EXAMINATION	NATIONAL SENIOR CERTIFICATE
GRADE	12
DATE	MAY/JUNE 2025
SUBJECT	LIFE SCIENCES
PAPER	1
MARK TOTAL	150
DURATION (HOURS)	2½
NUMBER OF PAGES	18

SOUTH AFRICAN COMPREHENSIVE ASSESSMENT INSTITUTE

SUID-AFRIKAANSE KOMPREHENSIEWE ASSESSERINGSINSTITUUT

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer **ALL** questions.
2. Write **ALL** the answers in your **ANSWER BOOK**.
3. Start the answers to each question at the top of a **NEW** page.
4. Number the answers according to the numbering system used in the question paper.
5. Present your answers according to the instructions of each question.
6. **ALL** drawings should be done in pencil and labelled in blue 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. You may use a non-programmable calculator, protractor and compass, where necessary.
10. Write neatly and legibly, in **BLUE** ink only.

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 1.1.9), for example 1.1.10. D.

1.1.1 The hormones involved in the regulation of blood sugar levels are:

A insulin and glycogen, that are secreted by the pancreas.

B insulin and glucagon, that are secreted by the pancreas.

C adrenaline and insulin, that are secreted by the pituitary gland.

D insulin and glucagon, that is secreted by the liver. (2)

1.1.2 Identify which of the following is a function of the sympathetic nervous system.

A Decrease in the secretion of digestive enzymes.

B Decrease in blood flow to skeletal muscles.

C Decrease of heartbeat.

D Decrease in breathing rate. (2)

1.1.3 A researcher tested the following hypothesis: **The range of sound frequencies that a person can hear decreases with age.**
Males and females of different ages were chosen and a sound generator that creates sound with different frequencies was used.

Identify the dependent variable in this investigation.

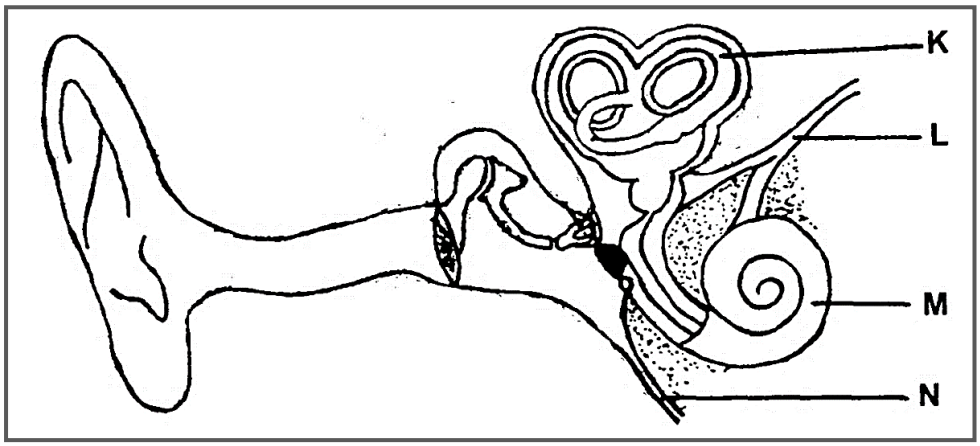
A Age

B Gender (male or female)

C The sound generator

D The range of frequencies that a person can hear. (2)

1.1.4 The diagram below illustrates a part of the human ear.



The labelled part that illustrates the auditory nerve is:

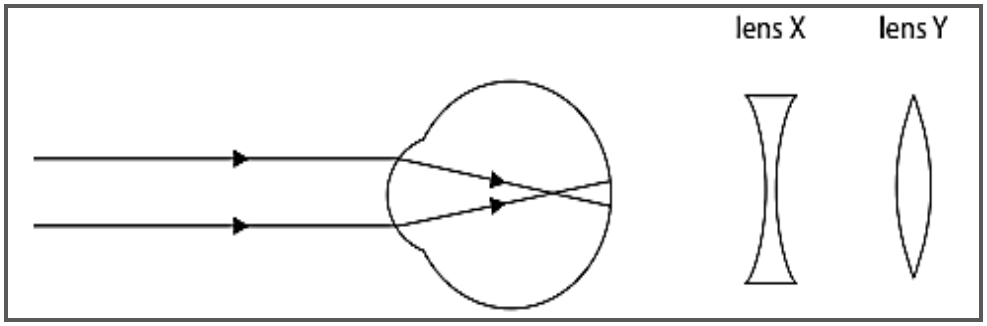
A **K**

B **L**

C **M**

D **N** (2)

1.1.5 The diagram below illustrates light rays entering the eye of a person with an eye defect and two lenses that can be used to correct eye defects.

