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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

**LIFE SCIENCES P1
FEBRUARY/MARCH 2016**

MARKS: 150

TIME: 2½ hours

This question paper consists of 18 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 to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 The microscopic space between two adjacent neurons is a/an ...

- A axon.
- B dendrite.
- C synapse.
- D cell body.

1.1.2 The following is a list of functions performed by different organs in an organism:

- (i) Protection
- (ii) Gaseous exchange
- (iii) Nutrition
- (iv) Excretion

Which ONE of the following combinations refers to the functions performed by parts of an amniotic egg?

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

1.1.3 An investigation was done to determine the effect of alcohol on the reaction time of a person.

Reaction time was measured by the time it took to catch a ruler.

The procedure was as follows:

- The person's reaction time was first measured in a room with bright light.
- The person was then given 200 ml of alcohol to drink.
- After 15 minutes the reaction time of the person was measured for the second time while he/she was in a room with dim light.
- Ten measurements were recorded each time and an average was calculated.

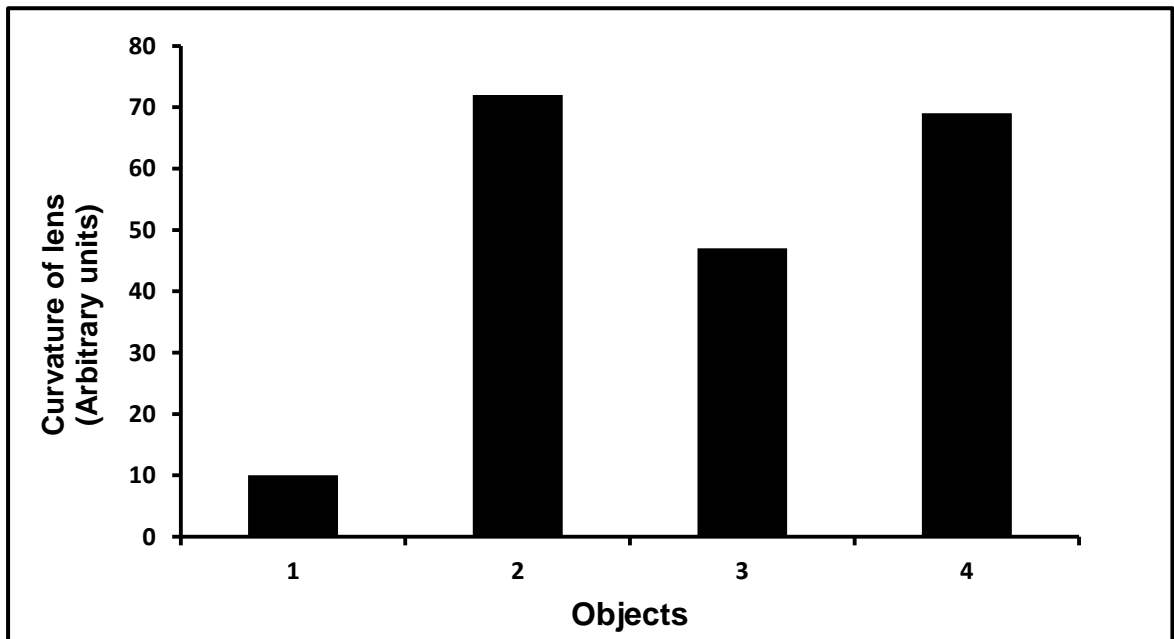
How was the validity of the investigation decreased?

- A The person's reaction time was measured in the absence of alcohol the first time.
- B Reaction time was measured by the time it took to catch a ruler.
- C Reaction time was measured in different light conditions.
- D Only ten measurements were recorded.

- 1.1.4 Which ONE of the following represents the CORRECT combination of a visual defect, its nature and the corrective measure?

