



education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

LIFE SCIENCES
SBA ASSIGNMENT

**CODE OF LIFE, MEIOSIS, REPRODUCTION, GENETICS, RESPONDING TO THE
ENVIRONMENT: HUMANS, ENDOCRINE AND HOMEOSTASIS, RESPONSE TO THE
ENVIRONMENT: PLANTS, EVOLUTION**

MARKS: 100

TIME: 1h 40 min

This question paper consists of 15 pages.

**N.B: This assignment has to be done under controlled conditions
(not to be taken home)**

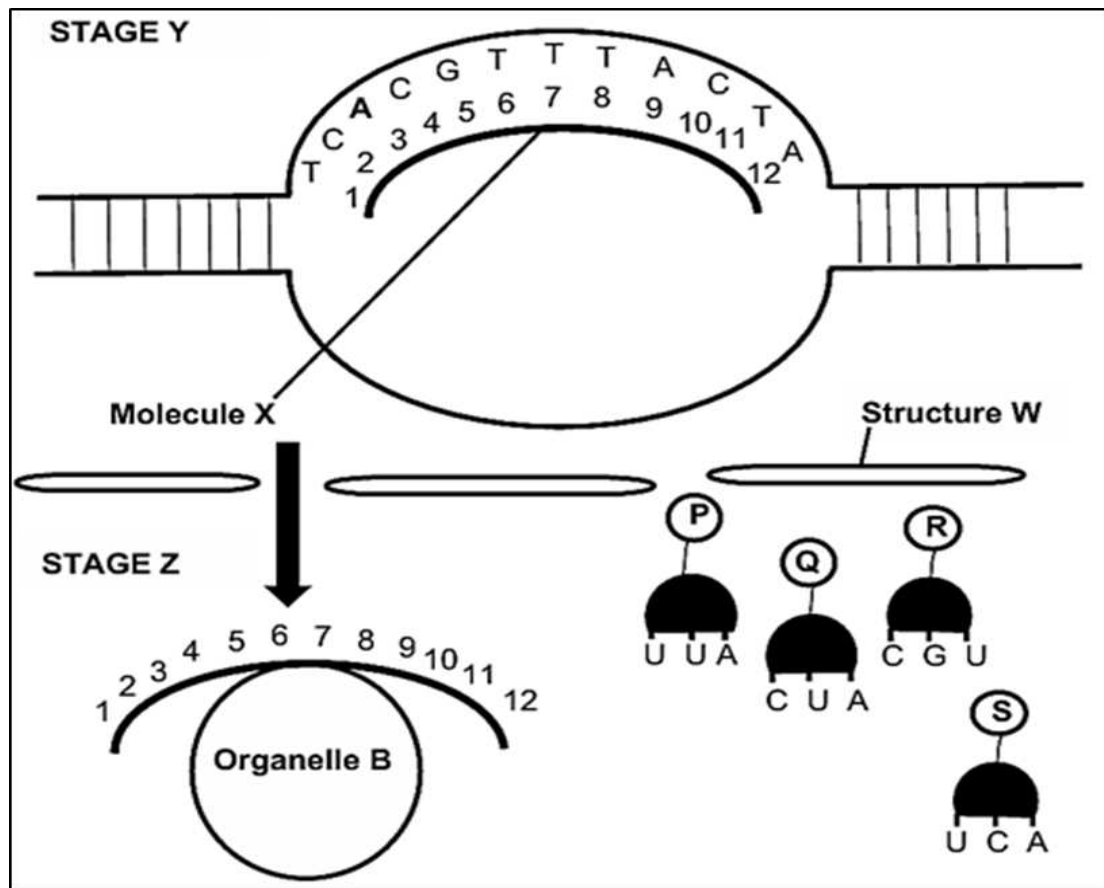
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the 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 correctly according to the numbering system used in this 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 or black ink.
7. Draw diagrams 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 may use a non-programmable calculator, protractor and a compass.
11. Write neatly and legibly.

QUESTION 1: DNA CODE OF LIFE

Study the diagram below.