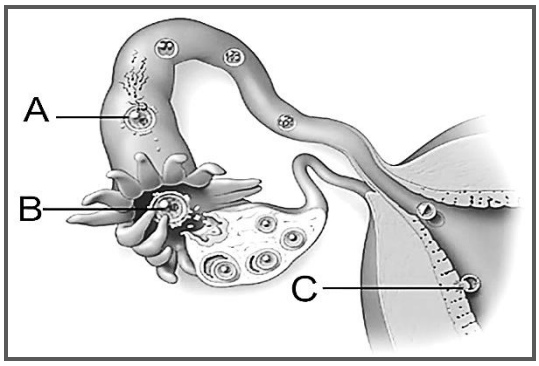


Identify the row in the table below that has the correct description of the eye defect and the lens to correct the eye defect.

	EYE DEFECT	LENS
A	Long-sightedness/hypermetropia	X
B	Short-sightedness/myopia	X
C	Long-sightedness/hypermetropia	Y
D	Short-sightedness/myopia	Y

(2)

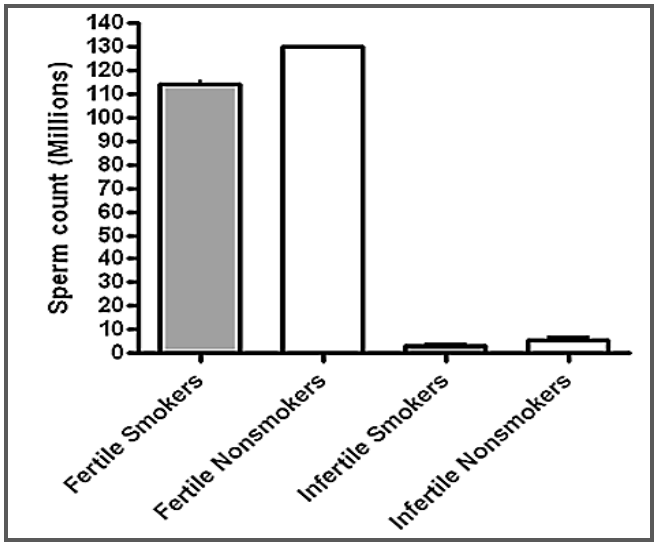
1.1.6 Identify the row in the table below that correctly describes the labelled processes of human reproduction illustrated in the diagram below.



LABELLED PROCESSES			
	A	**B**	**C**
A	Fertilisation	Implantation	Ovulation
B	Implantation	Fertilisation	Ovulation
C	Fertilisation	Ovulation	Implantation
D	Ovulation	Fertilisation	Implantation

(2)

1.1.7 The graph below illustrates the sperm count in smokers and nonsmokers.



The correct conclusion based on the information in the above graph is:

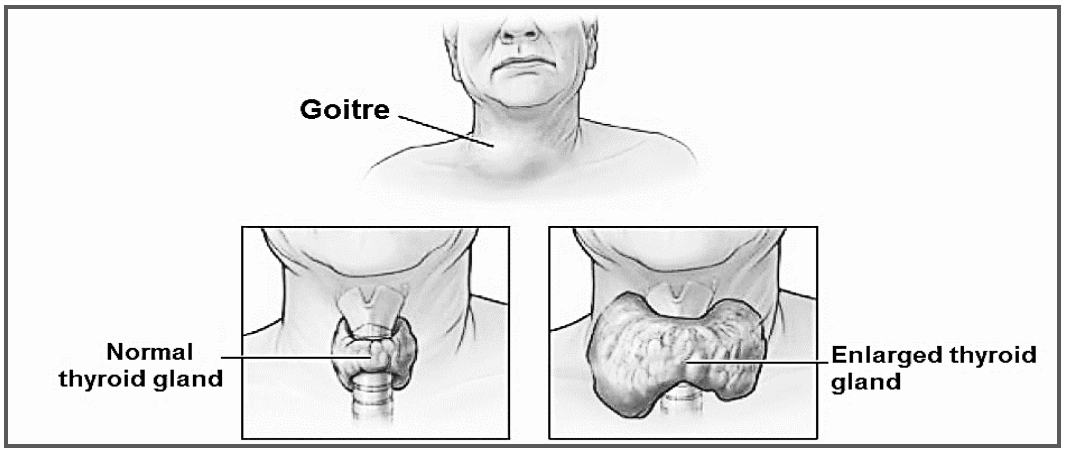
A Infertile males have higher sperm counts in both smokers and nonsmokers.

B Fertile nonsmokers have a sperm count of 15 million more than fertile smokers.

C Sperm count is the independent variable in this investigation.

D Smoking has no effect on the sperm count of males. (2)

1.1.8 The diagram below illustrates the occurrence of goitre.



Consider the following statements:

i) The patient will experience an increase in heart rate.
ii) The condition is caused by a vitamin A deficiency.
iii) The condition is caused by an iodine deficiency.
iv) The patient will have a lower metabolic rate.
v) The condition can be prevented by consuming a diet that includes fish and shellfish.

Which of the statements above are TRUE about a goitre?

