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Education and Sport Development

Department of Education and Sport Development
Departement van Onderwys en Sportontwikkeling
Lefapha la Thuto le Tlhabololo ya Metshameko
NORTH WEST PROVINCE

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES

JUNE 2019

MARKS: 150
TIME: 2½ hours

This question paper consists of 16 pages.

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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, flow charts or tables 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.

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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 Ovovivipary and vivipary are similar in that…

A internal fertilisation is a pre-requisite for both.
B external fertilisation is a pre-requisite for both.
C in both cases the egg is protected by a shell.
D in both cases the egg has no covering.

1.1.2 Non-disjunction in meiosis I does NOT result in...

A trisomy 21
B four haploid gametes.
C Downsyndrome infant.
D extra chromosome in certain gametes

1.1.3 Alleles are...

A different forms of the same gene.
B the total number of genes on a chromosome
C a homologous pair of chromosomes.
D two genes on the same chromatid.

1.1.4 A fragment of DNA has a total of 120 nitrogenous bases and 42 of these bases are thymine.

What is the percentage of cytosine in this fragment?

A 65%
B 18%
C 15%
D 36%

1.1.5 During the development of the embryo the function of the amnion is to...

A serve as a reserve food
B give rise to placenta
C prevent the developing foetus from moving about
D hold the fluid which protects the embryo against injury

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1.1.6 Which ONE of the following statements best describes a difference between a chromosome and a gene?

A A gene is a section of a chromosome, and a chromosome may carry many genes.
B A chromosome and a gene are identical
C A gene is larger than a chromosome
D A chromosome contains the entire DNA of a human; while a gene is a single portion of that DNA.

1.1.7 The advantage of cloning is that it ...

A will reduce variation within a population.
B produces genetically identical individuals with desirable characteristics.
C will enable offspring to survive under any unfavourable conditions.
D is the only scientific technique that is accepted all religious faiths.

1.1.8 Study the list of functions below.

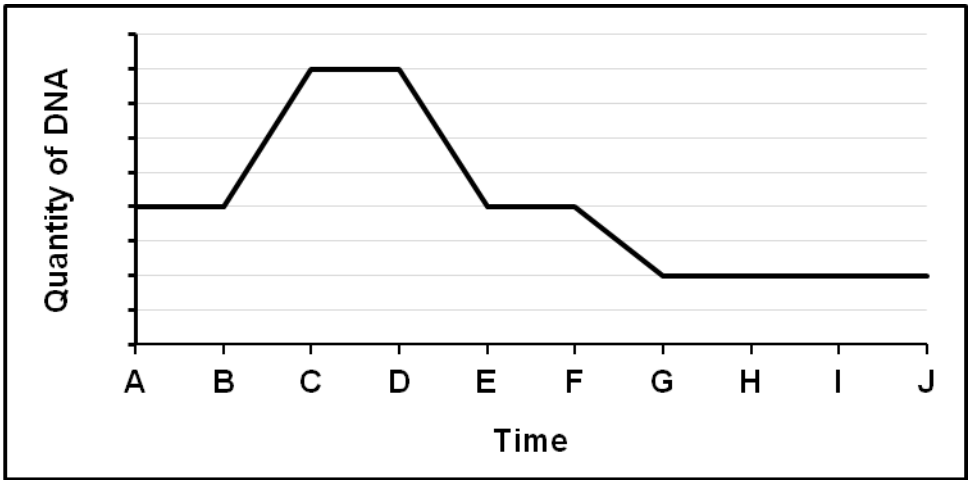
(i) Controls voluntary muscle movements
(ii) Controls higher thought processes
(iii) Regulates breathing rate
(iv) Interprets information from the receptors in the skin
(v) Controls involuntary actions

Which ONE of the following combinations of functions applies to the cerebrum?

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

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1.1.9 The graph below shows the amount of DNA present in a cell during the process of cell division.



During which time period did meiosis I occur?