	VISUAL DEFECT	NATURE OF DEFECT	CORRECTIVE MEASURE
A	Cataracts	Curvature of lens is uneven	Biconcave lenses
B	Short-sightedness	Lens cannot become less convex	Biconcave lenses
C	Astigmatism	Lens cannot become more convex	Surgery
D	Long-sightedness	Lens becomes cloudy and opaque	Biconvex lenses

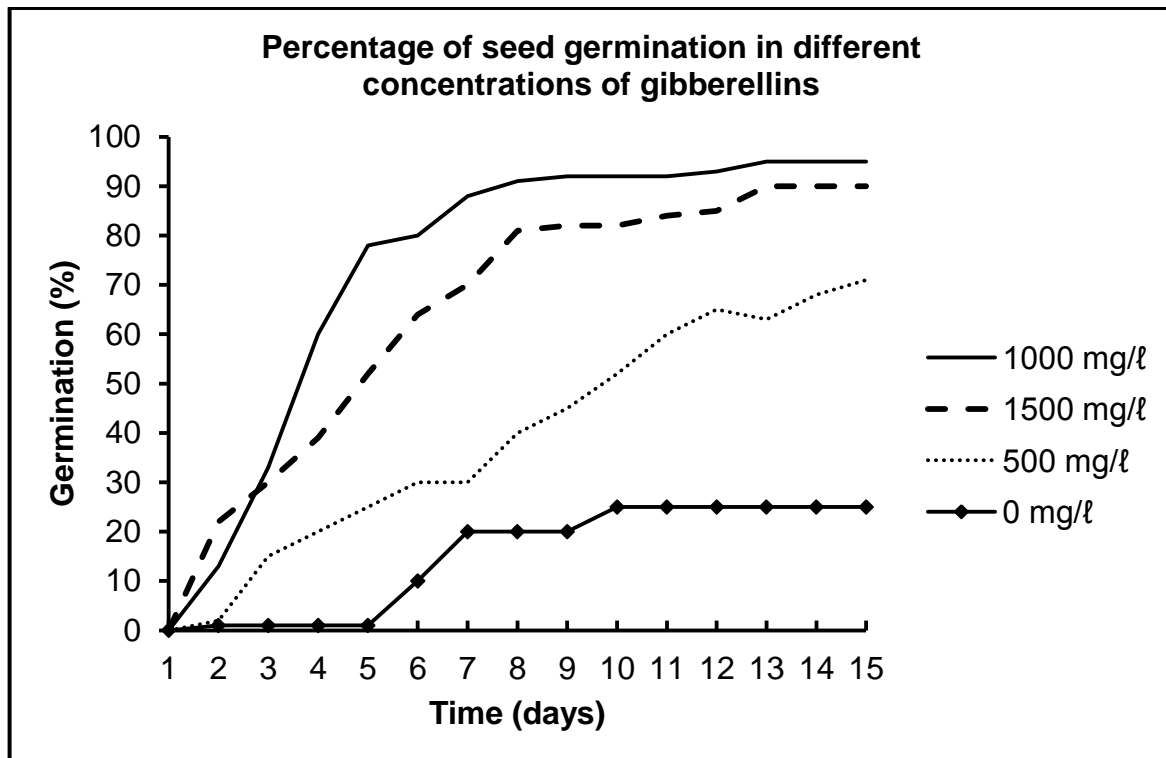
- 1.1.5 The graph below shows the curvature of the human lens when viewing objects at different distances.



Which ONE of the following objects is closest to the human eye?

- A 1
- B 2
- C 3
- D 4

- 1.1.6 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.
- 1.1.7 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.
- 1.1.8 One of the dangers of landfills is the contamination of underground water sources. This is prevented by ...

- A covering the rubbish with a layer of soil.
- B compacting the waste so that water cannot penetrate it.
- C spraying water on the soil to keep dust levels down.
- D lining the landfill with an impermeable barrier.

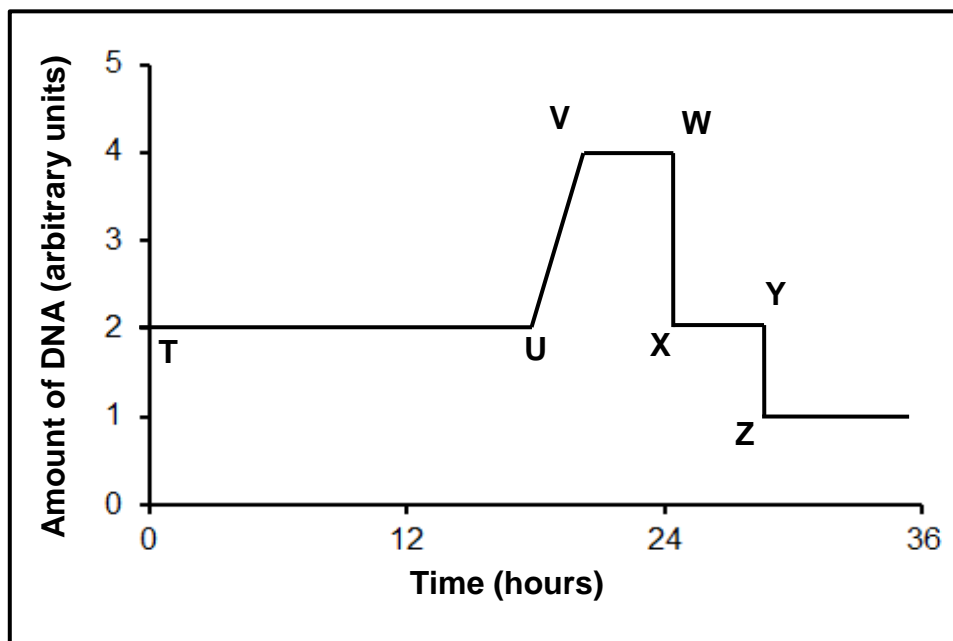
1.1.9 The following is a list of the factors affected by global warming:

