



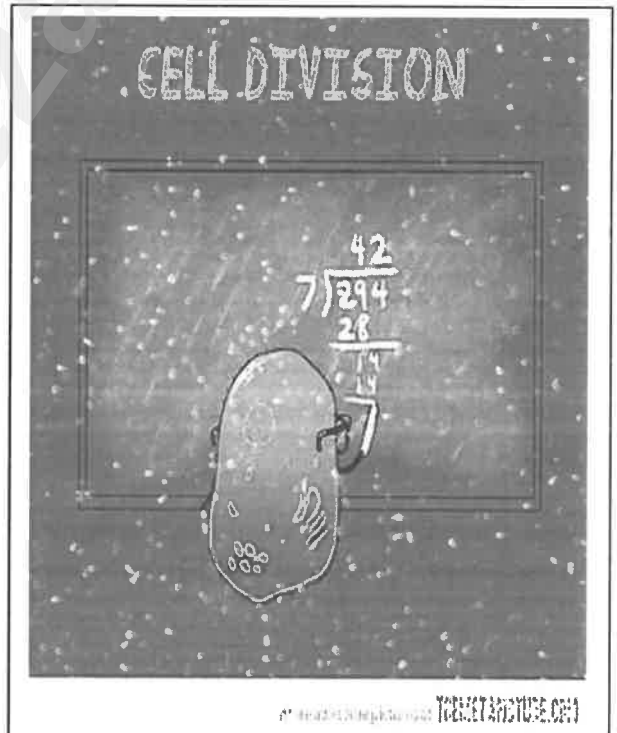
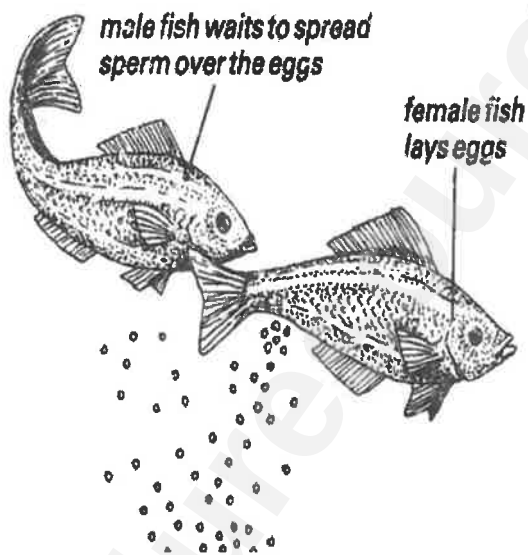
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LIFE SCIENCES

JUNE EXAM 2019

REVISION QUESTIONS

External Fertilization



NAME & SURNAME: _____

2019

ADAPTED BY MR S.J SILAULE

GRADE 12 JUNE EXAM REVISION

SECTION A

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 1.2.4) in your ANSWER BOOK.

1.2.1 The type of cell division that occurs in the production of gametes

1.2.2 Chromosome condition describing the presence of two sets of chromosomes in a cell

1.2.3 The 22 pairs of chromosomes in the human karyotype that is not associated with gender

1.2.4 The phase of meiosis where the two chromosomes of each homologous pair are pulled to the opposite pole

(4)

1.2 Give the correct biological term for each of the following descriptions. Write only the term next to the question number (1.2.1–1.2.7) in ANSWER BOOK.

1.2.1 A disorder of the eye which occurs when the lens becomes opaque and cloudy resulting in partial or no vision

1.2.2 Receptors for balance found within the ampullae of the semi-circular canals

1.2.3 Alternate forms of a gene that control the same characteristic but in different ways

1.2.4 Undifferentiated embryonic cells with a potential to become any tissue or organ in the body

1.2.5 Hormone responsible for apical dominance in plants

1.2.6 Gland that secretes FSH and LH in females

1.2.7 The cells that secrete testosterone in males

(7 x 1)

(7)

- 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 1.2.7) in your ANSWER BOOKLET.**
- 1.2.1 The condition where an individual has two copies of the same allele for a particular characteristic.**
 - 1.2.2 Cells which are undifferentiated and have the potential to develop into any type of tissue or organ in the body.**
 - 1.2.3 The position of a gene on a chromosome.**
 - 1.2.4 A condition of a phenotypical characteristic when it is not expressed in a heterozygous individual.**
 - 1.2.5 The part of the retina where there are no rods and cones.**
 - 1.2.6 The part of the brain that coordinates all voluntary muscle movements.**
 - 1.2.7 The point of contact between two homologous chromosomes during crossing over. (7)**

1.2 Give the correct biological term for each of the following descriptions. Write only the term next to the question number (1.2.1–1.2.10) in the ANSWER BOOK.

- 1.2.1 The connecting tube between the middle ear and the pharynx
 - 1.2.2 The layer in the human eye in which rods and cones are present
 - 1.2.3 A group of nerve cell bodies of neurons that form a swelling outside the spinal cord
 - 1.2.4 A zygote, having a pair of homologous chromosomes, both with recessive characteristics
 - 1.2.5 A point where the exchange of genetic material occurs during crossing over
 - 1.2.6 Phase in meiosis in which chromosomes line up at the equator in pairs
 - 1.2.7 The two strands that make up a chromosome
 - 1.2.8 The liquid secreted by the testes and associated glands containing sperm cells
 - 1.2.9 A technique of determining an individual's DNA characteristics
 - 1.2.10 The structure that holds two strands of the chromosome together
- (10 x 1) (10)

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 The variety of plant and animal species on Earth
- 1.2.2 The membrane that transmits sound vibrations to the inner ear
- 1.2.3 The reproductive strategy where the development of the young takes place in the uterus of the mother
- 1.2.4 The male reproductive tube that connects the testis with the urethra
- 1.2.5 The reproductive strategy involving the laying of eggs
- 1.2.6 Splitting of the cytoplasm during cell division
- 1.2.7 The access, by all people at all times, to adequate, safe and nutritious food
- 1.2.8 The part of the ear that equalises the pressure on either side of the tympanic membrane
- 1.2.9 A defective condition of the eye where a person can see nearby objects clearly while distant objects are blurred (9 x 1) **(9)**

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 your ANSWER BOOK.

- 1.2.1** The division of the cytoplasm during meiosis in animal cells
- 1.2.2** A representation of the number, shape and arrangement of all the chromosomes in the nucleus of a somatic cell
- 1.2.3** Undifferentiated cells that can form any other cell type in an organism
- 1.2.4** The structure formed from Graafian follicle after ovulation
- 1.2.5** A tentative explanation of a phenomenon that can be tested
- 1.2.6** The pattern of growth and development of organisms which can move around soon after birth or hatching
- 1.2.7** The reproductive strategy involving the laying of eggs
- 1.2.8** Inheritance due to genes on the gonosomes

(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 1.3.5) in the ANSWER BOOK.

0000	COLUMN I	COLUMN II
1.3.1	A heritable unit that determines a specific characteristic	A Gene B Allele
1.3.2	The use of living organisms to produce useful products	A Genetic engineering B Biotechnology
1.3.3	The genetic composition of the combination of alleles for a particular characteristic	A Dominant B Recessive
1.3.4	Plays a role in paternity testing	A Blood grouping B DNA profiles
1.3.5	A change in the nucleotide sequence in the DNA molecule	A Chromosomal mutation B Gene mutation

- 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 1.3.5) in the ANSWER BOOK, for example 1.3.6 **B only**

	COLUMN I	COLUMN II
1.3.1	Both alleles are equally dominant resulting in patches of two different colours of fur in animals	A Incomplete dominance B Co-dominance
1.3.2	Random arrangement of chromosomes on the equator during meiosis	A Mendel's law of Independent assortment B Mendel's law of segregation
1.3.3	Accommodation of the eye for distant vision	A Ciliary muscles contract B Lens becomes more convex
1.3.4	The hormone that controls the blood glucose level.	A Glucagon B Insulin
1.3.5	When red flowers (RR) are crossed with white flowers (ww) offspring will be	A All red B All pink

- 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 paper (1.3.1–1.3.3) in the ANSWER BOOK.

COLUMN I		COLUMN II	
1.3.1	Presence of umbilical cord	A	Vivipary
		B	Ovipary
1.3.2	The abiotic component essential for external fertilisation	A	Sunlight
		B	Water
1.3.3	Stores waste produced by the embryo in an amniotic egg	A	Chorion
		B	Amnion

(3 x 2) (6)

- 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 1.3.4) in the ANSWER BOOK.

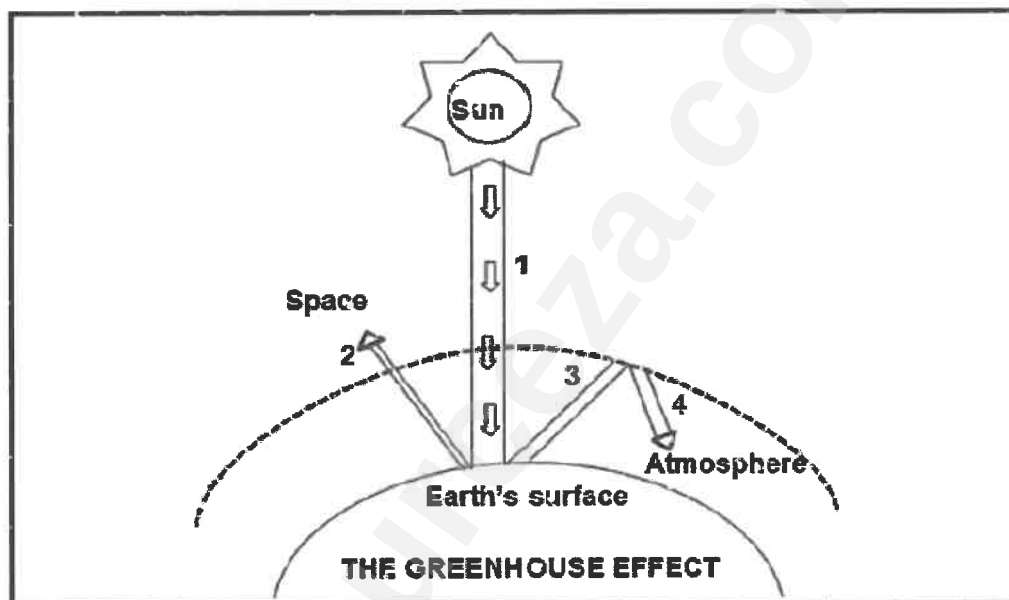
COLUMN I		COLUMN II	
1.3.1	Stimulated by changes in the position of the head	A:	Maculae
		B:	Cristae
1.3.2	Occurs during accommodation for distant vision	A:	Suspensory ligaments slacken
		B:	Lens becomes less convex
1.3.3	Occurs in the iris under dim light conditions	A:	Circular muscles relax
		B:	Radial muscles contract
1.3.4	A young bird is helpless soon after hatching	A:	Precocial development
		B:	Altricial development

(4 x 2) (8)

SECTION B

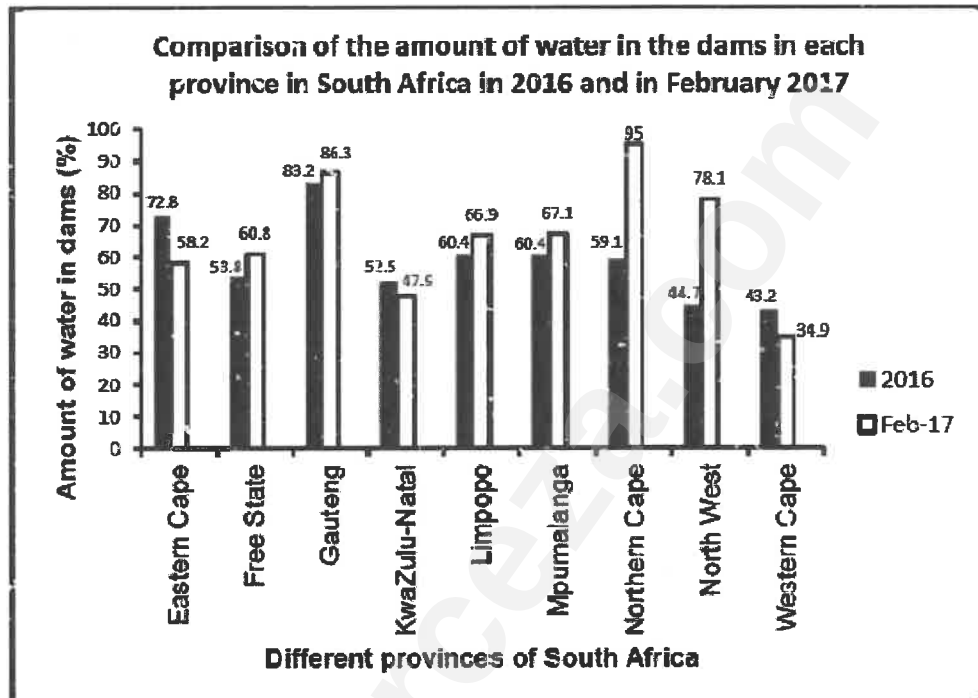
Human impact (Grade 11)