A A to D
B C to E
C C to F
D F to J

1.1.10 In a dihybrid cross, pure-breeding plants with flowers that are either yellow or white , and seeds that are either wrinkled or smooth are crossed.100 seedlings are produced in the F2 generation, of which 65 have yellow flowers and smooth seeds.The dominant alleles are thus:

A yellow and wrinkled.
B yellow and smooth.
C white and smooth.
D white and wrinkle.

(10x2) **(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 1.2.6) in the ANSWER BOOK.

1.2.1 The coiled tube where sperm cells are stored before ejaculation

1.2.2 The hormone that stimulates the mammary glands to secrete milk

1.2.3 The reproductive strategy where the young are born blind, hairless and helpless

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1.2.4 Physical expression of a gene

1.2.5 Absence of the protein that forms the pigment melanin

1.2.6 The proces whereby a small amount of amniotic fluid containing foetal cells is withdrawn and analysed for genetic defects (6 x 1) **(6)**

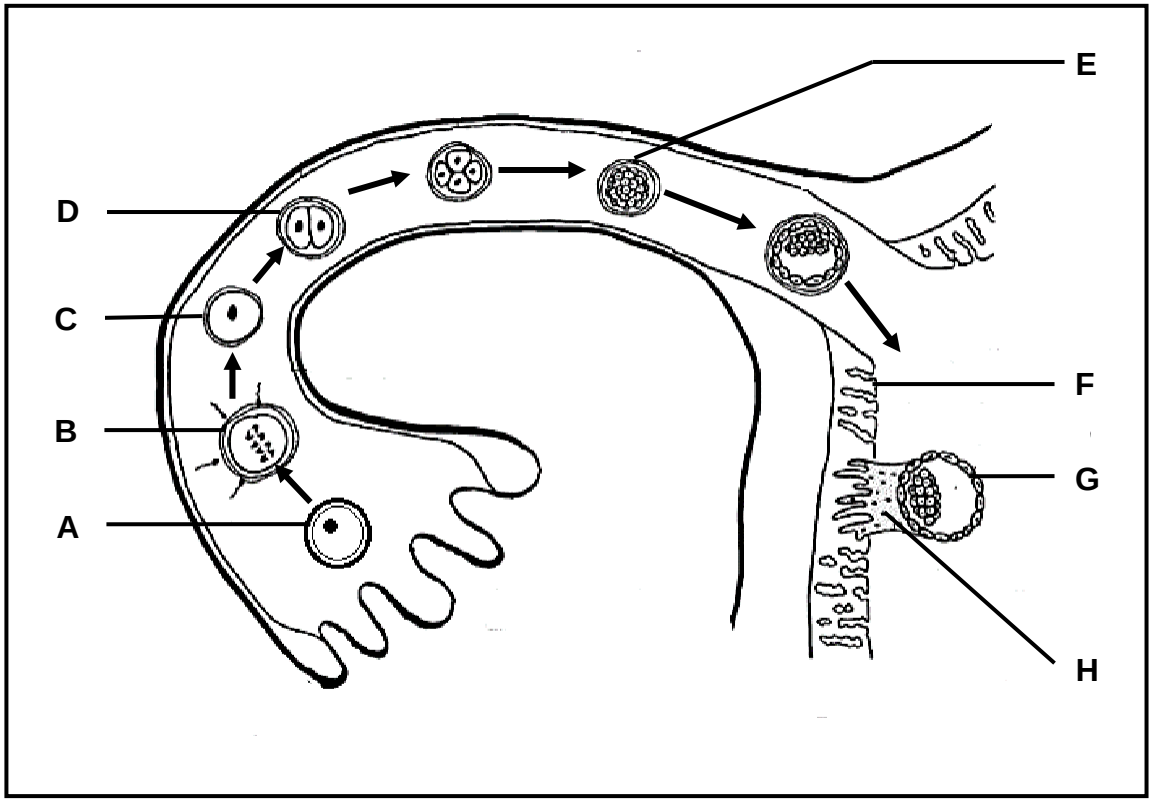
1.3 Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B**, or **none** next to the question number (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	Carried by the umbilical arteries	A:Deoxygenated blood B:Oxygenated blood
1.3.2	Mendel's law describing the separation of the chromosome in a homologous pair during meiosis	A:Law of dominance B:Law of segregation of genes
1.3.3	A condition in which the alleles at a particular locus are different	A:Heterozygous B:Homozygous

(3 x 2) **(6)**

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1.4 Study the diagram below of the sequence of events taking place in a part of human female reproductive system.