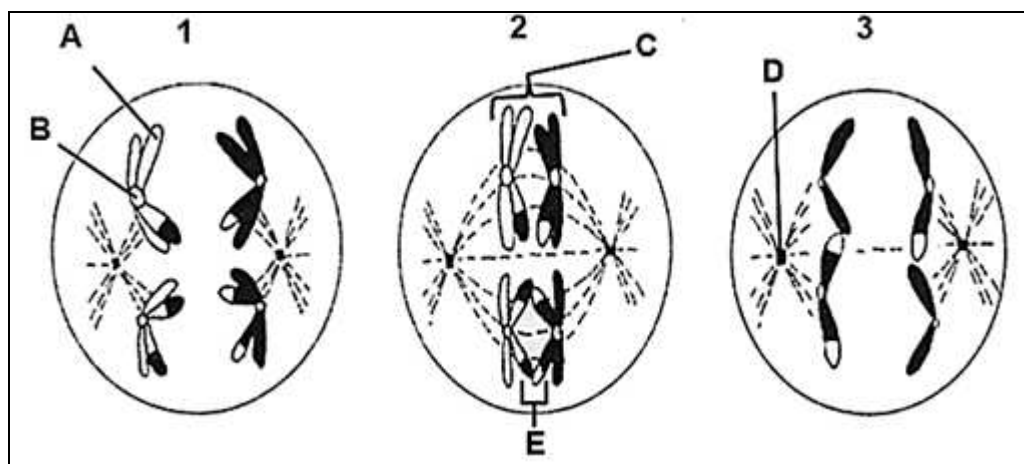


- 1.1 Name the process represented in the diagram above. (1)
- 1.2. Identify:
 - 1.2.1 Molecule X (1)
 - 1.2.2 Organelle B (1)
 - 1.2.3 Structure W (1)
 - 1.2.4 Stage Z (1)
- 1.3 Give the sequence of nitrogenous bases for the first codon on molecule X (1, 2, 3). (2)
- 1.4 Give the correct order in which molecules P, Q, R and S would attach to molecule X. (From left to right) (2)
- 1.5 Where in a cell does stage Z occur? (1)
- 1.6 If the third nitrogenous base (A) of the DNA strand was replaced by G, describe how this would affect the protein that will form. (4)

(14)

QUESTION 2: MEIOSIS

The diagram below represents 3 phases of a cell division process.



- 2.1 Name the type of cell division shown in the diagram above. (1)
- 2.2 State the: (1)
- 2.2.1 Process that has taken place at E (1)
- 2.2.2 Organ in a male animal where this type of cell division occurs (1)
- 2.3 Label parts: (1)
- 2.3.1 A (1)
- 2.3.2 B (1)
- 2.3.3 C (1)
- 2.3.4 D (1)
- 2.4 Identify phase: (1)
- 2.4.1 2 (1)
- 2.4.2 3 (1)
- 2.5 How many chromosomes will there be in each cell at the end of the cell division process indicated in the diagram above? (1)
- (10)**

QUESTION 3: REPRODUCTION IN VETERBRATES

Read the passage below.

Seahorses are strange but interesting animals in which the male seahorses undergo pregnancy and give birth to young seahorses. The male seahorse has a pouch (bag) on its stomach in which to carry babies.