3.1 The diagram given below illustrates the Greenhouse effect.



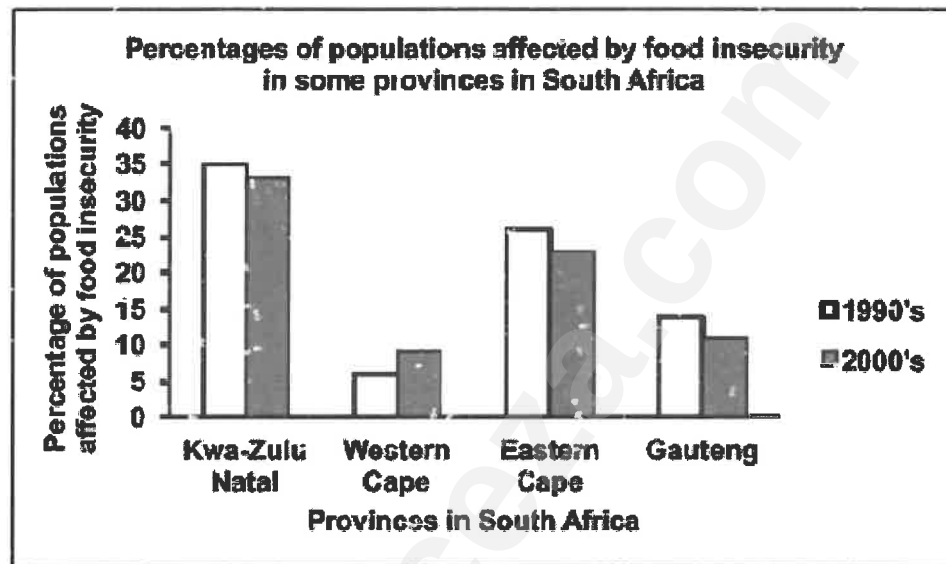
- 3.1.1 Explain how the Greenhouse Effect occurs by using numbers 1–4 on the diagram. (4)
- 3.1.2 What is the advantage of the natural greenhouse effect for life on earth? (1)
- 3.1.3 Which human activity makes the greatest contribution to carbon dioxide emissions? (1)
- 3.1.4 A big increase in the greenhouse effect can lead to the enhanced greenhouse effect which causes global warming. (4)
- Explain how global warming leads to desertification.

- 2.1 The graph below indicates the amount of water in the dams in each province shown as a percentage of the capacity of the dams. The information shows the amount of water in 2016 and at the end of February 2017.



- 2.1.1 Which province had the most water in their dams in February 2017? (1)
- 2.1.2 Which province had the greatest decrease in the amount of water from 2016 to February 2017? (1)
- 2.1.3 The amount of water in the dams of North West increased by 33,4% from 2016 to February 2017. Calculate the percentage increase this represents in comparison to the amount of water in 2016. (3)
- 2.1.4 Which TWO provinces had the lowest amount of water in their dams in February 2017? (2)
- 2.1.5 Explain TWO possible strategies, other than water restrictions, that the provincial governments of the provinces named in QUESTION 2.1.4 could implement to reduce the water shortages. (4)
- 2.1.6 Explain TWO ways in which the building of dams could have a negative effect on the environment. (4)
(15)

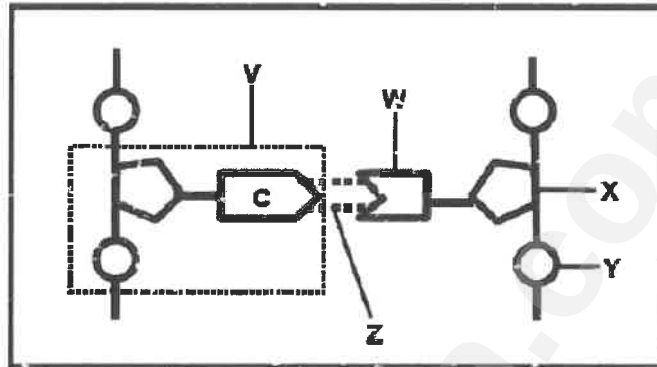
- 3.2 The graph below shows the percentage of populations affected by food insecurity in some provinces in South Africa.



- 3.2.1 Define *food security*. (2)
- 3.2.2 Name ONE province in which food insecurity has increased. (1)
- 3.2.3 List TWO factors that could have caused the increase in food insecurity in the province named in QUESTION 3.2.2. (2)
- 3.2.4 What percentage of the population in the Eastern Cape was food secure in the 1990's? Show ALL working. (2)
- 3.2.5 Explain ONE way in which pesticides could decrease food security. (2)
- 3.2.6 Explain TWO ways in which genetically modified foods could increase food security. (4)
- 3.2.7 What conclusion can be made about the food security in Kwa-Zulu Natal from the graph provided. (2)
- (15)**

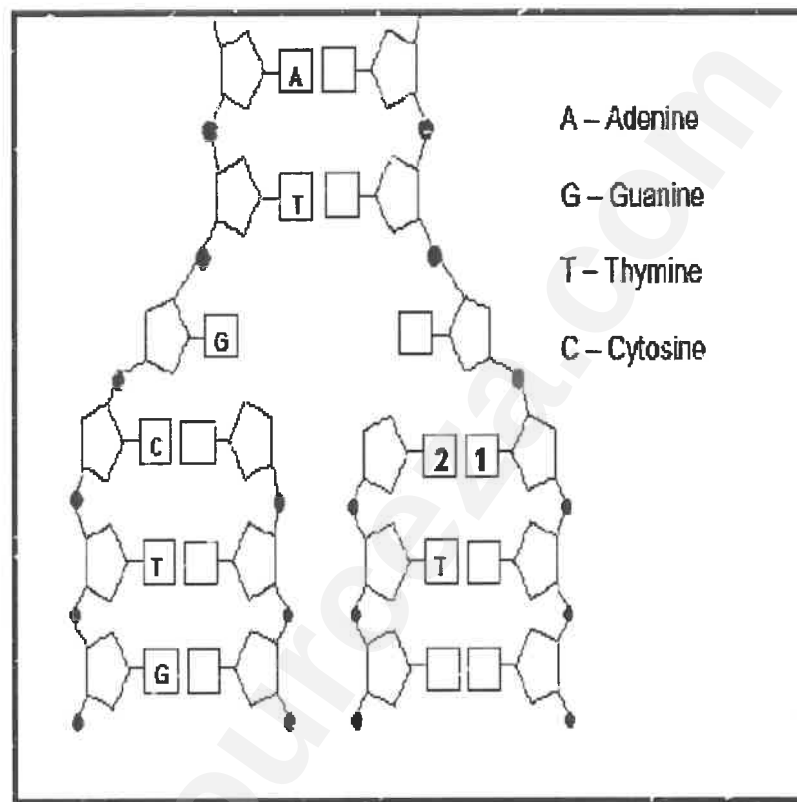
DNA code of life

1.4 The diagram represents a portion of a nucleic acid.



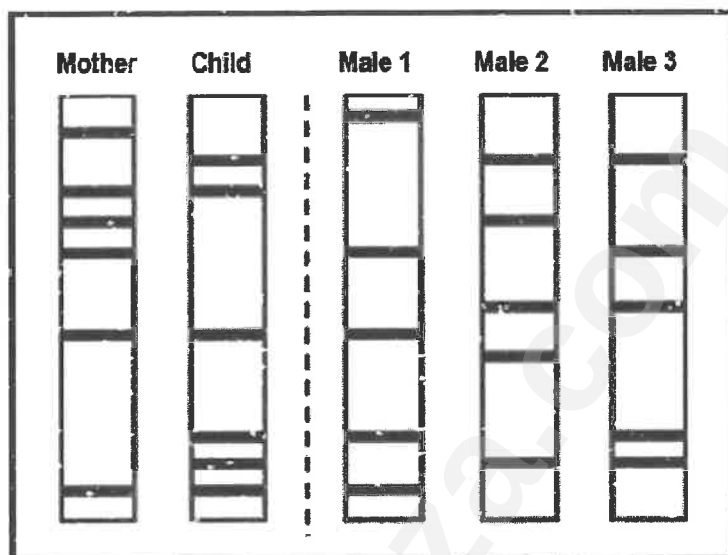
- 1.4.1 Name the nucleic acid. (1)
- 1.4.2 Name TWO places in animal cells where this nucleic acid may be found. (2)
- 1.4.3 Identify: (1)
- (a) Portion V (1)
 - (b) Nitrogenous base W (1)
 - (c) Molecule Y (1)
 - (d) Bond Z (1)
- 1.4.4 What is the natural shape of this molecule? (1)
- 1.4.5 Name the process during which this molecule makes a copy of itself. (1)
- (9)

- 2.1 Study the diagram below, which shows a section of a DNA molecule during a process taking place in a cell.



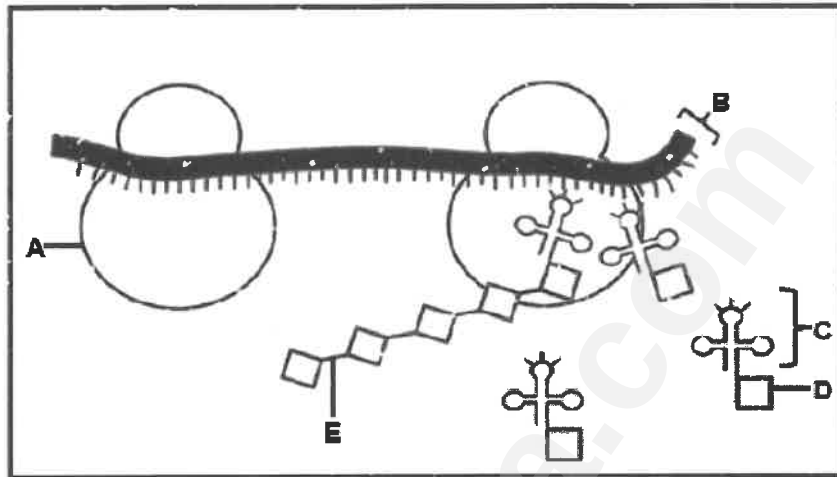
- 2.1.1 Name the process represented in the diagram. (1)
- 2.1.2 When exactly will this process take place in a cell? (1)
- 2.1.3 Give labels for 1 and 2. (2)
- 2.1.4 State TWO ways in which the structure of RNA differs from the DNA structure shown in the diagram. (2)
- (6)

3.3 The diagram below shows a technique used in paternity testing.



- 3.3.1 Identify the technique shown above. (1)
- 3.3.2 Which male is the biological father of the child? (1)
- 3.3.3 Explain your answer to QUESTION 3.3.2. (3)
- 3.3.4 State TWO other uses of this technique. (2)
- (7)

1.5 The diagram below represents a process that occurs during protein synthesis.



1.5.1 Identify the process above. (1)

1.5.2 Identify:

(a) Organelle A (1)

(b) Molecule B (1)

(c) The bond at E (1)

1.5.3 Give only the LETTER of the molecule that:

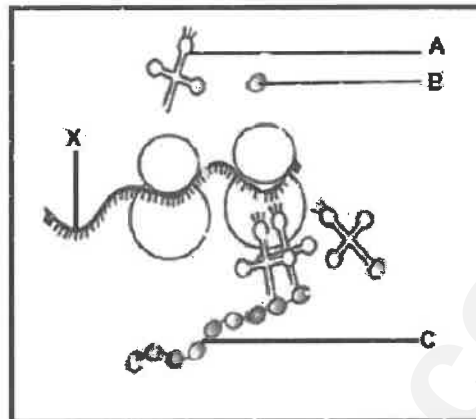
(a) Carries the amino acid (1)

(b) Is copied from DNA (1)

(c) Is the monomer/building block of proteins (1)

(7)

2.2 The diagram below shows a stage of protein synthesis.



2.2.1 Identify the following:

- (a) Molecule A (1)
- (b) Molecule B (1)
- (c) Bond C (1)

2.2.2 Name the stage of protein synthesis represented above.. (1)

2.2.3 The following sequence represents a part of the nitrogenous base sequence on molecule X.

UCG	AGA	GGA	AGC
Triplet 1	Triplet 2	Triplet 3	Triplet 4

- (a) Write down the base sequence of the anticodon of triplet 1 shown above. (1)
- (b) The table below shows the amino acids that correspond with different DNA codes.