1.4.1 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)

1.4.2 Name the process that takes place:

(a) At **B** (1)

(b) When **G** attaches to part **F** (1)

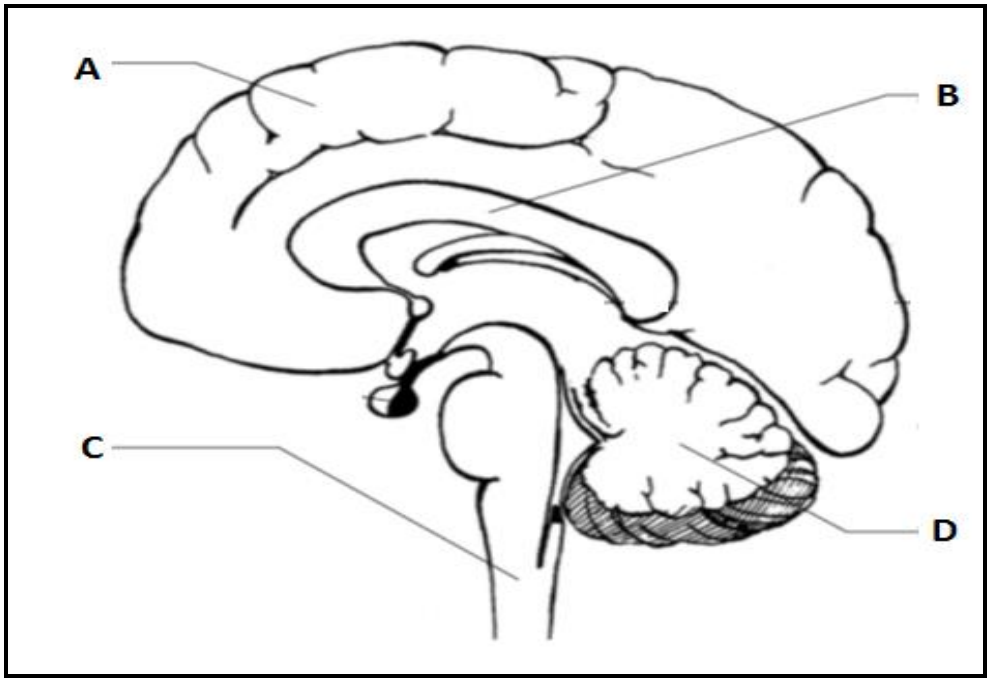
1.4.3 Give the chromosome number of:

(a) The cells at **D** (1)

(b) Cells **A** (1)
(7)

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1.5 Study the diagram below.



1.5.1 Label part A (1)

1.5.2 Give the letter and name of the part which has grey matter on the inside and white matter on the outside, (2)

1.5.3 Give the function of part labelled B. (1)

1.5.4 Name the part which controls balance, muscle tone and equlibrium. (1)
1.5.5 Identify the part which secretes the hormone FSH. (1)
(6)

1.6 The size and colour of seeds in a single species of plant varies.
The allele for big seeds **(B)** is dominant to the allele for small seeds **(b).**
The allele for green seeds**(y)** is recessive to the allele for yellow seeds**(Y).**

Plant **A**, heterozygous for both seed size and colour was crossed with Plant **C** which had small ,green seeds**.**

1.6.1 Name the type of genetic cross done between plants **A** and **C.** (1)

1.6.2 Write down the genotype of vplant **A.** (1)

1.6.3 List the genotypes of ALL the possible gametes that could be produced by plant **A.** (2)
1.6.4 What percentage of the offspring from the cross betwen plant A and plant C will produce plants with seeds that are small and green? (2)
(6)

TOTAL SECTION A: 50

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SECTION B

QUESTION 2

2.1 The first 7 triplets of nitrogenous bases that form part of the gene coding for a chain of heamoglobin that makes up the red blood corpuscles in humans is shown below.

