#### **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 answer 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 all 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 your ANSWER BOOK, for example 1.1.11 D.
  - 1.1.1 The process in the male body by which gametes are formed is called ...
    - A spermatogenesis.
    - B ovulation.
    - C copulation.
    - D fertilisation.
  - 1.1.2 Below is a list of human activities:
    - (i) Making use of public transport to go to work
    - (ii) Flying overseas regularly
    - (iii) Using alternative energy sources
    - (iv) Growing your own vegetables

Which combination of activities will help to reduce your carbon footprint?

- A (i), (ii) and (iv) only
- B (ii), (iii) and (iv) only
- C (i), (iii) and (iv) only
- D (i), (ii), (iii) and (iv)
- 1.1.3 The laying of eggs which hatch outside the body of the female is known as ...
  - A vivipary.
  - B ovipary.
  - C external fertilisation.
  - D ovovivipary.

# QUESTIONS 1.1.4 TO 1.1.6 ARE BASED ON THE DIAGRAM OF THE HUMAN EAR BELOW.



- 1.1.4 Which part is responsible for amplification of vibrations?
  - A 1
  - B 2
  - C 3
  - D 4
- 1.1.5 When the Eustachian tube is blocked, it is treated by inserting grommets into part ...
  - A 1
  - B 2
  - C 3
  - D 4
- 1.1.6 Which structures in part **1** are stimulated by changes in the direction and speed of movement?
  - A Utriculus
  - B Cristae
  - C Sacculus
  - D Maculae
- 1.1.7 A gardener removes the apical buds from a flowering shrub in her garden regularly. As a result the shrub will ...
  - A produce more lateral branches.
  - B grow taller.
  - C remain the same size.
  - D produce fewer flowers.

- 1.1.8 Farming practices such as monoculture may result in:
  - A Outbreaks of pests and diseases
  - B A decrease in the use of pesticides
  - C A decrease in pollution
  - D More stable ecosystems
- 1.1.9 A human male underwent a vasectomy where the vas deferens was cut just above the epididymis.

Which ONE of the following structures would no longer contribute towards the production of semen?

- A Seminal vesicles
- B Prostate gland
- C Seminiferous tubules
- D Cowper's gland
- 1.1.10 An investigation was conducted to determine the effect of alcohol on reaction time.

The procedure was as follows:

- Fifty adult volunteers were used.
- Their reaction times were measured at the beginning of the investigation.
- They were each given alcohol to drink.
- Their reaction times were measured again after 30 minutes.

The following factors were considered during the investigation:

- (i) Age of the volunteers
- (ii) Number of volunteers
- (iii) The amount of alcohol taken in
- (iv) Tool used to measure reaction time

Which ONE of the following combinations of factors will affect the validity of the investigation?

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

(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 number (1.2.1 to 1.2.9) in the ANSWER BOOK.
  - 1.2.1 Specialised structures in the inner ear containing sensory cells
  - 1.2.2 The part of the autonomic nervous system that prepares the body for an emergency
  - 1.2.3 A disease that is characterized by a loss of the myelin sheath of neurons in the brain
  - 1.2.4 A widening of the blood capillaries of the skin that results in increased heat loss
  - 1.2.5 The phase in meiosis in which chromosomes are arranged singly at the equator
  - 1.2.6 The use of the natural enemy of a pest to control the population size of that pest
  - 1.2.7 Vision using two eyes with overlapping fields of view, allowing good perception of depth
  - 1.2.8 The plant growth substance that is responsible for bringing about dormancy in seeds
  - 1.2.9 The hormone responsible for regulating the level of salt in the blood (9 x 1)
- 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. Write A only, B only, both A and B or none next to the question number (1.3.1 to 1.3.5) in the ANSWER BOOK.

