LIFE SCIENCES

GRADE 12

2020

Question Bank

Compiled by Susan Wiese

DCES: Life Sciences, GDE

PAPER 1

TOPIC	MARK
Meiosis	11
Reproduction in Vertebrates	6
Human Reproduction	31
Responding to the environment (Humans)	40
Human endocrine system	15
Homeostasis in humans	11
Responding to the environment (Plants)	11
Human impact on the environment (Gr.11)	25
TOTAL	**150**

MEIOSIS (11 MARKS)

TYPICAL EXAM QUESTIONS

QUESTION 1 *(Questions taken from various sources)*

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.4) in your ANSWER BOOK, for example 1.5 D.

1.1 Which ONE of the following is most likely the chromosome compliment of a person with Down Syndrome?

A 46 and XX
B 46 and XY
C 45 and XX
D 44 and XY

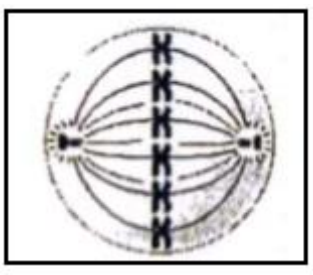
1.2 How many chromatids are found in a pair of homologous chromosomes?

A One
B Two
C Four
D Eight

1.3 The biological significance of meiosis is to …

A produce diploid gametes.
B produce identical daughter cells.
C double the chromosome number in the gametes.
D produce haploid gametes.

1.4 Which type of cell division and phase are illustrated in the following diagram?



A Metaphase I of meiosis
B Metaphase II of mitosis
C Metaphase II of meiosis
D Metaphase of mitosis II **(8)**

QUESTION 2 *(Questions taken from various sources)*

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.5) in your ANSWER BOOK.

2.1 Structure that holds two chromatids together to form a chromosome.
2.2 Point where crossing over takes place between chromatids of the homologous chromosome during prophase 1.
2.3 A process of cell division whereby the chromosomal number is halved for the production of haploid gametes (sperm cells and ova).
2.4 An organelle in the cytoplasm of the cell, which gives rise to spindle fibres during meiosis and mitosis.
2.5 Maternal and paternal chromosomes having the same shape and size which are paired but differs in genetic material. **(5)**

QUESTION 3 *(Questions taken from various sources)*

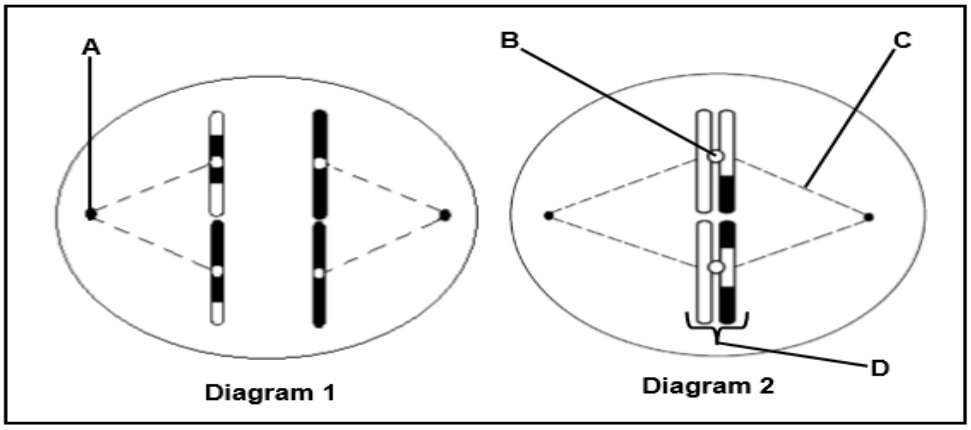
Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B or NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B,** or **none** next to the question number (3.1 to 3.3) in the ANSWER BOOK.

COLUMN I		**COLUMN II**	
3.1	A process that lead to genetic variation in cells	A B	Random arrangement of chromosomes Crossing over
3.2	The importance of meiosis	A B	Production of gametes Halving of the chromosome number
3.3	Cytokinesis takes place	A B	Telophase I Telophase II

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

QUESTION 4 *(DBE, Jun. 2018, Paper 1)*

The diagrams below represent two phases of meiosis in an organism.



4.1 Identify the phase of meiosis represented in Diagram 1 (1)

4.2 Identify part:

(a) A (1)

(b) B (1)

(c) C (1)

4.3 State what happens to structure D in the next phase of meiosis (1)

4.4 Name the process during which genetic material was exchanged, as shown in the diagrams above. (1)

4.5 State the consequence if the process named in QUESTION 4.4 does not occur. (1)

4.6 Give the number of chromosomes present in:

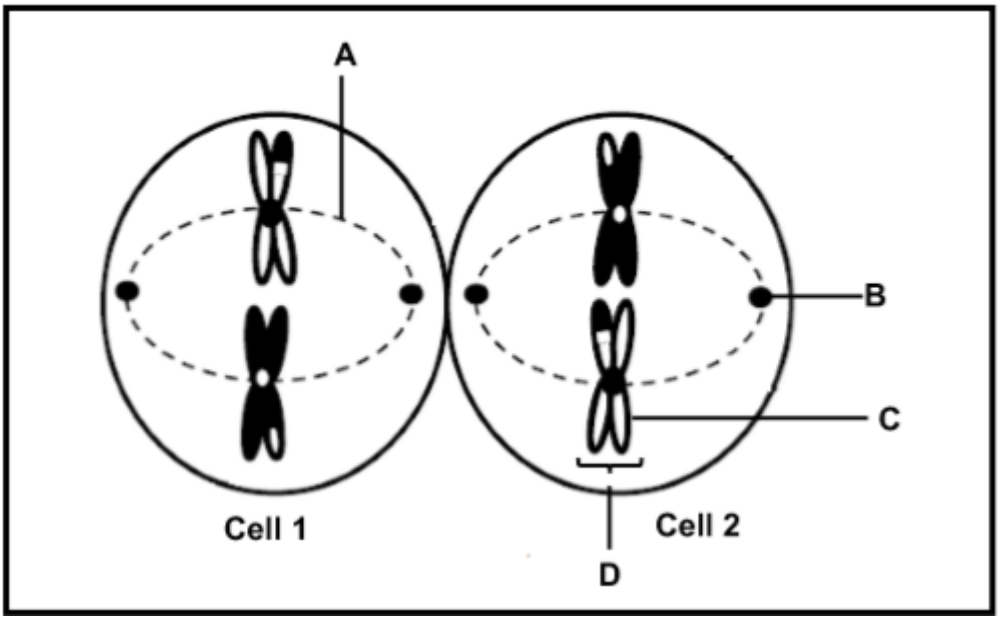
(a) The original parent cell in this organism (1)

(b) A human cell in the same phase as that shown in Diagram 2 (1)

(9)

QUESTION 5 *KZN, Prelim 2019, Paper 1)*

The diagram below represents a phase during meiosis in an animal cell.



5.1 Identify the phase represented in the diagram. (1)

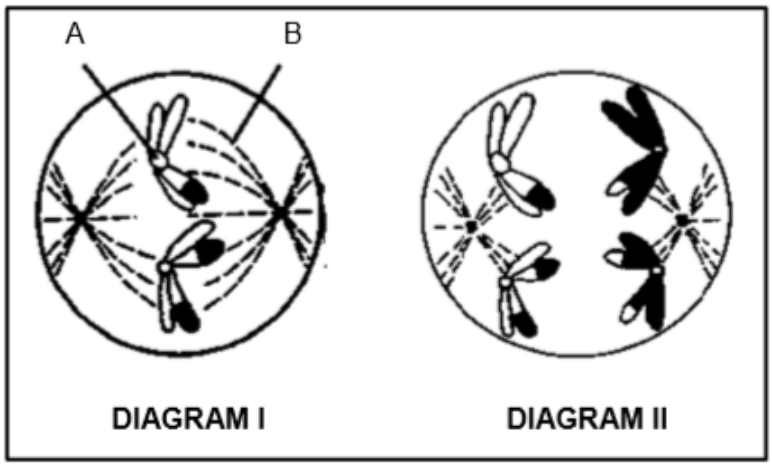
5.2 Name the process that led to the chromosomes having different shadings. (1)

5.3 Identify part:

(a) **A** (1)
(b) **B** (1)
(c) **C** (1)
(d) **D** (1)
(6)

QUESTION 6 (*FS, Prelim 2018, Paper 1)*

The diagrams below represent two phases of meiosis in a cell. The diagrams are not drawn to scale.



6.1 Identify the following parts in **Diagram I:**

(a) **A** (1)

(b) **B** (1)

6.2 Identify the phase represented by **Diagram II**. (1)

6.3 State the number of:

(a) Chromatids in **Diagram I** (1)

(b) Chromosomes in the original mother cell (1)

6.4 What evidence is visible in Diagram I that meiosis is responsible for genetic variation? (1)

6.5 Name and describe the process which is responsible for the evidence mentioned in QUESTION 6.4 (3)

6.6 Name the organ in a woman where meiosis occurs. (1)

(10)

MEIOSIS ANSWERS

QUESTION 1

1.1 C ✓✓
1.2 C ✓✓
1.3 D ✓✓
1.4 C ✓✓ **(8)**

QUESTION 2

2.1 Centromere ✓

2.2 Chiasma ✓

2.3 Meiosis ✓

2.4 Centriole ✓

2.5 Homologous chromosomes ✓ **(5)**

QUESTION 3

3.1 Both A and B ✓✓

3.2 Both A and B ✓✓

3.3 B only✓✓

(6)

QUESTION 4

4.1 Anaphase II✓ (1)

4.2 (a) Centriole✓ (1)
(b) Centromere✓ (1)
(c) Spindle fibre✓ (1)

4.3 The chromatids separate✓/centromere splits (1)

4.4 Crossing over✓ (1)

4.5 Reduces genetic variation✓ (1)

4.6 (a) Four✓/4 (1)
(b) 23✓ (1)
(9)

QUESTION 5

5.1 Metaphase II ✓ (1)

5.2 Crossing over ✓ (1)

5.3 (a) Spindle fibre ✓ (1)

(b) Centriole ✓ (1)

(c) Chromatid ✓ (1)

(d) Chromosome ✓ (1)

(6)

QUESTION 6

6.1 A – Centromere✓ (1)

B – Spindle fibre✓ (1)

6.2 Anaphase **I**✓ (1)

6.3 (a) 4✓ (1)

(b) 4✓ (1)

6.4 Chromatids contains different segments✓ (1)

6.5 - Crossing over✓*****

- Non-sister chromatids from each homologous chromosome pair overlap/cross✓

- The point where they touch is called a chiasma✓

- DNA is crossed over ✓ (swopped) at the chiasmata

(*****Compulsory+ any 2) (3)

6.6 Ovary✓ (1)

(10)

REPRODUCTION IN VERTEBRATES (6 MARKS)

QUESTION 1 *(Questions taken from various sources)*

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.4) in your ANSWER BOOK, for example 1.5 D.

1.1 An advantage of internal fertilisation is that …

A sperm and ova are protected within the female's body.
B there is better parental care.
C more gametes will be produced.
D the foetus receives food directly from the mother.

1.2 Which ONE of the following involves the development of the young inside the uterus of the mother and where it receives nutrients through the placenta?

A Ovipary
B Vivipary
C Ovovivipary
D Amniotic egg

1.3 Below is a list of terms relating to reproduction:

(i) Precocial development
(ii) Altricial development
(iii) Amniotic egg
(iv) Parental care

Which of the terms above refer to strategies used by birds that incubate their eggs in a nest and feed their young until they are able to fly?

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

1.4 Which ONE of the following involves the hatching of fertilised eggs in the body of a female, such that the young are born alive?

A External fertilisation
B Ovipary
C Vivipary
D Ovovivipary

(8)

QUESTION 2 *(Questions taken from various sources)*

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.6) in your ANSWER BOOK.

2.1 The structure that provides nutrients to the developing embryo in oviparous organisms

2.2 The type of fertilisation where the ovum is fertilised inside the female reproductive organs

2.3 A behavioural pattern of animals feeding their young and protecting them from predators

2.4 Happens mostly in aquatic habitats when eggs are released from the female's body and are sprayed with sperm

2.5 The type of development in birds where the young are incapable of moving around on their own

2.6 The type of fertilisation associated with vivipary **(6)**

QUESTION 3 *(Questions taken from various sources)*

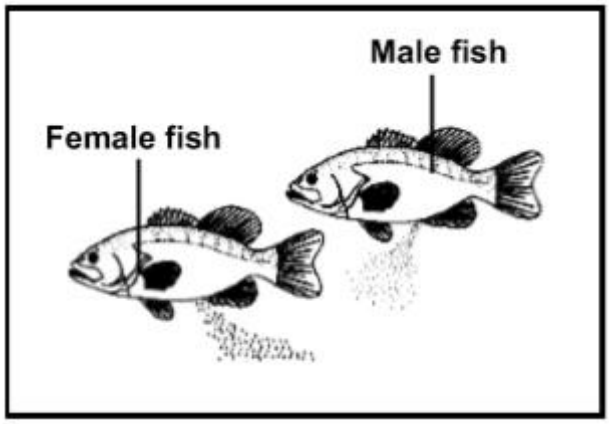
Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B or NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B,** or **none** next to the question number (3.1 to 3.3) in the ANSWER BOOK.

COLUMN I		**COLUMN II**	
3.1	A structure involved in gaseous exchange in the amniotic egg	A B	Allantois Amnion
3.2	Advantage(s) of the amniotic egg	A B	Provides nutrition Allows gaseous exchange
3.3	Embryo nourished from yolk found in the egg	A B	Ovipary Ovovivipary

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

QUESTION 4 *(KZN, Prelim 2018, Paper 1)*

The diagram below shows a certain species of fish mating.



4.1 Identify the type of fertilization displayed by the fish species. (1)

4.2 State TWO visible ways in which the chances of fertilisation in these fish are increased. (2)

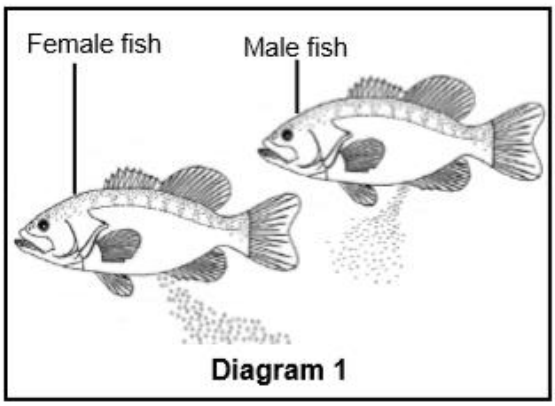
4.3 Name the reproductive strategy used by these fish that involves the production of eggs. (1)

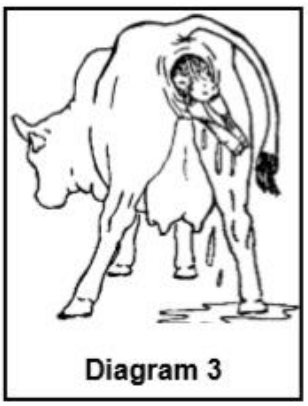
4.4 Give TWO reasons why there is no need for the eggs of these fish to be covered by a hard or leathery shell. (2)

(6)

QUESTION 5 *(DBE, Feb/March. 2018, Paper 1)*

The diagrams below represent organisms with different reproductive strategies.