- (i) Veld fires
- (ii) Biodiversity
- (iii) Drought
- (iv) Floods

Which ONE of the following combinations increases as a result of global warming?

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

1.1.10 The graph below shows changes in the amount of DNA present in a cell over a period of 36 hours.



[Adapted from www.slideshare.net]

Which ONE of the following parts of the graph represents interphase?

- A T to V
- B W to X
- C V to Y
- D X to Z

(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 1.2.8) in the ANSWER BOOK.

- 1.2.1 A type of reproduction in humans where the foetus develops inside the uterus
- 1.2.2 Structures found only in animal cells that form the spindle during cell division
- 1.2.3 The movement of part of a plant in response to gravity
- 1.2.4 The amount of carbon dioxide produced by an individual per unit time as a result of his/her activities
- 1.2.5 The stage in humans when sexual maturity is reached in males and females
- 1.2.6 A change in the internal or external environment that will be detected by a receptor and converted into an impulse
- 1.2.7 Small tubes placed in the tympanic membrane to drain liquid from the middle ear
- 1.2.8 Part of the human ear that directs sound waves into the auditory canal

(8 x 1)

(8)

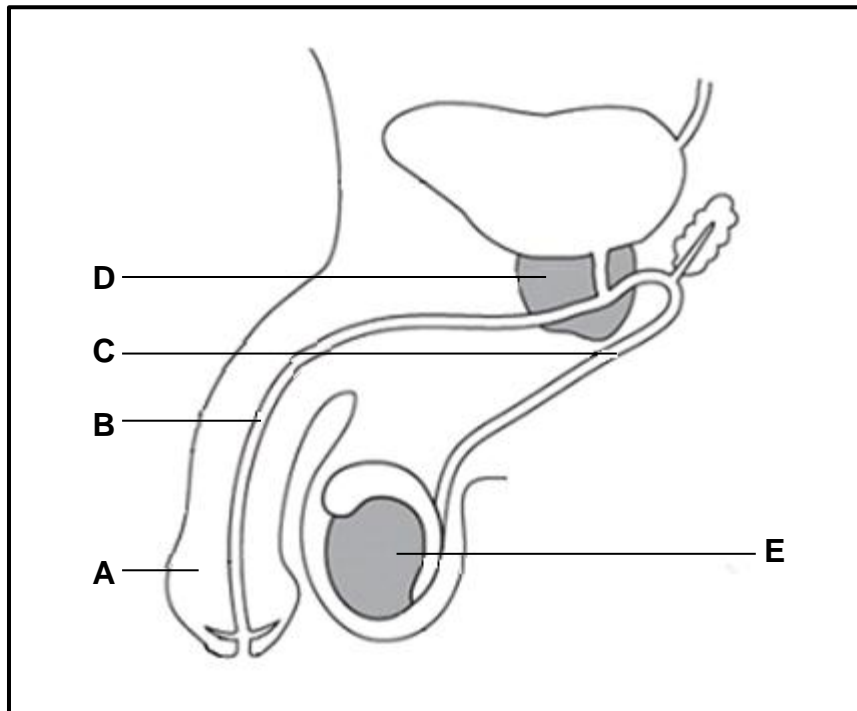
1.3 Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.4) in the ANSWER BOOK.