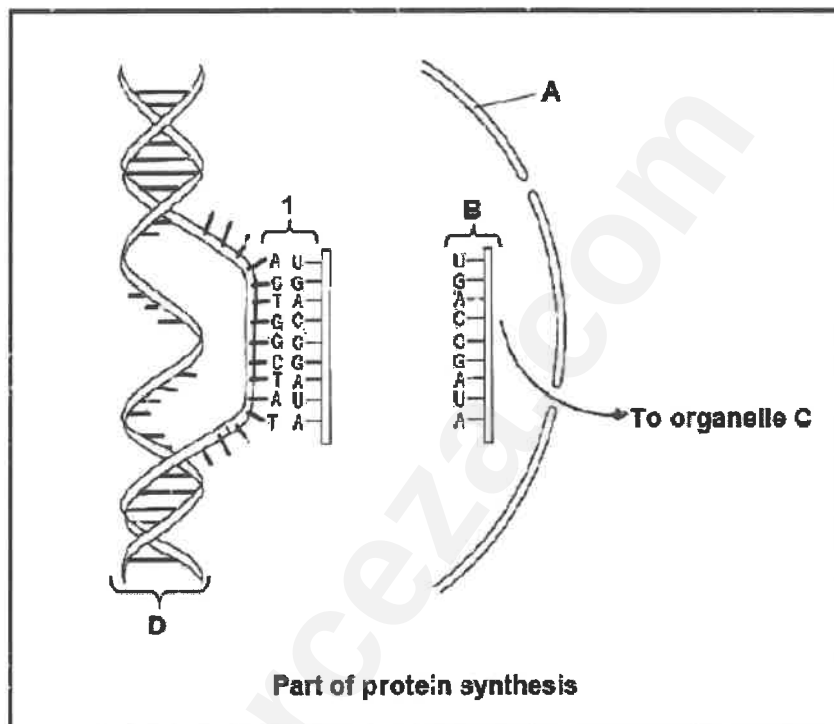
Amino acid	DNA base triplet
Serine	TCG
Serine	AGC
Glycine	CCT
Arginine	TCT

Write down the correct sequence of amino acids for triplets 2 to 4. (3)

- (c) Explain the effect on the protein if triplet 4 is replaced by triplet 1. (2)

(10)

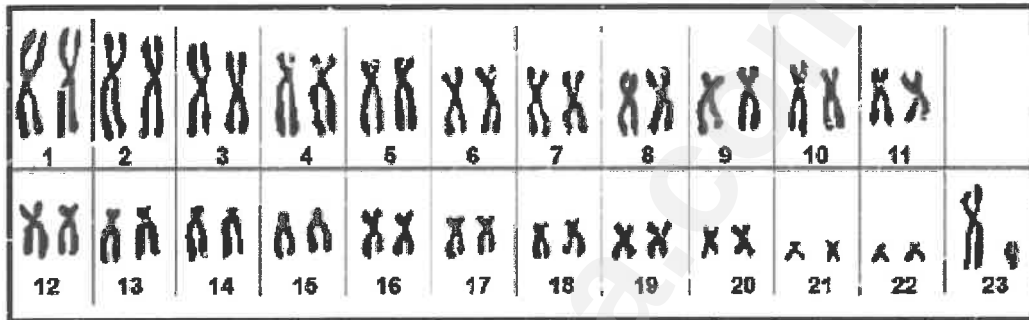
- 2.2 Study the diagram below which shows part of the process of protein synthesis.



- 2.2.1 Provide labels for structures A, B and D respectively. (3)
- 2.2.2 State ONE function of molecule D. (1)
- 2.2.3 Which part of protein synthesis takes place at 1? (1)
- 2.2.4 Name the type of proteins that control the process named in QUESTION 2.2.3. (1)
- 2.2.5 Identify organelle C. (1)
- 2.2.6 Name and describe the part of protein synthesis that takes place at organelle C. (6)

Meiosis

1.4 The diagram below shows a karyotype.



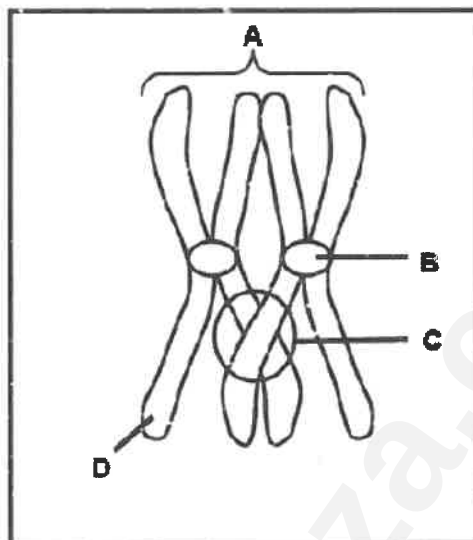
1.4.1 How many of the following are present in the karyotype:

- (a) Chromosomes (1)
- (b) Autosomes (1)
- (c) Gonosomes (1)

1.4.2 How many chromosomes would be present in the gametes produced by this individual? (1)

1.4.3 Is the karyotype in the diagram that of a male or a female? (1)
(5)

1.5 The diagram below represents a process that occurs during meiosis.



1.5.1 Provide labels for:

- (a) A (1)
- (b) B (1)
- (c) D (1)

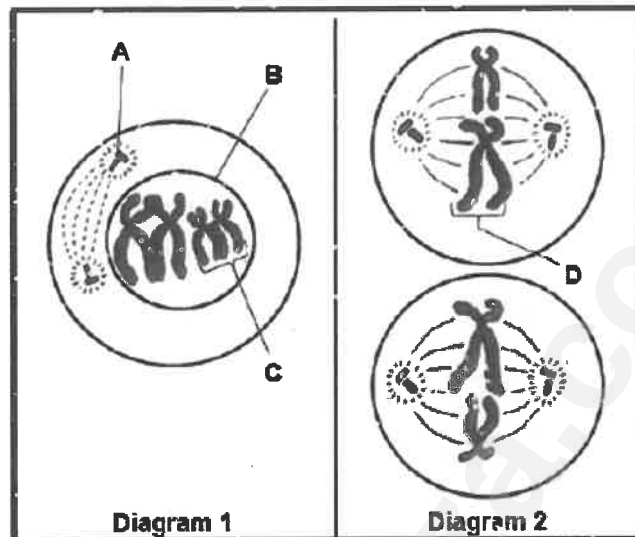
1.5.2 Give the function of the structure labelled B. (1)

1.5.3 Name:

- (a) The process occurring at C (1)
- (b) The phase in meiosis during which the process at C occurs (1)

1.5.4 State ONE reason why process C is significant. (1)
(7)

1.5 The diagrams below represent a cell in two different phases of meiosis.



1.5.1 Which phase is represented in:

- (a) Diagram 1 (1)
- (b) Diagram 2 (1)

1.5.2 Provide labels for:

- (a) A (1)
- (b) B (1)
- (c) C (1)

1.5.3 Give the functions of the parts labelled:

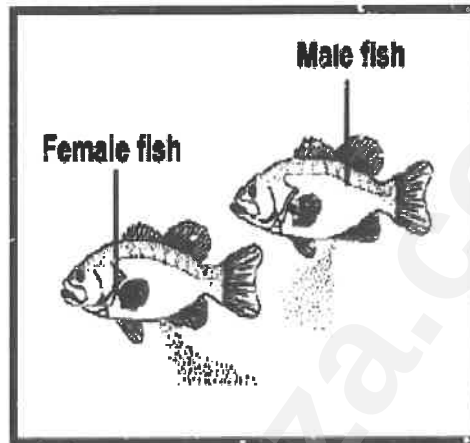
- (a) A (2)
- (b) D (1)

1.5.4 Are the cells in Diagram 2 haploid or diploid? (1)

1.5.5 Name the process that would have caused variation in structure D. (1)
(10)

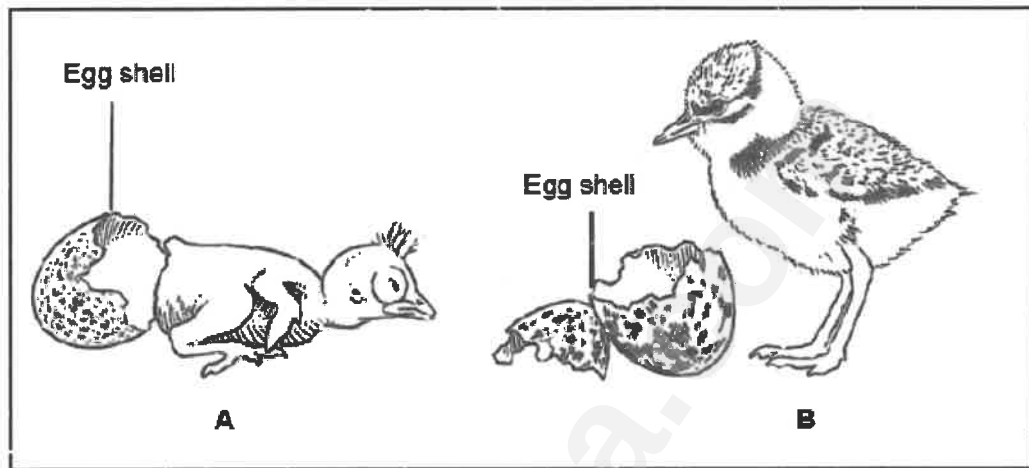
Reproduction in vertebrates

- 1.4 The diagram below shows a certain species of fish mating.



- 1.4.1 Identify the type of fertilization displayed by the fish species. (1)
- 1.4.2 State TWO visible ways in which the chances of fertilisation in these fish are increased. (2)
- 1.4.3 Name the reproductive strategy used by these fish that involves the production of eggs. (1)
- 1.4.4 Give TWO reasons why there is no need for the eggs of these fish to be covered by a hard or leathery shell. (2)
- (6)

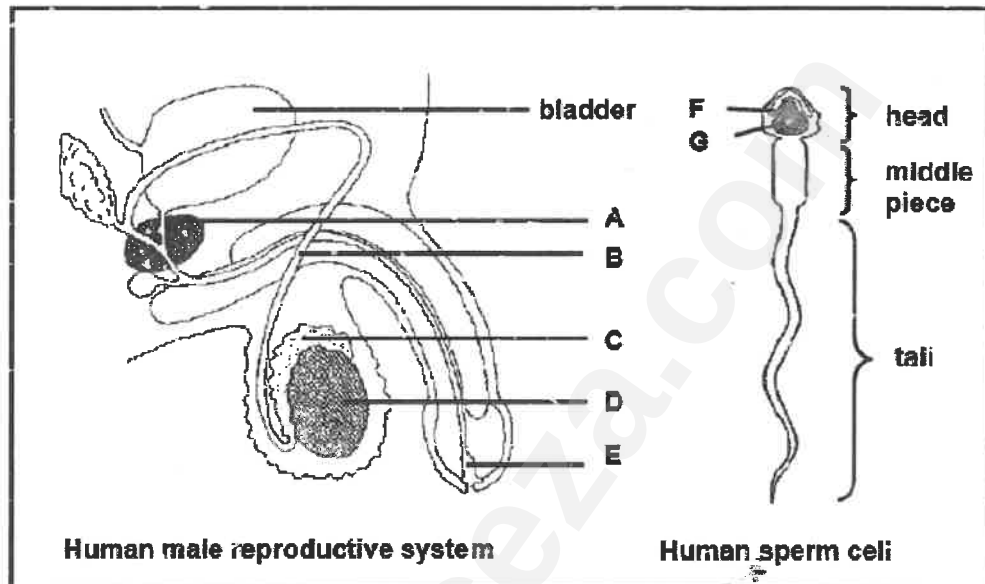
- 2.1 Study the diagram of one-day-old hatchlings **A** and **B** below. The diagram is not drawn to scale.



