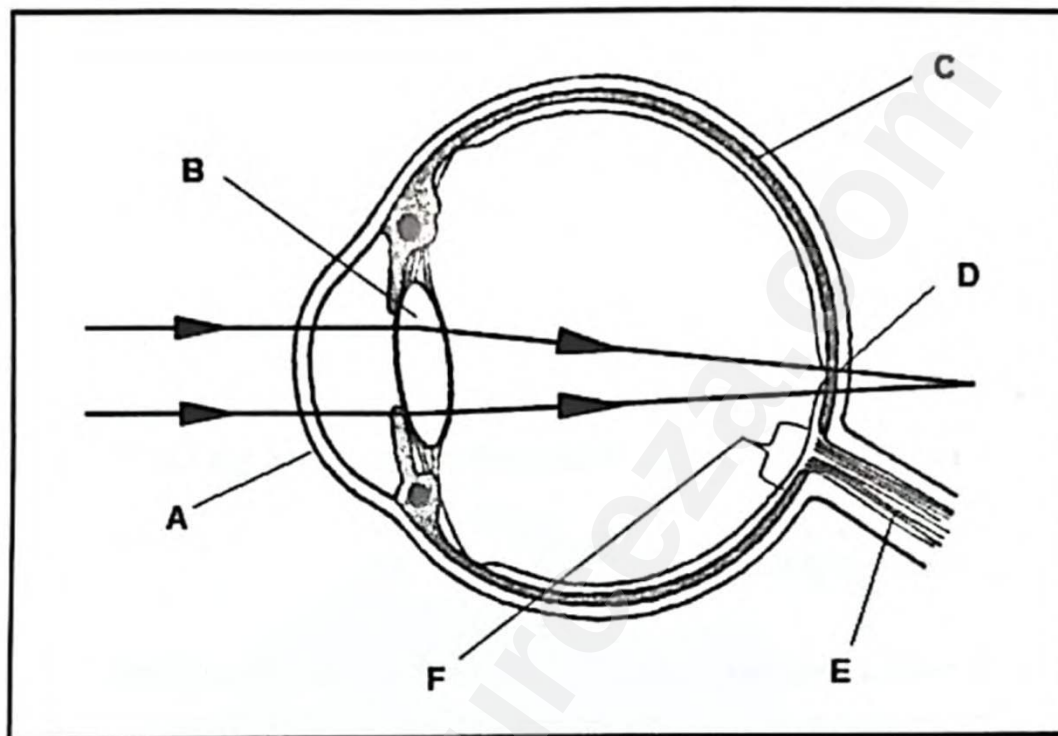
2.7.2 State TWO characteristics of the young, born of organisms to your answer in QUESTION 2.7.1(b) (2)

2.7.3 Explain the advantage of ovovivipary over ovipary as a reproductive strategy (4)
(8)

TOTAL QUESTION: [50]

QUESTION 3

3.1 The diagram below represents the structure of the human eye.



3.1.1 Give the LETTER of the part which:

- (a) Supplies nutrients and oxygen to the eye (1)
- (b) Transmits impulses to the cerebrum (1)

3.1.2 Name the visual defect that is shown in the diagram (1)

3.1.3 State TWO causes of the defect mentioned in QUESTION 3.1.2 (2)

3.1.4 Explain why when looking at a flower directly in front of you, the flower appears clear, but the trees in the distance appear blurred (4)
 (9)



- 3.2 Dale took part in an experiment on the eye's response to light. A lamp was placed at six different positions from Dale's face. The diameter of Dale's pupil was measured at each position. The results are shown in the table below.

Position of the lamp	Diameter of the pupil (mm)
A	2,2
B	2,8
C	3,4
D	4,0
E	4,6
F	5,2

3.2.1

- (a) At which position was the lamp furthest away from the eye? (1)
- (b) Explain your answer to Question 3.2.1 (a). (2)

- 3.2.2 When the lamp was moved from position E to position F, describe the process that caused the change in the diameter of the pupil (4)
- (7)

- 3.3 An investigation was conducted to determine the change in the diameter of a healthy follicle in the human ovary over the different days of the menstrual cycle.