5.1 Which diagram(s) (1, 2 or 3) represent(s) organism(s):

(a) Where external fertilisation takes place (1)

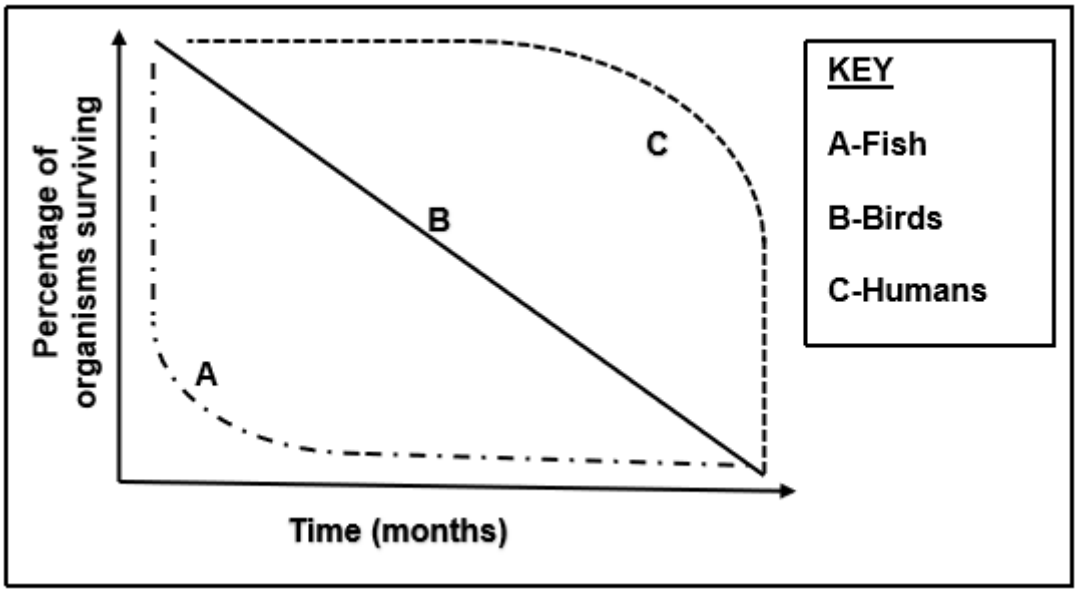
(b) Where extra-embryonic membranes develop to assist with the protection
and nutrition of the embryo (2)

(c) Which is/are oviparous (2)

5.2 Name the type of egg produced by the organism represented in **Diagram 2** (1)
(6)

QUESTION 6 *(LIMPOPO, Prelim 2018, Paper 1)*

The following graph shows the percentage of survivors in three different vertebrate populations over a period of time.



- Curve A shows that many offspring die when they are young and that few survive to be adults.
- Curve B shows that the offspring gradually died over time.
- Curve C shows that most of the offspring survive and that death occurs mainly among older organisms

6.1 Both organisms of population **A** and **B** are oviparous. Explain the difference in the two survivorship curves **A** and **B** by referring to parental care. (2)

6.2 Fish **(curve A)** produce very large amounts of offspring while humans **(curve C)** in comparison only produce a very small amount of offspring.

Explain this phenomenon as a survival strategy by referring to the type of fertilization (4)
(6)

REPRODUCTION IN VERTEBRATES ANSWERS

QUESTION 1

1.1 A ✓✓
1.2 B ✓✓
1.3 C ✓✓
1.4 D ✓✓ **(8)**

QUESTION 2

2.1 Yolk sac✓/Yolk

2.2 Internal✓ fertilisation

2.3 Parental care ✓

2.4 External fertilisation ✓

2.5 Altricial ✓

2.6 Internal ✓ fertilisation **(6)**

QUESTION 3

3.1 A only ✓✓

3.2 Both A and B ✓✓

3.3 Both A and B ✓✓

(6)

QUESTION 4

4.1 External ✓ fertilization (1)

4.2 - A large amount of sperm is released ✓
- A large amount of eggs is released ✓
- The male and female swim close to each other ✓/the sperm is released close to the eggs (Any 2)

(Mark first TWO only) (2)

4.3 Ovipary ✓ (1)

4.4 - No danger of drying out ✓

- Water provides support ✓ **(Mark first TWO only)** (2)

(6)

QUESTION 5

5.1 (a) Diagram 1 ✓ (1)

(b) Diagram 2 ✓ and Diagram 3 ✓ (2)

(c) Diagram 1 ✓ and Diagram 2 ✓ (2)

5.2 Amniotic ✓ egg (1)

(6)

QUESTION 6

6.1 Because fish does not have parental care predators feed on the eggs and young and therefore very few survive✓.
In birds, parental care is offered through protecting the eggs and young and increases the chances of survival ✓ (2)

6.2 Internal fertilization in humans is more certain as external fertilization✓
Because the male deposits the sperm inside the reproductive organs of the female✓
In fish fertilization is external, ✓ where predators and environmental factors can kill large amounts of eggs✓ (4)

(6)

HUMAN REPRODUCTION (31 MARKS)

QUESTION 1 *(Questions taken from various sources)*

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.6) in your ANSWER BOOK, for example 1.7 D.

1.1 The hormone that stimulates the production of milk in a mother after the birth of a baby.

A oestrogen
B progesterone
C prolactin
D FSH

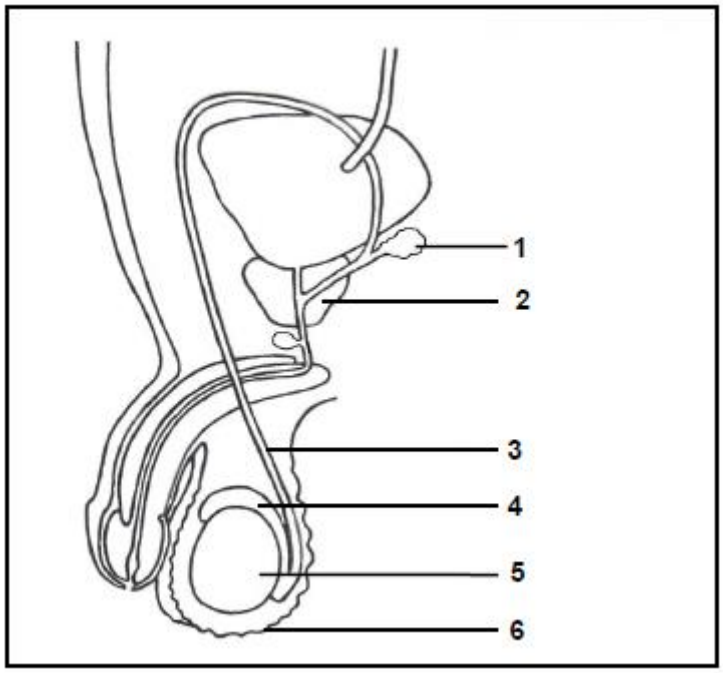
1.2 A healthy sperm that will be able to fertilise an ovum is produced by the …

A prostate glands at a temperature of about 35^{o}C.
B prostate glands at a temperature of about 37^{o}C.
C testis at a temperature of about 35^{o}C.
D testis at a temperature of about 37^{o}C.

1.3 The tube in the male reproductive system that connects the epididymis with the urethra is the …

A fallopian tube.
B vas deferens.
C vulva.
D seminal vesicle.

QUESTIONS 1.4 AND 1.5 ARE BASED ON THE DIAGRAM OF THE HUMAN MALE REPRODUCTIVE SYSTEM BELOW.



1.4 Which part stores sperm until maturation?

A 3
B 4
C 5
D 6

1.5 A man who had cancer underwent surgery to remove part **1** and part **2**. The man …

A will be able to release semen not containing sperm and therefore cannot reproduce.
B cannot reproduce because he will produce abnormal sperm.
C cannot reproduce as his sperm will not be able to survive the acidic conditions of the vagina.
D will be able to reproduce but his sperm will not be able to move fast as they will not have energy.

1.6 Which ONE of the following is a function of amniotic fluid?

A Transports oxygen to the developing foetus
B Protects the foetus from temperature changes
C Produces progesterone and oestrogen
D Protects the foetus from disease

(12)

QUESTION 2 *(Questions taken from various sources)*

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.9) in your ANSWER BOOK.

2.1 A hormone that stimulates the maturation of sperm
2.2 The outermost extra-embryonic membrane surrounding the embryo
2.3 The outer most extra-embryonic membrane in an embryo that plays a role in the formation of the placenta
2.4 A process when an embryo embeds itself into the endometrium
2.5 The finger-like projections that develop from the outer extra- embryonic membrane
2.6 A structure in the female reproductive system where semen is deposited during copulation
2.7 The period of development of the foetus in the uterus
2.8 A structure in the female reproductive system where fertilisation takes place
2.9 The stage when secondary sexual characteristics develop in males and females **(9)**

QUESTION 3 *(Questions taken from various sources)*

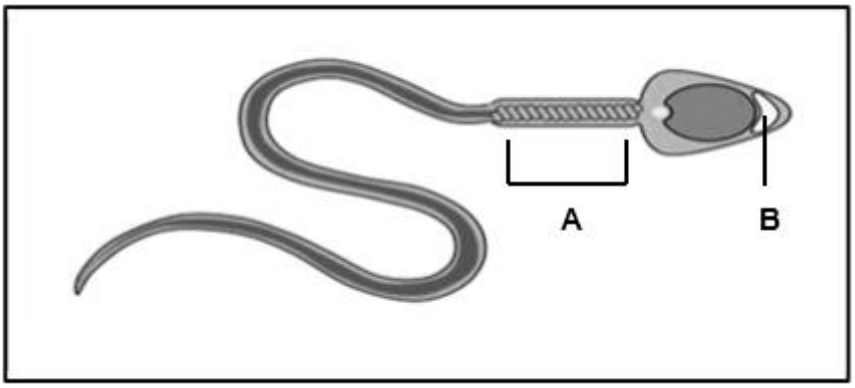
Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B or NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B,** or **none** next to the question number (3.1 to 3.3) in the ANSWER BOOK.

COLUMN I		**COLUMN II**	
3.1	A structure that is formed after fertilisation	A B	Blastocyst Morula
3.2	The blood vessel that transports oxygenated blood from the placenta to the foetus	A B	Umbilical vein Umbilical artery
3.3	The period of development of an embryo in the uterus until birth	A B	Copulation Gestation

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

QUESTION 4 *(NW, Prelim 2019, Paper 1)*

The diagram below represents a sperm.



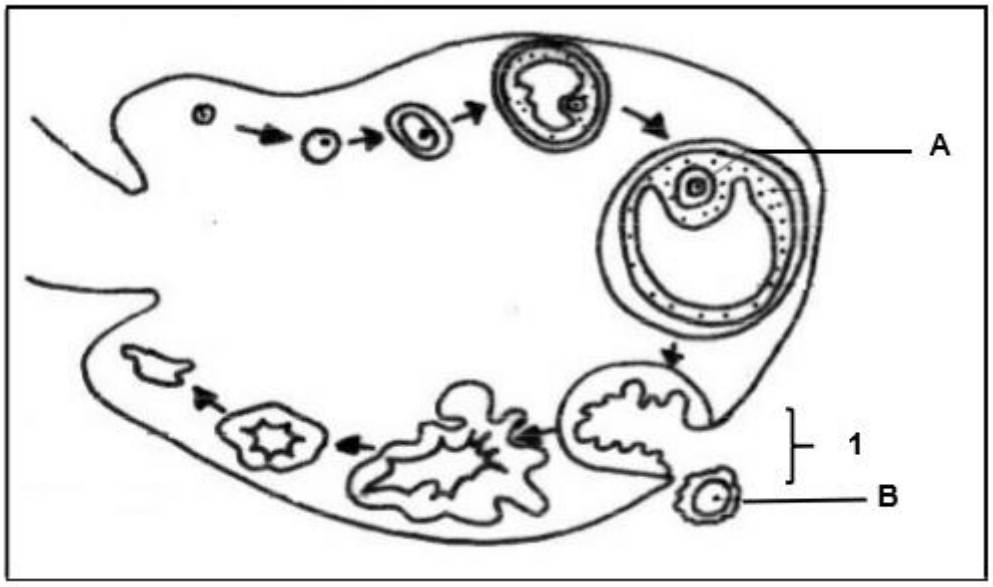
4.1 Give a label for part A. (1)

4.2 Explain TWO ways in which the sperm is adapted to ensure effective movement towards the Fallopian tubes. (4)

4.3 Name part **B** and explain the consequences for reproduction if a sperm does not have it. (4)
(9)

QUESTION 5 *(MP, Prelim 2019, Paper 1)*

The diagram below shows events in the ovary during the menstrual cycle in a 28-day cycle.



5.1 Identify:
(a) Structure **A** (1)

(b) Process 1 (1)

5.2 Name the hormone responsible for process **1**. (1)

5.3 A woman was given medication with high concentration of progesterone.

Explain the effect of this medication on the ovarian cycle. (3)

5.4 Give an observable reason which suggest that fertilisation did not take place after the process numbered **1.** (2)

5.5 Ovariotomy is a term used to describe the surgical removal of only the ovaries. They can be removed due to certain illnesses such as cancer.

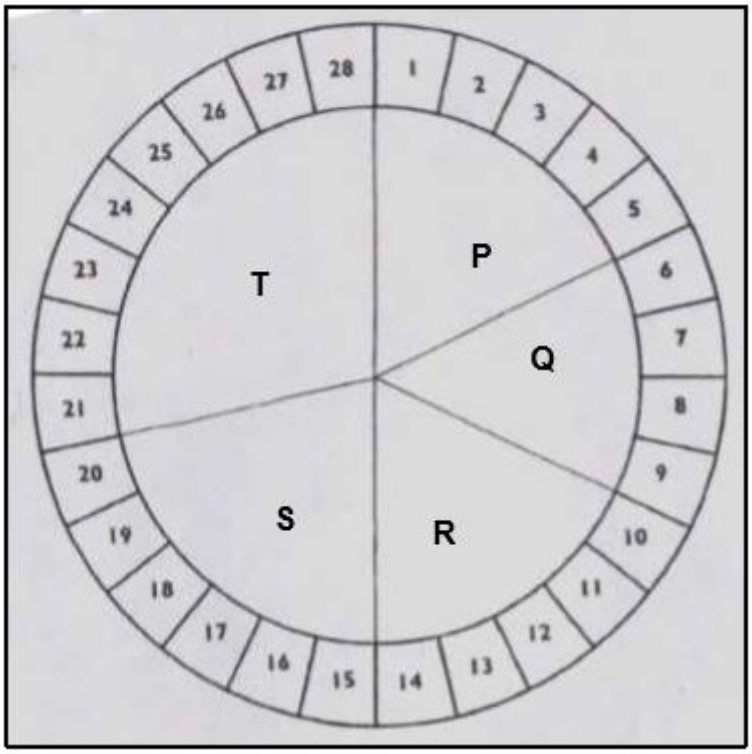
Explain why a female who have done ovariotomy will not undergo menstruation (4)

5.6 Draw a labelled diagram of the structure **B**. (3)

(15)

QUESTION 6 *(LIMPOPO, Prelim 2019, Paper 1)*

The following diagram represents a menstrual cycle of a woman, starting at day one.



6.1 Indicate the LETTER of the phase when:

(a) Menstruation is likely to occur. (1)

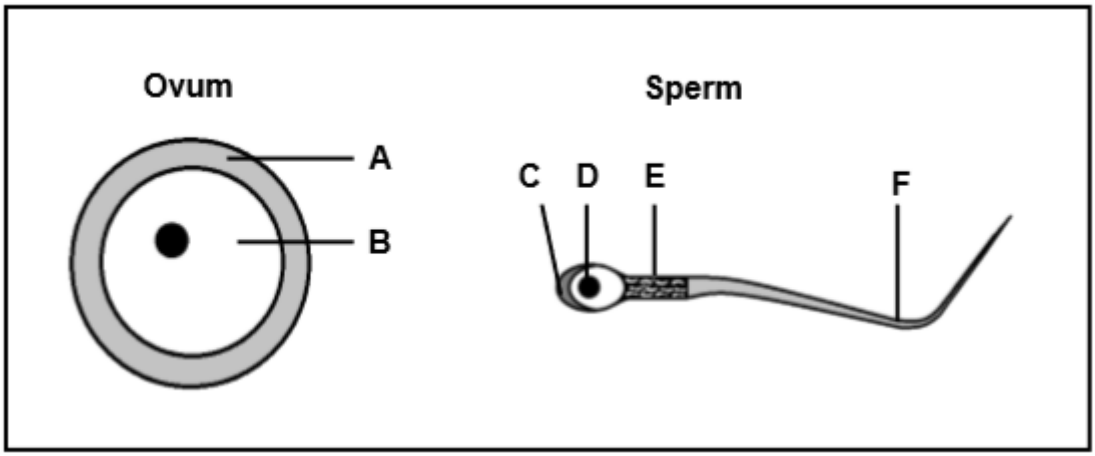
(b) The levels of progesterone and oestrogen are the highest. (1)

6.2 The birth control pill is one of the most commonly used contraceptive products. It contains oestrogen and progesterone and is taken daily except for the last 5 days of the 28-day menstrual cycle. Explain how the presence of high levels of these hormones prevents pregnancy. (5)

6.3 Draw a labelled diagram of an ovary with only the follicles indicated at stages **P** and **S** on the diagram. (4)
(11)

QUESTION 7 *(DBE, Nov. 2019, Paper 1)*

The diagrams below represent the structures of an ovum and a sperm.