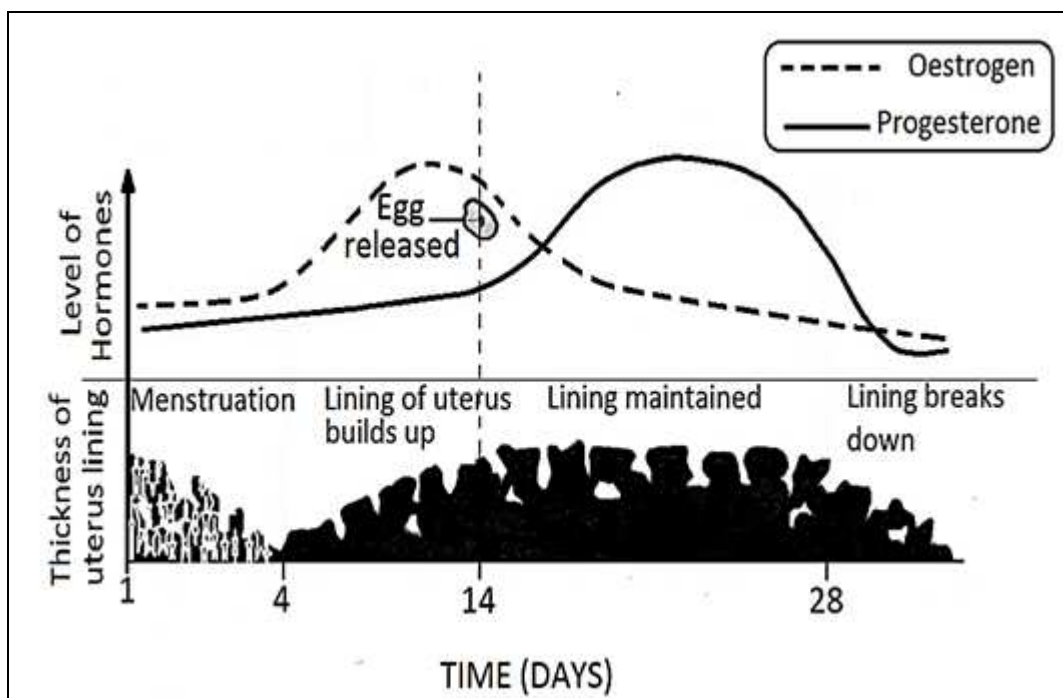
The reproductive process begins when a male and a female seahorse engage in a dance which can last as long as eight hours. This ends with the female depositing her eggs in the male's pouch. The eggs are then fertilised and hatch in the male's pouch.

The male cares for the embryos as they develop providing oxygen and nutrients through the thickened skin inside a pouch until they are ready to be born; unlike in humans where the placenta provides the oxygen and nutrients to the developing embryo.

- 3.1 What type of fertilisation does the seahorse have? (1)
- 3.2 Explain your answer to QUESTION 3.1. (1)
- 3.3 Why is the seahorse reproductive strategy considered to be ovovivipary? (2)
- (4)**

QUESTION 4: HUMAN REPRODUCTION

- 4.1 Study the graphical representation of a normal menstrual cycle and answer the question

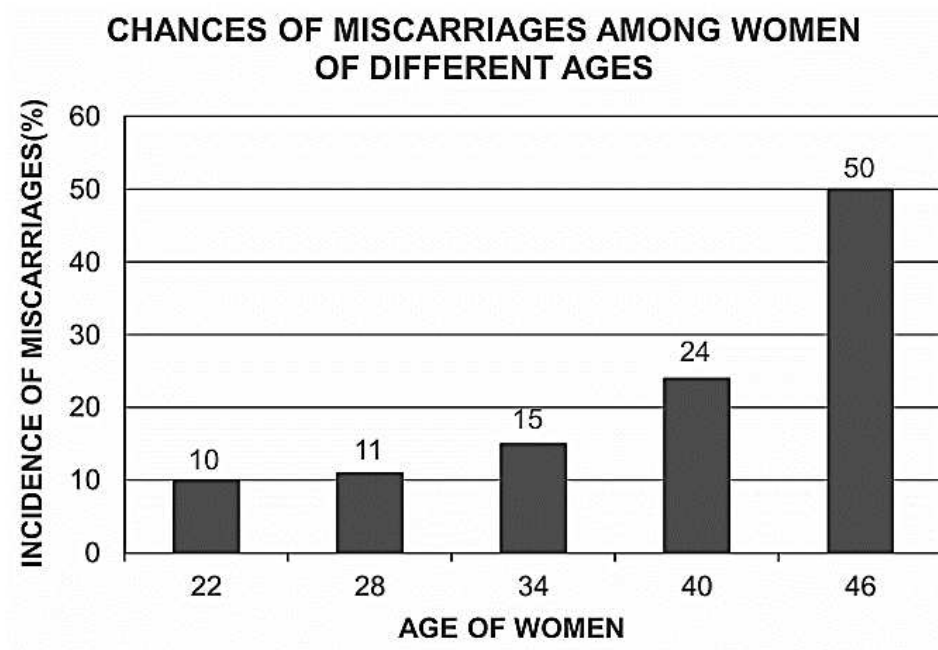


- 4.1.1 Name the source of the hormones below:
- (a) Oestrogen (1)
 - (b) Progesterone (1)
- 4.1.2 What possible conclusion can be drawn if the progesterone level remains high after the 28th day of the cycle? (1)
- 4.1.3 Explain why the insertion of IUD (Intra Uterine Device) into the uterus does not stop the occurrence menstrual cycle but prevents pregnancy. (2)
- (5)**