DNA TEMPLATE	CAC	GTG	GAC	TGA	GGA	CTC	CTC
BASE TRIPLET NUMBER	1	2	3	4	5	6	7

2.1.1 How many of the following are coded for in the DNA template sequence above:

(a) Nitrogenous base (1)

(b) Different types of tRNA molecules that are required to form the polypeptide from this piece of DNA. (1)

(c) Amino acids (1)

2.1.2 Write down the mRNA sequence from the triplet number 4 to 6 for the DNA template above. (3)

2.1.3 Study the table below.

Anticodon on tRNA coding for the amino acid	**Amino acid coded for**
CUC	Glutamine
GUG	Histidine
GGA	Proline
GAC	Leucine
UGA	Threonine
CAC	Valine

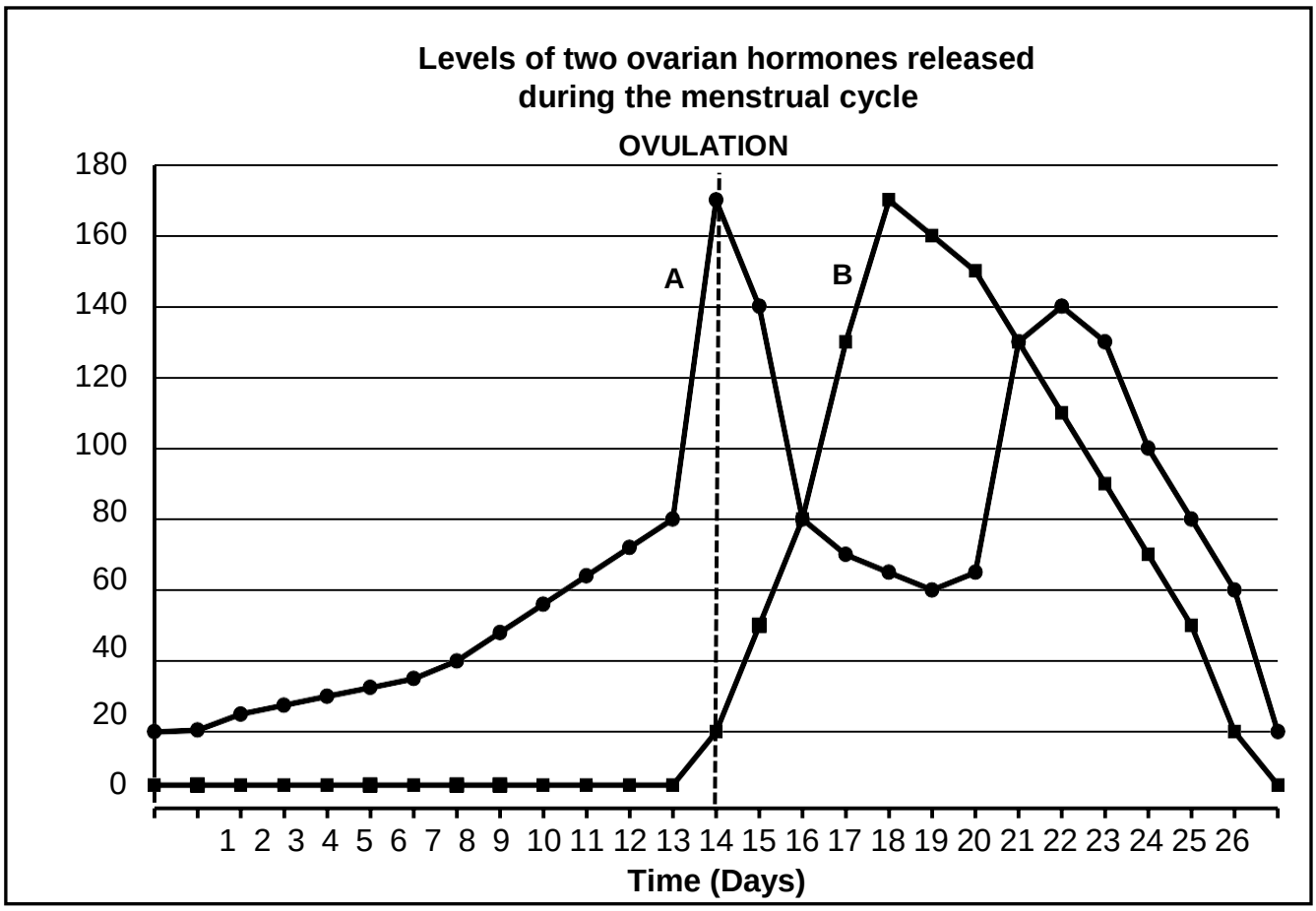
2.1.3 Using the table above , determine the amino acid sequence coded by triplet number 4 to 6. (3)