7.1 Identify part:

(a) **A** (1)

(b) **B** (1)

(c) **C** (1)

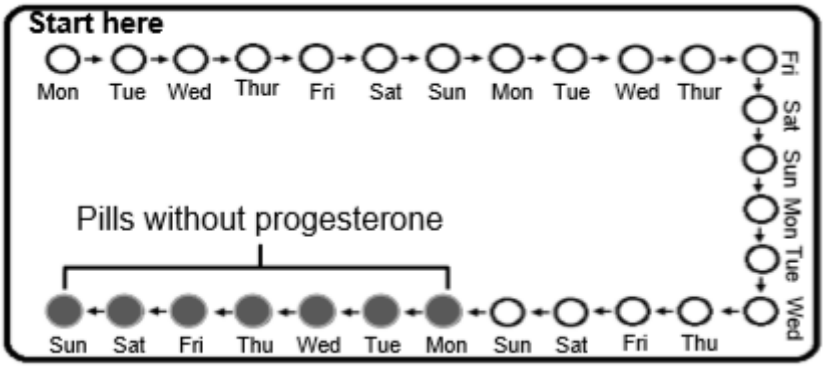
7.2 Name the process involving meiosis that leads to the formation of an ovum. (1)

7.3 Write down only the LETTER of the part of the sperm that enters the ovum. (1)

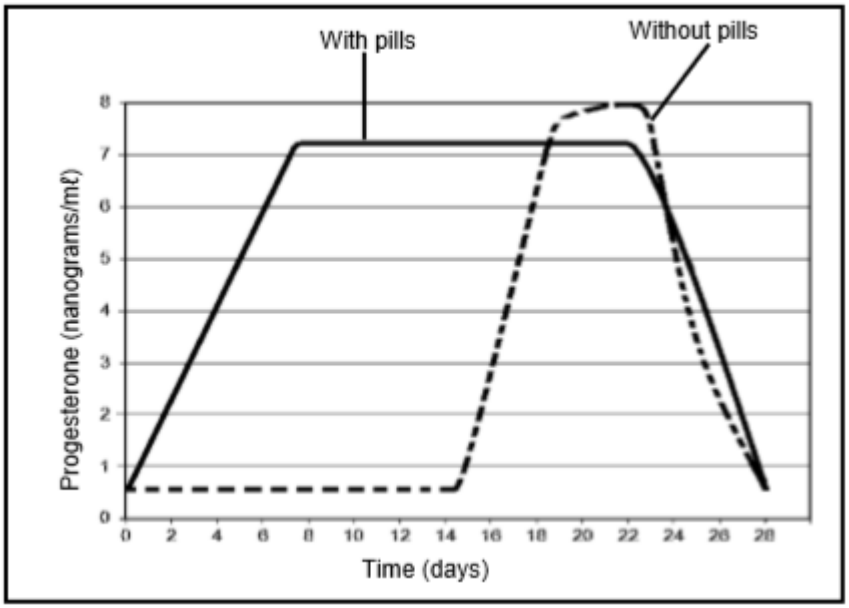
7.4 Write down only the LETTERS of TWO parts that enable the sperm to move towards the ovum. (2)
(7)

QUESTION 8 *(DBE, Nov. 2019, Paper 1)*

Contraceptives are used to prevent pregnancy. Some females use pills that contain progesterone. In one packet there would be 28 pills, of which 21 contain different concentrations of progesterone according to the day in the cycle and the remaining 7 will contain no progesterone. A female has to take one pill daily at the same time in a given sequence, as shown below.



The graph below shows the difference in the progesterone levels during a menstrual cycle of a woman taking contraceptive pills and a woman not taking contraceptive pills.



8.1 The oestrogen levels between days **8** and **22** will remain low in the woman who takes contraceptive pills. Explain why this is the case. (4)

8.2 Ovulation took place on day **14** in the woman not taking contraceptive pills. Explain the evidence in the graph that supports this conclusion (2)

8.3 Suggest ONE reason for including pills with no hormones in the contraceptive pill packet. (1)

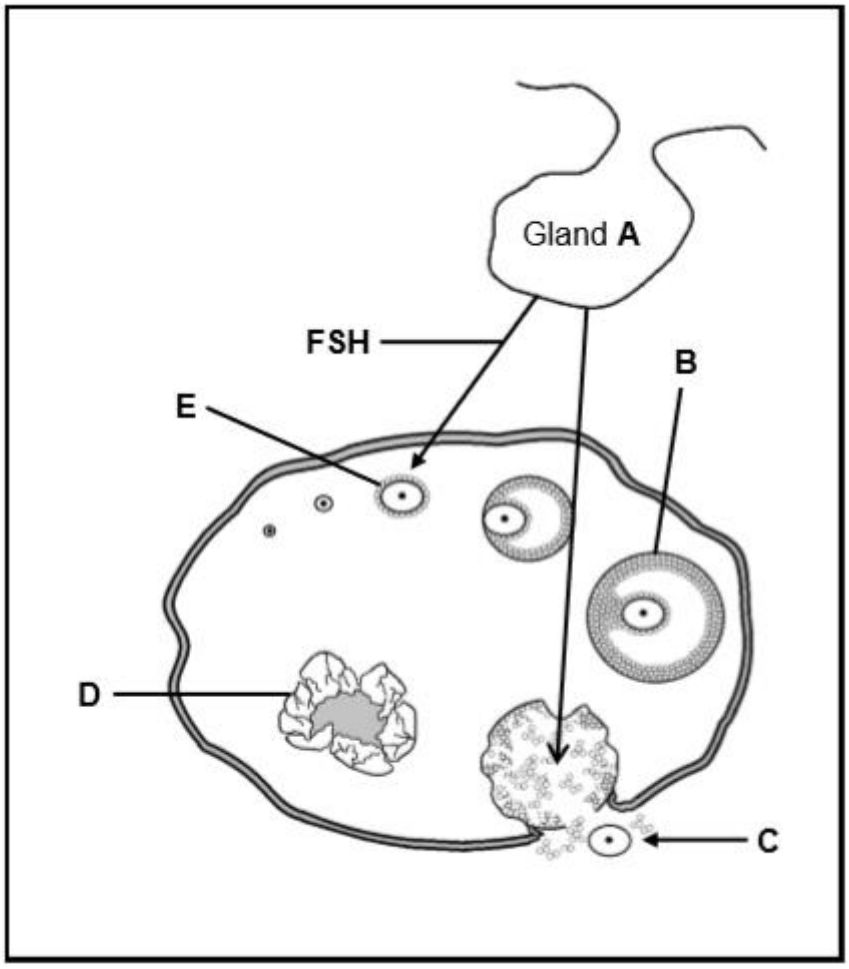
(7)

QUESTION 9 *(DBE, Nov. 2019, Paper 1)*

Describe the development of a zygote until implantation occurs. (4)

QUESTION 10 *(DBE, Feb/March 2019, Paper 1)*

The diagram below represents an endocrine gland A and the events that take place in the ovary during the menstrual cycle in humans.



10.1 Identify:

(a) Gland **A** (1)

(b) Structure **B** (1)

(c) Process **C** (1)

(d) Structure **D** (1)

10.2 State the effect on the oestrogen levels in the blood if gland A stops secreting

FSH. (1)

10.3 State ONE function of LH. (1)

(6)

HUMAN REPRODUCTION ANSWERS

QUESTION 1

1.1 C ✓✓
1.2 C ✓✓
1.3 B ✓✓
1.4 B ✓✓
1.5 C ✓✓
1.6 B ✓✓ **(12)**

QUESTION 2

2.1 Testosterone ✓
2.2 Chorion ✓
2.3 Chorion ✓
2.4 Implantation ✓
2.5 Chorionic villi ✓
2.6 Vagina ✓
2.7 Gestation ✓
2.8 Fallopian tube/Oviduct ✓
2.9 Puberty ✓ **(9)**

QUESTION 3

3.1 None ✓✓

3.2 A only ✓✓

3.3 B only ✓✓

(6)

QUESTION 4

4.1 A – Middle piece ✓ (1)

4.2 Mitochondria ✓: supplies energy ✓ for locomotion of the sperm cell
Tail ✓: can propel forward ✓ for swimming/locomotion of the sperm cell
Torpedo shape ✓: reducing friction ✓ **(MARK FIRST TWO ONLY)**
Any 2 x 2 (4)

4.3 - Acrosome* ✓

- therefore will be no enzymes ✓
- Sperm will be unable to penetrate the ovum ✓
- therefore no fertilisation will occur ✓ **1 * compulsory + 3** (4) **(9)**

QUESTION 5

5.1 (a) Graafian follicle ✓ (1)
(b) Ovulation ✓ (1)

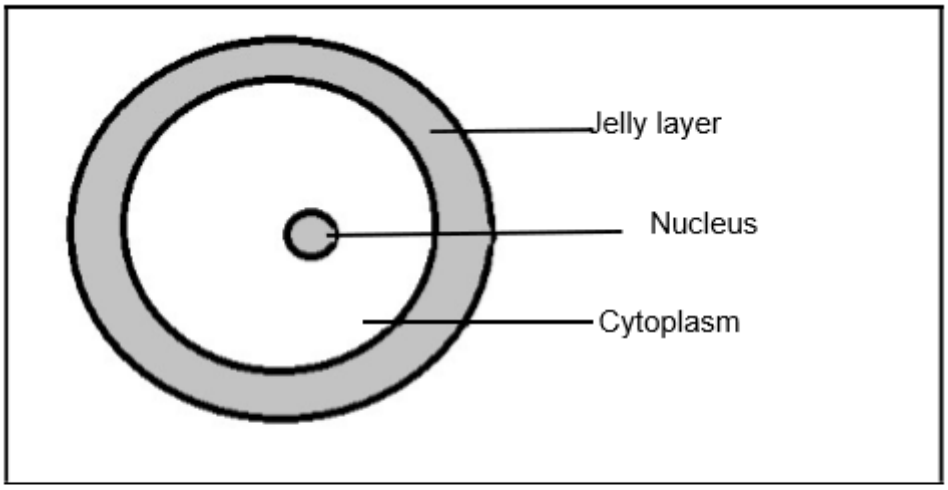
5.2 LH✓/Luteinising hormone (1)

5.3 - High level of progesterone will inhibit the secretion of FSH✓
- by the pituitary gland ✓/hypophysis
- No follicle development will occur✓
- and therefore, no ovulation✓ Any (3)

5.4 The corpus luteum✓has degenerated✓ (2)

5.5 - No follicle will develop✓
- No oestrogen✓
- to thickening of the endometrium✓
- which is shed✓ during menstruation (4)

5.6 (3)
(15)



Criteria for marking diagram

Criteria	Marks
Correct diagram (ovum)	1
Any 2 correct labels	2

QUESTION 6

6.1 (a) P ✓ (1)

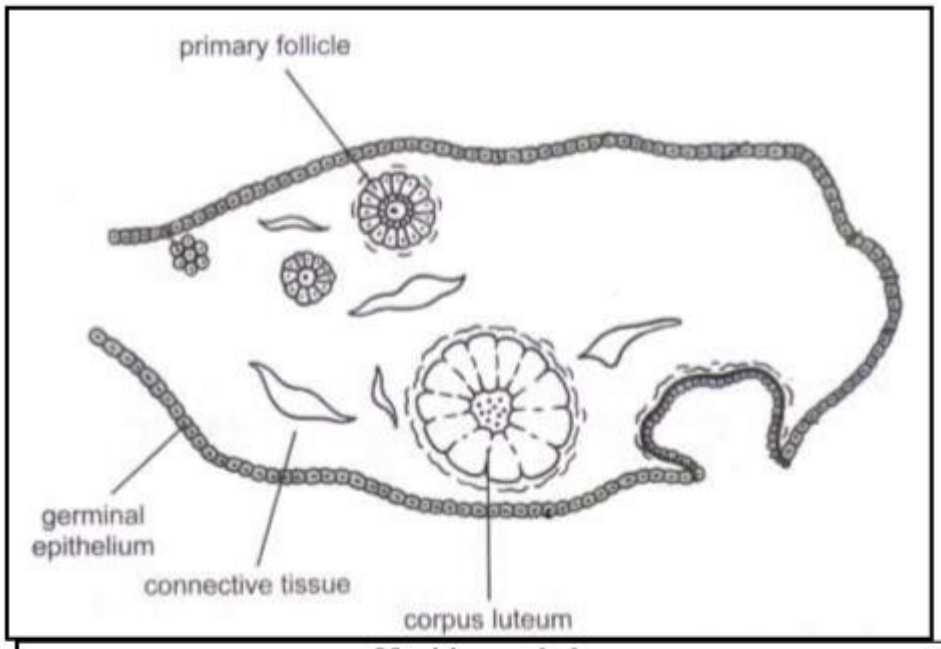
(b) S ✓ (1)

6.2 Increased progesterone and oestrogen concentrations

- Stops the pituitary gland✓
- Secreting FSH✓
- and LH✓
- This prevents the development of a Graafian follicle✓
- And ovulation is impaired ✓
- No ova no fertilisation✓

Any (5)

6.3 Ovary



Marking rubric		
Code		**Mark**
D	Correct sketch of ovary with only primary follicle and corpus luteum	1
L	3 Correct labels	3
	Total	**4**

(4)
(11)

QUESTION 7

7.1 (a) Jelly layer ✓/Zona pellucida (1)

(b) Cytoplasm ✓/cytosol (1)

(c) Acrosome ✓ (1)

7.2 Oogenesis ✓ (1)

7.3 D ✓ (1)

7.4 E ✓
F ✓ **(Mark first TWO only)** (2)
(7)

QUESTION 8

8.1 - The high levels of progesterone ✓ in the pills
- will inhibit the secretion of FSH ✓ pituitary gland
- No follicle will develop ✓
- and hence no oestrogen will be secreted ✓ (4)

8.2 - The increase in the progesterone level ✓
- indicates that the corpus luteum has been formed ✓ (2)

8.3 - Women will stay in the habit of taking a pill every day ✓/ will not forget to take the progesterone containing pills
- To allow menstruation to occur ✓ **Any** (1)
(Mark first ONE only) **(7)**

QUESTION 9

- Zygote divides by mitosis ✓
- to form a ball of cells ✓
- called the morula ✓
- which further divides to form a hollow ball of cells ✓
- called the blastula/blastocyst ✓ **Any** (4)

QUESTION 10

10.1 (a) Pituitary✓ gland/hypophysis (1)
(b) Graafian follicle ✓ (1)
(c) Ovulation ✓ (1)
(d) Corpus luteum ✓ (1)

10.2 Remains low ✓/decreases (1)

10.3 - Stimulates ovulation ✓
- Stimulates the development of the corpus luteum ✓
(Mark first ONE only) **Any** (1)
(6)

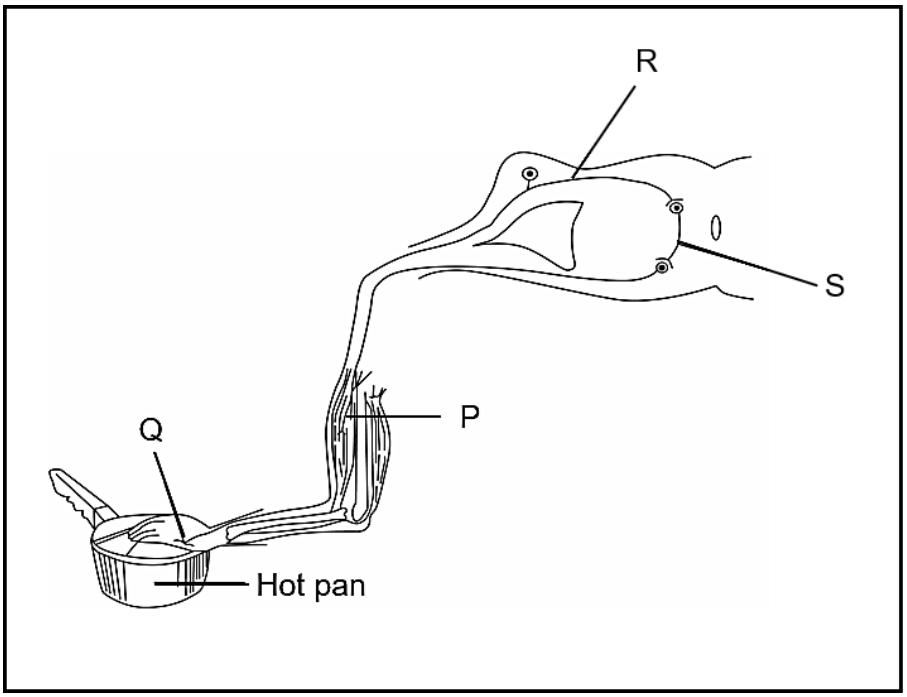
RESPONDING TO THE ENVIRONMENT – HUMANS (40 MARKS)

TYPICAL EXAM QUESTIONS

QUESTION 1 *(Questions taken from various sources)*

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.16) in your ANSWER BOOK, for example 1.17 D.