4.2 An investigation was conducted to determine the relationship between the ages of women and the chances of miscarriages. A group of 20 women from each age group and from different racial groups in a specific area were selected randomly.

- Different groups of women were exposed to similar medical care and similar diets
- Women were encouraged to do similar physical activities
- Different groups were monitored and exposed to similar social environment

The results of the investigation are shown in a graphical form below:



- 4.2.1 What was the sample size selected for this investigation? (1)
- 4.2.2 Identify the: (1)
- (a) Independent variable (1)
- (b) Dependent variable (1)
- 4.2.3 Describe the relationship that exists between the ages of women and the chances of them miscarrying. (2)
- 4.2.4 How would you improve the reliability of this investigation? (2)
- 4.2.5 According to the data obtained, how many of the women sampled who are 46 years old are likely to miscarry? Show ALL working. (2)
- (9)**

QUESTION 5: GENETICS AND INHERITANCE

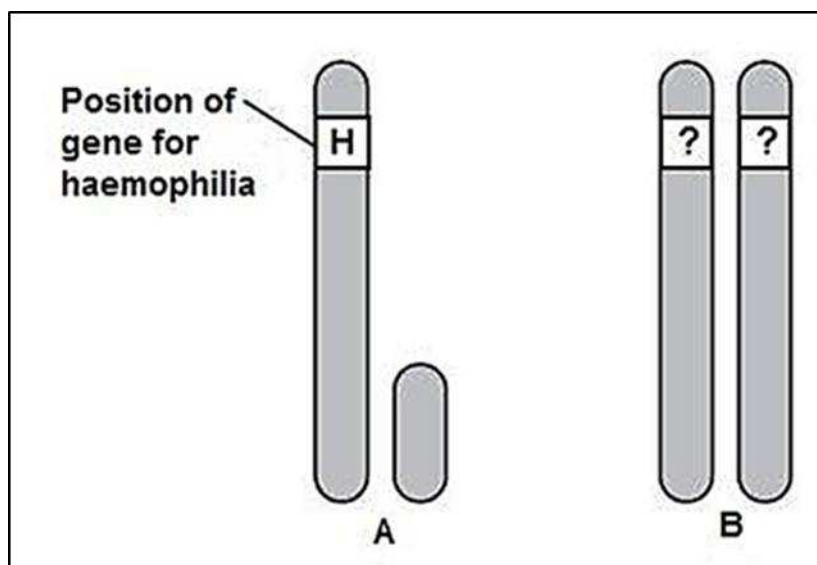
- 5.1 Huntington's disease is caused by a single dominant allele (H) of a gene which is not sex-linked. A man heterozygous for this condition marries a woman that is unaffected.

Show by means of a genetic cross the percentage chance of them having children with Huntington's disease.

(6)