A sample of 100 women aged between 25 and 30, with regular menstrual cycles, was used for this investigation.



The average follicle diameters of all 100 women during their menstrual cycles were measured and recorded

The following results were obtained from this investigation.

DAYS WHEN FOLLICLES WERE MEASURED	AVERAGE DIAMETERS OF THE FOLLICLES (mm)
5	6,9
10	13,3
13	18,8
14	22,0
20	3,4
25	2,6

- 3.3.1 For the investigation, state the:

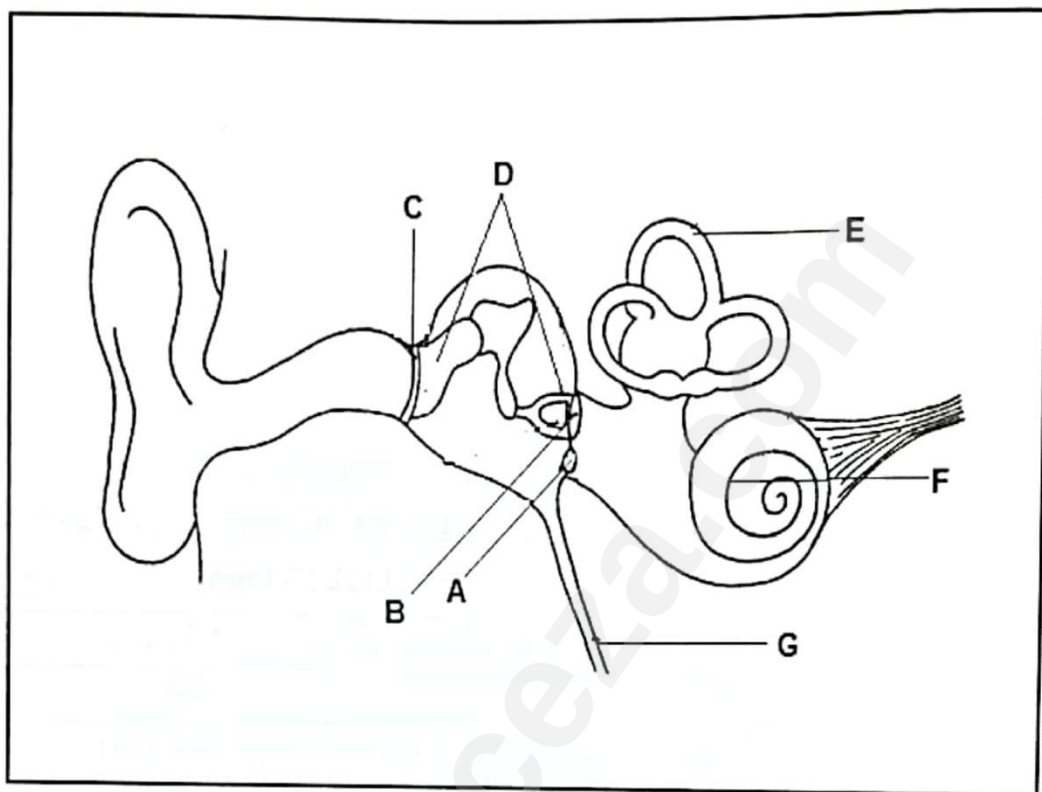
- (a) Dependent variable (1)
(b) Independent variable (1)

- 3.3.2 Name THREE planning steps that had to be considered before carrying out the investigation (3)

- 3.3.3 Explain the changes in the follicle diameters from day 14 to day 25 (3)

- 3.3.4 Explain how the results would probably differ if all the women used contraceptive pills that contained a high level of progesterone (3)
(11)