1.1 The diagram below shows the structures involved in a reflex action.



What is the sequence in which these structures become involved?

A P → Q → R → S
B P → S → R → Q
C Q → R → S → P
D Q → S → P → R

1.2 Which of the following pairs of body functions are normally involuntary actions but can be controlled voluntarily for short periods of time?

A Heartbeat and blood pressure
B Blinking of the eye and the mechanism of breathing
C Contraction of skeletal muscles and pupil size
D Control of body temperature and shivering

1.3 A function of the medulla oblongata is to …

A control higher thought processes.
B regulate blood glucose levels.
C regulate breathing.
D inhibit voluntary movement.

1.4 A disorder of the brain that is characterised by memory loss and confusion is …

A Alzheimer's disease.
B haemophilia.
C multiple sclerosis.
D Down syndrome.

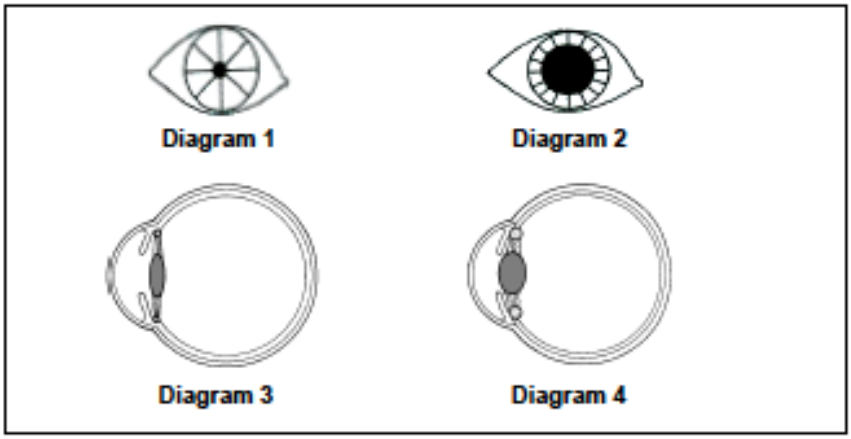
1.5 The nerve impulse in the axon of a sensory neuron is transmitted …

A towards the dendrite of the sensory neuron.
B towards the cell body of the sensory neuron.
C away from the effector organ.
D away from the cell body

1.6 Which ONE of the following CORRECTLY matches a visual defect and its corrective treatment?

A Cataracts – concave lens
B Short-sightedness – convex lens
C Astigmatism – concave lens
D Long-sightedness – convex lens

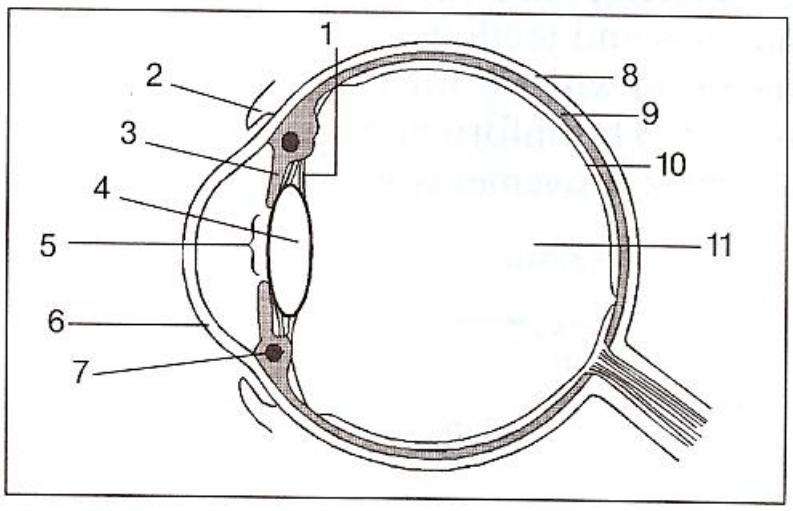
1.7 The diagrams below show the human eye under different conditions.



Which TWO diagrams above show the result when the ciliary muscles contract and the circular muscles of the iris relax?

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

Refer to the diagram of the human eye below for Questions 1.8 to 1.10



1.8 The parts that control the amount of light rays that enter the eye are…

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

1.9 The greatest convergence takes place when light rays pass through the part numbered…

A 4
B 5
C 6
D 11

1.10 The function of part numbered 9 is to:

1. reflect light
2. change the shape of the eyeball
3. refract light rays
4. prevent reflection
5. supply the retina with nutrients and oxygen
6. absorb excess light

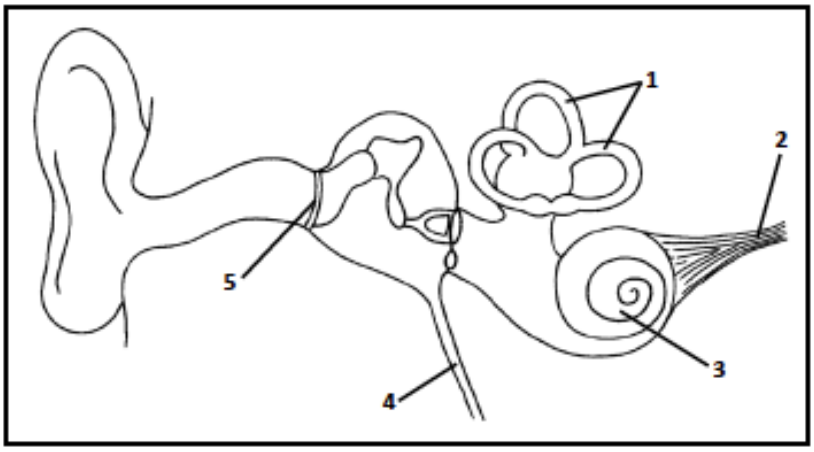
Choose the correct options for the function of part no.9

A 1, 2, 3
B 4, 5, 6
C 2, 4, 6
D 1, 3, 5

1.11 Which ONE of the following occurs when you look up from reading a book on a clear, sunny day to focus on a mountain more than 100 metres away?

A Radial muscles of the iris contract.
B Pupil becomes dilated.
C Ciliary muscles relax.
D Lens becomes more convex

QUESTIONS 1.12 AND 1.13 REFER TO THE DIAGRAM BELOW SHOWING THE STRUCTURE OF THE HUMAN EAR.



1.12 Which part sends vibrations to the ossicles?

A 3
B 1
C 4
D 5

1.13 Which part maintains equal pressure on either side of the tympanic membrane?

A 4
B 3
C 2
D 1

1.14 Grommets may be used in the treatment of …

A astigmatism
B cataracts.
C middle ear infections.
D long-sightedness.

1.15 The vibrations on the tympanic membrane are transferred to the …

A ossicles and then the oval window.
B oval window and then the ossicles.
C ossicles and then the round window.
D cochlea and then the ossicles.

1.16 Which part of the ear converts pressure waves into nerve impulses?

A Auditory nerve
B Organ of Corti
C Eustachian tube
D Auditory canal **(32)**

QUESTION 2 *(Questions taken from various sources)*

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.13) in your ANSWER BOOK.

2.1 The structure that connects the left and right hemispheres of the brain, allowing communication between them
2.2 The part of the brain that controls the heart rate
2.3 The part of the nervous system made up of cranial and spinal nerves
2.4 A disorder of the nervous system that is characterised by the breakdown of the myelin sheath of neurons
2.5 A single nerve cell
2.6 Uneven curvature of the lens or cornea resulting in distorted images
2.7 The nerve that carries impulses from the retina to the brain
2.8 The watery fluid that supports the cornea and the front chamber of the eye
2.9 The open passage through which sound waves travel to the middle ear
2.10 Inflammation and infection of the middle ear which causes pressure on the eardrum
2.11 The outer portion of the external ear: sound travels through the outer ear to the ear canal
2.12 Fluid-filled structures in the inner ear that detect movement and function as balance organs
2.13 A taut, circular piece of skin that vibrates when hit by sound waves **(13)**

QUESTION 3 *(Questions taken from various sources)*

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 (3.1 to 3.5) in the ANSWER BOOK.

COLUMN I		COLUMN II	
3.1	Components of the autonomic nervous system	A B	Peripheral nervous system Somatic nervous system
3.2	A part of the brain that receive impulses from the sense organs	A B	Cerebrum Cerebellum
3.3	A structure in the neuron that insulates the axon	A B	Cell body Myelin sheath
3.4	A disorder caused by the degeneration of the myelin sheath of motor neurons	A B	Multiple sclerosis Alzheimer's disease
3.5	The part of the nervous system which is concerned with voluntary action	A B	Sympathetic Parasympathetic

(5 x 2) **(10)**

QUESTION 4 *(LP, Sept. 2019, Paper 1)*

The frequency of sound is measured in units called Hertz (Hz) Three learner's hearing were tested by testing their range of sound that they can hear. The results are recorded in the following table:

	Lowest frequency of sound heard	Highest frequency of sound heard
Pabalelo	19 Hz	20300 Hz
Nkazi	18 Hz	20100 Hz
Hazel	320 Hz	1000 Hz

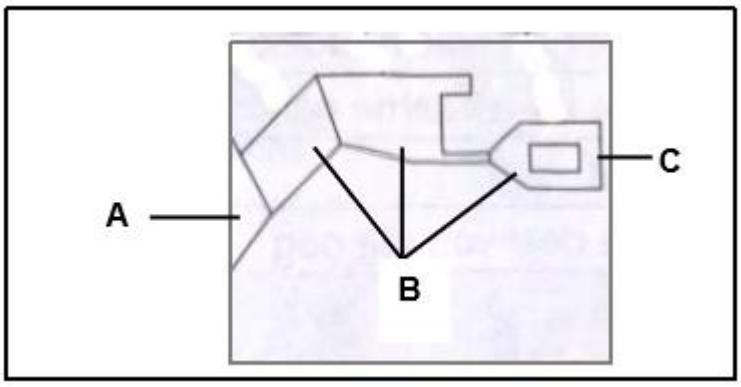
4.1 Which learner most probably needs a hearing-aid? (1)

4.2 Explain your answer in QUESTION 4.1. (2)

4.3 Bats produce sounds between 30 000 and 80 000 Hz. Explain why humans are not able to hear sound produced by bats. (2)
(5)

QUESTION 5 *(LP, Sept. 2019, Paper 1)*

The following diagram is a simplified diagram of structures in the middle ear of a human.



5.1 Give the NAMES and the FUNCTIONS of the membranes labelled:

(a) **A** (2)

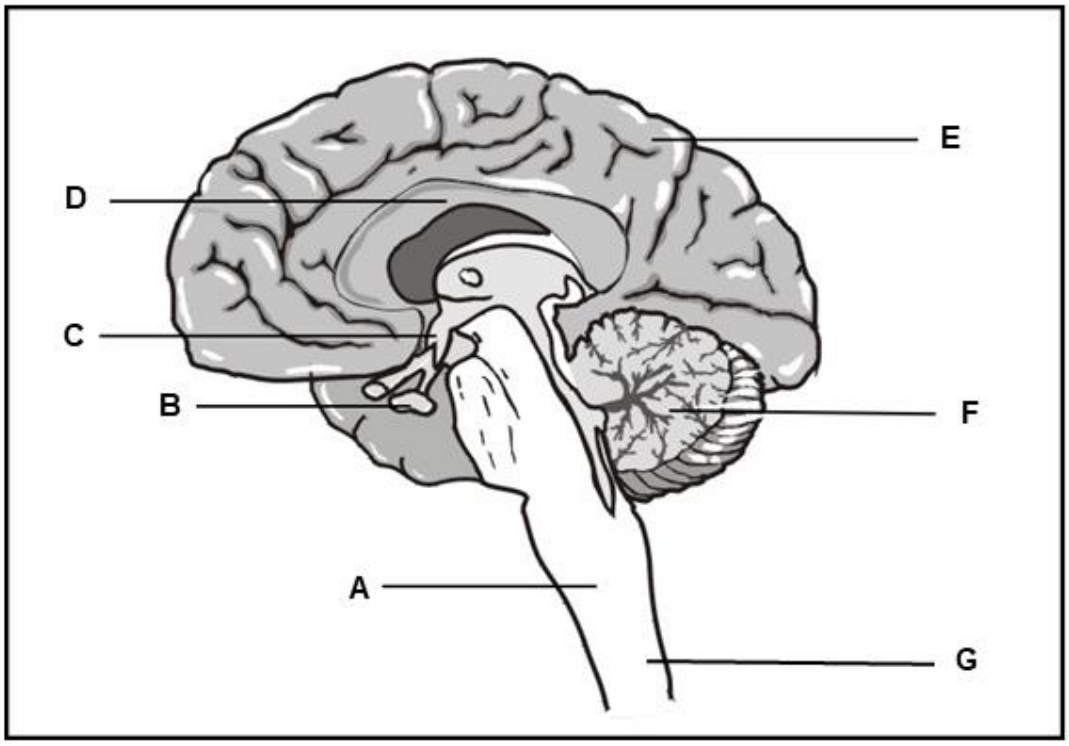
(b) **C** (2)

5.2 Explain how parts **B** are structurally suited to amplify sound waves (2)

5.3 Describe the role of the sacculus and utriculus in maintaining balance (5)
(11)

QUESTION 6 *(GDE, Sept. 2019, Paper 1)*

Study the diagram below.



6.1 Identify part:

(a) **D** (1)

(b) **G** (1)

6.2 Name the system of membranes that surround the brain. (1)

6.3 Identify only the **LETTER** of the part of the brain that:

(a) Controls body temperature

(b) Produces prolactin

(c) Controls involuntary activities such as heartbeat

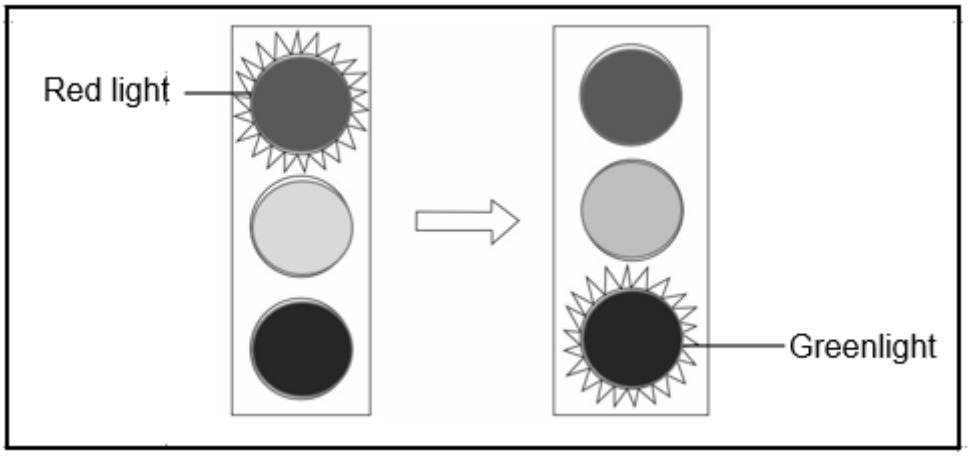
(d) Controls memory storage and voluntary actions (4)

(7)

QUESTION 7 *(GDE, Sept. 2019, Paper 1)*

7.1 Describe how accommodation takes place in the eye for distant vision. (5)

7.2 Car drivers need quick reactions to avoid accidents. A learner uses a computer to measure reaction time. The computer screen shows a traffic light on red. The traffic light then changes to green. The diagram below shows the change the person sees on the computer screen.