A i, iii and v
B ii, iv and v
C iii, iv and v
D i, iii and iv (2)

1.1.9 Interpretation of nerve impulses occurs in:

A the brain
B cell body of neurons
C effectors
D receptors (2)

(9x2) **(18)**

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).

1.2.1 The ability to look at an object with both eyes.

1.2.2 The colourless body fluid found within the tissue that surrounds the brain and spinal cord of humans.

1.2.3 The tough, white outer membrane of the eyeball that protects the eye.

1.2.4 The hormone that increases muscle mass.

1.2.5 The ball of cells formed through cell division after the formation of a zygote through fertilisation.

1.2.6 Growth response of plants due to gravity.

1.2.7 The muscles in the eye that control the shape of the lens.

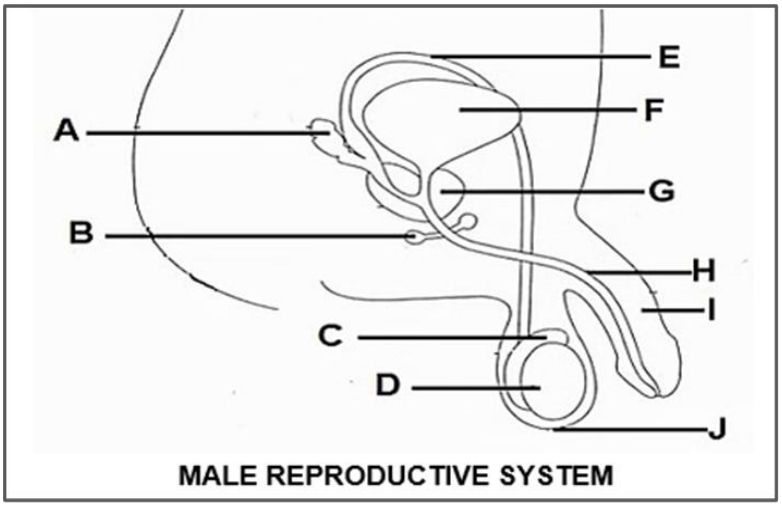
1.2.8 The hormone that stimulates ovulation. **(8)**

1.3 Indicate whether each of the descriptions in Column I applies to **A ONLY, B ONLY, BOTH A and B** or **NONE** of the items in Column II. Only write **A, B, BOTH** or **NONE** next to the question numbers (1.3.1 to 1.3.5).

COLUMN I		**COLUMN II**	
1.3.1	Vitreous humour	A	Found in posterior cavity of the eye
		B	Waterlike fluid
1.3.2	Plant hormone that slows down plant growth during autumn	A	Gibberellins
		B	Abscisic acid
1.3.3	Peripheral nervous system	A	Somatic nervous system
		B	Autonomic nervous system
1.3.4	Treatment for middle ear infection	A	Cochlear implant
		B	Grommets
1.3.5	Bright light	A	Pupil dilates
		B	Radial muscles in iris contract

(5x2) **(10)**

1.4 The diagram below illustrates parts of the human male reproductive system. Study the diagram and answer the questions that follow.



MALE REPRODUCTIVE SYSTEM

1.4.1 Name the parts labelled:

a) **B** (1)
b) **E** (1)
c) **H** (1)
d) **J** (1)
e) **G** (1)

1.4.2 Give the LETTER and the NAME of the part associated with the following:

a) Storage of sperm. (2)
b) Production of fluid rich in sugar to provide energy for sperm cells. (2)

1.4.3 State

a) ONE function of the part labelled **F**. (1)
b) TWO functions of the part labelled **D**. (2)

1.4.4 State the pH of the fluid that is secreted by the structure labelled **G**. (1)

1.4.5 Give the LETTER of the structure that consists of spongy tissue. (1)

(14)

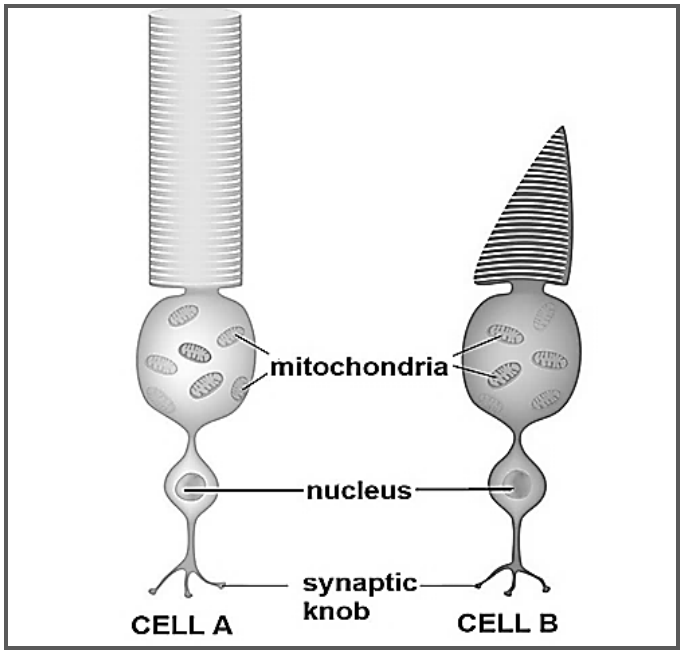
TOTAL QUESTION 1: [50]

TOTAL SECTION A: [50]

SECTION B

QUESTION 2

2.1 The diagram below illustrates two types of photoreceptors from the human eye. Study the diagram and answer the questions that follow.