3.4 Study the diagram of the human ear



3.4.1 Identify structures:

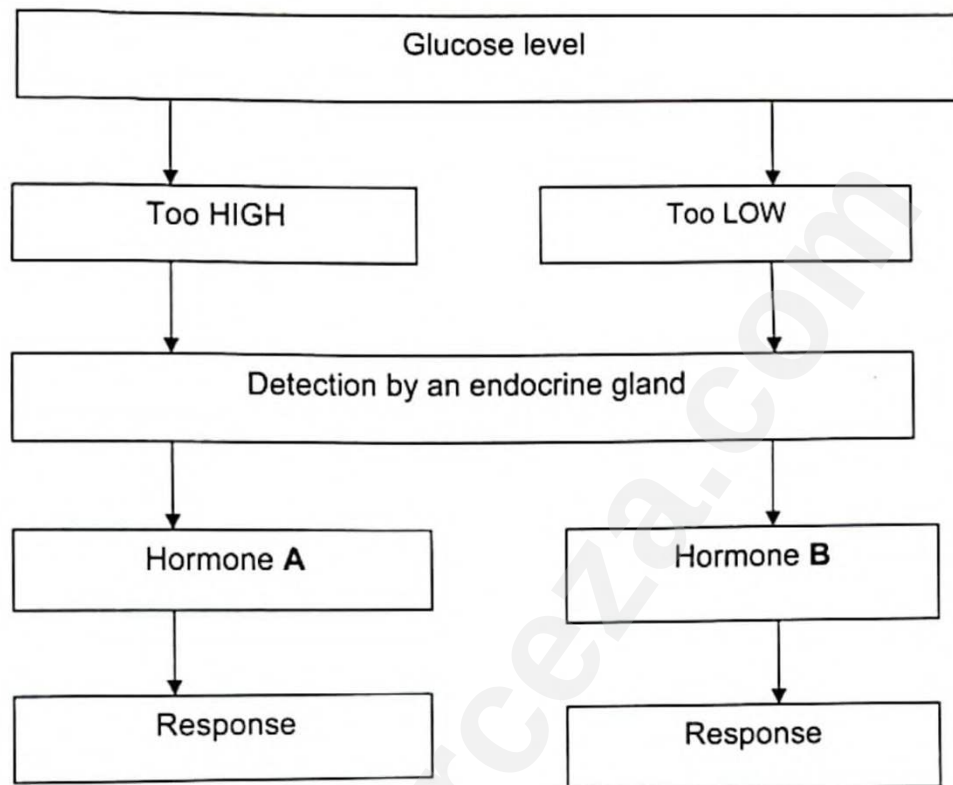
(a) **D** (1)

(b) **F** (1)

3.4.2 Explain how structures **B** and **C** contribute to the amplification of sound (2)

3.4.3 Describe how structure **E** restores balance when the position of the head changes (5)
(9)

3.5 The flow diagram below shows the homeostatic control of blood glucose



3.5.1 What is an endocrine gland? (2)

3.5.2 Identify:

(a) Hormone A (1)

(b) Hormone B (1)

3.5.3 Name the gland that secretes the hormones mentioned in QUESTION 3.5.2 (1)

3.5.4 Explain the consequences for a person if the gland mentioned in question 3.5.3 fails to secrete hormone A (4)
(9)



3.6 Describe osmoregulation in humans when a person has not had enough water to drink (5)

TOTAL QUESTION 3: [50]

TOTAL SECTION B: 100

GRAND TOTAL: 150



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GRADE 12

LIFE SCIENCES
PREPARATORY EXAMINATION
2022
MARKING GUIDELINES

MARKS: 150

This MARKING GUIDELINES consists of 11 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 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 are 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**
Memorandum will allocate marks for units separately, except where it is already given in the question.
16. Be sensitive to the **sense of an answer, which may be stated in a different way.**
17. **Caption**
Credit will be given for captions to all illustrations (diagrams, graphs, tables, etc.) except where it is already given in the question.
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 B✓✓