When the traffic light changes to green the person has to click the computer mouse as quickly as possible. The computer programme works out the time taken to react to the light changing colour.

The learner used three measurements to calculate the average reaction time. The table below shows the results.

Age in years	Average reaction time (milliseconds)
30	182
45	221
60	258
75	364
90	526

7.2.1 Plot a line graph of the results shown in the table in your ANSWER BOOK. (6)

7.2.2 Some people think that people in the age group 75 – 90 should not be allowed to drive a car.

Use the information from the table to explain why it is more dangerous for old people to drive cars. (2)

7.2.3 State ONE way in which the learner increased the reliability of the results. (1)

(14)

QUESTION 8 *(EC, Sept. 2019, Paper 1)*

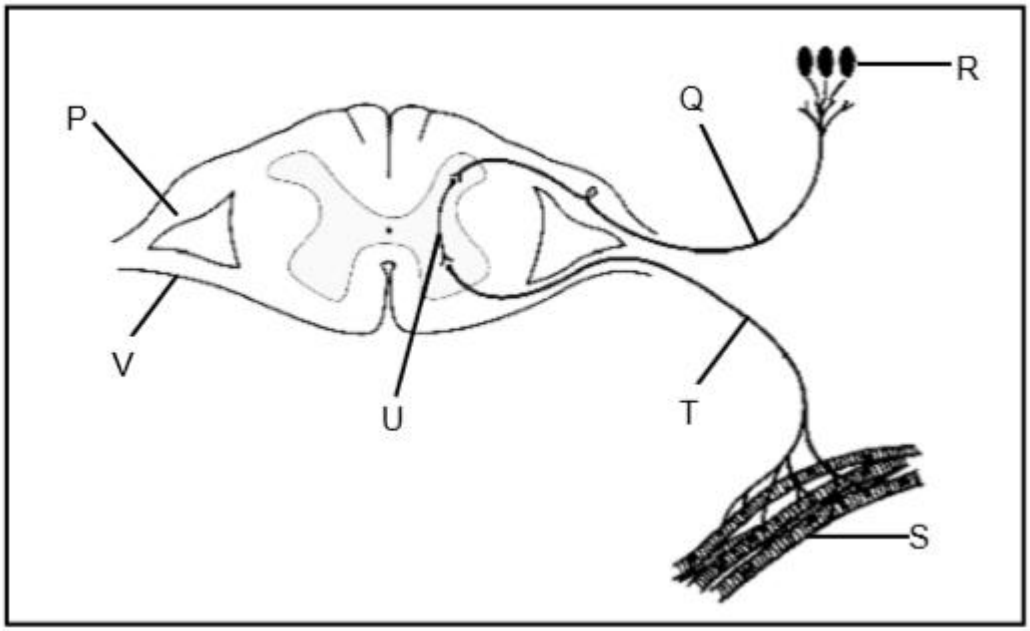
Read the following extract about motor neuron disease.

> Motor neuron diseases (MNDs) refers to a group of conditions that cause the motor neurons in the nerves of the spinal cord and brain to progressively lose function. MNDs are rare but serious and incurable forms of progressive neurodegeneration. Motor neurons are nerve cells that send impulses to the muscles.
>
> Genetic, viral and environmental issues may play a role in causing MNDs. Motor neuron diseases (MNDs) can appear at any age, but most patients are over 40 years old at diagnosis. It affects men more than women.
>
> [Adapted from www.medicalnewstoday.com]

8.1	According to the extract, what is the definition of motor neuron disease?	(1)
8.2	From the extract, list TWO factors that can cause motor neuron disease.	(2)
8.3	Explain the possible effect that this disease will have on the reflex action if a person was to step on a thorn.	(3)
8.4	Draw a labelled diagram of a motor neuron.	(4)
		(10)

QUESTION 9 *(FS, Sept. 2018, Paper 1)*

The diagram below shows a section of the human nervous system.



9.1 What impulse pathway is represented in the diagram? (1)

9.2 Write the LETTERS of the neurons involved in the process mentioned in QUESTION 9.1 in the correct order. (3)

9.3 Give the LETTER of the following:

(a) An effector (1)

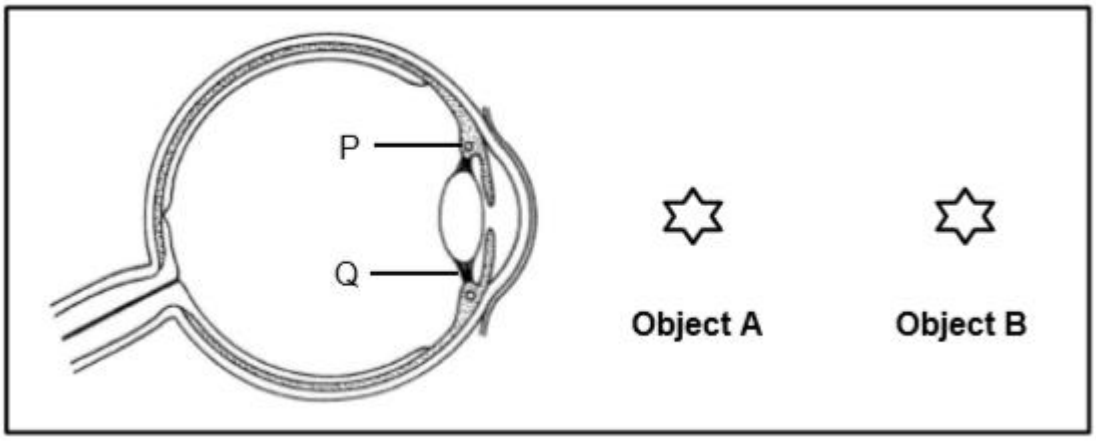
(b) Dorsal root of the spinal nerve (1)

9.4 After an accident a person is able to feel stimuli but not respond. Give the LETTER of the part that is damaged. (1)

(7)

QUESTION 10 *(FS, Sept. 2018, Paper 1)*

The diagram below represents a human eye when the person is looking at an object that is 6 meters away.
Object A is placed 3 meters away and Object B is placed 8 meters away.



10.1 Name the following on the retina of the eye:

(a) The area that is responsible for forming the clearest image (1)

(b) The photoreceptors that are stimulated in low light intensity (1)

10.2 Name the disorder that results in the inability of the eye to focus on object **A** (1)

10.3 Name the type of lens that should be used to correct the disorder mentioned in QUESTION 10.2 (1)

10.4 Explain the role of structures **P** and **Q** to ensure a clear image if the person moves his focus from object **B** to object **A.** (6)

(10)

RESPONDING TO THE ENVIRONMENT – HUMANS: ANSWERS

QUESTION 1

1.1	C	✓✓
1.2	B	✓✓
1.3	C	✓✓
1.4	A	✓✓
1.5	D	✓✓
1.6	D	✓✓
1.7	D	✓✓
1.8	C	✓✓
1.9	C	✓✓
1.10	B	✓✓
1.11	C	✓✓
1.12	D	✓✓
1.13	A	✓✓
1.14	C	✓✓
1.15	A	✓✓
1.16	B	✓✓

(32)

QUESTION 2

2.1 Corpus callosum ✓

2.2 Medulla oblongata ✓

2.3 Peripheral (nervous system) ✓

2.4 Multiple sclerosis ✓

2.5 Neuron ✓

2.6 Astigmatism ✓

2.7 Optic nerve ✓

2.8 Aqueous humour ✓

2.9 Auditory Canal ✓

2.10 Otis media ✓

2.11 Pinna ✓

2.12 Semi-circular Canals ✓

2.13 Tympanum ✓/ Eardrum

(13)

QUESTION 3

3.1 None ✓✓

3.2 Both A and B ✓✓

3.3 B only✓✓

3.4 A only ✓✓

3.5 None ✓✓

(10)

QUESTION 4

4.1 Hazel✓ (1)

4.2 Hazel has the smallest range of sound✓ And won't be able to hear most of the frequencies of sound✓ like other learners (2)

4.3 The sound bats make range of frequency of sound is much higher✓ than what can be heard by humans✓/than the hearable range of frequencies of humans. (2)

(5)

QUESTION 5

5.1 (a) Tympanum✓ - converts sound waves to vibrations which are transmitted to the ossicles✓ (2)

(b) Oval window✓– transfer vibrations as pressure waves to the inner ear ✓ (2)

5.2 The ossicles are arranged from big to small✓ which concentrate the soundwaves✓ (2)

5.3
- The maculae are stimulated ✓
- by changes in the position of the head✓
- the maculae convert the stimulus into nerve impulses✓
- which are transported via the auditory nerve✓
- to the cerebellum to be interpreted ✓

(5)

(11)

QUESTION 6

6.1 (a) Corpus callosum ✓ (1)

(b) Spinal cord ✓ (1)

6.2 Meninges ✓ (1)

6.3 (a) C ✓ (1)

(b) B ✓ (1)

(c) A ✓ (1)

(d) E ✓ (1)

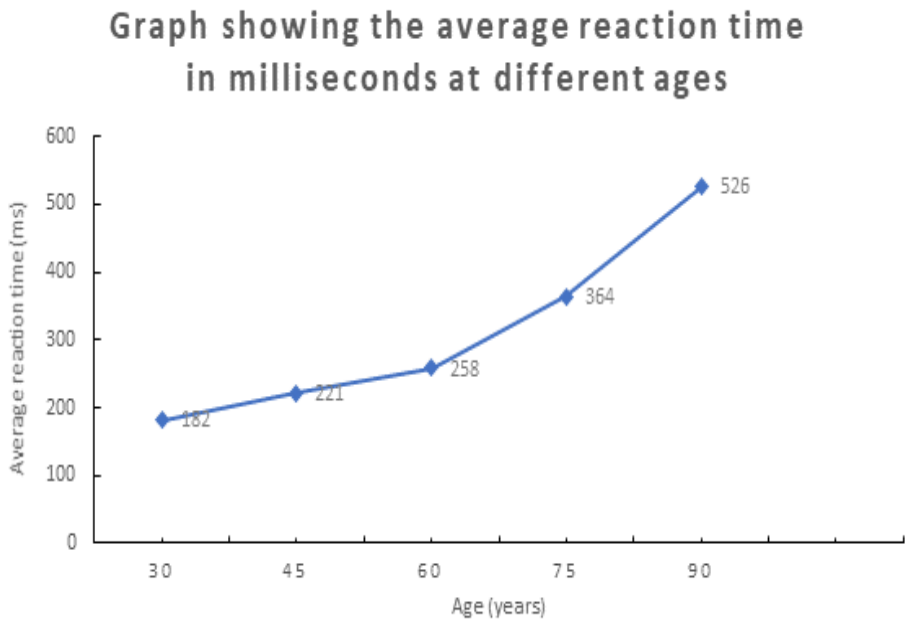
(7)

QUESTION 7

7.1
- Ciliary muscles relax ✓
- Suspensory ligaments tighten (become taut) ✓
- Tension on the lens increases ✓
- Lens is less convex (flatter) ✓
- Light rays are refracted (bent) less ✓
- Light rays are focused onto the retina ✓

Any (5)

7.2.1



Rubric for assessment of the graph

Correct type of graph (T)	**1**
Caption for graph (C)	**1**

Correct label for X-axis (including unit) and Y-axis (including unit) (L)	**1**
Correct scale for X-axis and Y-axis (S)	**1**
Plotting of points **1 to 4 points correct** **All 5 points correct**	 **1** **2**
	6

(6)

7.2.2 - There is a rapid increase in the reaction time in older people ✓
- A slower reaction is more likely to result in accidents ✓ (2)

7.2.3 - The learners did the measurements three times ✓
- The average was used ✓

(Mark first ONE only) Any (1)
(14)

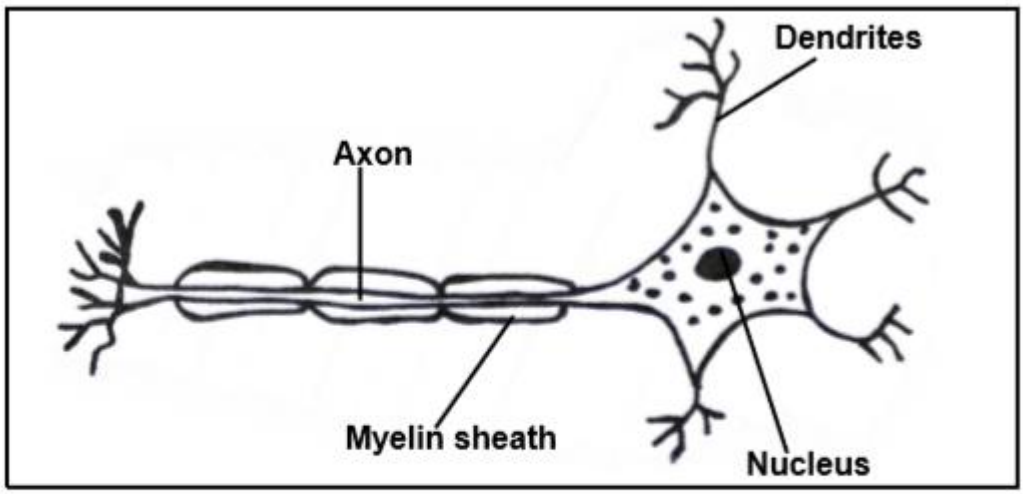
QUESTION 8

8.1 A group of conditions that cause the motor neurons in the nerves in the spine and brain to progressively lose function ✓ (1)

8.2 - Genetic issues ✓
- Viruses ✓
- Environmental issues ✓ **(Mark first TWO only** (Any 2) (2)

8.3 - The person would feel the pain ✓
- but would not be able to react ✓
- The motor neuron is not functioning; therefore the muscles would not be stimulated ✓ (3)

8.4



Criteria	Mark allocation
Correct neuron drawn	1
Any THREE correct labels	3

(4)
(10)

QUESTION 9

9.1 Reflex arc✓ (1)

9.2 Q✓ U✓ T✓ (in the correct order) (3)

If the letter U is in the middle with Q and T incorrectly swopped give 1 mark for U

9.3 (a) S✓ (1)
(b) P✓ (1)

9.4 T✓ or V (1)
(7)

QUESTION 10

10.1 (a) Yellow spot✓/fovea centralis/fovea (1)

(b) Rods✓ (1)

10.2 Long-sightedness✓/hypermetropia (1)

10.3 Convex✓ lenses (1)

10.4 - P/Ciliary muscles contract✓

- Ciliary body moves closer to lens✓

- Q/Suspensory ligaments slacken✓
- Tension on the lens decreases✓
- Convexity of lens increases✓
- Incoming light rays are refracted more✓

(6)
(10)

HUMAN ENDOCRINE SYSTEM (15 MARKS)

TYPICAL EXAM QUESTIONS

QUESTION 1 *(Questions taken from various sources)*

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.5) in your ANSWER BOOK, for example 1.6 D.

1.1 Which ONE of the following hormones controls metabolic rate?

A Testosterone
B Thyroxin
C Growth hormone
D Insulin

1.2 An investigation was carried out to determine the effect of growth hormone on children with a particular disorder that causes their height to be below the average height expected for their age and sex.

The following procedure was followed:

- 740 children with the disorder were included in the investigation.
- Their initial heights were measured.
- They were divided into two groups (**A** and **B**).
- Group **A** was given a growth hormone injection every day for 3 years.
- Group **B** did not receive the treatment.

The height of each child in each group was then measured.

The following is a list of variables in the investigation:

(i) Children of the same age and sex with the same disorder
(ii) The nutrition given to the children
(iii) The type of growth hormone used
(iv) The height of the children at the end of the investigation

Which ONE of the following combinations are factors that should have been kept constant during this investigation?

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

1.3 An extract from a gland of an adult monkey was injected into the bloodstream of a young monkey. It caused the young monkey to grow abnormally tall. From which gland was the extract obtained?

A Hypothalamus
B Adrenal gland
C Hypophysis/Pituitary gland
D Pancreas

1.4 The following are effects of the secretion of different hormones.

1. An increase in the blood glucose level
2. An increase in the heart rate
3. An increase in the amount of digestive enzymes
4. An increase in blood flow to the skeletal muscles

Which one of the following combinations of the above effects is due to adrenalin?