	COLUMN I		COLUMN II	
1.3.1	Internal fertilisation occurs	A:	Vivipary	
		B:	Ovovivipary	
1.3.2	The development in some birds	A:	Precocial	
	where the hatchlings are unable to	B:	Altricial	
	move and feed on their own			
1.3.3	Regulation of water in the body	A:	Hypothalamus	
		B:	Corpus callosum	
1.3.4	Wastage of food	A:	During production	
		B:	During consumption	
1.3.5	Gland that releases its secretions	A:	Endocrine	
	directly into the bloodstream	B:	Exocrine	
				(5 x 2)

(10)

(9)

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1.4 The diagram below shows a longitudinal section of the human brain.



1.4.1	Give labels for parts <b>A</b> and <b>B</b> .	(2)
1.4.2	Give the LETTER and the NAME of the part that:	
	<ul> <li>(a) Is stimulated when the carbon dioxide level in the blood is too high</li> </ul>	(2)

(b) Is responsible for coordination of voluntary actions (2) (6)



1.5 The diagram below represents an action that takes place in the human body.

1.5.1	Provide the diagram with a heading.	(1)
1.5.2	Identify neurons <b>A</b> , <b>B</b> and <b>C</b> .	(3)
1.5.3	Name the microscopic gap between neuron <b>A</b> and neuron <b>C</b> .	(1) <b>(5)</b>

# TOTAL SECTION A: 50

## **SECTION B**

#### **QUESTION 2**

2.1 The diagram below represents stages in the life cycle of a mammal. The number of chromosomes in cells at different stages in the life cycle are shown. Study the diagram and answer the questions that follow.

9



- 2.1.1 Name the type of cell division represented by **R** in the diagram. (1)
- 2.1.2 State where in the male body the process mentioned in QUESTION 2.1.1 takes place. (1)
- 2.1.3 Identify the process represented by **S** in the diagram. (1)
- 2.1.4 If the sex chromosomes are the same as in humans, how many autosomes would be present in one of the female gametes in this mammal? (1)
- 2.1.5 Explain ONE significance of crossing over which occurs during process **R** in the diagram. (2)
- 2.1.6 Draw and label a chromosome to show its appearance after crossing over takes place. (3)

2.2 The diagram below illustrates the circulation of blood in the uterus wall of a pregnant woman. The arrows show the direction of blood flow.



- 2.2.1 Identify **A** as the region where the exchange of substances between the mother's body and the developing foetus takes place. (1)
- 2.2.2 Identify **B** as the structure in which there is a vein and two arteries. (1)
- 2.2.3 Tabulate TWO differences in the composition of the blood in a vein and in an artery found in structure **B**.

(5) (7) 2.3 The diagram below illustrates the tip of a stem at the start and at the end of an investigation on the effect of light on the growth of the stem.



- 2.3.1 State the type of growth response shown in the diagram. (1)
- 2.3.2 Name the hormone that is responsible for the growth response shown. (1)
- 2.3.3 Describe the role of the hormone mentioned in QUESTION 2.3.2 on the growth of the stem as seen at the end of the investigation.

2.4 The mammalian reflex is most prominent in aquatic animals, but is also present in humans. It allows mammals to stay underwater for longer periods of time by slowing down the heart rate and blood circulation.

In humans a way to trigger the reflex is to submerge the face in ice-water.

A group of grade 12 learners designed and performed an experiment under supervision to test the effect on heart rate when the face is submerged in ice-water.

Their procedure was as follows:

- They took a large cooler box and filled it with ice-water.
- They strapped a heart rate monitor to the forearm of each of 3 participants.
- Each person submerged/plunged their face into the ice-water and held their breath for 15 seconds.
- After removing their face from the ice-water, their heart rate was measured and recorded.

	HEART RATE (BEATS PER MINUTE)			
PARTICIPANT	CONTROL	PLUNGE 1	PLUNGE 2	PLUNGE 3
John	73	69	70	65
Katlego	69	62	63	61
Sandra	98	85	88	86

The table below shows the results of their investigation:

2.4.1 Formulate a hypothesis for this investigation.

- 2.4.2 In this investigation, identify the:
  - (a) Dependent variable (1)
  - (b) Independent variable (1)
- 2.4.3 Name what their control for the experiment might have been. (2)
- 2.4.4 The ice-water slows down the heart rate and blood circulation.