COLUMN I		COLUMN II	
1.3.1	A type of development in birds in which offspring are poorly developed at birth and are thus unable to feed themselves	A:	Precocial development
		B:	Altricial development
1.3.2	Forms the placenta	A:	Chorionic villi
		B:	Endometrium
1.3.3	The state of the blood vessels in the skin of a human when the environmental temperature is high	A:	Constricted
		B:	Dilated
1.3.4	Having access to enough food of good quality at all times	A:	Monoculture
		B:	Eutrophication

(4 x 2)

(8)

1.4 The diagram below represents a part of the male reproductive system.



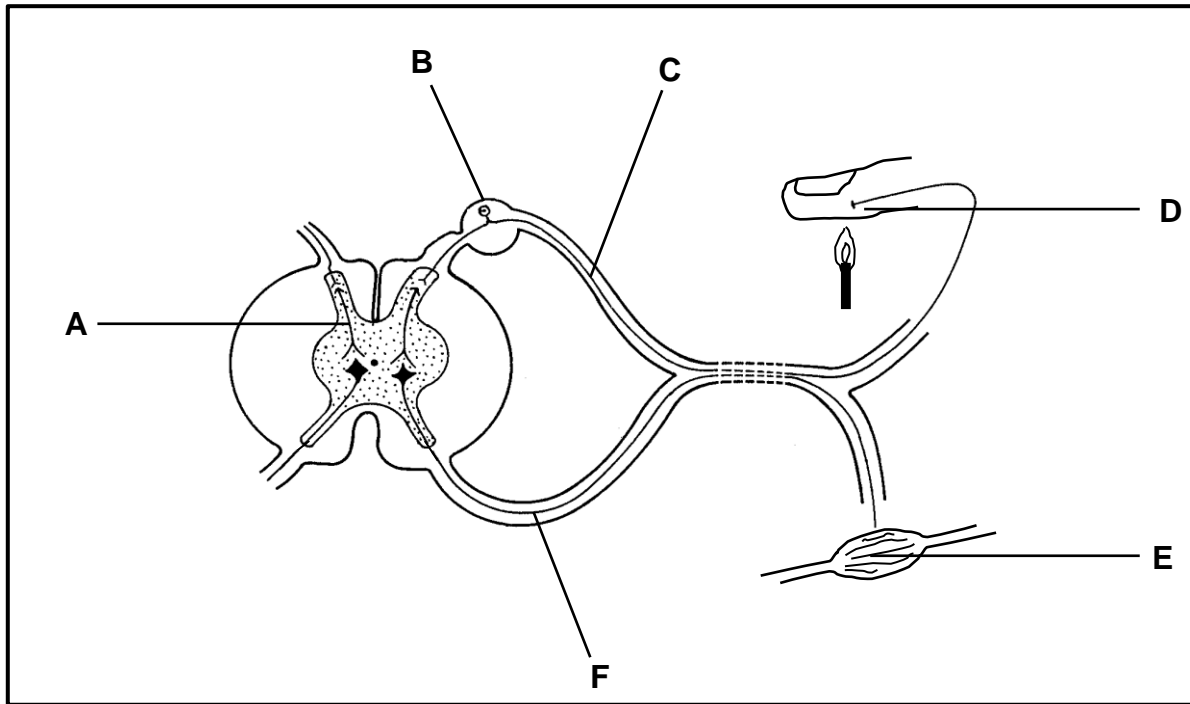
1.4.1 Give the LETTER and the NAME of the part that:

- (a) Is used in copulation (2)
- (b) Produces testosterone (2)

1.4.2 Give ONLY the LETTERS of the TWO parts in the diagram that:

- (a) Contribute to the formation of semen (2)
- (b) Provide a passage for the sperm cells (2)
- (8)**

1.5 The diagram below shows a reflex arc.



1.5.1 Give ONLY the LETTER of the part that represents the:

- (a) Effector (1)
- (b) Interneuron/Connector neuron (1)
- (c) Sensory neuron (1)