2.1.4 If the **T** in the 6th triplet base changed to **A** in the DNA template above:

Write down the new amino acid using the table above that this 6th triplet now codes for. (1)
(10)

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2.2 Study the graph below.



2.2.1 Identify:

(a) Hormone A (1)

(b) Hormone B (1)

2.2.2 What effect does an increase in hormone A have on the endometrium? (1)

2.2.3 Ovulation is indicated on the graph.

(a) On which day did ovulation take place? (1)

(b) Name the hormone which stimulates ovulation. (1)

2.2.4 Explain why high levels of hormone **B** prevent development of new follicles. (2)

2.2.5 Explain evidence in the graph that indicates that no fertilisation took place during the menstrual cycle shown above. (2)
(9)

2.3 A local optometrist, helped Sipho with his school project.Sipho wanted to determine the effect of different light intensities on the diameter of the pupil in the eye.

They carried out the following procedure in the examination room.

Step 1-Sipho sat on a chair with the light switched off for one minute
Step 2-The diameter of the pupil of his eye was measured-
Step 3-The light was switched on at a specific light intensity for one minute
Step 4-The diameter of the pupil of his eye was measured again
Steps 3 and 4 were repeated five more times at different light intensities
The resuits of the investigation are shown in the table below.

LIGHT INTENSITY	THE DIAMETER OF PUPIL (mm)
Darkness	5
Level **A**	3.5
Level **B**	2
Level **C**	2.5
Level **D**	3
Level **E**	3,2
Level **F**	4

2.3.1 State the following in this investigation:

(a)The independent variable (1)

(b)The dependent variable (1)

2.3.2 State TWO factors that should be kept constant in this investigation. (2)

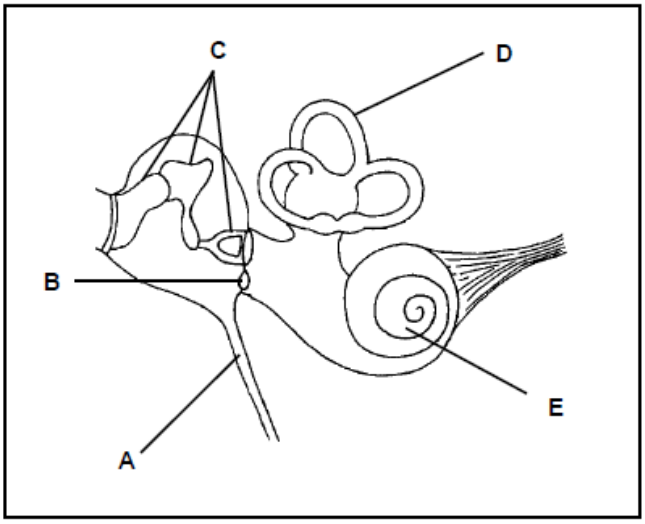
2.3.3 State ONE way in which the results of this investigation can be made more reliable. (1)

2.3.4 Describe the changes that occurred in the eye to bring about the change in the pupil diameter from level **C** to level **D.** (2)

2.3.5 Explain how we can conclude that the light intensity was greatest at level **B**? (2)
(9)

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2.4 Study the diagram below.