2.1.1 Name the part of the eye that contains photoreceptors. (1)

2.1.2 Name the area of the part mentioned in QUESTION 2.1.1 that will contain no photoreceptors. (1)

2.1.3 Describe the function of photoreceptors. (2)

2.1.4 The cell labelled **A** is responsible for night vision.
Identify the cell labelled **A**. (1)

2.1.5 Describe how photoreceptor **A** and **B** differ in their function to form vision. (4)

2.1.6 State the function of the mitochondria in the photoreceptor cells. (1)

2.1.7 Define the term *synapse*. (2)

2.1.8 A human eye contains 92 million of the cells labelled **A** and only 4,6 million of the cells labelled **B**.
Calculate how many times the amount of cell **A** in one eye is more than cell **B**. Show your calculations. (2)

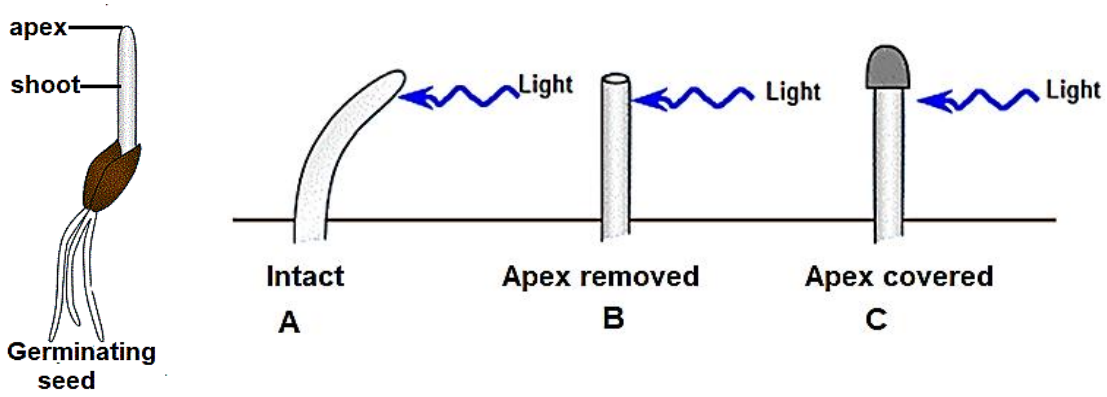
(14)

2.2 Read the following information on plant growth and answer the questions that follow.

Charles Darwin's botanical interests were wide ranging, but he also appreciated the value of plants as experimental organisms. In 1880 Charles and his son Francis investigated the response of plants to light. A group of learners repeated their experiment as described below.

A – They exposed the shoots of germinating seeds to light from one side.
B – They cut off the apex/tip of the shoots and exposed them to light from one side.
C – They covered the apex/tips of the shoots with metal foil and exposed them to light from one side.

The result of their experiment is illustrated in the diagram below.



2.2.1 Name the plant growth response that was investigated by the learners. (1)

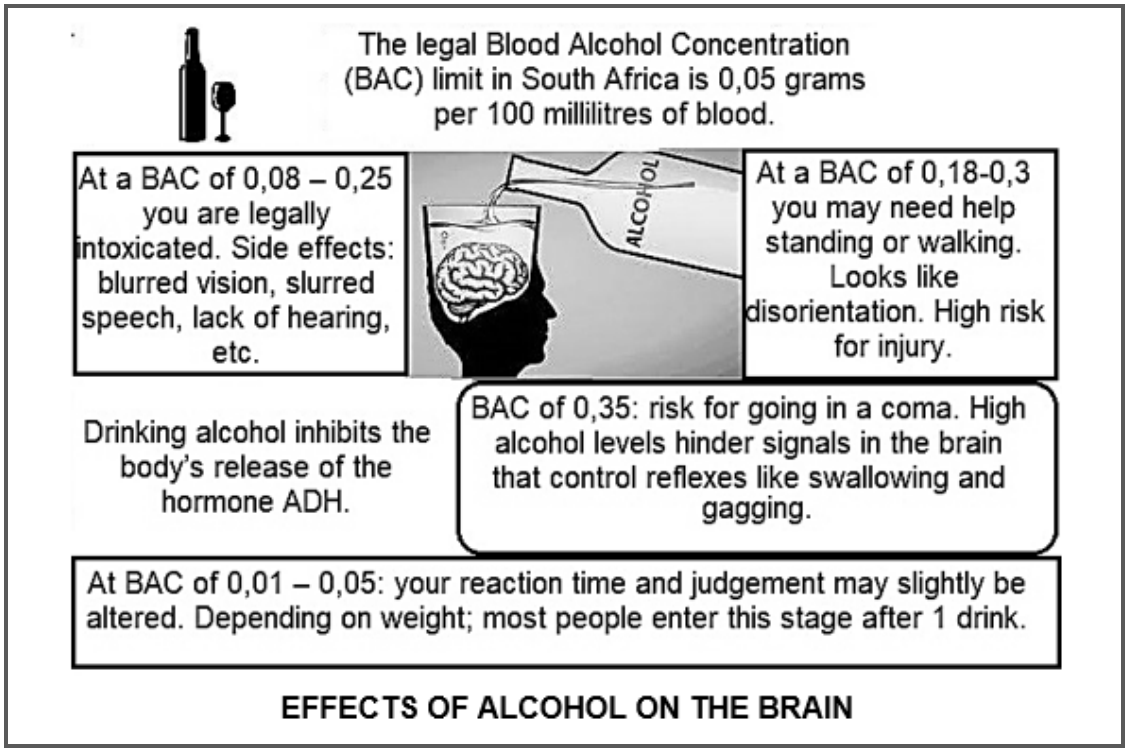
2.2.2 Explain the growth response of the shoot in experiment **A**. (4)