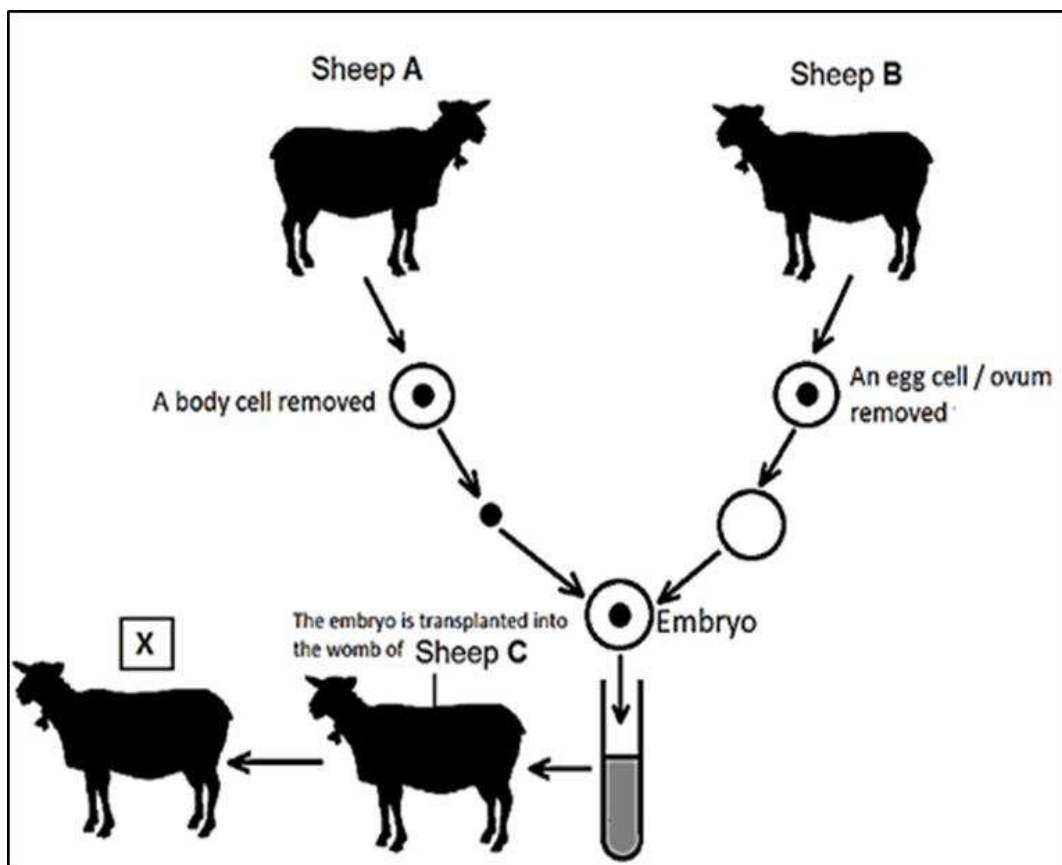
- 5.2 Haemophilia is a disorder which results in a faulty blood-clotting protein.

The diagram below shows the chromosomes from two individuals relating to this disorder.



- 5.2.1 Individual B is a normal female who is a carrier of the allele for haemophilia. Give the genotype of individual B. (1)
- 5.2.2 State the phenotype of individual A. (1)
- 5.2.3 Why is there no chance of this couple (A and B) producing a daughter with haemophilia? (3)
- (5)

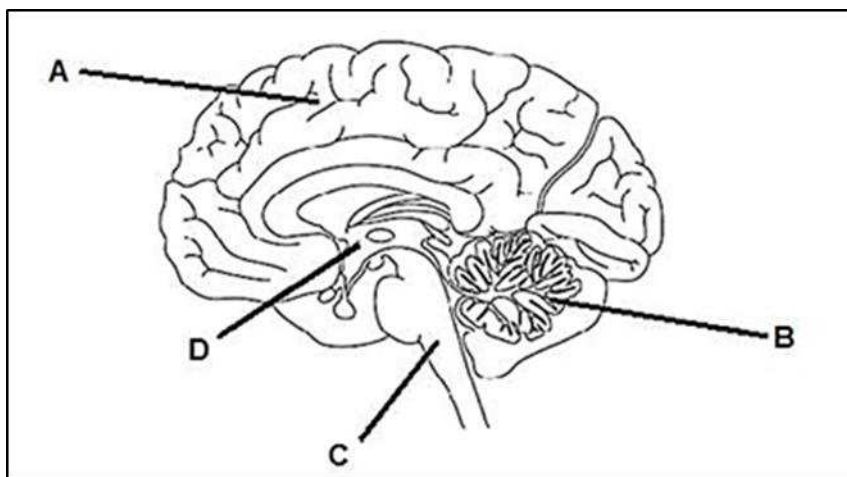
- 5.3 The diagram below shows a biotechnology research project to improve quality of sheep. Study the diagram and answer the questions.