2.4.1 Write down ONE letter from the above diagram which assist in amplifying sound waves. (1)

2.4.2 Explain how balance is maintained by the ear. (5)
(6)

2.5 Read the following passage and answer the questions that follow

Multiple sclerosis is an inflammatory disease in which the insulating covers of neurons of the brain and spinal cord are affected.The immune system progressively destroyes the myelin sheath of these neurons,affecting their ability to transmit impulses in the central nervous system.The myelin sheath harden over time and eventually the neuron, and subsequently the entire nerve, is permanently damaged.

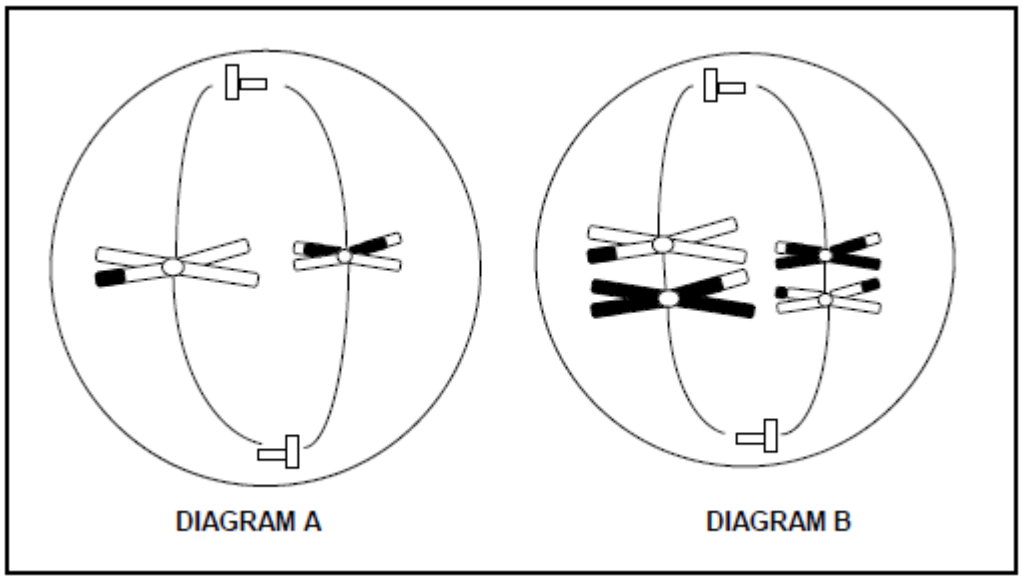
2.5.1 Explain what is meant by the *myelin sheath of neurons* and state its role in the central nervous system. (2)