- 2.1.1 State TWO visible features in hatchling **A** which indicate altricial development. (2)
- 2.1.2 The diagram represents ovipary.
Explain ONE possible advantage of vivipary when compared to ovipary. (2)
- 2.1.3 Explain why you would expect that the yolk content of the egg of hatchling **B** was more than that of hatchling **A**. (2)
(6)

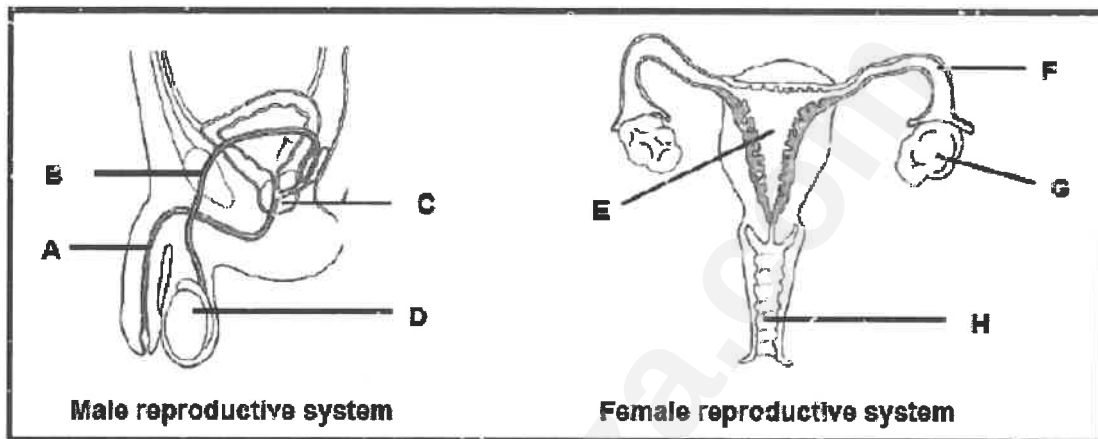
Human reproduction

3.1 Study the diagrams below and answer the questions that follow.



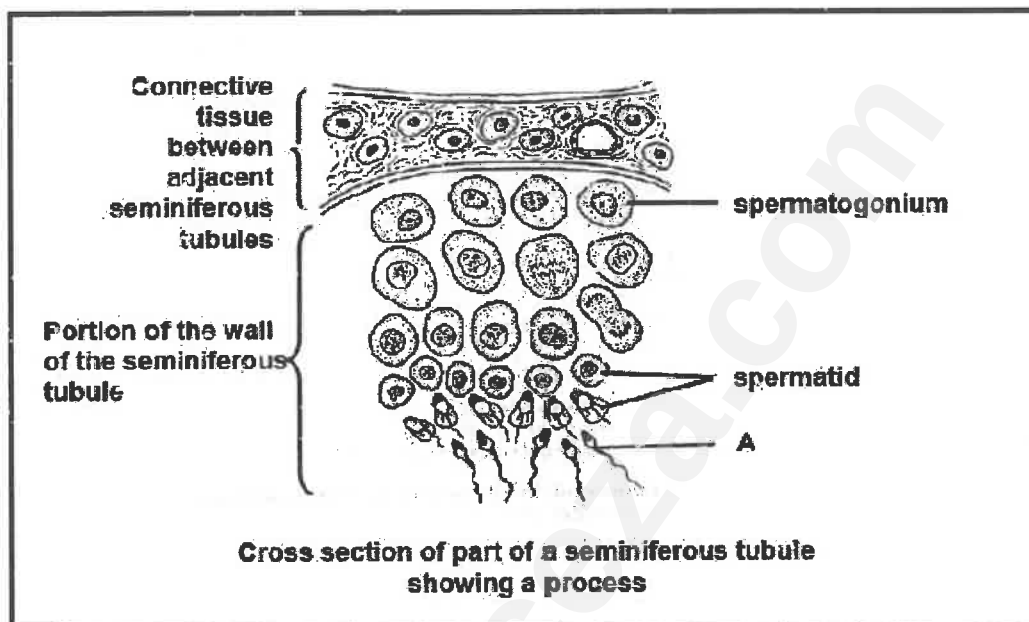
- 3.1.1 Label A, B, E and G respectively. (4)
- 3.1.2 State ONE function each of C and F respectively. (2)
- 3.1.3 Write down the LETTER and NAME of the part where sperms are produced. (2)
- 3.1.4 Explain why it is necessary for part D to 'hang outside' the body of the male. (2)
- 3.1.5 Name the following: (1)
- The cells in the testes that secrete a male sex hormone (1)
 - The hormone that stimulates the development of secondary sexual characteristics in males (1)
- 3.1.6 During a vasectomy, part B is surgically cut. (2)
- Will it be possible for a man who is HIV positive to pass the HI virus to another person after he undergoes a vasectomy? (1)
 - Explain your answer to QUESTION 3.1.6(a). (2)
- (15)

2.1 Study the diagrams below showing the male and female reproductive systems.



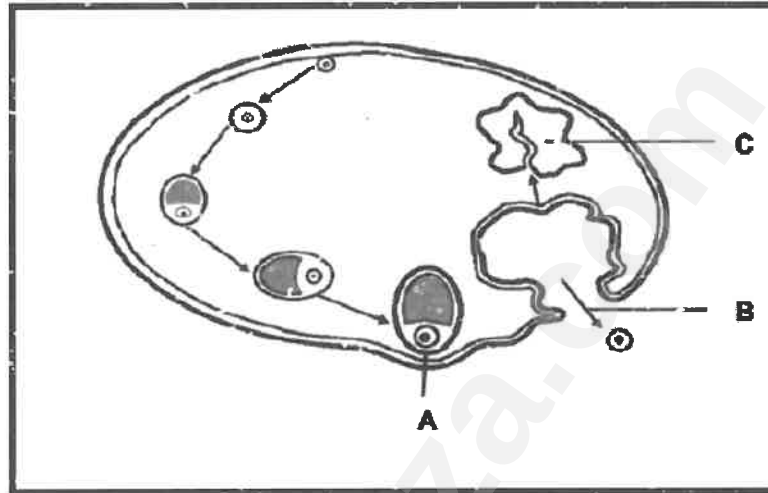
- 2.1.1 Identify parts A, B and F respectively. (3)
- 2.1.2 State ONE function of each of the following:
- (a) The fluid produced by part C (1)
 - (b) Part E (1)
- 2.1.3 Give the LETTER ONLY of the organ where meiosis takes place in the:
- (a) Male reproductive system (1)
 - (b) Female reproductive system (1)
- 2.1.4 Name the type of gametogenesis that takes place in the:
- (a) Male reproductive system (1)
 - (b) Female reproductive system (1)
- 2.1.5 State TWO functions of part H. (2)
- 2.1.6 Explain why it is necessary for part D to be 'outside' the body in males. (2)
- (13)

- 2.1 The diagram below represents a cross-section of a human seminiferous tubule in which a process is occurring.



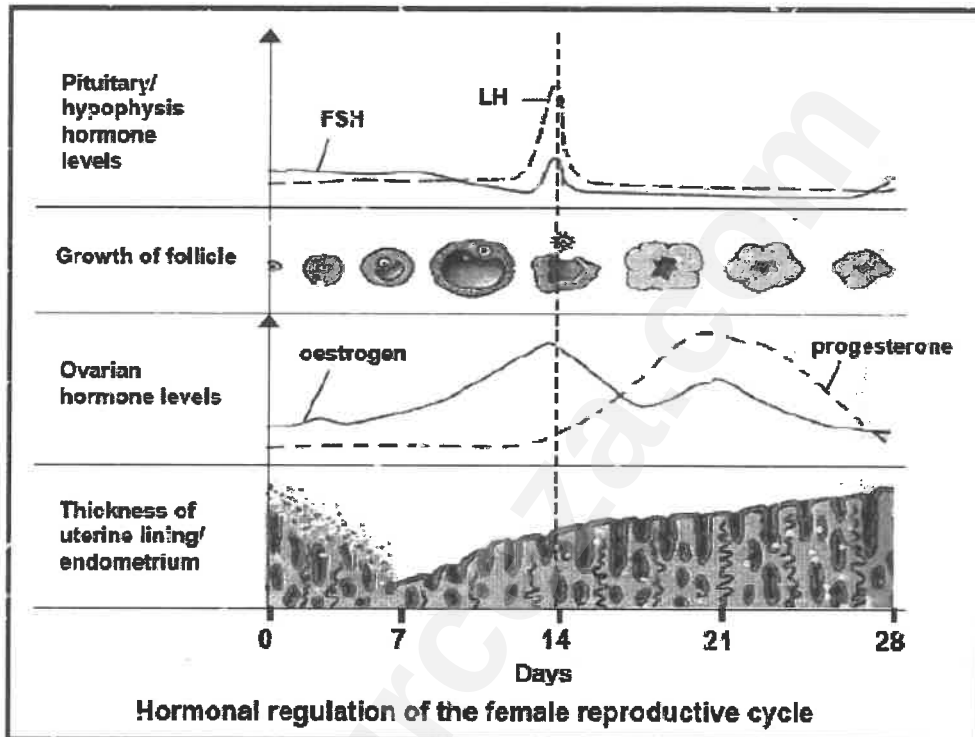
- 2.1.1 Name the specific process illustrated in the seminiferous tubule which leads to the formation of structure A. (1)
- 2.1.2 Name the hormone produced by the organ containing seminiferous tubules. (1)
- 2.1.3 Give ONE function of the hormone named in QUESTION 2.1.2. (1)
- 2.1.4 How many chromosomes are there in each: (1)
- (a) Spermatogonium cell (1)
- (b) Spermatid (1)
- 2.1.5 Make a labelled drawing to show the structure of the cell labelled A. (5)
- (10)

- 2.3 The diagram below represents the changes that occur in the ovary during the menstrual cycle.



- 2.3.1 Identify:
- Process B (1)
 - The hormone responsible for the development of C (1)
 - The hormone produced by A (1)
- 2.3.2 Describe the effect on the menstrual cycle if structure C did not form. (5)
- 2.3.3 Describe the development of the zygote until a foetus is formed. (6)
- 2.3.4 List THREE functions of the amniotic fluid. (3)
- 2.3.5 Identify TWO systems of the baby's body whose role is performed by the placenta during gestation. (2)
- (19)**

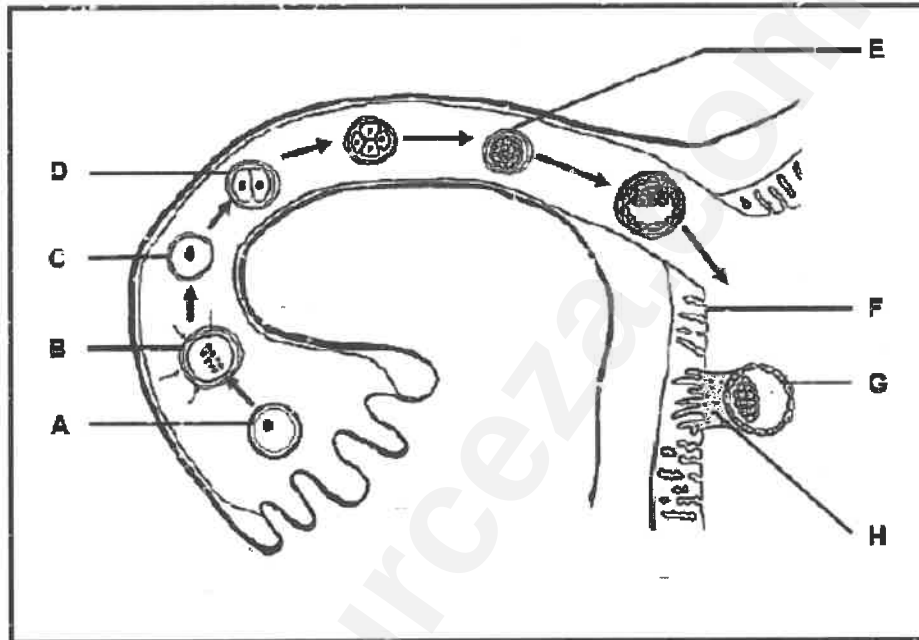
- 2.3 Study the graph below of a menstrual cycle and the influence of the different hormones on it.



- 2.3.1 On which day does ovulation take place? (1)
- 2.3.2 Between which days does menstruation take place? (1)
- 2.3.3 State ONE function of FSH during the menstrual cycle. (1)
- 2.3.4 Describe the functional relationship between progesterone and FSH. (2)
- 2.3.5 Account for the change in the thickness of the endometrial lining between day 14 and day 21. (2)
- 2.3.6 Did fertilisation take place within the 28-day cycle illustrated in the graph? (1)
- 2.3.7 Give TWO reasons for your answer to QUESTION 2.3.6. (2)
- (10)**

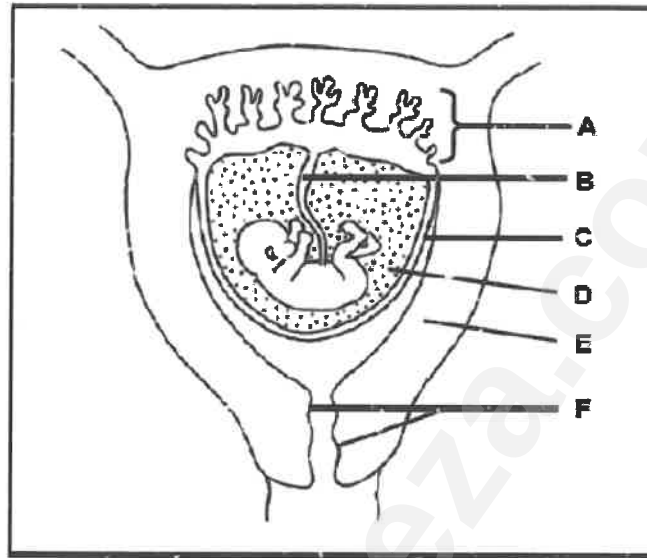
- 1.5 Study the diagram below of the sequence of events that takes place from the fertilisation of the ovum to the development of the embryo in a part of the human female reproductive system.