- 5.3.1 Identify the biotechnological process represented in the above diagram. (1)
- 5.3.2 Describe the process mentioned in QUESTION 5.3.1. (4)
- 5.3.3 Does sheep X inherit desired characteristics from Sheep A or B? (1)
- 5.3.4 Explain your answer in QUESTION 5.3.4. (2)
- (8)**

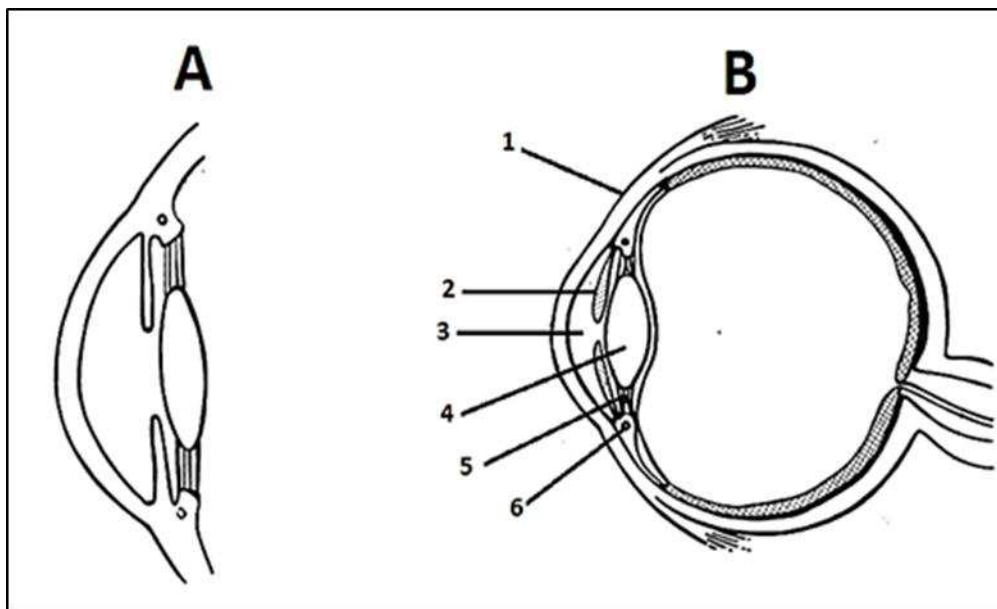
QUESTION 6: RESPONDING TO THE ENVIRONMENT – HUMANS

- 6.1 The brain acts as the main coordinated centre for nervous activity. It receives information, interprets it and responds accordingly.



- 6.1.1 Give the LETTER only of the part of the brain that controls the following:
- (a) Breathing (1)
 - (b) Memory (1)
- 6.1.2 The part labelled A is made up of two similar halves.
How are these two halves attached to each other? (1)
- 6.1.3 State ONE way in which the brain is protected. (1)
- 6.1.4 State TWO reasons why humans need a nervous system. (2)
- (6)**

- 6.2 The diagrams below illustrate how a human eye accommodates distant and near vision. Study them and answer the questions.