A 1, 3 and 4
B 2, 3 and 4
C 1, 2 and 4
D 1, 2, 3 and 4

1.5 The level of thyroxin in the body is controlled by the ...

A hypothalamus and the pituitary.
B thyroid and the hypothalamus.
C thyroid and the adrenal gland.
D pituitary and the thyroid gland. **(10)**

QUESTION 2 *(Questions taken from various sources)*

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.5) in your ANSWER BOOK.

2.1 A hormone that stimulates the mammary glands to produce milk
2.2 Organic chemical messengers secreted directly into the blood by an endocrine gland.
2.3 Ductless glands secreting hormones directly into bloodstream
2.4 The hormone that regulates the amount of salt in the blood
2.5 Secrete substances into ducts that lead into cavities in the body or lead directly to the external environment. **(5)**

QUESTION 3 *(Questions taken from various sources)*

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 (3.1 to 3.3) in the ANSWER BOOK.

COLUMN I		**COLUMN II**	
3.1	Hormone secreted by the pituitary gland	A B	Aldosterone Growth hormone
3.2	Promotes reabsorption of salt in the kidneys	A B	ADH Aldosterone
3.3	Hormones secreted by the pituitary gland	A B	Prolactin Growth hormone

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

QUESTION 4 *(EC, Sept. 2019, Paper 1)*

An investigation was conducted by scientists to determine the effect of a low GI breakfast and a high GI breakfast on the average blood glucose concentration of women.

NOTE:

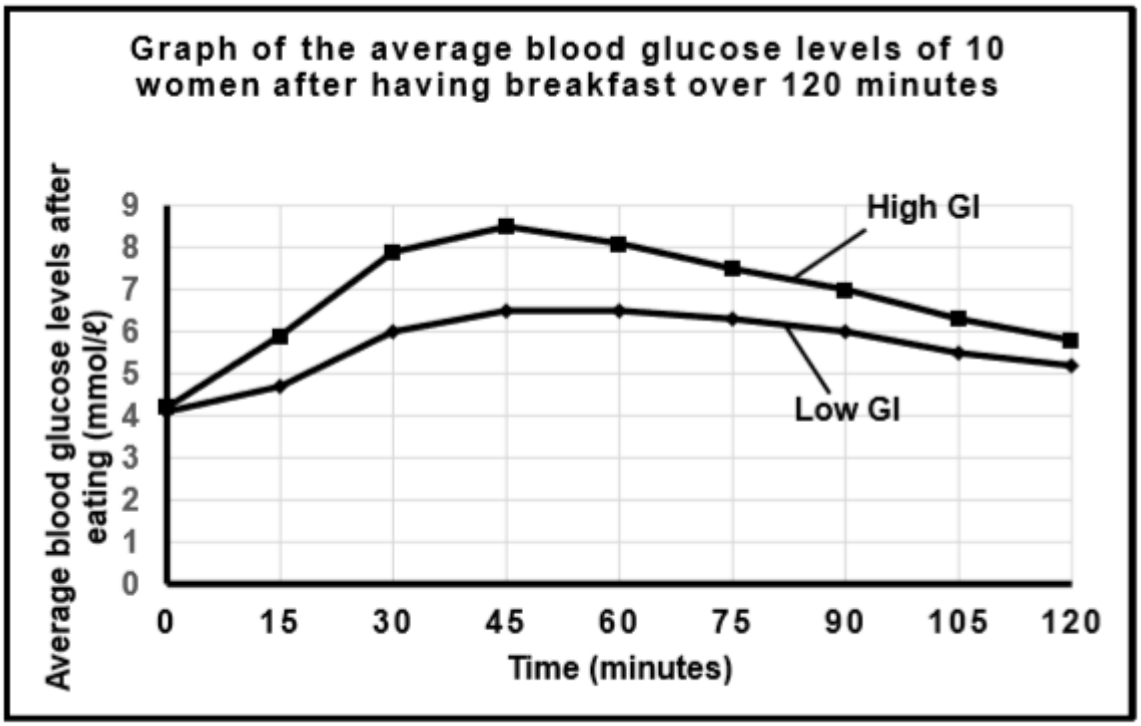
- High GI food is quickly digested and absorbed.
- Low GI food is slowly digested and absorbed.
- GI is the Glycaemic Index of a person. Glycaemic Index is a figure representing the relative ability of a carbohydrate food to increase the level of glucose in the blood.

The following steps were followed during the investigation:

- Ten women who were between the ages of 28 and 30 volunteered to participate.
- The blood glucose concentration of each female was measured before eating breakfast.
- After eating breakfast, the blood glucose concentration was measured at 15-

minute intervals over a period of 120 minutes.

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



[Adapted from www.ncbi.nih.gov]

4.1 Explain ONE possible reason why blood samples were taken before breakfast was eaten. (2)

4.2 Give the independent variable for this investigation. (1)

4.3 Give the blood glucose concentration at 45 minutes after eating a high GI breakfast in mmol/ℓ (1)

4.4 With reference to the graph, describe the difference between the effect of eating low GI food compared to eating high GI food on the blood glucose levels of the women. (2)

4.5 Name the hormone secreted by the pancreas that will cause the effects on blood glucose levels as seen in the graph from 45 to 120 minutes (1)

4.6 Explain the effect of a high GI breakfast on the secretion of the hormone named in QUESTION 4.5. (2)

4.7 Six months later the scientists decided to repeat the investigation. Five additional women joined the investigation and were not given breakfast at all as a control group.

(a) Give ONE reason why the scientists decided to repeat the investigation. (1)

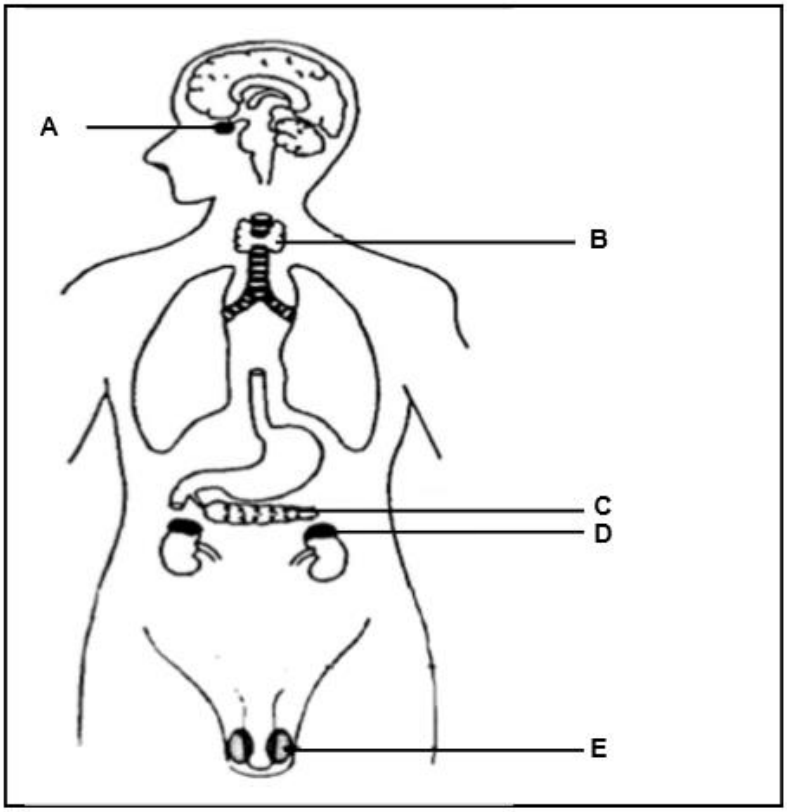
(b) Explain the significance of having a control group for this investigation (2)

4.8 Give TWO ways in which the scientists ensured the validity of the original investigation. (2)

(14)

QUESTION 5 *(MP, Sept. 2019, Paper 1)*

The diagram below shows the position of the endocrine glands found in a male human body.



5.1 Identify the NAME and LETTER of the gland that secrete a hormone that:

(a) Stimulates the growth of long bones (2)

(b) Regulate salt balance (2)

5.2 Explain the consequence if gland **E**, found only in males, cannot secrete its hormone. (2)

5.3 Explain the consequences to the weight of a person if the hormone secreted by gland **B** remain abnormally high for extended periods of time. (3)

(9)

HUMAN ENDOCRINE SYSTEM ANSWERS

QUESTION 1

1.1 B ✓✓
1.2 B ✓✓
1.3 C ✓✓
1.4 C ✓✓
1.5 D ✓✓ **(10)**

QUESTION 2

2.1 Prolactin ✓

2.2 Hormones ✓

2.3 Endocrine ✓ glands

2.4 Aldosterone ✓

2.5 Exocrine gland ✓ **(5)**

QUESTION 3

3.1 B only ✓✓

3.2 B only ✓✓

3.3 Both A and B ✓✓

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

QUESTION 4

4.1 - To establish a baseline/starting point for the investigation from where the glucose levels will increase ✓✓

OR

- To compare the change in the blood glucose levels to what it was before breakfast was eaten ✓ (2)

4.2 The type of breakfast ✓ /Low or high GI food (1)

4.3 8,0 ✓ – 8,2 mmol/ℓ (1)

4.4 - Low GI food causes a smaller increase in the blood glucose levels than high

GI food ✓✓/ High GI food causes a larger increase in the blood glucose levels than low GI food

OR

- Eating Low GI food causes the blood glucose levels to increase closer to normal after 120 minutes (4 mmol/ℓ to 5,2 mmol/ℓ) than high GI food (4 mmol/ℓ to 5,8 mmol/ℓ) ✓✓ (2)

4.5 Insulin ✓ (1)

4.6 - A high GI breakfast causes a sharp increase in the blood glucose level ✓

- This will cause a large ✓/rapid increase in the blood insulin levels (2)

4.7 (a) - To improve reliability ✓ of the investigation (1)

(b) - To ensure the results were caused by the breakfast only ✓✓/ low and high GI food and not any other factor (2)

4.8 - Only females were used✓/same sex

- Females of the same age ✓/28–30 years old were used

- Same time intervals for measuring blood glucose concentration✓

(Mark first TWO only) (Any 2) (2)

(14)

QUESTION 5 *(MP, Sept. 2019, Paper 1)*

5.1 (a) A✓ – Pituitary gland ✓/ hypophysis (2)

(b) D✓ – Adrenal gland ✓ (2)

5.2 - Secondary sexual characteristics✓

- may not develop✓

OR

- Sperm production✓

- will stop✓ Any (1 x 2) (2)

5.3 - Metabolism will be higher than normal✓/cellular respiration increases

- The energy from food eaten will be used✓

- leaving nothing for storage✓

- therefore, a person could be under-weight✓ Any (3)

(9)

HOMEOSTASIS IN HUMANS (11 MARKS)

TYPICAL EXAM QUESTIONS

QUESTION 1 *(Questions taken from various sources)*

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.4) in your ANSWER BOOK, for example 1.5 D.

1.1 Which ONE of the following will occur in the human body on a cold day?

A Vasodilation in the skin
B Increase in the activity of sweat glands
C Decrease in evaporation of sweat from the surface of the skin
D Increase in blood flow to the surface of the skin

1.2 During an investigation a man was placed in an airtight room. Sensors were used to monitor his breathing and heart rate. The investigators were able to change the environmental conditions in the room.

After 30 minutes the man's breathing, and heart rate had increased.

The investigators changed the environmental conditions in the room by …

A decreasing the light intensity.
B increasing the amount of carbon dioxide in the air.
C decreasing the humidity.
D increasing the amount of oxygen in the air.

1.3 Negative feedback control involves the following four stages:

(i) Effectors bring about corrective responses.

(ii) A receptor detects a change in the internal environment.

(iii) Factor brought back to normal levels.

(iv) Nervous or hormonal messages are sent to effectors.

The order in which these stages occur is:

A (ii), (iv), (iii), (i)
B (iv), (ii), (iii), (i)
C (ii), (iv), (i), (iii)
D (iv), (ii), (i), (iii)

1.4 Which ONE of the following is controlled by a negative feedback mechanism in the human body?

A Changes in the speed and direction of the body
B Colour vision
C Water concentration
D The activities of the right side of the body being controlled by the left hemisphere **(8)**

QUESTION 2 *(Questions taken from various sources)*

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.5) in your ANSWER BOOK.

2.1 When there is an increase from normal, a corrective mechanism causes a decrease and vice versa to maintain a balanced system.
2.2 The widening of the blood vessels in the skin that increases the amount of blood flowing to the skin in humans when the environmental temperature is high.
2.3 It is the process of maintaining a constant internal environment within narrow limits, despite changes that take place internally and externally.
2.4 The narrowing of the blood vessels in the skin that decreases the amount of blood flowing to the skin in humans when the environmental temperature is low
2.5 The regulation of the body temperature of an organism **(5)**

QUESTION 3 *(Questions taken from various sources)*

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 (3.1 to 3.3) in the ANSWER BOOK.

COLUMN I		**COLUMN II**	
3.1	Reduces heat loss from the blood	A	Vasoconstriction
		B	Vasodilation

3.2	Hormone that maintains the salt balance in the body	A B	ADH Aldosterone
3.3	Regulation of water in the body	A B	Hypothalamus Corpus callosum

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

QUESTION 4 *(NC, Sept. 2017, Paper 1)*

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

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

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

Their procedure was as follows:

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

The table below shows the results of their investigation:

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

4.1 Formulate a hypothesis for this investigation. (2)

4.2 In this investigation, identify the:

(a) Dependent variable (1)

(b) Independent variable (1)

4.3 Name what their control for the experiment might have been. (2)

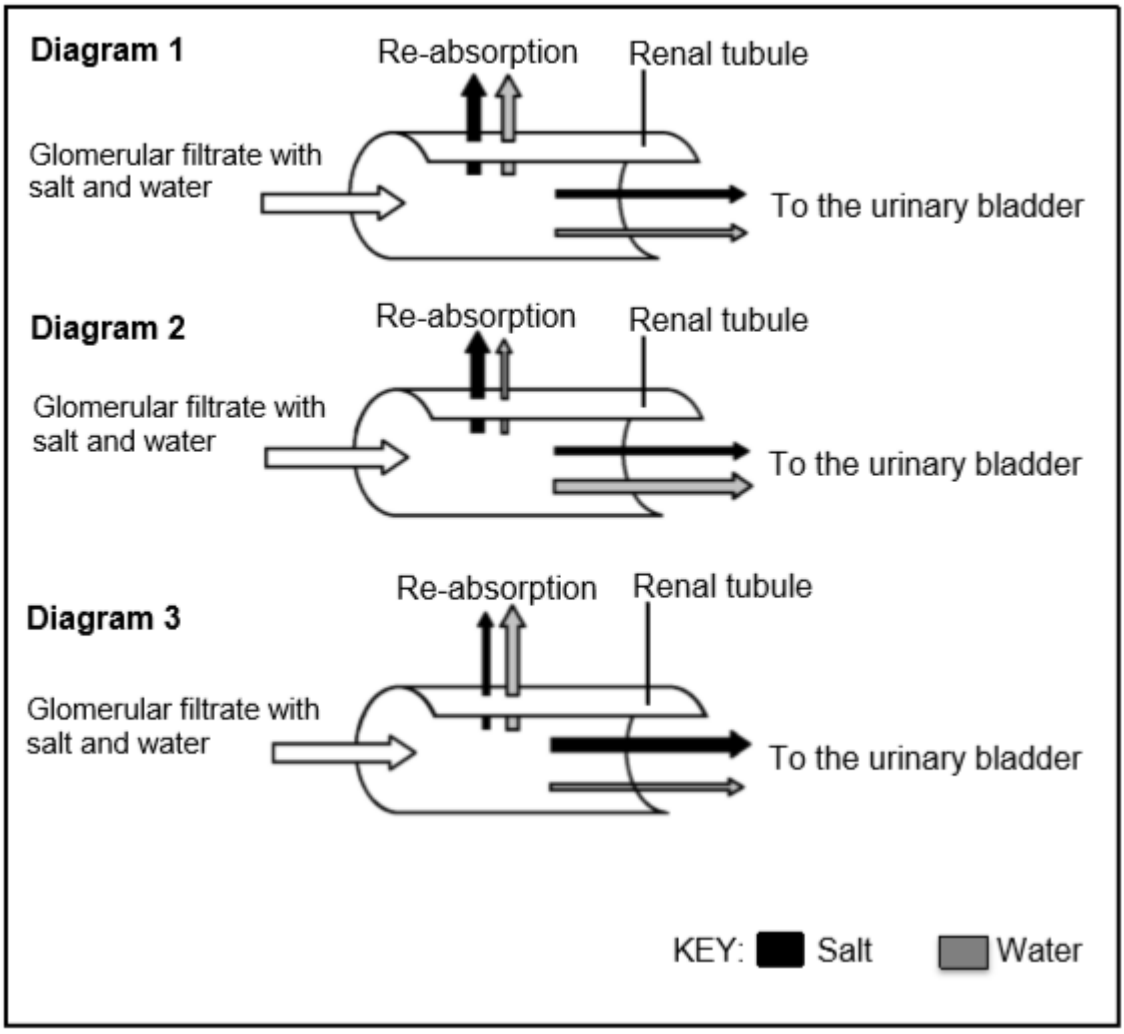
4.4 The ice-water slows down the heart rate and blood circulation.