2.5.2 Mention TWO possible causes of multiple sclerosis in humans. (2)

2.5.3 What are the symptoms to look for in a person diagnosed with multiple sclerosis. (2)
(6)
[40]

QUESTION 3

3.1 Study the diagram below.



3.1.1 Identify the phase represented by DIAGRAM B. (1)

3.1.2 Explain why homologous chromosomes in DIAGRAM B have a mixture of genetic material. (2)

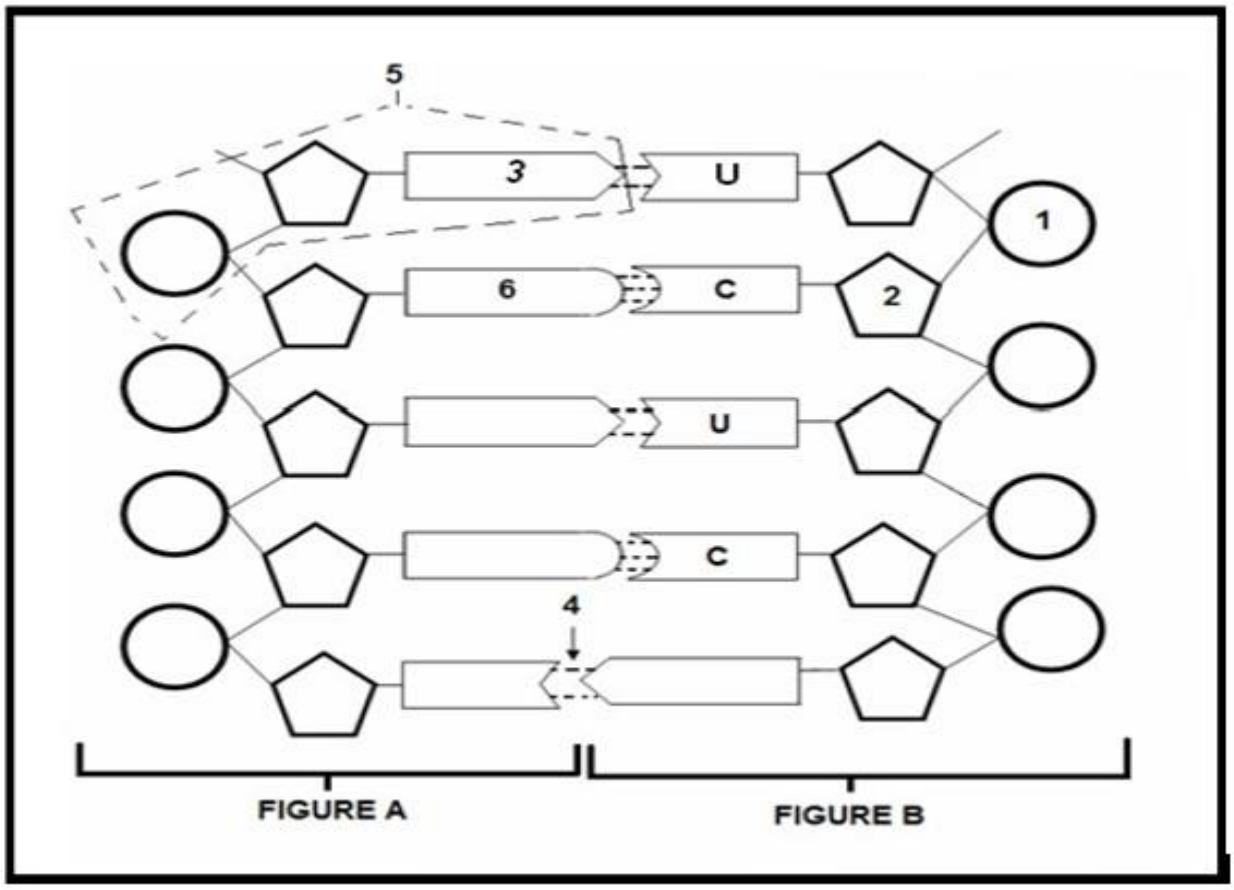
3.1.3 Name the phase that will follow the one represented by Diagram A. (1)

3.1.4 Describe the events that take place in the phase mentioned in QUESTION 3.1.3 (3)

3.1.5 Name ONE place in a human male where meiosis takes place. (1)
(8)

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3.2 Study the diagram below.