The arrows indicate the direction of development of one ovum after fertilisation.



- 1.5.1 Identify:
- (a) Structure C (1)
 - (b) The stage of embryo development at E (1)
 - (c) The structure that develops from a combination of parts F and H (1)
- 1.5.2 Name the process that takes place:
- (a) At B (1)
 - (b) When G attaches to part F (1)
- 1.5.3 Give the chromosome number of:
- (a) The cells at D (1)
 - (b) Cell A (1)

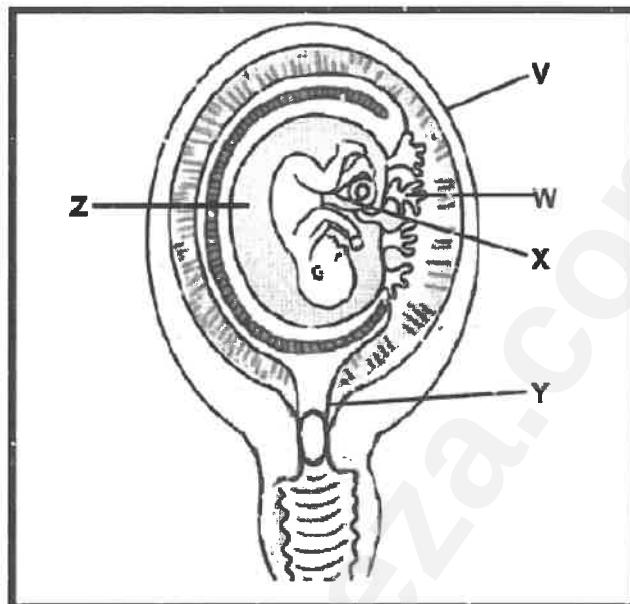
1.5 Study the diagram below.



Match the structures (A to F) with the descriptions (1.5.1 to 1.5.5) below, for example 1.5.6 G. A letter may be used more than once, or not at all.

- | | | |
|-------|---|-----|
| 1.5.1 | Where gaseous exchange occurs between the mother and the foetus | (1) |
| 1.5.2 | Removes excretory products from the foetus | (1) |
| 1.5.3 | Contains strong muscles which will push the foetus out during birth | (1) |
| 1.5.4 | Clamped and cut after the baby is born | (1) |
| 1.5.5 | Acts as a shock absorber for the developing foetus | (1) |
| | | (5) |

2.3 The diagram below represents a developing foetus in a human body.



2.3.1 Identify the parts labelled:

- (a) X (1)
- (b) Y (1)

2.3.2 State ONE function of the fluid labelled Z. (1)

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

2.3.4 Name TWO systems in the baby's body that take over the functions of part W once the baby is born. (2)

2.3.5 Explain what prevents another ovum from being produced while the foetus is developing in a human body. (2)
(9)

GENETICS

- 2.1 In rabbits, black fur is produced by the allele (B) and white fur by the allele (b).

The table below shows the genotypes of some rabbits.

RABBIT	GENOTYPE
1	BB
2	Bb
3	bb

- 2.1.1 What is the phenotype:

- (a) Produced by the recessive allele (1)
 (b) Of rabbit 2 (1)

- 2.1.2 Give the NUMBER only (1, 2 or 3) of the rabbit(s) that is/are:

- (a) Pure-bred
 (b) Homozygous dominant (3)

- 2.1.3 Use a genetic cross to show the percentage chance of rabbits 1 and 3 having offspring with white fur.

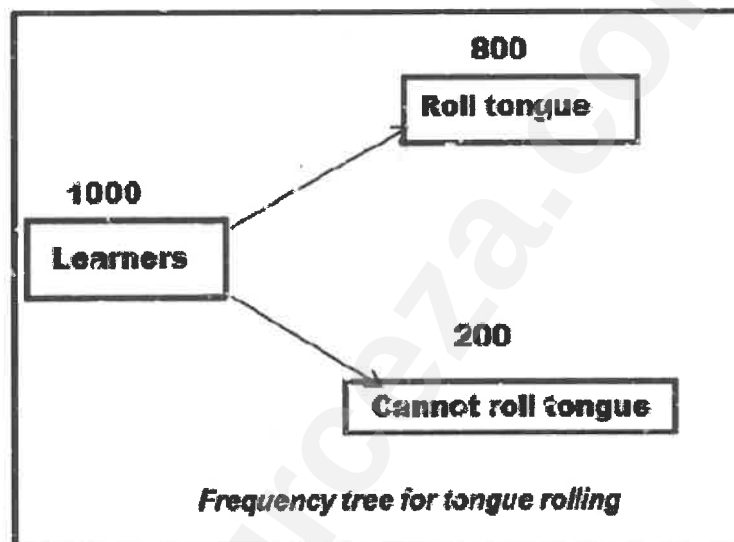
(6)
(11)

- 4.1 In an experiment to show co-dominance, cows with white fur (W) were crossed with bulls with red fur (R). All the offspring of the F₁-generation have roan fur (RW). A roan fur consists of patches of white and patches of red fur. Roan cows and roan bulls were crossed and the results are given below.

Genotype	RR	RW	WW
Number of offspring	120	240	120

- 4.1.1 Give the ratio of the different phenotypes shown in the above table. (2)
 4.1.2 Use the information in the table above to draw a pie-chart showing the proportions of the different genotypes. (7)
 4.1.3 Explain why the cows and bulls with genotype RW have roan fur and not only red or only white fur. (3)
 (12)

- 2.3 A class of Grade 11 learners conducted an investigation to determine the frequency of dominant and recessive characteristics in their school. The characteristic investigated was the ability to roll one's tongue. The results obtained were recorded in the frequency tree as shown below.



- 2.3.1 Based on the results obtained from this investigation, which characteristic is dominant? (1)
- 2.3.2 List THREE steps that the learners need to follow while planning this investigation. (3)
- 2.3.3 Use the data given in the frequency tree to plot a bar graph. (6)
- 2.3.4 Would you classify the ability to roll one's tongue as continuous or discontinuous variation? (1)
- 2.3.5 Explain your answer to QUESTION 2.3.4. (2)

- 2.1** Haemophilia is a sex-linked disease caused by the presence of a recessive allele (X^h). A normal father and heterozygous mother have children.
- 2.1.1** Represent a genetic cross to determine the possible genotypes and phenotypes of the children of the parents mentioned in QUESTION 2.1. (6)
- 2.1.2** What are the chances of the parents having a child that will be a haemophiliac male? (2)
- 2.1.3** Explain why the father is not a carrier for haemophilia. (2)
- (10)**

- 3.3** The inheritance of fur colour in cats is sex-linked. The tortoise-shell colour of cats is a combination of black and orange fur. The allele for black fur is represented by X^B and the allele for orange fur is represented by X^O . A female cat with a tortoise-shell colour mates with an orange male cat.

HINT: The sex chromosomes/gonosomes in cats are the same as in humans.

- 3.3.1** Use the symbols X^B , X^O and Y to represent a genetic cross of the mating stated above. Also indicate the proportion of the F_1 phenotypes. (7)
- 3.3.2** Explain why the male kittens can never have the tortoise-shell colour. (2)
- 3.3.3** Explain why the female kittens can have the tortoise-shell colour. (2)
- (11)**

3.4 Human blood groups are controlled by multiple alleles.

3.4.1 Name ALL the alleles that control human blood groups. (3)

3.4.2 How many of the alleles named in QUESTION 3.4.1 can any individual inherit? (1)

3.4.3 Give a reason for your answer to QUESTION 3.4.2. (2)

3.4.4 A man has blood group A and his wife has blood group B. Their first child has blood group AB and the second child has blood group O.

**What can one conclude about the blood groups of their future children? (3)
(9)**

1.3 THREE babies (X, Y and Z) from three different sets of parents were born in a hospital. TWO of the babies were accidentally swapped. Blood groups of the parents were used to establish which baby belonged to which set of parents.

The blood groups of the parents and the babies are shown in the table below.

PARENTS	BABIES	BLOOD GROUPS OF PARENTS AND BABIES		
		Mother	Father	Baby
Mr and Mrs Pule	X	B	A	A
Mr and Mrs Chaka	Y	AB	B	O
Mr and Mrs Tau	Z	O	B	AB

1.3.1 Which TWO babies (from X, Y and Z) were swapped? (2)

1.3.2 Give the surnames of the biological parents of the two babies that were swapped. Write the correct surnames of the parents next to the letter (X, Y or Z). (2)

**1.3.3 Give the possible genotype(s) of Mr Pule that could have produced baby X. (2)
(6)**

- 1.4 In tomato plants the allele for red fruit (**R**) is dominant over the allele for yellow fruit (**r**). The allele for tallness (**T**) is dominant over the allele for shortness (**t**).

Plant **A**, which is heterozygous for red fruit and homozygous tall, was crossed with Plant **B**, which has yellow fruit and is short.

- 1.4.1 Write down the genotype of:

(a) Plant **A** (1)

(b) Plant **B** (1)

- 1.4.2 Write down ALL the possible genotypes of the gametes of plant **A**. (2)

- 1.4.3 Name the phenotype of an offspring having the genotype:

(a) **Rrtt** (1)

(b) **RrTt** (1)

- 1.4.4 Plant **B** was then crossed with another plant (Plant **C**) and all the offspring had red fruit and were tall.

Use this information to write down the genotype of Plant **C**. (2)

(8)

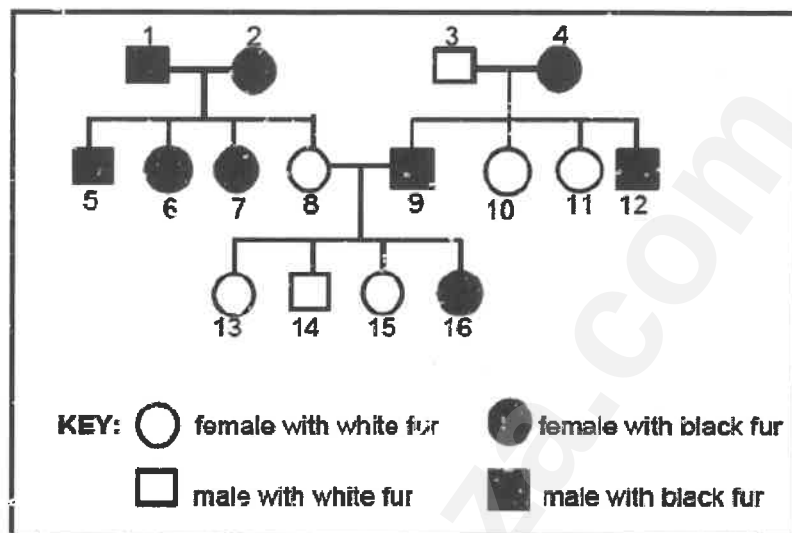
- 1.6 Coat colour in mice is controlled by two alleles, black (B) and grey (b). Tail length is controlled by two alleles, long (T) and short (t).

The Punnett square below shows a part of the cross between two mice. Genotype (i) has been left out.

		Parent 1				
		Gametes	BT	Bt	bT	bt
Parent 2	Bt	BBTt	BBtt	BbTt	Bbtt	
	Bt	BBTt	BBtt	BbTt	Bbtt	
	Bt	BBTt	BBtt	(i)	Bbtt	
	Bt	BBTt	BBtt	BbTt	Bbtt	

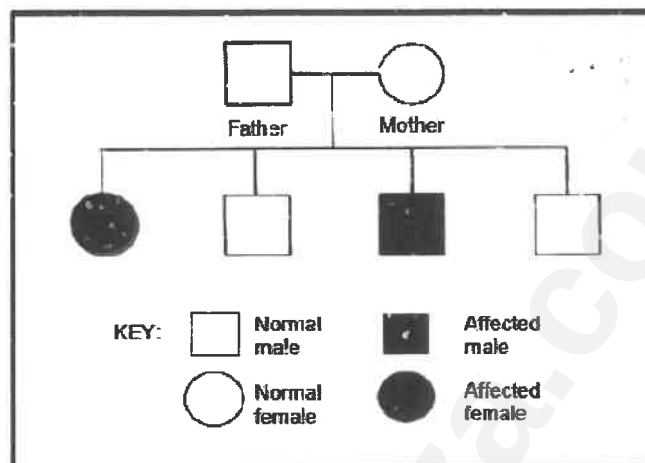
- 1.6.1 Give the:
- (a) Genotype of parent 1 (2)
 - (b) Phenotype of parent 2 (2)
 - (c) Genotype of offspring (i) (1)
- 1.6.2 What percentage of the offspring above is grey with short tails? (1)
- 1.6.3 State the genotypes of TWO gametes from the table above that will result in offspring that are heterozygous for both traits, if fertilisation occurs. (2)
(8)

- 1.5 Mice may have white fur or black fur. The diagram shows the inheritance of fur colour in mice.