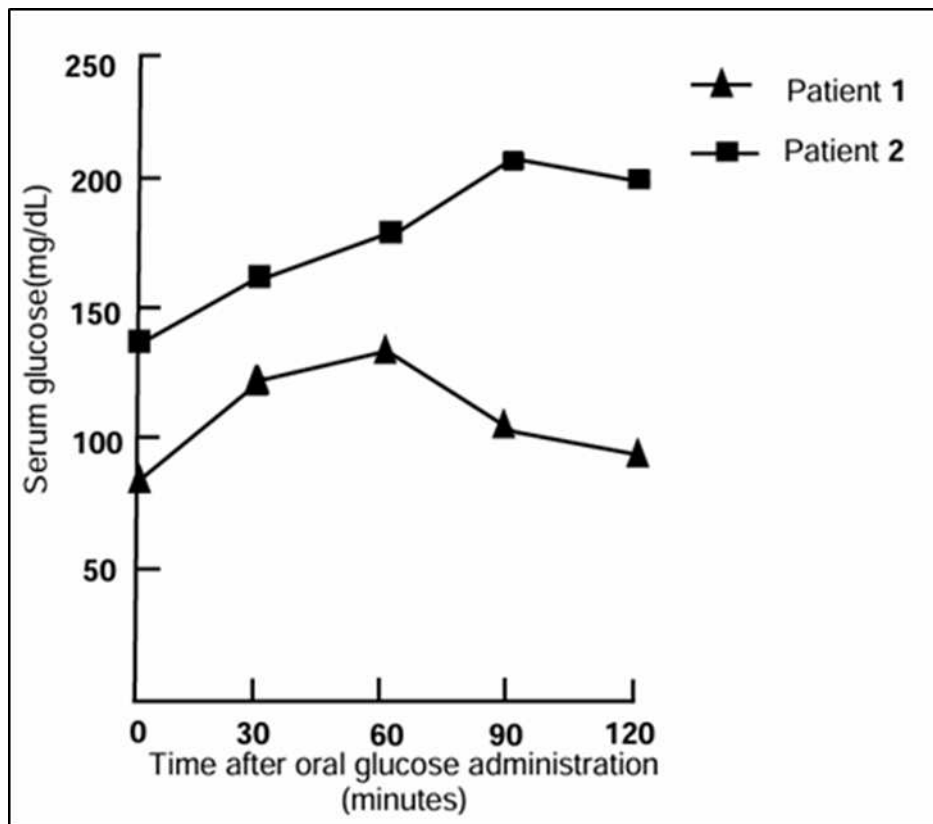
- 6.2.1 Which lens (A or B) is adjusted to accommodate distant vision? (1)
- 6.2.2 Which numbered part regulates the amount of light entering the eye? (1)
- 6.2.3 Which part can be damaged permanently if laser beams are directed into the eye? (1)
- 6.2.4 Explain how the changes from A to B were brought about. (5)
- (8)**

QUESTION 7: ENDOCRINE SYSTEM & HOMEOSTASIS

- 7.1 An oral glucose tolerance test is used to determine if a person is normal or is already diabetic.

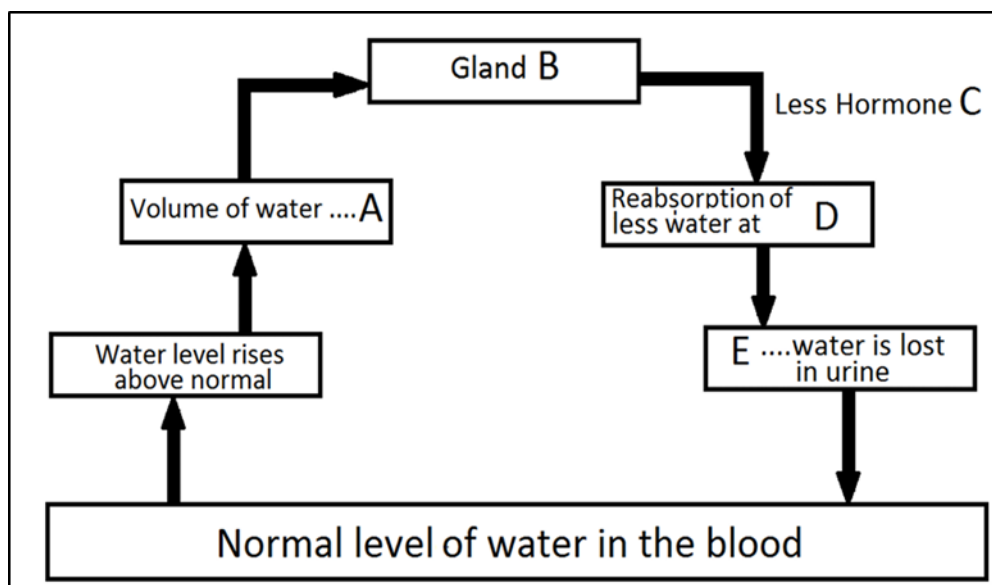
This test was performed on two people. After fasting for 12 hours, each person was given the same glucose solution to drink and then their blood glucose levels were measured every 30 minutes for two hours.