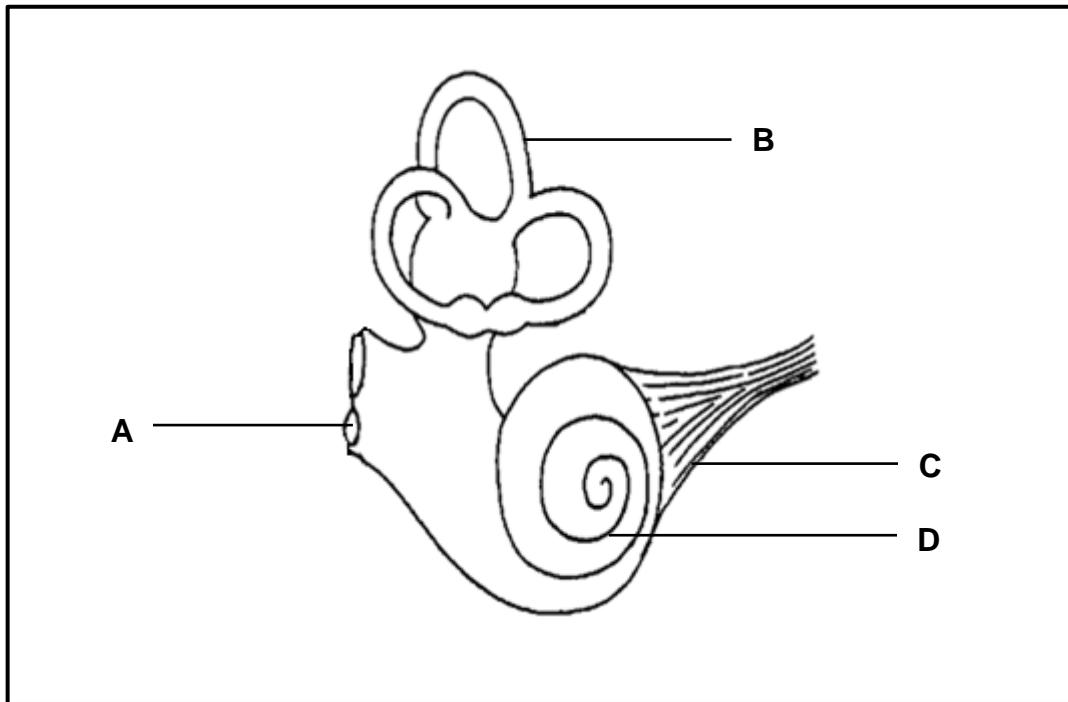
1.5.2 Give the LETTER and NAME of the neuron in the diagram that is probably damaged if a person is able to detect the stimulus, but cannot respond. (2)

1.5.3 State if the nerve impulse travels from **D** to **E** or from **E** to **D**. (1)
(6)

TOTAL SECTION A: 50

SECTION B**QUESTION 2**

2.1 The diagram below represents a part of a human ear.



2.1.1 Identify part:

- (a) **A** (1)
- (b) **D** (1)

2.1.2 Name the receptors that are found in part **B**. (1)

2.1.3 Explain the consequence to the human body if:

- (a) Part **C** is damaged (2)
- (b) Part **A** becomes hardened (2)
- (7)**

2.2 Explain why people with middle-ear infections are usually advised not to travel by aeroplane. (4)

- 2.3 An investigation was conducted to determine the relationship between the ages of women, the number of pregnancies per month and the chances of miscarriages.

The results of the investigation are shown in the table below.

AGES OF WOMEN	PREGNANCIES PER MONTH (%)	MISCARRIAGES (%)
22	25	10
28	24	11
34	18	15
40	6	24
46	2	50

[Adapted from <http://www.children.gov.on.ca>]

- 2.3.1 Draw a line graph to show the relationship between the ages of the women and the percentage of pregnancies per month. (6)
- 2.3.2 Describe the relationship that exists between the ages of women and the chances of them miscarrying. (2)
- 2.3.3 According to the data obtained, if there are 12 pregnant women who are 46 years old, how many of them are likely to miscarry? Show ALL working. (2)
- (10)**