1.1.3 C✓✓

1.1.4 B✓✓

1.1.5 A✓✓

1.1.6 C✓✓

1.1.7 C✓✓

1.1.8 C✓✓

1.1.9 D✓✓

1.1.10 A✓✓

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

1.2

1.2.1 Prostate gland✓

1.2.2 Meninges✓

1.2.3 Adrenalin✓

1.2.4 Acrosome✓

1.2.5 Round window✓ /fenestra rotunda

1.2.6 Blastula✓ /Blastocyst

1.2.7 Photoreceptors✓

1.2.8 Stereoscopic✓ vision/binocular

1.2.9 Menstruation✓

1.2.10 Spermatogenesis✓

(10 x 1) **(10)**

- 1.3
- 1.3.1 B only ✓✓
- 1.3.2 A only ✓✓
- 1.3.3 None ✓✓ (3 x 2) **(6)**
- 1.4
- 1.4.1 (a) B ✓ – Sensory neuron ✓ (2)
- (b) F ✓ – Motor neuron ✓ (2)
- (c) G ✓ – Effector ✓ / muscle (2)
- 1.4.2 A to G ✓ (1)
- (7)**
- 1.5
- 1.5.1 (a) Hypothalamus ✓ (1)
- (b) Adrenal gland ✓ (1)
- 1.5.2 (a) B ✓ – Pituitary gland ✓ / Hypophysis (2)
- (b) C ✓ - Thyroid gland ✓ (2)
- 1.5.3 Goitre ✓ (1)
- (7)**

TOTAL QUESTION 1: [50]

TOTAL SECTION A : 50

SECTION B

QUESTION 2

2.1

2.1.1 (a) Umbilical cord✓ (1)

(b) Endometrium✓/uterus wall (1)

2.1.2 - Carbon dioxide✓ (2)
 - Nitrogenous wastes✓/ examples (2)

2.1.3 - It allows free movement of the foetus✓
 - It acts as a shock absorber✓/prevents mechanical injury to the foetus
 - It protects the foetus against dehydration✓
 - It protects the foetus against temperature changes✓
(Mark first TWO only) Any (3)

2.1.4 - Uterine walls are made up of muscles✓
 which contract and relax to push foetus✓/afterbirth forward (1 x 2) (2)

2.1.5 - Respiratory✓/Gaseous exchange system
 - Digestive✓system
 - Excretory✓system
(Mark first TWO only) Any (2)
(11)

2.2 - Fertility is reduced✓
 - because the temperature is always high✓
 - This will lead to production of abnormal sperms/no sperms/fewer sperms✓ (3)

2.3 (a) for family planning✓/to know when they can get pregnant (1)

(b) LH ✓/FSH/Oestrogen
 - There is a rise in levels✓of LH/FSH/Oestrogen
 - around the time of ovulation✓ (3)
(4)
(18)

2.4

2.4.1 - Gibberellins stimulates cell elongation✓/cell enlargement/
 elongation of internodes/cell growth (1)

2.4.2 $(120 - 80) \checkmark \text{ mm} = 40 \checkmark \text{ mm}$ ✓ (3)

2.4.3 - Increase the number of plants used in each treatment✓
 - Repeat the investigation✓
 - Increase the period of the investigation✓
(Mark first TWO only) Any (2)

2.4.4 - Same species of pea plants✓
 - Same age✓
 - Same height✓
 - Same environmental conditions✓
 - Same number of pea plants✓
(Mark first TWO only) Any (2)

2.4.5 Auxins diffused from the paste into the plants✓
 Inhibiting growth of the lateral branches✓
 Once all the auxins were used up✓ from the paste
 The growth of the lateral branches increased✓ (4)
(12)

2.5

2.5.1 Brain✓ and spinal cord✓ (2)

2.5.2 - (Electrical) insulation✓
 - Speed up the transmission of impulses✓ (2)

2.5.3 Viruses✓
 Heredity✓
 Environment✓
 Auto-immunity✓
 Any (2)

2.5.4 Vision problems✓
 Weakness✓/fatigue
 Pains✓
 Spasms✓
 Cognitive problems✓
 Problems with bladder control✓ Any (2)
(8)

2.6

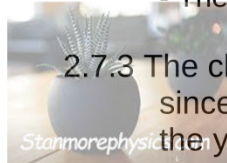
- Every organ and gland is controlled by two sets of
 nerves✓/double innervations
 - that act antagonistically/oppose each other✓
 - to control involuntary actions✓/brings about homeostasis
 - Sympathetic✓ nerves
 - stimulates a response✓/example
 - Parasympathetic✓ nerves
 - inhibits a response✓/example Any **(4)**

2.7

2.7.1 (a) Altricial✓development (1)

(b) Precocial✓ development (1)