Explain how this can be an advantage when a person is drowning in icy waters.

(4) (10)

(2)

2.5 The diagram below is of a feedback mechanism between two endocrine glands in the human body.



- 2.5.1 Identify the gland labelled **A**.
- 2.5.2 A hormone from gland **A** controls the secretion of a hormone from gland **B**.

With regard to the above, explain why an under secretion of the hormone from gland  $\bf{A}$  can lead to an increase in the weight of a person.

(5) (6) [40]

(1)

# **QUESTION 3**

3.1 Study the diagram of a longitudinal section through a human eye below.



3.1.5	Describe accommodation in the eye for distant vision.	(4) <b>(12)</b>
3.1.4	State the significance of the mechanism described in QUESTION 3.1.3.	(2)
3.1.3	Describe the mechanism that causes part ${f C}$ to become smaller.	(2)
3.1.2	State ONE function of part <b>D</b> .	(1)
3.1.1	Label parts A, B and E.	(3)

- 3.2 The food we eat affects how quickly the blood glucose concentration changes. An experiment was done to record how different kinds of bread influence a woman's blood glucose concentration. She consumed three different kinds of bread as follows:
  - Firstly, two slices of white bread
  - Secondly, two slices of brown bread
  - Thirdly, two slices of wholegrain bread.

Her blood glucose levels were recorded over a period of 120 min for each kind of bread.

The graph below shows the results of the three experiments.



- 3.2.1 What was the blood glucose concentration at 80 minutes when the person ate the brown bread?
- 3.2.2 Name the organ in the human body that monitors and controls blood glucose concentration. (1)
- 3.2.3 Describe the effect of eating two slices of white bread on the person's blood glucose concentration during the two-hour period. (3)
- 3.2.4 Explain why people with diabetes mellitus have very little glycogen in their liver and muscle cells.

(3) (8)

(1)

3.3 Read the article below on the water situation in South Africa and answer the questions.

The amount of water on earth is constant, but is unevenly distributed across the earth. South Africa receives an annual rainfall of 492 mm whereas the world annual rainfall is 1 477 mm.

Scientists predict that with global warming, South Africa will experience much wetter wet seasons and much drier dry seasons, resulting in more floods and droughts.

According to the Department of Water and Environmental Affairs, the demand of water will outstrip supply in Gauteng by 2015 and the rest of South Africa by 2025. Thus water in South Africa is in great demand and as the human population increases, demand for water also increases.

A further problem adding to this demand is the decreasing water quality. One of the main causes for this is industries which produce waste that can affect the amount of nutrients like minerals that land in the water.

The table below indicates water use in	households in South Africa.
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	% Water Used	
	Low Income	High Income
Toilets	75	35
Baths and showers	20	30
Washing Machine	N/A	20
Other (cooking, washing dishes, drinking, etc.)	5	15
[Adapte	pted from an article by Rand Water's Water Wise programm	

- 3.3.1Calculate South Africa's annual rainfall as a percentage of the<br/>world annual rainfall. Show ALL working.(3)
- 3.3.2 Define global warming.
- 3.3.3 Describe the effect that an increase in nutrients can have on a water body as a result of runoff from fertilisers and pesticides. (5)
- 3.3.4 Explain TWO management strategies that local government can use to reduce water pollution in our country. (4)
- 3.3.5 Draw a pie chart to represent the data in the table for high income households in South Africa. Show ALL calculations.

(6) (20) [40]

(2)

TOTAL SECTION B: 80

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# SECTION C

#### **QUESTION 4**

Describe the process of oogenesis as it takes place in the female body. Also describe the functions of the two hormones produced by the ovaries including their role in the body during puberty.

Content: (17)

Synthesis: (3)

(20)

- **NOTE:** NO marks will be awarded to answers in the form of tables, flow charts or diagrams.
  - TOTAL SECTION C: 20
    - GRAND TOTAL: 150