2.2.3 Explain the purpose of experiment **C** in this investigation. (2)

2.2.4 Pruning is the removal of the tip of stems or branches of plants. Farmers use pruning to stimulate new growth, and this process can cause the development of two to six new stems/branches.
Explain why pruning will have this effect on plants. (2)

(9)

2.3 Read the following information on the effects of alcohol on the brain and answer the questions that follow.



2.3.1 Name the part of the brain that will be affected at blood alcohol levels of 0,18–0,3 g / 100 ml of blood. (1)

2.3.2 Explain your answer to QUESTION 2.3.1. (2)

2.3.3 Name the part of the brain that controls reflexes like swallowing and gagging. (1)

2.3.4 Symptoms that may occur after excessive alcohol intake are the increase in urination and excess loss of fluids.
Explain why these symptoms are caused by alcohol intake. (4)

2.3.5 The National Road Traffic Act states that if a driver's BAC is found to be above the legal limit, they may encounter a fine, suspension of their driver's licence or a prison sentence. Professional drivers, such as bus or truck drivers, are held to even higher standards. For them, the BAC limit is reduced to 0,02 grams per 100 millilitres of blood.
Explain if you agree with the legal limit set by the National Road Traffic Act. (2)

(10)

2.4 Read the table below that illustrates the number of egg cells/ova produced by different species of the vertebrate classes.

Class	Species	Average number of egg cells/ova produced at a time
Fish	Koi fish	300 000
Amphibians	North American bull frog	10 000
Reptiles	Boomslang	11
Birds	Mallard duck	7
Mammals	Elephants	1

TABLE OF THE AVERAGE NUMBER OF EGG CELLS PRODUCED BY DIFFERENT VERTEBRAE CLASSES

2.4.1 Name the species listed in the above table that produces egg cells that are covered with shells after fertilisation and contain a large amount of yolk. (1)

2.4.2 The bodies of the offspring of the Mallard duck are covered with feathers when they hatch, and they can immediately walk around.
Give the term for this type of development. (1)

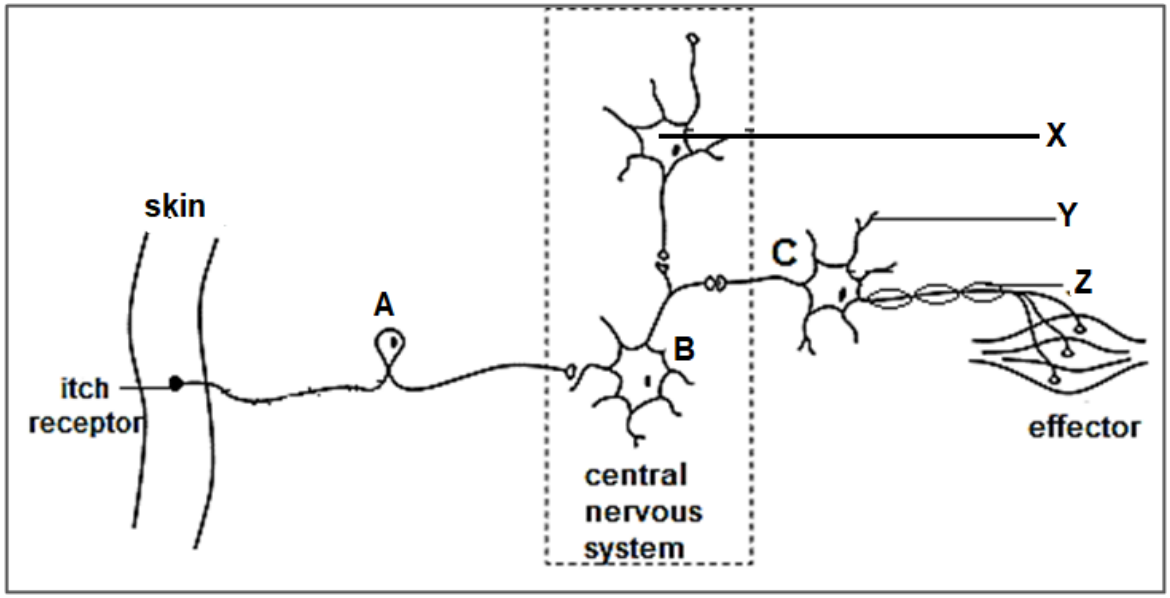
2.4.3 Draw a conclusion about the number of egg cells produced and the type of fertilisation that occurs in the type of animal. (2)