3.2.1 Name the nucleic acid represented by FIGURE B (1)

3.2.2 Give an observable reason from the diagram for your answer to QUESTION 3.2.1 (1)

3.2.3 Identify parts numbered 1,2,3 and 6. (spaces) (4)

3.2.4 Name the unit that is formed by part labelled 5 (1)

3.2.5 Many chemical bond exists between FIGURE A and B. Name the bonds represented by 4. (1)

3.2.6 Specify the site in a living cell where FIGURE A can be located. (1)

3.2.7 Mention ONE biological significance of the molecule represented by FIGURE A. (1)

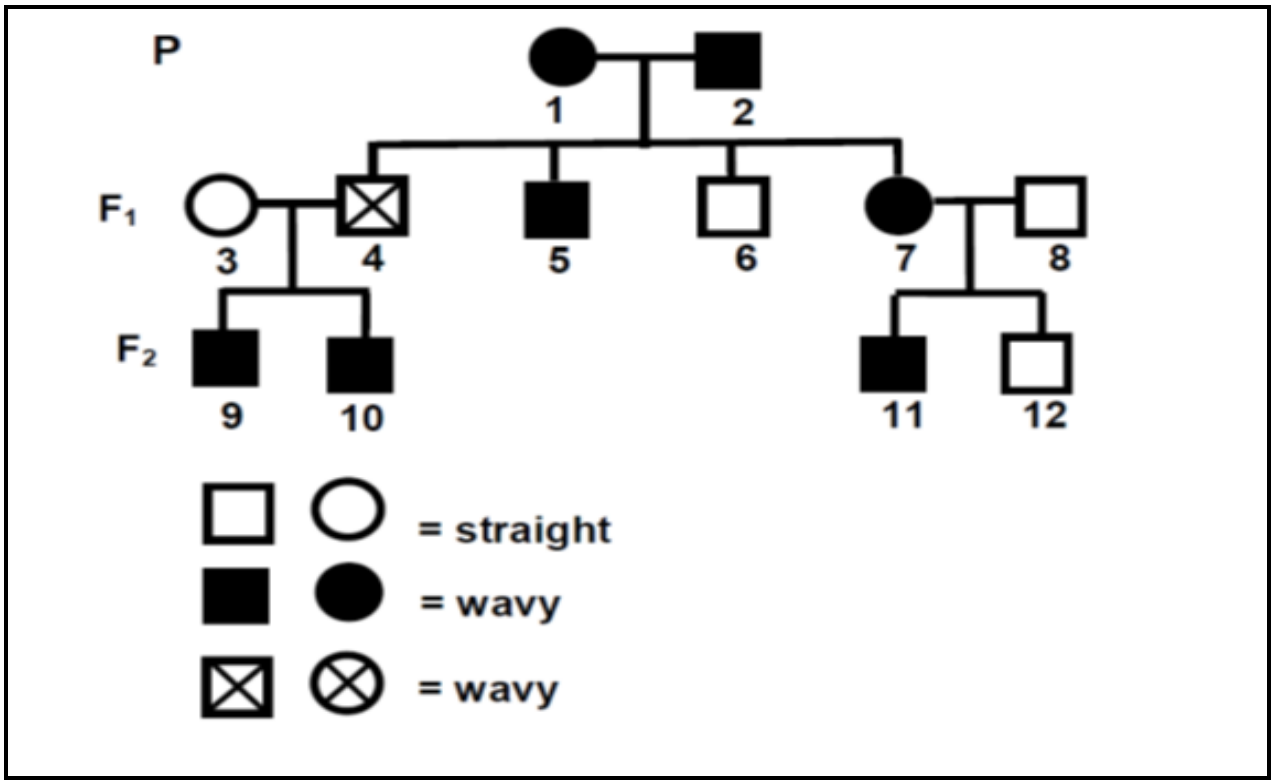
3.2.8 Name THREE forms of nucleic acid represented by FIGURE B. (3)
(13`)

3.3 Haemophilia is a sex-linked disorder that causes excessive bleeding due to a lack of the blood clotting protein. The recessive allele responsible for this disorder is represented by X^h.

3.3.1 Show by means of a genetic cross the possible genotypes and phenotypes of the parents and children if a man is suffering from haemophilia and the woman is a carrier of this disorder decide to have children. (6)

3.3.2 Explain why this disorder affects mostly males in a family. (2)
(8)

3.4 The pedigree diagram shows the phenotypes of offspring from wavy-haired parents. Study the diagram below Wavy-hair **(H)** is dominant over straight **(h)** hair.



3.4.1 Give the genotype of the individuals

(a) 1 (1)

(b) 2 (1)

3.4.2 Individuals 2 and 4 are both males with wavy hair. How does the genotype of 4 differ from 2? (1)

3.4.3 If individual 6 married a woman with straight hair, what would be the phenotype of the children? (1)

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3.4.4 Is straight and wavy hair a sex linked characteristic? Explain your answer. (2)

3.4.5 What is meant by a transgenic organism? (2)

3.4.6 Name any TWO advantages of genetic manipulation (2)
(10)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

The nervous system and endocrine systems help to protect the human body. Use suitable examples and describe how this occurs by means of a reflex action and the hormone adrenaline.

Content: (17)
Synthesis: (3)

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

TOTAL SECTION C: 20
GRAND TOTAL: 150

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