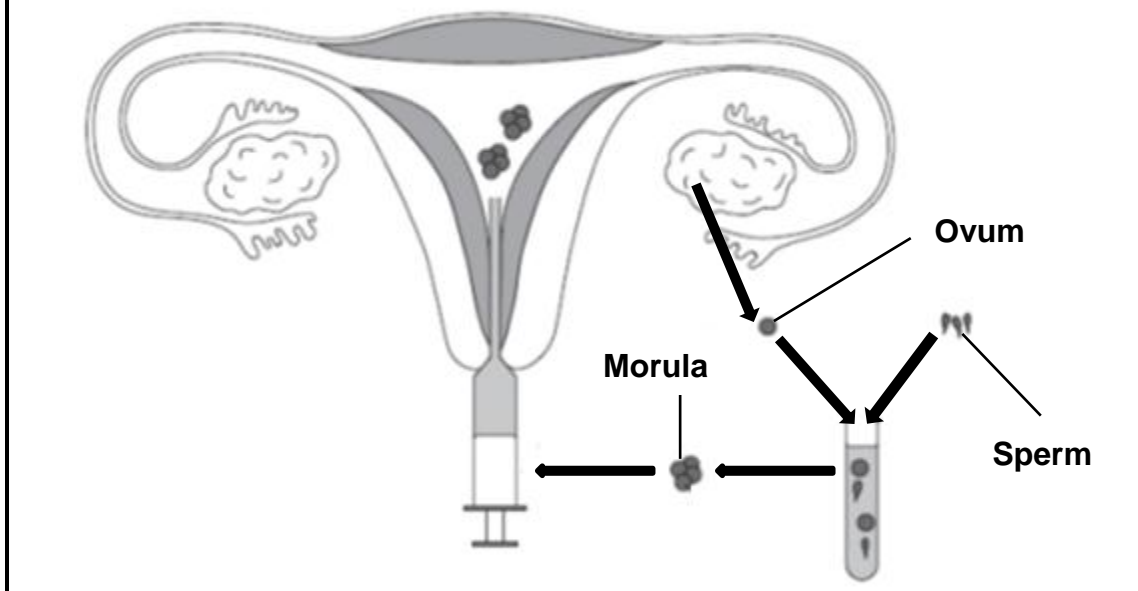
2.4 Read the extract below.

Anele found out that she had scar tissue blocking both her Fallopian tubes and therefore could not have a baby. She decided to try in vitro fertilisation (IVF).

The IVF procedure was performed as follows:

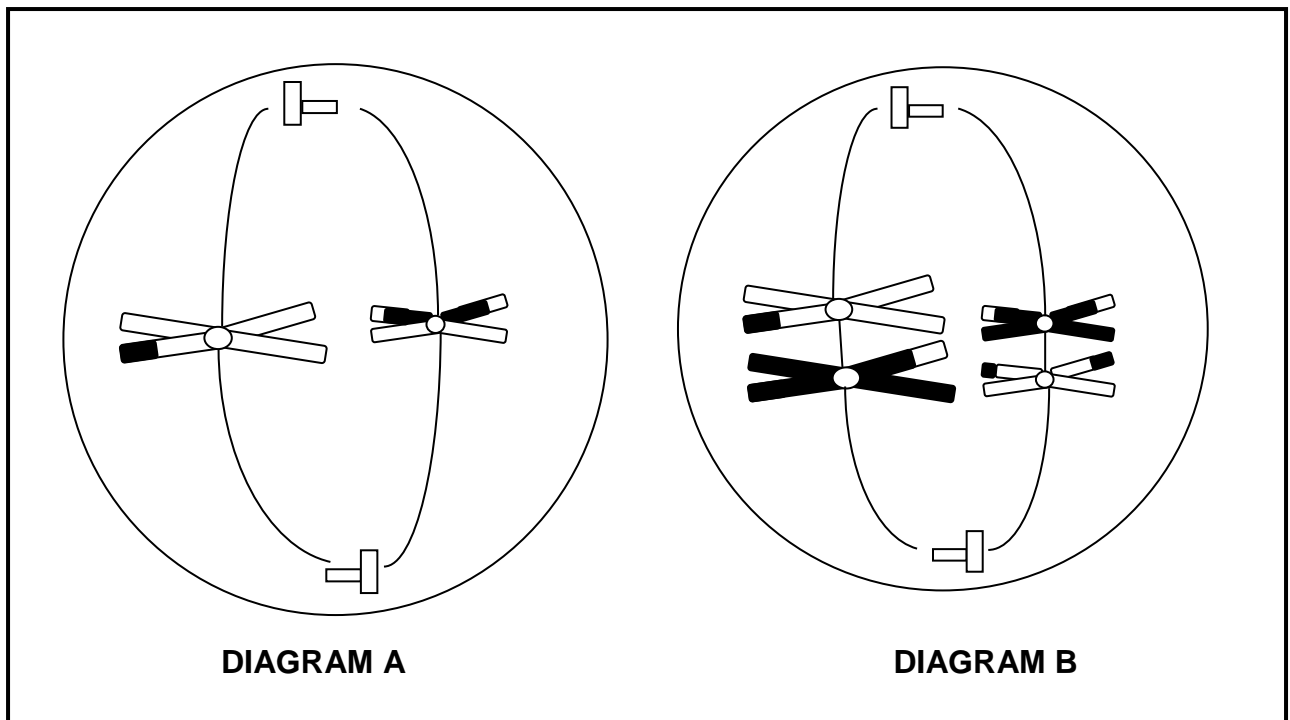
- Anele was given hormone supplements to stimulate the production of ova in the ovaries.
- The mature ova were then collected and placed in a test tube.
- Her partner was then asked to release his semen into a special container.
- The ova and the semen were then mixed in a test tube.
- The morulas that developed after a few days were then inserted into Anele's uterus.