2.4.4 Some of the animals mentioned in the above table produce a large amount of egg cells at a time but their population size stays constant. State TWO reasons for this. (2)

2.4.5 Female elephants usually produce only one egg cell at a time. Describe TWO examples of parental care in elephants that increase the chance that the offspring will survive into adulthood. (2)

(8)

2.5 The diagram below illustrates cells involved in detecting and responding to an itch stimulus. An example of an itch stimulus is the bite of an insect, which can result in itchy skin. The response to an itch is a scratching reflex. Study the diagram and answer the questions that follow.



2.5.1 Identify the type of neurons labelled:

a) **A** (1)

b) **B** (1)

2.5.2 Identify the parts labelled:

a) **X** (1)

b) **Y** (1)

c) **Z** (1)

2.5.3 State ONE function of the part labelled **Y**. (1)

2.5.4 Name the part of the central nervous system illustrated in the diagram. (1)

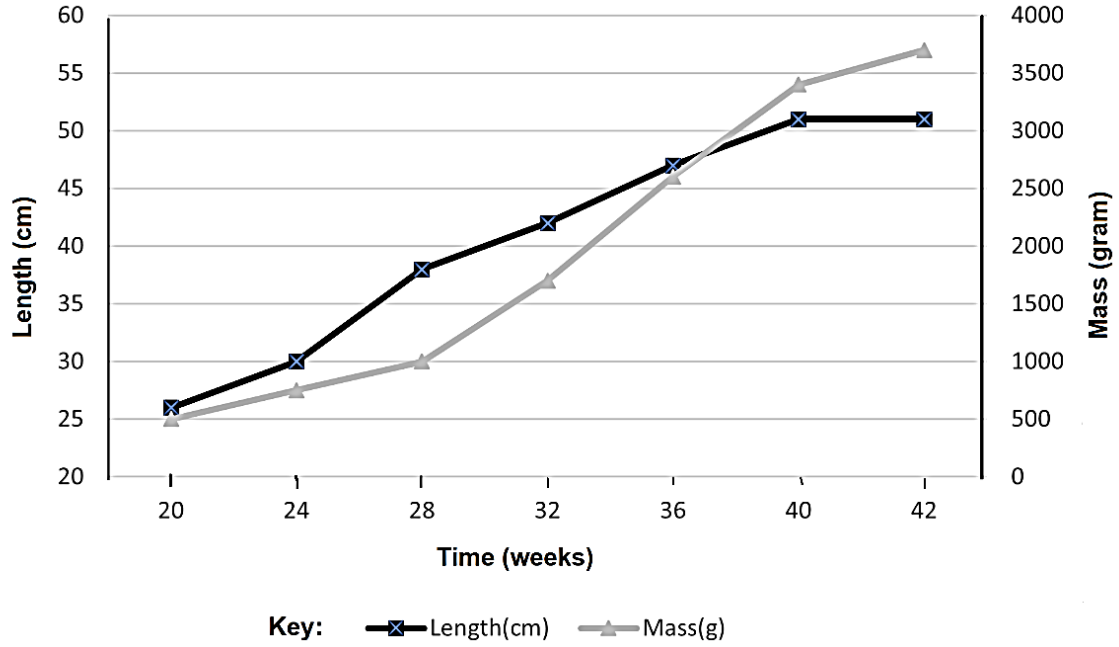
2.5.5 Describe how the reflex action will be affected if the neuron labelled **C** is cut. (2)

(9)

TOTAL QUESTION 2: [50]

QUESTION 3

3.1 The graph below illustrates the growth in length and mass of the human foetus between 20 and 42 weeks. The diagram below illustrates the changes in the size of the uterus during pregnancy. Study the graph and the diagram and answer the questions that follow.



GRAPH ILLUSTRATING THE GROWTH IN LENGTH AND MASS OF HUMAN FOETUS BETWEEN 20 AND 42 WEEKS.