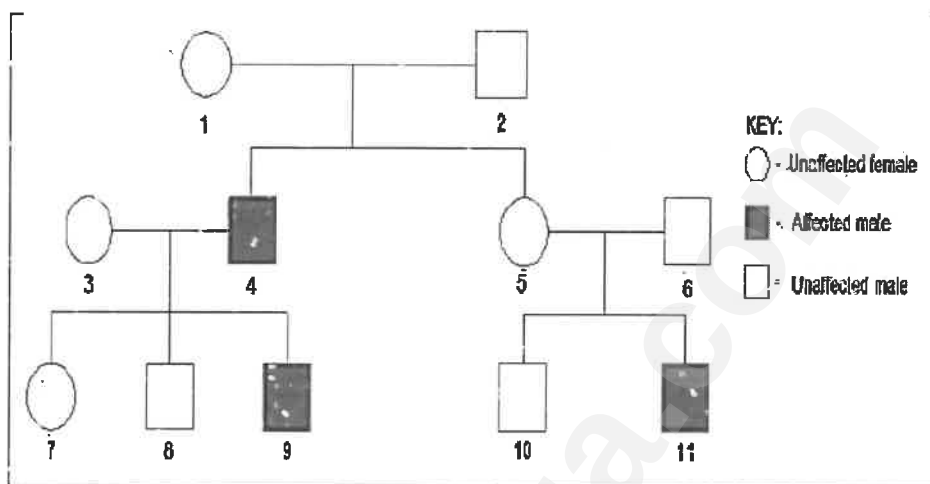
- 1.5.1 What is this diagram called? (1)
- 1.5.2 How many sets of parents are represented in this diagram? (1)
- 1.5.3 Give the phenotype:
- (a) Which is dominant (1)
- (b) Of individual 9 (1)
- 1.5.4 Use the letter A for the dominant allele and a for the recessive allele to give the genotype of:
- (a) 8 (1)
- (b) 16 (1)

- 3.5 The pedigree diagram below shows the pattern of inheritance of a certain genetic disorder controlled by a recessive allele. The dominant allele is represented by N and the recessive allele by n.



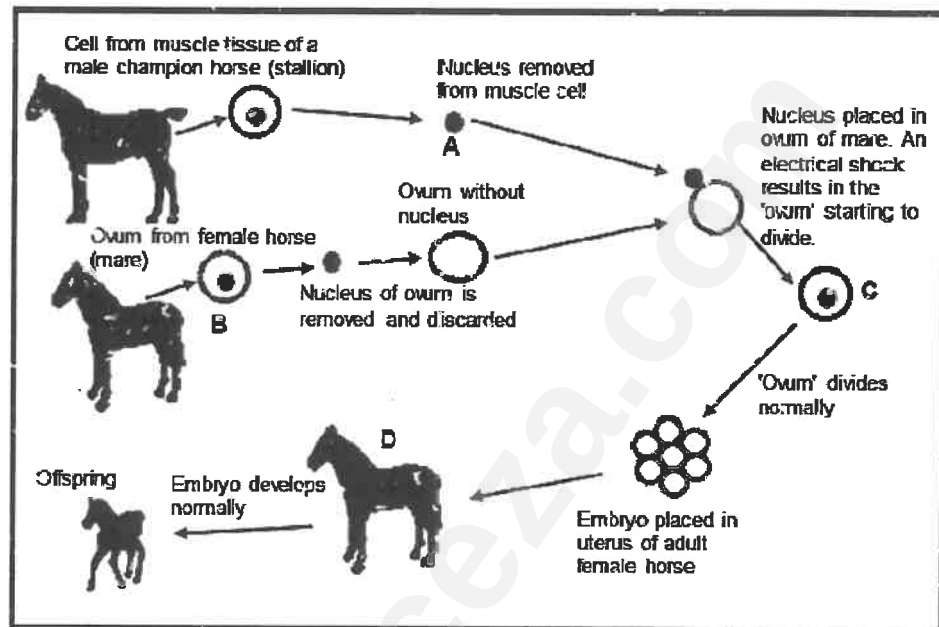
- 3.5.1 Explain why both parents must be heterozygous for this characteristic. (2)
- 3.5.2 Give the possible genotype(s) of the normal children. (2)
- 3.5.3 Provide evidence from the pedigree diagram to show that this characteristic is not sex-linked. (2)
- (6)

3.4 The pedigree diagram below traces the inheritance of *haemophilia* in a family. Study the diagram and answer the questions that follow.



- 3.4.1 How many family members not affected by *haemophilia* are carriers? (2)
- 3.4.2 Use the possible alleles X^H , X^h and Y to determine the genotype for each of the following:
- (a) Individual 1 (1)
- (b) Individual 4 (1)
- 3.4.3 Explain why this disorder affects mostly males. (2)
- 3.4.4 Individual 10 and his wife, who is a carrier (not shown in the diagram), have a son. What are the chances of this son developing *haemophilia*? (1)
- 3.4.5 Suggest TWO reasons why individual 9 and his partner should undergo genetic counselling before starting a family. (2)

- 3.5 The diagram below shows a genetic engineering process. A donor cell was taken from the muscle cell of a male champion horse (stallion) to create a new offspring.



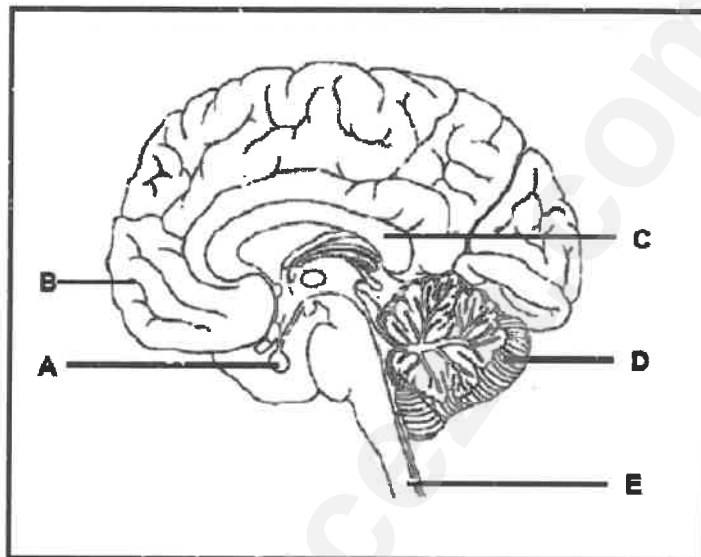
[Adapted from www.biologyreference.com]

- 3.5.1 Name the:
- Genetic engineering process shown in the diagram above (1)
 - Process that produced ovum B (1)
- 3.5.2 Why is the donor cell extracted from a champion horse? (2)
- 3.5.3 Explain why only the nucleus of the donor cell is used. (2)
- 3.5.4 A somatic cell in a horse contains 64 chromosomes.
- How many chromosomes would there be in:
- Structure A (1)
 - Ovum B (1)
 - A muscle cell in organism D (1)
- 3.5.5 Explain why the 'ovum' labelled C cannot be considered a gamete. (2)

(11)

Responding to the environment (humans)

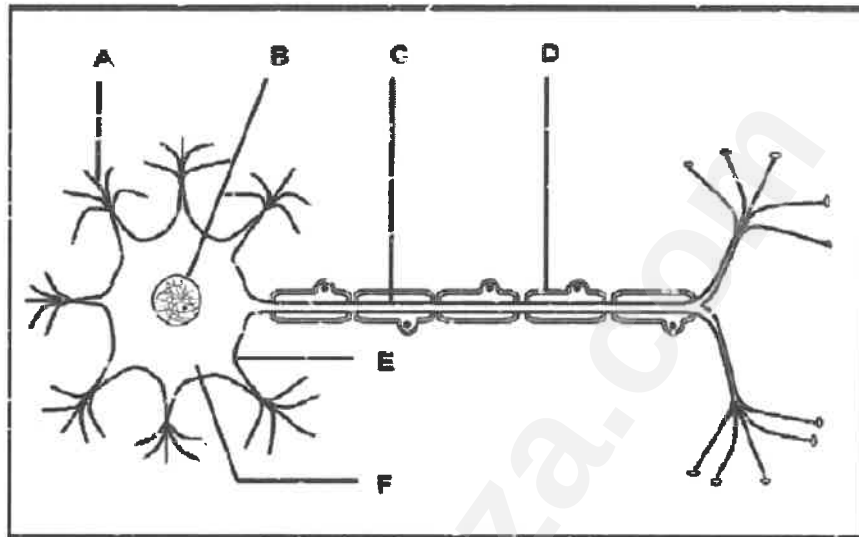
1.4 The diagram below represents a human brain.



Give the LETTER and NAME of the part of the brain responsible for:

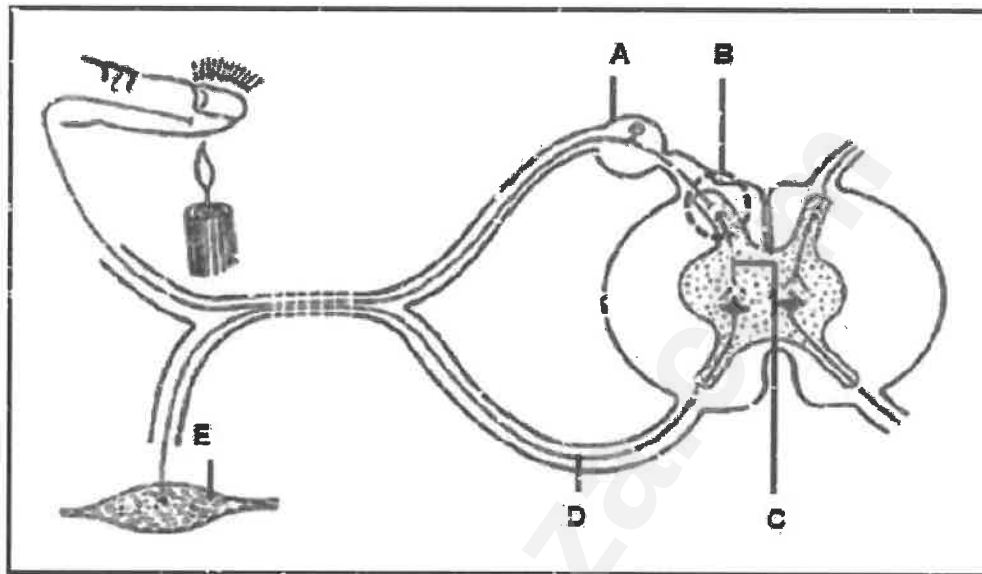
- | | | |
|-------|--|------|
| 1.4.1 | Memorising a cellular phone number | (2) |
| 1.4.2 | Coordinating all voluntary movements | (2) |
| 1.4.3 | Secreting hormones | (2) |
| 1.4.4 | Connecting the two hemispheres of part B | (2) |
| 1.4.5 | The reflex action that occurs when stepping barefooted on a sharp object | (2) |
| | | (10) |

1.4 The diagram below represents the structure of a neuron.



- 1.4.1 Name the type of neuron in the diagram above. (1)
- 1.4.2 Identify part:
- (a) B (1)
- (b) F (1)
- (c) A (1)
- 1.4.3 Give the LETTER and NAME of the part that:
- (a) Transmits impulses away from the cell body (2)
- (b) Insulates and speeds up the transmission of impulses (2)
- 1.4.4 Name the condition caused by the progressive degradation of part D. (1)
- (9)

2.4 The diagram below shows a reflex action.



2.4.1 Identify parts:

(a) A (1)

(b) E (1)

2.4.2 State ONE the function of each part:

(a) B (1)

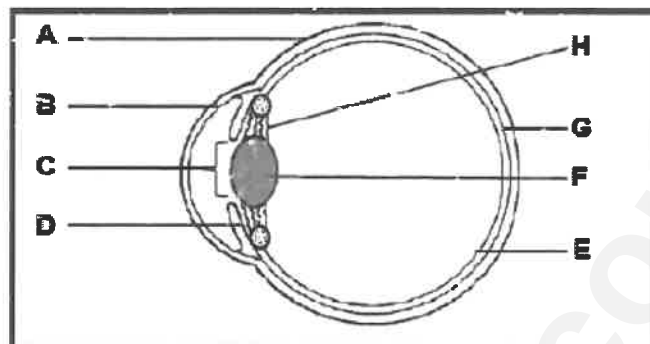
(b) C (1)