The diagram below is a representation of how the procedure was done.



- 2.4.1 Explain why Anele's condition had prevented her from falling pregnant. (2)
- 2.4.2 Name ONE hormone that was:
- (a) Given to Anele to ensure that ova were produced in the ovaries (1)
 - (b) Produced by the developing follicles in the ovaries, as the ova were maturing (1)
- 2.4.3 Describe the events that take place in the test tube after fertilisation, until a blastocyst is formed. (4)
- 2.4.4 Explain ONE possible consequence for the developing embryo if the corpus luteum disintegrates immediately after implantation. (3)
- (11)**

2.5 The diagrams below show two phases of meiosis in an animal cell.

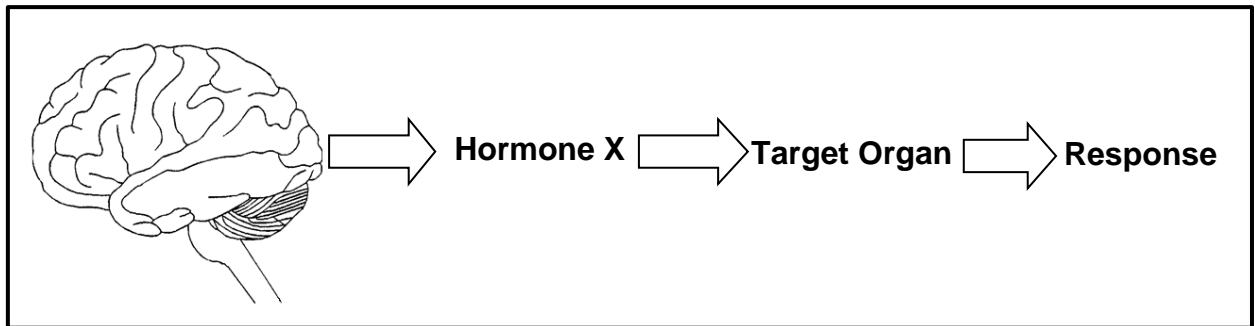


- 2.5.1 Identify the phase represented by **DIAGRAM B**. (1)
- 2.5.2 Explain why the homologous chromosomes in **DIAGRAM B** have a mixture of genetic material from each chromosome. (2)
- 2.5.3 Name the phase that will follow the one represented by **DIAGRAM A**. (1)
- 2.5.4 Describe the events that take place in the phase mentioned in QUESTION 2.5.3. (3)
- 2.5.5 Name ONE place in a human male where meiosis takes place. (1)
- (8)**
[40]

QUESTION 3

- 3.1 The diagram below represents one part of the negative feedback response that occurs when a person is dehydrated.