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



- 7.1.1 Which patient is diabetic? (1)
- 7.1.2 Give TWO reasons from the graph to justify your answer in QUESTION 7.1.1 (2)
- 7.1.3 Explain why patient 1 is able to survive without food for a longer period than patient 2. (2)
- (5)

- 7.2 The diagram below illustrates a homeostatic process to restore the correct level of water in the blood. Study the diagram and answer the questions that follow.

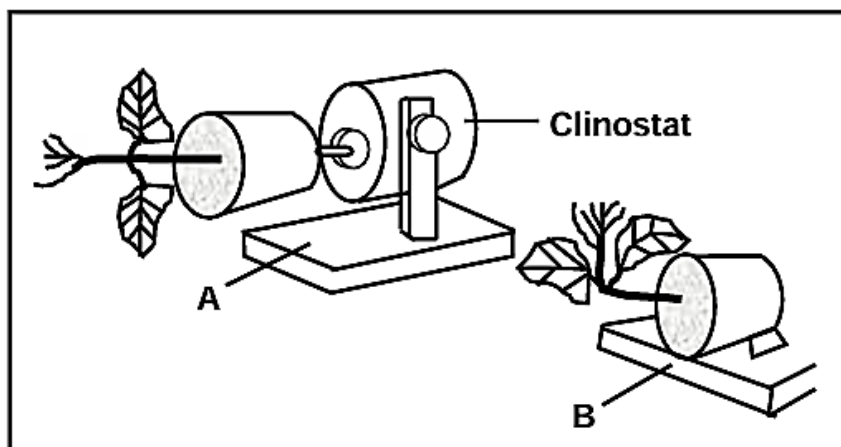


- 7.2.1 Does the volume of water in the blood at A, increase or decrease? (1)
- 7.2.2 Identify the gland labelled B. (1)
- 7.2.3 Name the hormone C. (1)
- 7.2.4 In which specific part of organ D does the reabsorption of water take place? (1)
- 7.2.5 What quantity of water E is lost in urine? (more / less) (1)
- (5)**

QUESTION 8: RESPONDING TO THE ENVIRONMENT – PLANTS

A group of Grade 12 learners set up the following apparatus in their classroom. Two plants were used. One was placed on a clinostat that rotated (Diagram A) and the other was placed in a stationary position (Diagram B). They left the apparatus in these positions inside a dark cupboard for two weeks before making the observations as indicated in the diagram below.

NOTE: A clinostat is an apparatus that is able to rotate.



- 8.1 What type of plant growth movement was observed? (1)
- 8.2 Briefly explain the results observed in A. (3)
- 8.3 State ONE reason why the apparatus was placed in a dark cupboard for the duration of the investigation. (1)
- (5)**

QUESTION 9: EVOLUTION – THEORIES OF EVOLUTION

Read the following extract.

**Sea stars have undergone 'superfast biological evolution'
(A new species has emerged in the past 6 000 to 22 000 years)**

Two species of *Cryptasterina* sea stars are found in coastal Australia. *Cryptasterina pentagona* is found in warmer water further north, while *Cryptasterina hystera* is found further south in cooler water.

C. pentagona has two separate sexes, males and females, which release sperm and eggs into the water to fertilize and become larvae. These larvae float around in the water before settling down and growing into adult sea stars.

C. hystera are bisexual that brood their young inside their bodies and give birth to tiny sea stars that then mature into adults. Researchers have concluded that these two species arose from a recent common ancestor via natural selection. They believe that, over thousands of years, the sea environment has changed, with the boundary line between cold water and warm water moving further north. They also have found that water temperature and predation of sea star larvae by cold water predators are important selection pressures on these sea stars.

[Adapted from: www.livescience.com/sea-stars-fast-evolution]

- 9.1 Use the theory of evolution through natural selection to explain why only *C. hystera* is found in Australia's cooler water, but not *C. pentagona*. (6)
- 9.2 State the TWO principles (laws) that Lamarck used to explain evolution. (2)
- 9.3 Give TWO reasons why most scientists reject this theory. (2)

(10)

GRAND TOTAL: 100