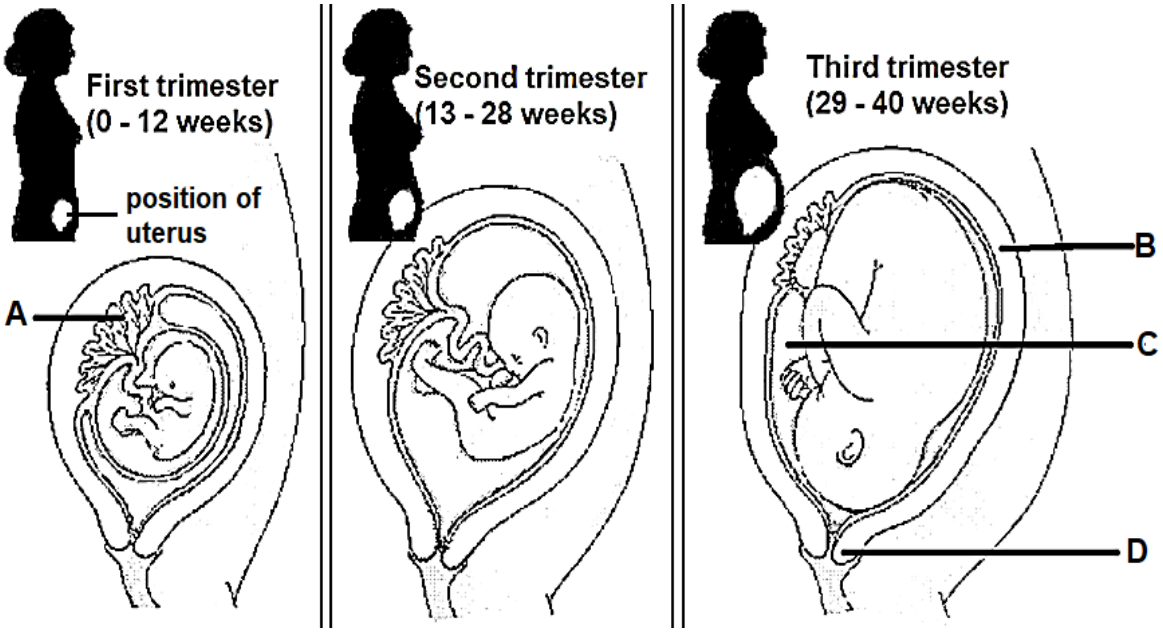


DIAGRAM ILLUSTRATING THE CHANGE IN THE SIZE OF THE UTERUS DURING PREGNANCY

3.1.1 Tabulate the data from the graph. (6)

3.1.2 Identify the period of pregnancy when no growth in length occurs. (1)

3.1.3 Compare the growth rate in mass from 20 to 28 weeks with the growth rate between 32 and 40 weeks. Use data from the graph to support your answer. (3)

3.1.4 Identify the parts labelled:

a) **A** (1)

b) **B** (1)

c) **D** (1)

3.1.5 Describe the role of the part labelled **D** during the normal birth process. (2)

3.1.6 Back pain in pregnancy is very common, affecting about 50 percent to 80 percent of pregnant women.
Explain ONE reason for back pain in pregnant women by analysing the diagrams on the previous page. (2)

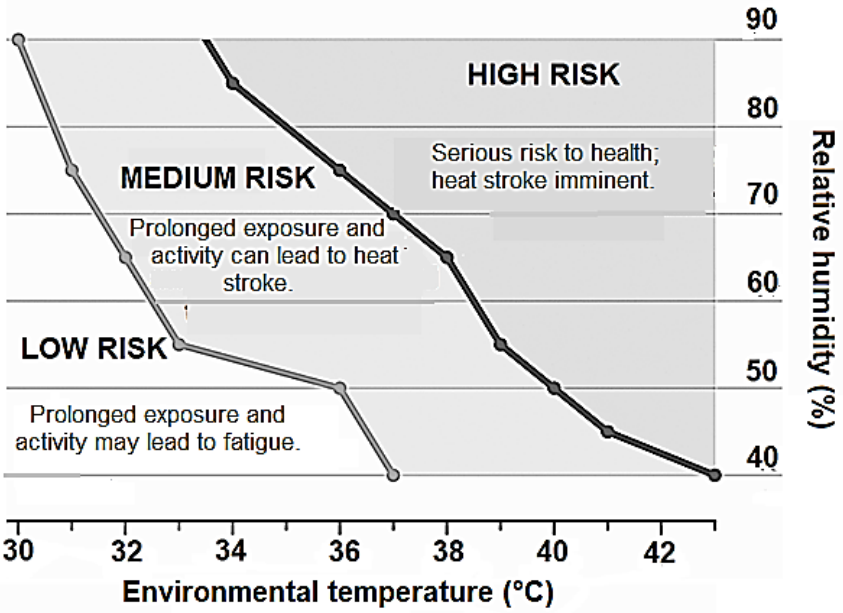
3.1.7 Name the hormone secreted from the 6th week of pregnancy by the part labelled **A**. (1)