- 2.7.2 - Eyes are open when they are born✓
- Their bodies are covered with fur ✓
- They are able to move about soon✓ after birth
- They are able to feed themselves✓
- They are independent of their parents✓ Any (2)



2.7.3 The chances of producing offsprings are greater✓ in ovovivipary since the eggs are protected✓ within the mother the young ones are better developed to cope in the environment✓

In ovipary many eggs laid may be eaten by predators✓
the young are not well developed ✓
and therefore have a smaller chance of survival✓ Any (2 x 2) (4)
(8)

TOTAL QUESTION 2: 50

QUESTION 3



3.1

- 3.1.1 (a) C✓ (1)
- (b) E✓ (1)
- 3.1.2 Long sightedness✓/hypermetropia/hyperopia (1)
- 3.1.3 The eyeball being too rounded✓
 the inability of the lens of the eye to become more convex✓ (2)
- 3.1.4 - The eyes are focused on the flower✓
 - The lens of the eye adjusts its convexity✓ to accommodate
 - the distance between the flower and the lens✓
 - The trees are at a different distance from the lens✓
 - The lens cannot adjust its convexity to accommodate two different distances at the same time✓ Any (4)
(9)

3.2

- 3.2.1 (a) F✓ (1)
- (b) - Diameter of the pupil is the largest✓
 - indicating dim light conditions✓ (2)
- 3.2.2 -***Pupillary mechanism**✓
 - Radial muscles of the iris contract✓
 - Circular muscles relax✓
 - The pupil dilates✓/becomes wider/bigger
 * **1 COMPULSORY MARK** (4)
(7)

3.3

- 3.3.1 (a) Diameters of the follicles✓ (1)
- (b) Days ✓ of the menstrual cycle (1)
- 3.3.2 - Seek permission from participants✓
 - Decide on the sample size✓
 - Decide on the equipment for measuring✓
 - Decide on the age- group of participants✓
 - Decide on using women with regular menstrual cycles✓
 - Decide on the recording tool✓/instrument/method
 - Decide on the duration✓
 - Learning how to use the equipment
 Any (3)

- 3.3.3 - The follicles decrease in size✓
 - as ovulation has taken place✓
 - The resulting corpus luteum becomes smaller✓
 - because fertilisation did not take place✓ Any (3)
- 3.3.4 - The production of FSH✓
 - will be inhibited✓
 - which will stop/inhibit the development/growth of a follicle✓
 - therefore the follicle will remain the same✓ Any (3)
(11)
- 3.4
- 3.4.1 (a) Ossicles✓ (1)
 (b) Cochlea✓ (1)
- 3.4.2 Structure C (tympanic membrane) has a larger surface area than B✓✓ (oval window) (2)
- 3.4.3 - Maculae✓ are stimulated
 - by changes in the position of the head✓
 - and convert the stimulus to nerve impulses✓
 - The impulses are transmitted by the vestibular/auditory nerve✓
 - to the cerebellum✓ to be interpreted
 - The cerebellum sends impulses via motor neuron✓
 to skeletal muscles✓ to restore balance Any (5)
(9)
- 3.5
- 3.5.1 - Gland that secretes hormones✓
 - directly into the blood ✓ (2)
- 3.5.2 (a) Insulin ✓ (1)
 (b) Glucagon✓ (1)
- 3.5.3 Pancreas✓ (1)
- 3.5.4 - There will be no conversion of glucose into glycogen✓
 - in the liver✓/muscles
 - no absorption of glucose by the cells✓
 - the blood glucose levels will remain high✓
 - and may lead to diabetes mellitus✓ Any (4)
(9)

- 3.6
- The receptor cells in the hypothalamus are stimulated✓
 - the hypothalamus sends impulses to the pituitary gland✓
 - which secretes ADH✓
 - ADH causes the permeability of renal tubules to increase✓
 - this causes the renal tubules to reabsorb more water✓
 - to the surrounding blood vessels✓
 - the blood becomes more dilute✓
 - a smaller volume of concentrated urine is excreted✓

Any (5)

TOTAL QUESTION 3: [50]

TOTAL SECTION B: [100]

GRAND TOTAL: 150