Explain how this can be an advantage when a person is drowning in icy waters. (4)

(10)

QUESTION 5 *(DBE, Nov. 2019, Paper 1)*

The diagrams below show the re-absorption of salt and water through the tubules of a nephron in the kidney under three different conditions. The width of the arrows represents the amounts of salt and water.



5.1 Name the hormone in a human body that is responsible for controlling the:

(a) Water content (1)

(b) Salt content (1)

5.2 Name the gland that secretes the hormone in QUESTION 5.1(b). (1)

5.3 Which diagram (**1, 2** or **3**) would represent a person who had eaten salty chips on a hot day without any intake of water? (1)

5.4 Explain your answer to QUESTION 5.3. (5)

(9)

HOMEOSTASIS IN HUMANS ANSWERS

QUESTION 1

1.1 C ✓✓
1.2 B ✓✓
1.3 C ✓✓
1.4 C ✓✓ **(8)**

QUESTION 2

2.1 Negative feedback mechanism ✓

2.2 Vasodilation ✓

2.3 Homeostasis ✓

2.4 Vasoconstriction ✓

2.5 Thermoregulation✓ **(5)**

QUESTION 3

3.1 A only ✓✓

3.2 B only ✓✓

3.3 A only B ✓✓

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

QUESTION 4

4.1 Submerging the face in ice-water will slow down the heart rate✓✓

OR

Submerging the face in ice-water will have no effect on the heart rate✓✓

OR

Submerging the face in ice-water will increase the heart rate✓✓ (2)

4.2 (a) Heart rate✓ (in bpm) (1)

(b) The temperature of the water✓/ice-water (1)

4.3 - Heart rate after holding their breaths for 15 seconds✓
- without being in ice-water✓ (2)

4.4 - Less blood flows to the skin✓
- decreasing heat loss✓
- and thus more energy is conserved✓
- causing the metabolism to drop✓
- Less oxygen is therefore required✓
- The need to inhale decreases✓
- making it possible to stay alive for longer✓ (Any 4) (4)

(10)

QUESTION 5

5.1 (a) ADH ✓/ antidiuretic hormone/ vasopressin (1)

(b) Aldosterone ✓ (1)

5.2 Adrenal ✓ gland (1)

5.3 3 ✓ (1)

5.4 - The blood will have a high salt content ✓
- and therefore less/no aldosterone will be secreted ✓
- resulting in less salt reabsorbed into the blood ✓/more salt excreted in the urine

- The blood will have less water than normal ✓
- and therefore more ADH will be secreted ✓
- making the kidney tubules more permeable ✓
- resulting in more water reabsorbed into the blood ✓/less water will leave the body with the urine **Any** (5)

(9)

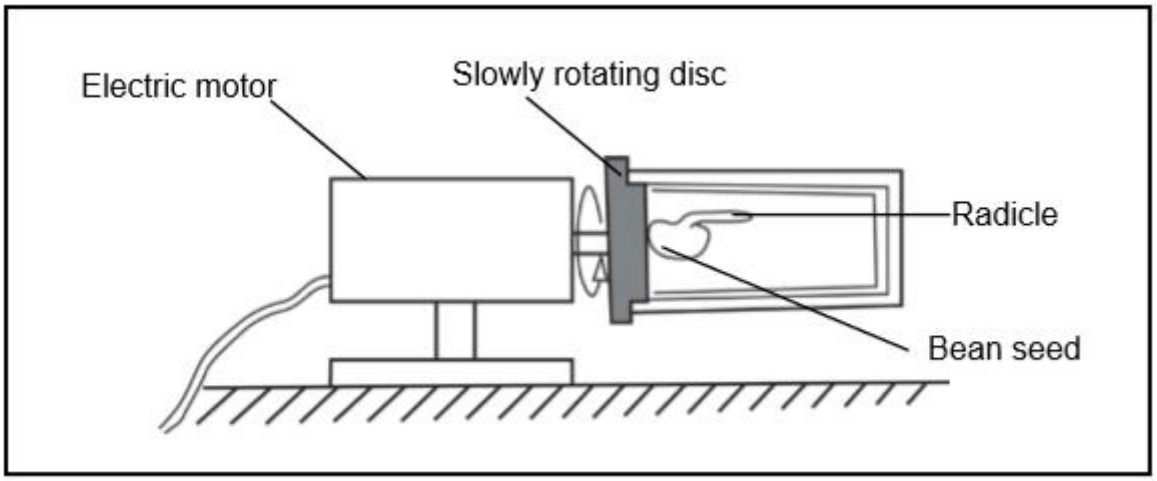
RESPONDING TO THE ENVIRONMENT – PLANTS (11 MARKS)

TYPICAL EXAM QUESTIONS

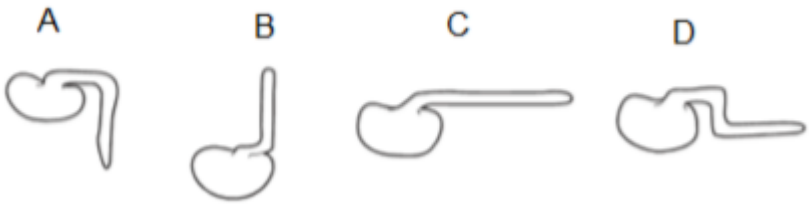
QUESTION 1 *(Questions taken from various sources)*

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.4) in your ANSWER BOOK, for example 1.5 D.

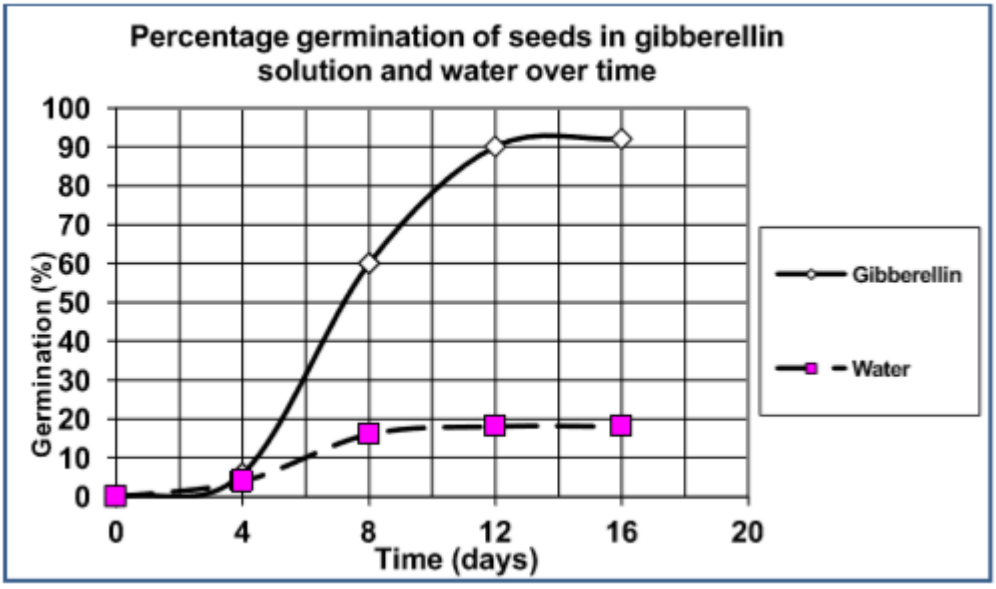
1.1 The diagram below shows a germinating bean seed with a horizontal radicle. This is placed on a slowly rotating disc and is left for three days.



Which diagram shows the appearance of the radicle after three days?



1.2 A group of Grade 12 learners carried out an investigation to determine the effect of gibberellins on the germination of seeds.



Which ONE of the following is a CORRECT conclusion for the above investigation?

A Gibberellins show a greater increase in the rate of germination of seeds than water
B Water shows a greater increase in the rate of germination of seeds than gibberellins
C There is no difference in the rate of germination of seeds placed in gibberellins and water
D Gibberellins decrease the rate of germination of seeds

1.3 Which ONE of the following is a function of gibberellins?

A Apical growth
B Stimulation of seed germination
C Inhibition of side branches
D Dropping of leaves in winter

1.4 Which of the following are plant growth hormones?

A Prolactin and abscisic acid
B Abscisic acid and glucagon
C Gibberellins and abscisic acid
D ADH and gibberellins

(8)

QUESTION 2 *(Questions taken from various sources)*

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.5) in your ANSWER BOOK.

2.1 The growth of a plant in response to light
2.2 The growth movement of a plant or part of a plant in response to an environmental stimulus
2.3 The growth of part of a plant in response to gravity.
2.4 Chemical used to kill weeds
2.5 A sharp structure found on plants for protection against herbivores **(5)**

QUESTION 3 *(Questions taken from various sources)*

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 (3.1 to 3.3) in the ANSWER BOOK.

COLUMN I		**COLUMN II**	
3.1	Inhibits the growth of lateral branches	A B	Abscisic acid Auxins
3.2	Defence mechanism in plants	A B	Thorns Sunken stomata
3.3	Plant hormone that helps plant seeds to survive unfavourable conditions, e.g. droughts	A B	Gibberellins Abscisic acid

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

QUESTION 4 *(MP, Sept. 2019, Paper 1)*

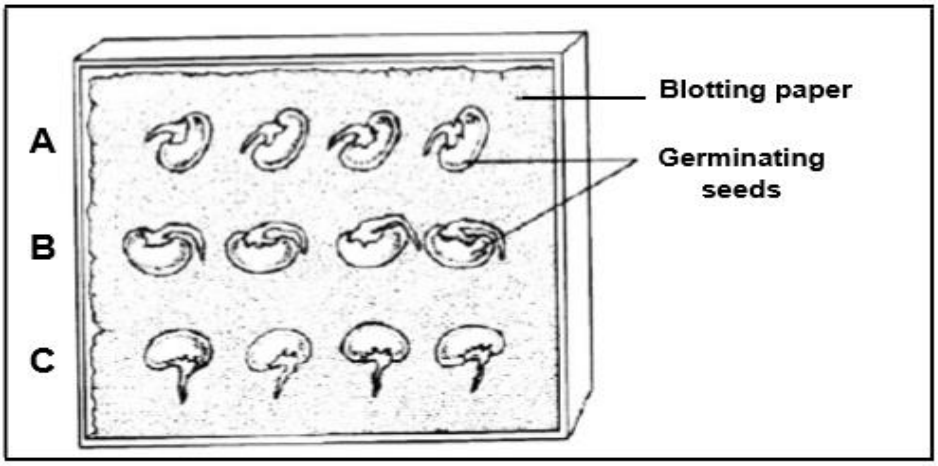
An investigation was conducted to determine the effect of gravity on the direction of root growth in germinating seeds.

The procedure was as follows:
- A glass jar was lined with a layer of thick blotting paper
- 12 germinating bean seeds were placed between the glass jar and the blotting paper as follows:

A. 4 seedlings with their root tips pointing horizontal
B. 4 seedlings with their root tips pointing upwards
C. 4 seedlings with their root tips pointing downwards

- The glass jar received light from all directions
- The growth response of the root tips was observed

The diagram below shows the observation made after a week



4.1 In this investigation, identify the:

(a) Independent variable (1)

(b) Dependent variable (1)

4.2 Mention TWO ways in which the validity of the investigation could have been improved. (2)

4.3 Give the name of the growth in response to gravity as observed in this investigation. (1)

4.4 Why did the investigator use 4 bean seeds for each group? (1)

4.5 Explain the results of the investigation as observed in group A. (5)
(11)

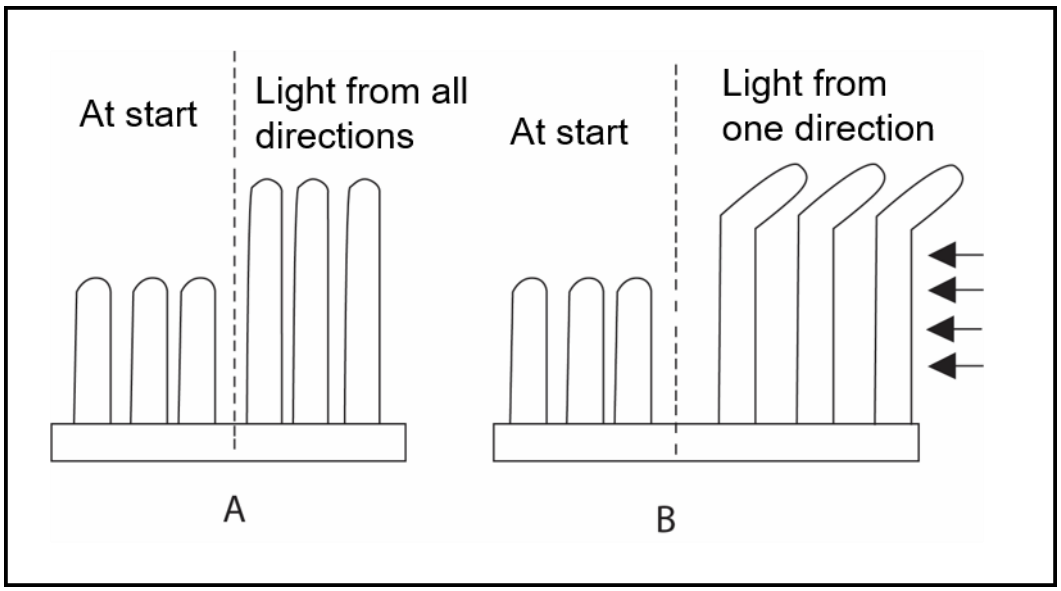
QUESTION 5 *(GDE, Sept. 2019, Paper 1)*

Maria wanted to investigate the effect of light coming from one direction on the growth of shoots. She planted some bean seeds in two seed trays and allowed them to germinate. When the young shoots appeared above the soil level, the shoots were exposed to light from all directions for three days.

After three days, the trays received the following different treatments:

- Tray **A**: The shoots were exposed to light from all directions.
- Tray **B**: The shoots were exposed to light from one direction only.

The diagram below shows the effects of these treatments.