2.4.3 Explain why the brain is not initially involved in a reflex action shown above. (3)

2.4.4 Explain what the effect will be, in the action shown in the diagram above, if a person is suffering from multiple sclerosis. (2)

2.4.5 Explain the effect on the body if the part labelled D is cut/severed. (4)

1.5 The diagram below represents a section through a human eye.



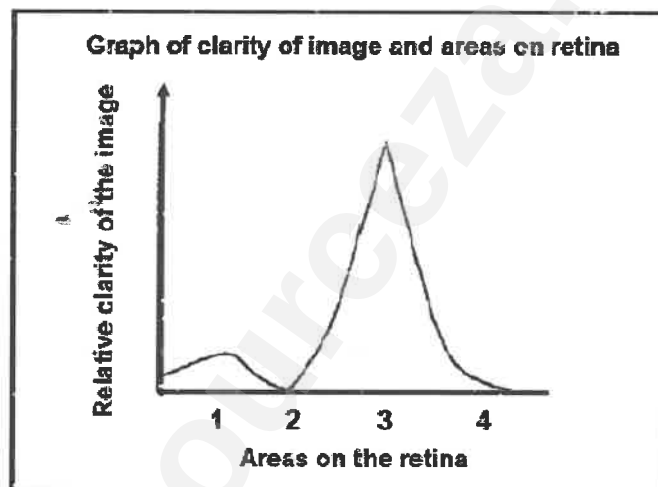
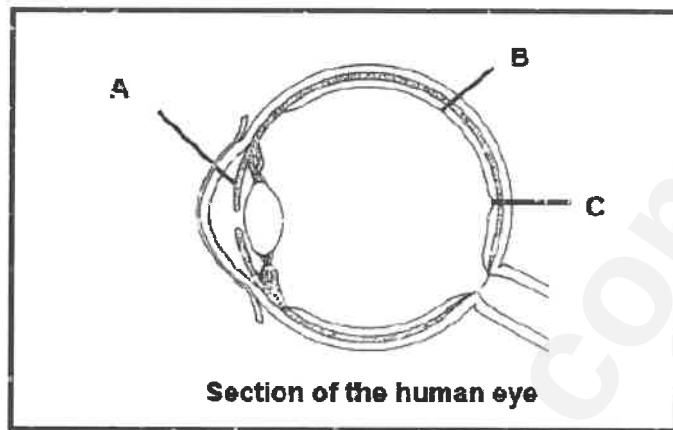
1.5.1 Identify:

- (a) A (1)
- (b) B (1)
- (c) C (1)

1.5.2 Give the LETTER and NAME of the part that:

- (a) Regulates the amount of light entering the eye (2)
 - (b) Contains a dark pigment that absorbs excess light in the eye (2)
 - (c) Contains receptors sensitive to light (2)
- (9)**

2.3 Study the diagram and the graph below and answer the questions that follow.



- 2.3.1 Explain ONE way in which part **B** is suitable for its function. (2)
- 2.3.2 Explain how and why the part labelled **A** makes adjustments when a person moves from bright light into a dark room. (5)
- 2.3.3 Which NUMBER (1–4) on the graph represents **C** in the diagram? (1)
- 2.3.4 Give a reason for your answer to QUESTION 2.3.3. (1)
- 2.3.5 Name the part of **B** in the diagram which corresponds to number 2 on the graph. (1)
- (10)

- 2.2 Jabu took part in an experiment on the eye's response to light. A lamp was placed at seven positions from Jabu's face. The diameter of Jabu's pupil was measured at each position.

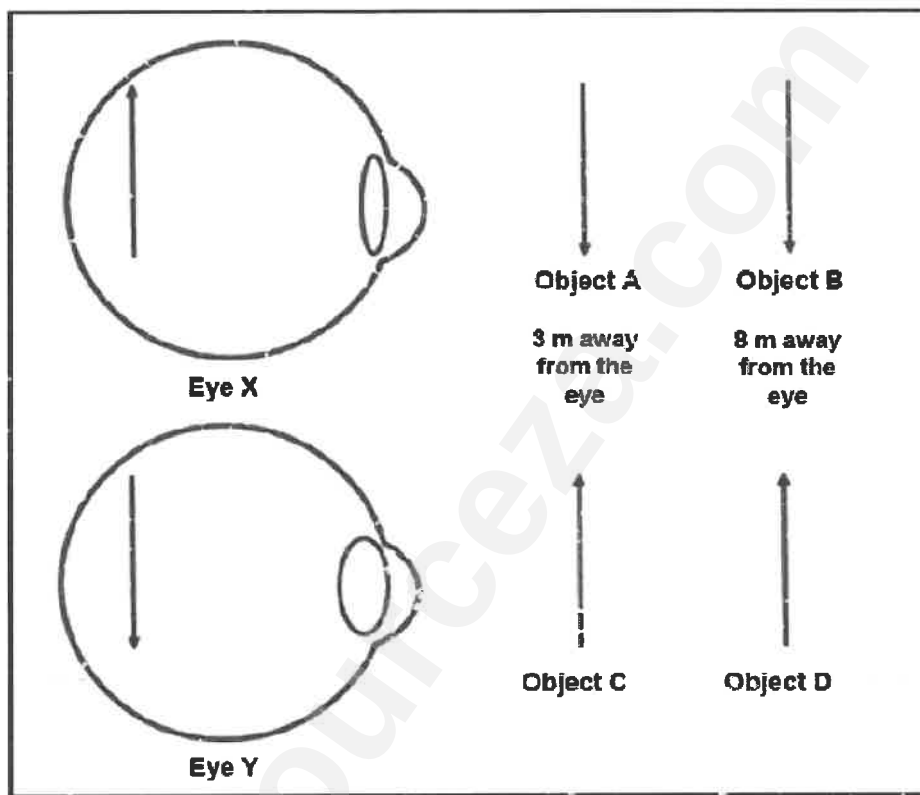
The results are shown in the table below.

POSITION OF THE LAMP	DIAMETER OF THE PUPIL (mm)
1	1,2
2	1,8
3	2,4
4	3,0
5	3,6
6	4,2
7	4,8

- 2.2.1 (a) At which position was the lamp furthest from the eye? (1)
- (b) Explain your answer to QUESTION 2.2.1(a). (2)
- 2.2.2 When the lamp was moved from position 1 to position 2, describe the mechanism that caused the change in the diameter of the pupil. (4)
- (7)

- 2.1 The diagram shows two eyes (X and Y) focused on objects (represented by arrows) at different distances from the eye. Objects A and C were 3 metres away from the eye. Objects B and D were 8 metres away from the eye

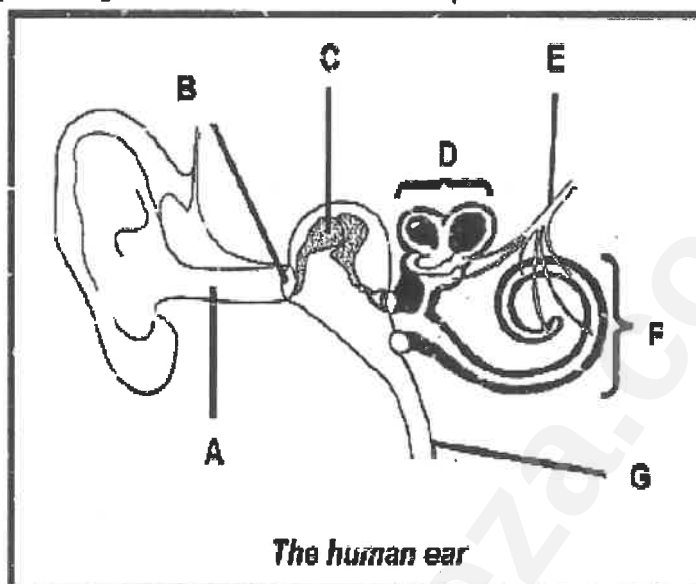
NB: The diagrams are not drawn to scale



- 2.1.1 Write down the LETTER ONLY of the object that:
- (a) Eye Y is focused on (1)
 - (b) Eye X is focused on (1)
- 2.1.2 (a) Name the eye defect which results from the inability of the Eye Y to focus on Object D. (1)
- (b) Name the type of lens used to rectify the defect mentioned in QUESTION 2.1.2(a). (1)
- 2.1.3 Name and describe the process that allows Eye Y to form a clear image on the retina. (5)

(4)

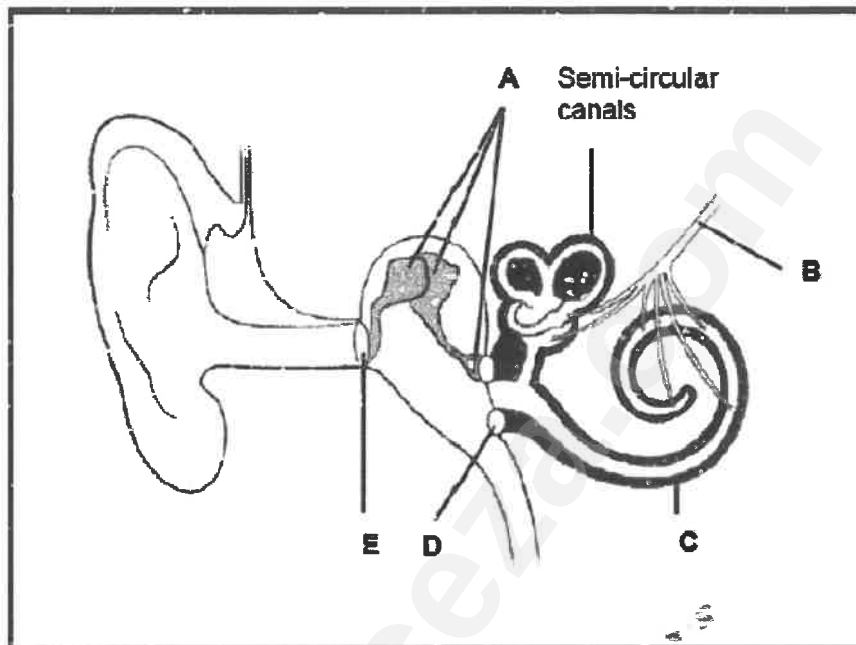
1.5 Study the diagram below and answer the questions that follow.



Write down the letters of the part that

- | | | |
|-------|--|-----|
| 1.5.1 | has receptors for balance. | (1) |
| 1.5.2 | transmits impulses to the brain. | (1) |
| 1.5.3 | equalises pressure on either side of part B. | (1) |
| 1.5.4 | amplify vibrations to the oval window. | (1) |
| | | (4) |

3.4 Study the diagram of the human ear below.



3.4.1 Identify:

- (a) B (1)
- (b) D (1)

3.4.2 Which part of the brain will receive impulses from part C? (1)

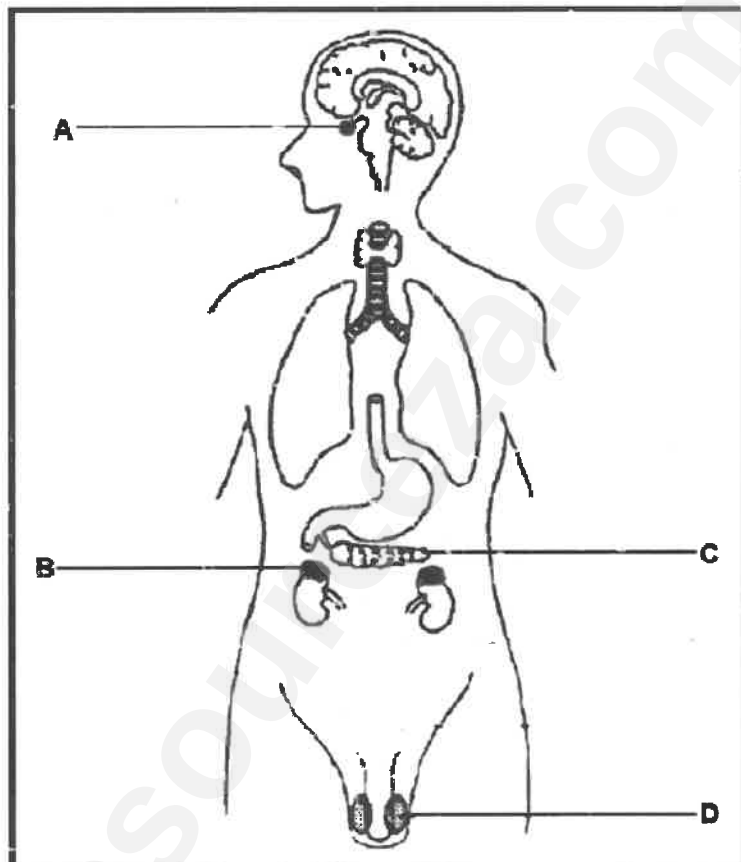
3.4.3 Describe the role of the semi-circular canals in maintaining balance. (5)