3.1.8 Explain how the foetus receives energy for growth in mass and length. (3)

(21)

3.2 Read the following information about the occurrence of hyperthermia and answer the questions that follow.

Humidity measures the amount of water vapour in the air. A high level of humidity means there is a lot of water vapour in the air. A heat stroke is when the body overheats, reaching internal temperatures of 40 °C and higher. Heat stroke can be life-threatening and requires immediate medical attention. Scientists determined the risk of heat stroke at different environmental temperatures and humidity levels. The diagram below illustrates their results:



GRAPH ILLUSTRATING RISK OF HEAT STROKE

3.2.1 Identify the independent variables in the scientists' investigation. (2)

3.2.2 Name the process by which the body maintains a constant internal body temperature. (1)

3.2.3 A person is exposed to a temperature of 37 °C at a humidity of 65%. Predict the risk level that this person will suffer from heat stroke. (1)

3.2.4 State ONE environmental temperature at 50% humidity that will present a low risk for heat stroke. (1)

3.2.5 Explain why the chance for a heat stroke is higher in high humidity levels than in low humidity levels. (3)

3.2.6 Name TWO ways in which heat stroke can be prevented, besides drinking more water. (2)

3.2.7 Explain what happens in the blood capillaries in the skin on a hot day to maintain a constant internal body temperature. (3)

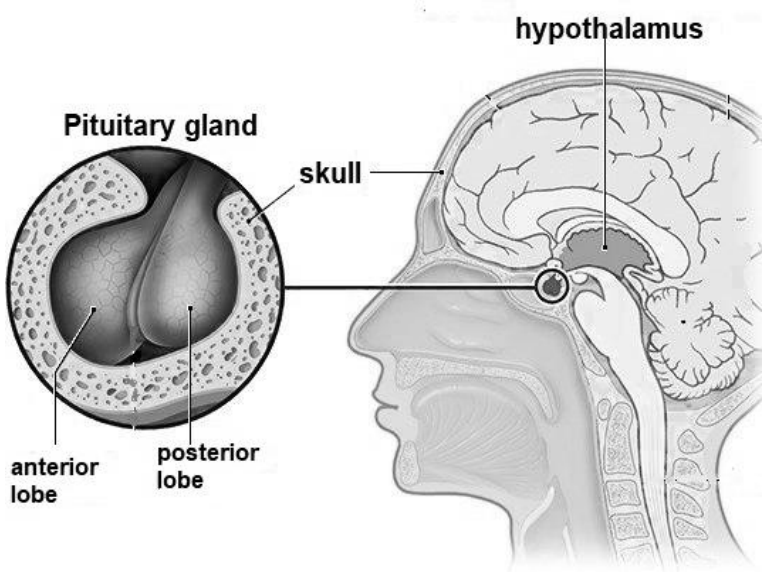
(13)

3.3 Read the following information and answer the questions that follow.

The pituitary is a small, pea-sized endocrine gland. It is found at the base of your brain, in line with the top of your nose. It is referred to as the body's "master gland" because it controls the activity of most other hormone-secreting glands.

The earliest history of the pituitary gland dates to Ancient Egypt (around 1365 BC). In 1892, Vassale and Sacchi showed that the pituitary gland produced an essential substance for life. By removing the pituitary gland, they proved that the water and mineral metabolism of the body were affected.

In 1907, Schloffer became the first scientist to operate on the pituitary via the nasal route (through the nose).
In 1910, Cushing and his team made the first experimental link between the pituitary and the reproductive organs.
Many scientists have performed experiments on dogs, trying to determine the effect of the removal of the pituitary gland.



SHAPE AND POSITION OF THE PITUITARY GLAND

3.3.1 Explain what an *endocrine gland* is. (2)

3.3.2 The pituitary gland stimulates the adrenal glands to release aldosterone in the blood.

a) Describe the position of the adrenal glands in the human body. (2)

b) State TWO functions of aldosterone in the human body. (2)

3.3.3 The scientist Cushing proved the link between the pituitary gland and the reproductive organs.
Name the hormone secreted by the pituitary gland that target the primary follicles in the ovaries to start developing.

(1)

3.3.4 The pituitary gland secretes the hormone prolactin.

a) Name the target organ of prolactin. (1)

b) Describe ONE effect of prolactin on the target organ mentioned in QUESTION 3.3.4 a). (1)

3.3.5 Describe how the pituitary gland is protected. (1)

3.3.6 State TWO functions of the hypothalamus. (2)

3.3.7 Explain how the removal of the pituitary gland in dogs would affect the release of thyroxin. (2)

3.3.8 Schloffer was the first scientist to operate on the pituitary via the nasal route. This is still the most common surgery used today to remove tumours from the pituitary gland.
Explain why scientists rather use the nasal route than opening the skull to operate on the pituitary gland. (2)

(16)

TOTAL QUESTION 3: [50]

TOTAL SECTION B: [100]

GRAND TOTAL: [150]