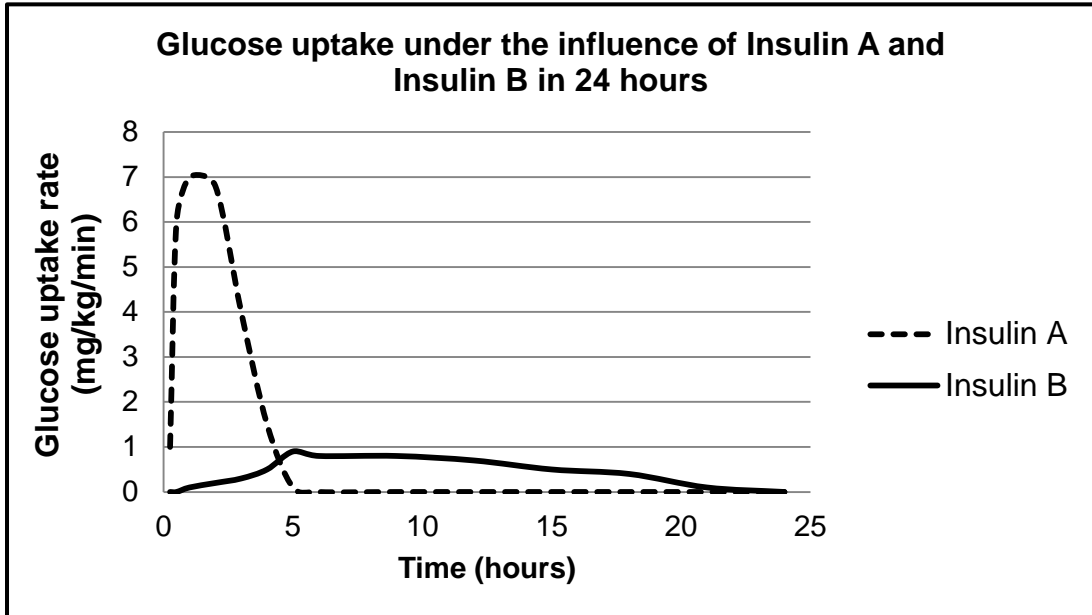
The decrease in blood volume, as a result of the excessive loss of water, is detected by the brain.



- 3.1.1 Identify the:
- (a) Hormone **X** (1)
 - (b) Endocrine gland that secretes hormone **X** (1)
 - (c) Target organ (1)
- 3.1.2 Describe the negative feedback response that occurs when a person is dehydrated, after it has been detected by the brain. (4)
- (7)**

3.2 Some people with type I diabetes cannot produce insulin and therefore need to inject themselves regularly (insulin-dependent).

An investigation was done to determine the action of two types of insulin (**A** and **B**). The glucose uptake rate of cells, when using each type of insulin, was measured over time.



[Adapted from www.webmed.com]

3.2.1 Name the human organ that produces insulin. (1)

3.2.2 Using the information in the graph, state TWO differences in the functioning of insulin **A** and **B**. (4)
(5)

3.3 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.

3.3.1 In the investigation identify the:

(a) Independent variable (1)

(b) Dependent variable (1)

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

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

3.3.4 Explain your answer to QUESTION 3.3.3. (3)

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

3.3.6 Explain your answer to QUESTION 3.3.5. (2)
(12)

3.4 Read the extract below.

WATER CRISIS IN SOUTH AFRICA

The impact of the water scarcity will be one of South Africa's biggest problems soon. Recently a province had to switch off the water supply because the dams were 'so close on the edge'. It is stated that people are using more water than what's available; the demand is more than the supply.

About 37% of the clean, drinkable water is being lost through poor infrastructure (leaking pipes, dripping taps) and wastage. About 60% is used for irrigation.

Industries and mines also contribute to the water crisis by polluting our water bodies. They generate harmful waste which is sometimes dumped into water bodies, creating acid mine drainage. The impact of climate change also adds to the water crisis.

There is a suggestion that South Africa needs to work with neighbouring countries to come up with solutions. An example is to grow the agricultural products in neighbouring countries with a higher rainfall, and then South Africa imports these products.

[Adapted from mq.co.za/article and www.news24.com]

- 3.4.1 Refer to the extract and state TWO causes of the water crisis facing South Africa. (2)
- 3.4.2 State how importing agricultural products from neighbouring countries would reduce South Africa's water crisis. (1)
- 3.4.3 Explain how switching off the water supply would affect the industries that depend on water. (2)
- 3.4.4 The South African government could possibly solve the water crisis by increasing the cost of water.
- Suggest TWO ways in which this solution could help to reduce the water crisis. (2)
- (7)**

- 3.5 Invasive alien plants can cause environmental problems in an area.
- 3.5.1 Explain the impact of invasive alien plants on:
- (a) Food security (3)
 - (b) Water availability (2)
- 3.5.2 Explain ONE DISADVANTAGE of controlling invasive alien plants using the following methods:
- (a) Biological method (2)
 - (b) Mechanical method (2)
- TOTAL SECTION B: 80**

SECTION C

QUESTION 4

Plants and animals are both able to sense and respond to light.

Explain how plant stems respond to unilateral light and describe the path taken by light through the human eye until it is converted into an impulse.

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

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

TOTAL SECTION C: 20
GRAND TOTAL: 150