3.4.4 Describe how an increased production of mucus in the nose and throat may lead to the bursting of part E. (3)

3.4.5 Explain why fusion of the structures at A may lead to hearing loss. (2)
(13)

Human endocrine system

1.4 The diagram below represents parts of the endocrine system in humans.



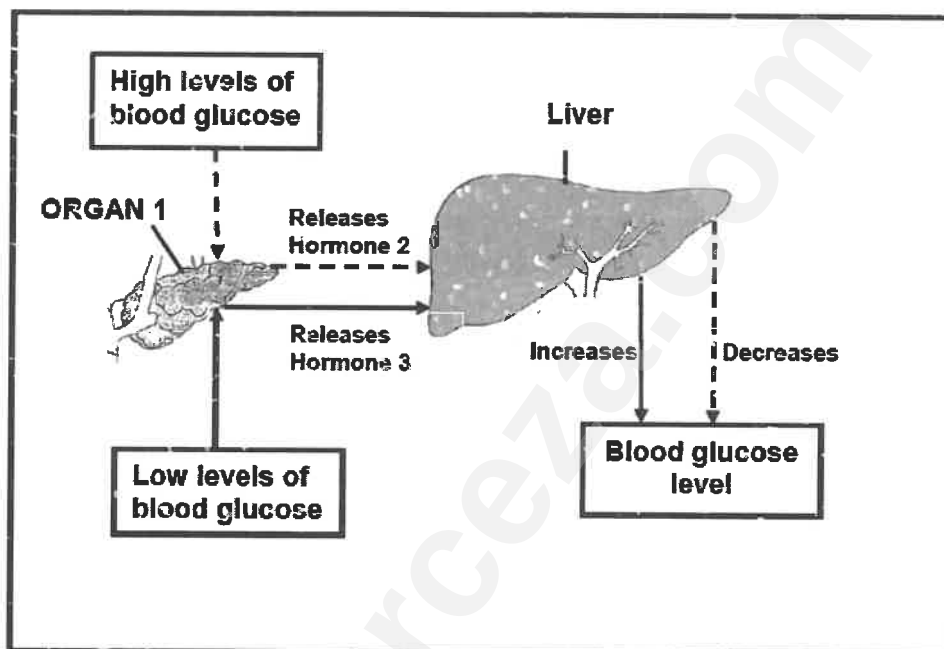
1.4.1 Identify gland:

- (a) A (1)
- (b) B (1)

1.4.2 Give the LETTER and the NAME of the gland that secretes a hormone responsible for:

- (a) Starting puberty in males (2)
- (b) Stimulating absorption of glucose by cells (2)
- (c) Making the kidney tubules permeable to water (2)
- (8)

1.5 Study the flow diagram below.



Identify:

- | | | |
|-------|---|------------|
| 1.5.1 | Organ 1 | (1) |
| 1.5.2 | Hormone 2 | (1) |
| 1.5.3 | Hormone 3 | (1) |
| 1.5.4 | The disorder caused when organ 1 fails to release sufficient amounts of hormone 2 | (1) |
| 1.5.5 | The mechanism that controls the levels of glucose in the body | (1)
(5) |

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- 3.2 An investigation was conducted to compare the glucose concentration in the blood of two people, Mo and Thabiso, before and after ingesting glucose.

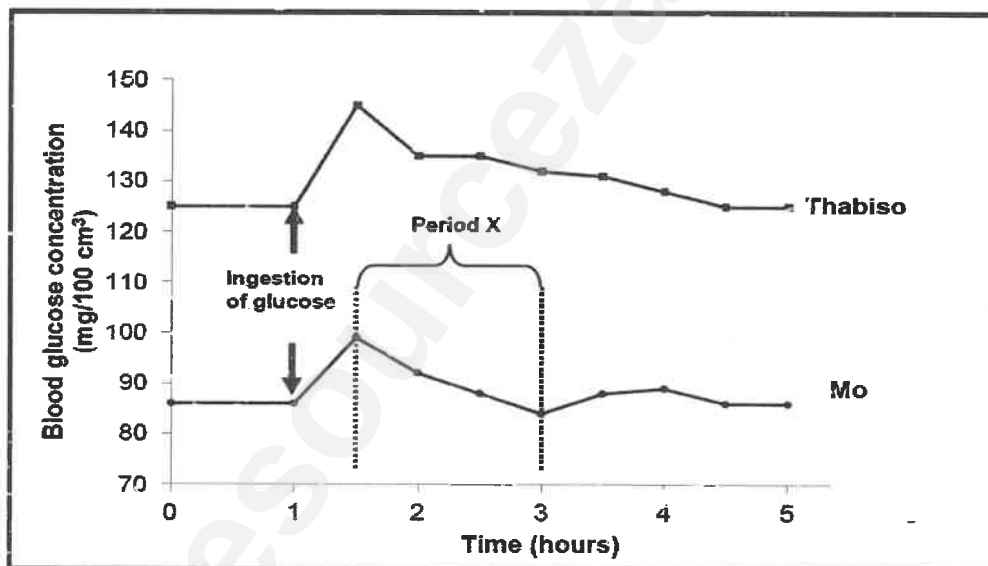
The following procedure was followed:

- The glucose concentration in their blood was measured at the start of the investigation and again 1 hour into the investigation.
- One hour into the investigation each of them was given 50 ml of a glucose solution to drink.
- For the next 4 hours after ingesting the glucose solution the glucose concentration in their blood was measured every 30 minutes.

The results are shown in the graph below.

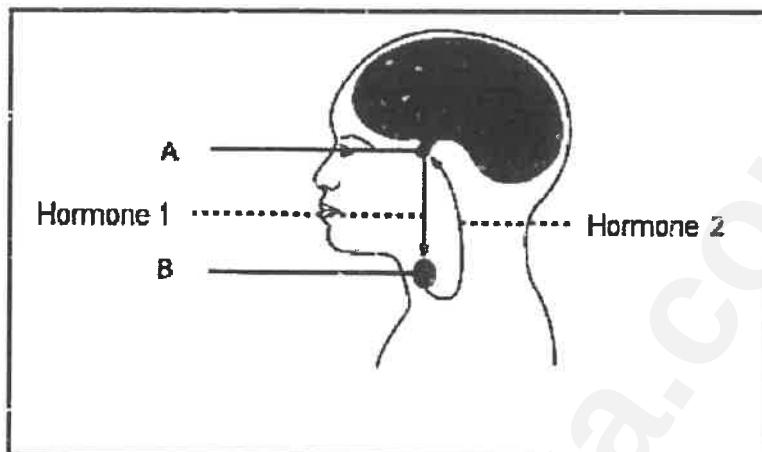
The arrows indicate when they drank the glucose solution.

NOTE: The normal glucose concentration in blood is between 80 and 120 mg/100 cm³.



- 3.2.1 Provide a suitable title for this graph. (2)
- 3.2.2 By how much did Thabiso's blood glucose concentration level increase (in mg/100 cm³) after drinking the glucose solution? Show ALL working. (2)
- 3.2.3 How long did it take Mo's blood glucose concentration level to return to its original level after ingesting the glucose solution? (1)
- 3.2.4 (a) Who (Thabiso or Mo) has diabetes mellitus? (1)
- (b) Give ONE observable reason for your answer to QUESTION 3.2.4(a). (1)
- 3.2.5 Explain the changes in Mo's glucose level during period X. (4)
- (11)

1.5 The diagram below represents the location of TWO endocrine glands.

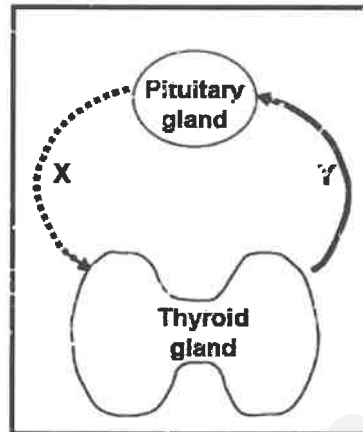


1.5.1 Identify glands A and B. (2)

1.5.2 Negative feedback regulates the levels of the hormones secreted by the glands mentioned in QUESTION 1.5.1.

Identify hormones 1 and 2. (2)
(4)

- 2.4 The diagram below represents a negative feedback mechanism. X and Y represent hormones secreted by the respective glands.



- 2.4.1 What is the role of any negative feedback mechanism in the human body? (1)
- 2.4.2 Identify hormone X. (1)
- 2.4.3 Explain the consequences for a person if hormone Y remained abnormally high for extended periods of time. (3)
(5)

- 3.3 An investigation was conducted to determine the effect of different amounts of thyroxin on metabolic rate.

The procedure was as follows:

- Nine healthy adult male rats were used.
- They were divided into three groups of three rats each: A, B and C.
- All three groups were kept in the same environment in three separate cages.
- Each group received the same amount of water.
- Each group was given a different diet.
- Their initial mass was taken.
- Three weeks later the mass was taken again.
- Their oxygen consumption was also measured.

DIET X: Food containing all the essential nutrients

DIET Y: Food containing all the essential nutrients and an extract of thyroxin

DIET Z: Food containing all the essential nutrients and a chemical that inhibits the effect of thyroxin

The table below shows the results of the investigation.

GROUP	DIET	AVERAGE MASS OF RATS (g)		AVERAGE OXYGEN CONSUMPTION (ml/kg/min)
		INITIAL	AFTER THREE WEEKS	
A	X	319	321	4,0
B	?	320	309	10,0
C	?	318	340	2,7

NOTE: Group A was given DIET X.

- 3.3.1 Name the group(s) (A, B or C) in which the average mass of the rats increased. (2)
- 3.3.2 For this investigation state the: (1)
- (a) Independent variable (1)
- (b) Dependent variable and how it was measured (2)
- 3.3.3 Arrange the diets (X, Y and Z) in order of increasing amounts of thyroxin that would be found in the rats after they were given these diets. (2)
- 3.3.4 Which group (B or C) was given diet Y? (1)
- 3.3.5 Refer to changes in mass and oxygen consumption of the rats in the table above. Explain your answer to QUESTION 3.3.4. (5)
- 3.3.6 State THREE ways in which the validity of this investigation could be increased. (3)
- (16)

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SECTION C

QUESTION 4

Define and describe the process of DNA replication, stating when it takes place as well the significance of this process. Also describe the uses of DNA profiling in everyday life.

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

QUESTION 4

Describe the location, structure and functions of the DNA molecule and the process whereby copies of this molecule are made.

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

QUESTION 4

Write an essay in which you describe how invasive alien plants affect the quality of water and discuss various ways of controlling invasive alien plants including their advantages and/or disadvantages.

Content: (17)
Synthesis: (3)

- 4.3 Start with a cell containing FOUR chromosomes and describe ALL the chromosomal changes that occur during meiosis, resulting in the formation of abnormal gametes due to non-disjunction in meiosis 1.

Content (17)
Synthesis (3)
(20)

4.3 Describe the menstrual cycle and how it is influenced by different hormones.

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

QUESTION 4

Sperm is produced, transported and then combined with secretions from the accessory glands to form semen. The semen is then transferred into the body of the female where it meets the ovum.

Describe all the processes referred to in the statement above and explain THREE structural adaptations of the sperm for fertilisation.

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

QUESTION 4

A goalkeeper in a soccer match prevented a goal from being scored when he dived to his right after the ball was kicked towards him. Just before he dived, he heard his team-mate shout, 'your ball'.

Describe how his eyes adjusted to see the ball as it travelled towards him and describe how he heard his team-mate and maintained his balance as he dived to save the ball.

QUESTION 4

Describe how blood groups in humans are determined by different alleles and explain how blood typing can be used to solve paternity cases. Also explain why and how DNA profiling is sometimes required to solve paternity cases.

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

QUESTION 4

Describe TWO types of mutations and how they lead to altered characteristics in FOUR genetic disorders you have studied.

Content: (17)
Synthesis: (3)

- 4.4 Name and state the functions of FOUR hormones secreted by the pituitary gland in humans. Describe how the pituitary gland controls the functioning of the thyroid gland using negative feedback.

Content (17)
Synthesis (3)
(20)

- 4.3 Describe the negative feedback mechanism involving TSH and thyroxine and describe the consequences if this mechanism does NOT function well.

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

- 4.3 Describe how the principle of negative feedback operates in controlling the glucose concentration of the blood in a normal healthy person. Also describe the causes, symptoms and management of the disease diabetes mellitus which results from an inability of the body to normalise the glucose concentration of the blood.

Content (17)
Synthesis (3)
(20)