5.1 Explain why it is important to include Tray **A** as part of this investigation. (2)

5.2 Explain the results obtained in Tray **B** in terms of the role of auxins. (6)

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

(10)

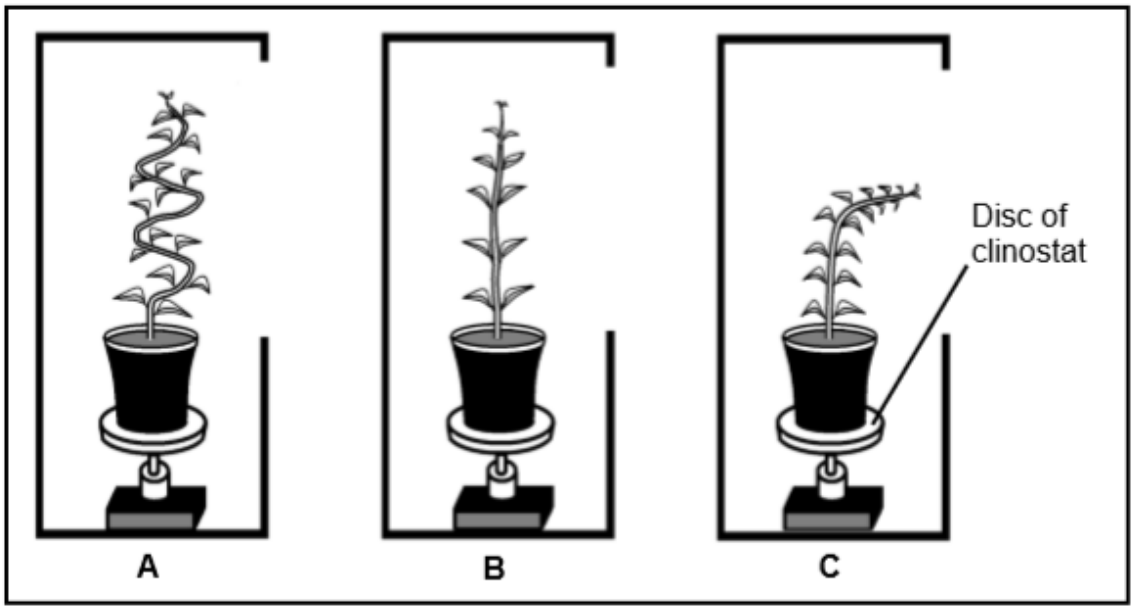
QUESTION 6 *(DBE, Jun. 2019, Paper 1)*

A clinostat is a device used to investigate plant growth responses. It has a disc that rotates very slowly when the clinostat is switched on.

During an investigation on plant responses to light, the procedure below was followed:

- Three pot plants of the same species were used.
- Each pot plant was placed on one of three identical clinostats.
- Each set of apparatus**, A, B** and **C**, was placed in a box with a single opening.
- Each clinostat was treated in a different way over a period of five weeks.

The results of the investigation are represented in the diagrams below.



Name the plant growth response to light. (1)

State TWO factors that were kept constant during the investigation. (2)

Give ONE reason why the results of this investigation may be considered to be unreliable. (1)

In which apparatus (**A, B** or **C**) was the clinostat:

(a) Switched on and rotating slowly (1)

(b) Switched off, but manually rotated through 180° once a week (1)

Explain the effect of the unilateral light on the distribution of auxins in the plant in apparatus C. (3)

(9)

RESPONDING TO THE ENVIRONMENT- PLANTS: ANSWERS

QUESTION 1

1.1 C ✓✓
1.2 B ✓✓
1.3 C ✓✓
1.4 C ✓✓ **(8)**

QUESTION 2

2.1 Negative feedback mechanism ✓

2.2 Vasodilation ✓

2.3 Homeostasis ✓

2.4 Vasoconstriction ✓

2.5 Thermoregulation✓ **(5)**

QUESTION 3

3.1 A only ✓✓

3.2 B only ✓✓

3.3 A only B ✓✓

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

QUESTION 4

4.1 (a) Gravity ✓ (1)

(b) Direction of root growth ✓ (1)

4.2 - Use beans of the same species✓
- Expose seeds to the same environmental conditions✓/ light/ temperature
(Mark first TWO only) Any (2)

4.3 Geotropism ✓ (1)

4.4 To improve the reliability✓ of the results (1)

4.5 - Auxins✓
- moved to the lower side of the root✓
- because gravity attracts auxins✓
- Therefore, there was high concentration on the lower side of the root✓

- There will be a low concentration of auxins on the upper side of the root✓
- More growth occurs on the upper side of the root✓
- on the lower side the high concentration inhibits/slows down growth✓
- Uneven growth will result with the root bending downwards✓ towards gravity.

Any (5)

(11)

QUESTION 5

5.1
- It is the control ✓
- to verify the results of the experiment ✓ / to allow for one variable only

(2)

5.2 As a result of receiving light from one side only:

- Auxins produced in the tip of the stem ✓
- are unequally distributed ✓
- auxins moved to the shaded side of the stem✓
- where the concentration increased ✓
- thus promoting growth ✓
- whilst the brightly lit side with the lower concentration✓
- inhibited growth ✓
- resulting in the stem bending and growing towards the light ✓

Any (6)

5.3
- Use same type / species of plant ✓ / seeds
- Use same type and amount of soil in the trays ✓
- Watering at the same time of day ✓
- Same amount of water given when watering shoots ✓
- Same environmental conditions ✓ / temperature / humidity
- Same nutrients ✓

(Mark first TWO only) Any (2)

(10)

QUESTION 6

6.1 Phototropism✓ (1)

6.2
- The same species✓ of plant was used in each set-up
- Identical clinostats✓ were used in each set-up
- The same period of time✓/5 weeks was used for each set-up
- Each apparatus was placed in a box with a single opening✓
- The opening on each box was in the same position✓/was the same size

(Mark first TWO only) Any (2)

6.3
- The investigation was only done once✓/not repeated
- Only one plant was used in each set-up✓/the sample size was too small

(Mark first ONE only) Any (1)

6.4 (a) B✓ (1)

(b) A✓ (1)

6.5 - The auxins moved away from the light✓/were destroyed by the light (3)
- so that the darker side had a higher concentration of auxins✓
- and the lighted side had a lower concentration of auxins✓

(9)

HUMAN IMPACT ON THE ENVIRONMENT (25 MARKS)

TYPICAL EXAM QUESTIONS

QUESTION 1 *(Questions taken from various sources)*

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.10) in your ANSWER BOOK, for example 1.11 D.

1.1 The following gases are found in the atmosphere:

(i) Carbon dioxide
(ii) Methane
(iii) Oxygen
(iv) Ozone

Which ONE of the following combinations represents greenhouse gases?

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

1.2 Alien plants flourish in a new habitat because they …

A do not have natural enemies and therefore they are able to outcompete the indigenous species.
B are able to photosynthesise better than indigenous species.
C are able to defend themselves from diseases.
D are able to survive with limited resources

1.3 An increased growth of algae due to too many nutrients in the water is known as …

A bleaching.
B eutrophication.
C ionisation.
D leaching.

QUESTIONS 1.4 AND 1.5 are based on the information in the table below. It shows the amount of waste products dumped in landfills each year and the time taken for each type of product to break down (decompose).

Type of product	Amount of waste (in tons)	Time to break down waste (in years)
Plastic bags	200	300
Leather shoes	30	20
Batteries	20	100
Nylon fibre	100	50
Aluminium cans	50	75

1.4 What is the percentage contribution of aluminium cans to the total amount of waste generated from the products listed?

A 12,5%
B 75%
C 50%
D 18,8%

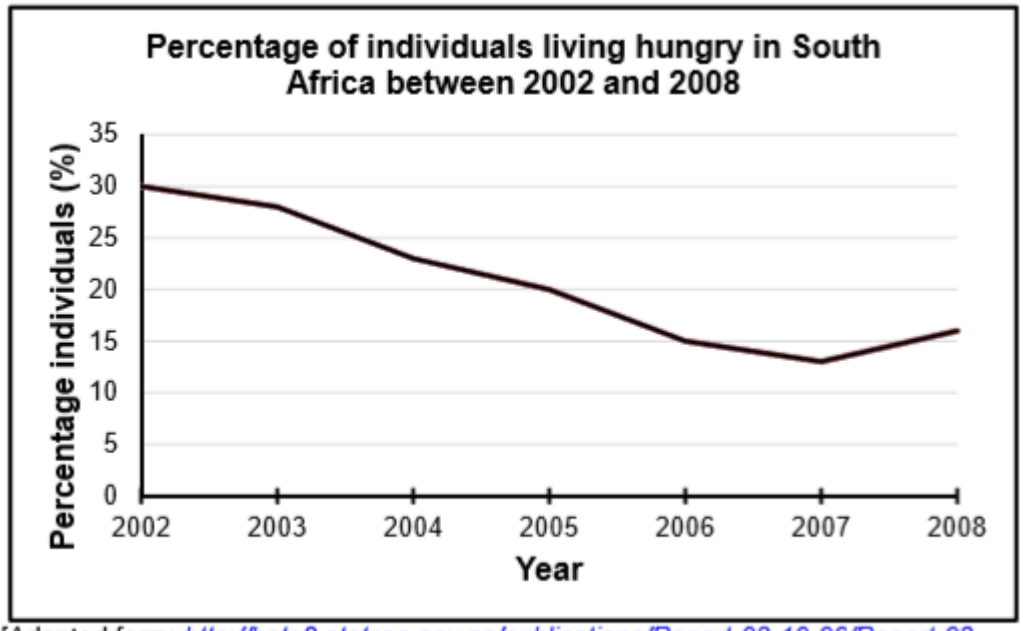
1.5 The statements below refer to the information given in the table above.

(i) Plastic bags take 250 years more than nylon fibre to decompose
(ii) Aluminium cans decompose faster than nylon fibre
(iii) Leather shoes decompose fastest
(iv) Batteries are responsible for the largest proportion of waste produced.

Which of these statement(s) is/are correct?

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

1.6 The graph below gives information about the number of hungry people in South Africa from 2002 to 2008. Living below the food poverty line expresses itself most basically as hunger.



[Adapted form: http://beta2.statssa.gov.za/publications/Report-03-10-06/Report-03-10-06March2014]

The graph shows that …

A food insecurity in the country decreased from 2002 to 2008.
B food security in the country increased from 2007 to 2008.
C food insecurity in the country decreased from 2002 to 2007.
D food security in the country decreased from 30% to 13%.

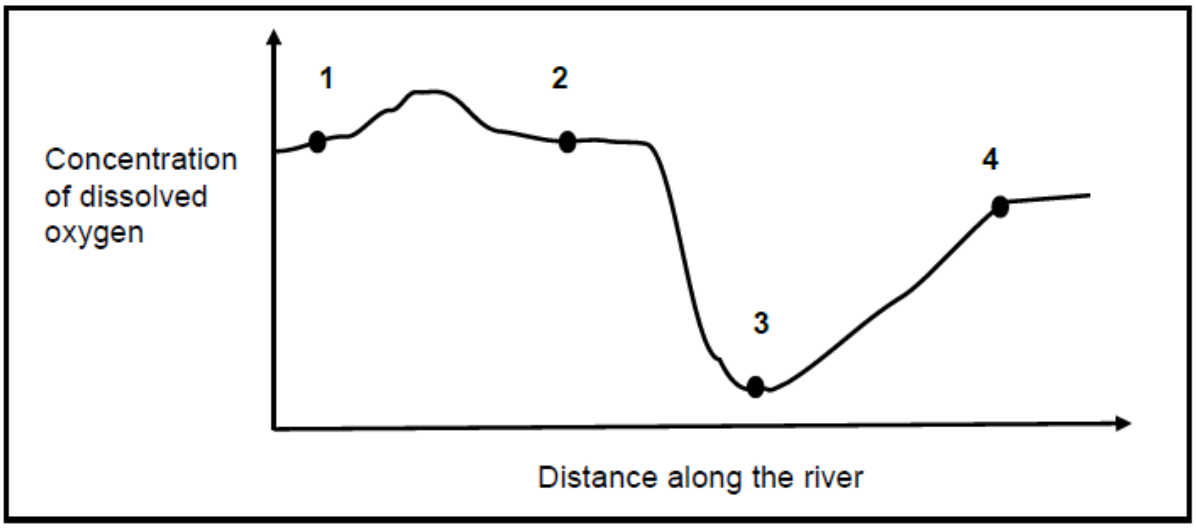
1.7 Eutrophication in dams is caused by …

A excess nitrates and phosphates from rivers.
B increased numbers of fish species in the dam.
C hot water released into rivers.
D the reduction in the availability of water supply from the rivers.

1.8 The correct way of disposing nuclear waste must be by …

A burying it deep underground in sealed containers.
B dumping it in landfill sites.
C burning it in large incinerators.
D dumping it in the sea.

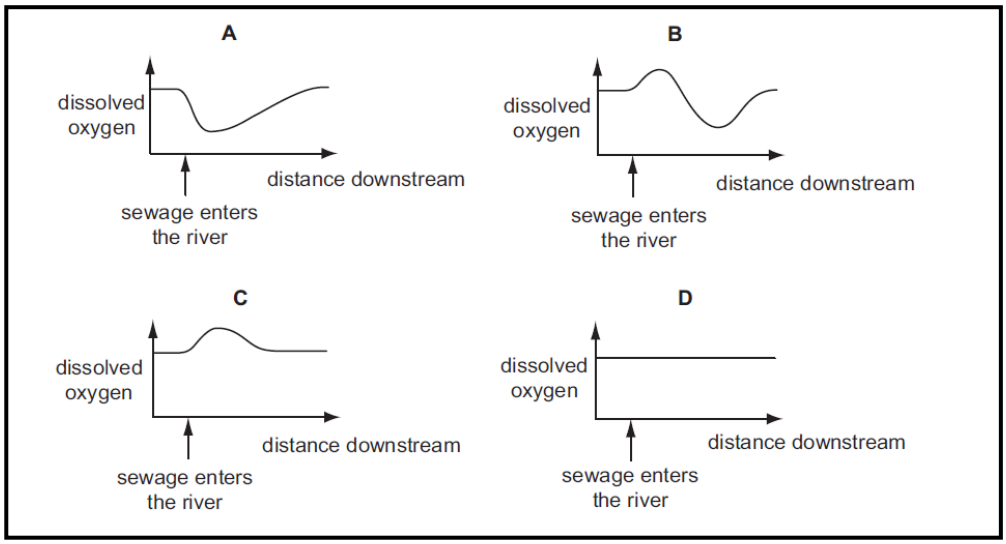
1.9 The graph below shows the concentration of dissolved oxygen at different points along a river.



At which point on the graph is sewage most likely to have been poured into the river?

A 1
B 2
C 3
D 4

1.10 Which graph shows the effect of pollution by sewage on the amount of dissolved oxygen in a river?



(20)

QUESTION 2 *(Questions taken from various sources)*

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.10) in your ANSWER BOOK.

2.1 The farming practice of growing a crop of a single species only
2.2 A measure of the total amount of carbon dioxide emissions of a person/population/company per year
2.3 The permanent destruction of forests
2.4 The replanting of trees and shrubs in a forest
2.5 A layer of earth or rock that holds water
2.6 Process by which a region becomes progressively drier and drier
2.7 The process that traps heat in the Earth's atmosphere by gases such as carbon dioxide
2.8 Species that no longer exist on Earth
2.9 Refers to the long-term prevalent weather conditions of an area
2.10 A gas produced in waste disposal sites that can be used for cooking, heating and lighting.

(10)

QUESTION 3 *(Questions taken from various sources)*

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 (3.1 to 3.5) in the ANSWER BOOK.

COLUMN I		**COLUMN II**	
3.1	Decreases food security	A B	Alien plant invasion Exponential growth of the human population
3.2	A gas consisting of three atoms of oxygen and that shields the earth from ultraviolet light.	A B	Ozone Methane
3.3	Greenhouse gas	A B	Methane Carbon dioxide
3.4	Having access to enough food of good quality at all times	A B	Monoculture Eutrophication
3.5	Sustainable use of medicinal plants	A B	Banning all sales of medicinal plants Collecting plants only from mountainous areas

(5 x 2) **(10)**

QUESTION 4 *(NW, Sept. 2019, Paper 1)*

The table below shows the gasses that contribute to the Greenhouse effect.

Greenhouse Gas	Contribution to the Greenhouse Effect
Carbon dioxide	53%
Methane(CH_4)	**B**
Nitrous oxide (N_2O)	5%
Ozone (O_3)	13%
CFC's	12%

[Adapted from www.globalwarming.org]

4.1 Calculate the value of B. Show all calculations. (2)

4.2 Draw a pie chart to represent the gasses that contribute to the Green House effect (6)

(8)

QUESTION 5 *(MP, Sept. 2019, Paper 1)*

Read the extract below.

> Water scarcity has a huge impact on agriculture. The Water Project attempt to fix this problem by helping build water collection systems such as sand dams in some rural areas.
>
> A sand dam is a cement wall built across a seasonal sandy river. This cement wall retains rainwater and recharges ground water.
>
> By recharging the aquifer, sand dams provide enough water to establish vegetable gardens and crop fields.

5.1 State what is meant by an 'aquifer' (1)

5.2 Explain how the building of sand dams' impact on food security. (3)

5.3 Describe the impact of sand dams on biodiversity in the river beyond. (3)

(7)

QUESTION 6 *(LP, Sept. 2019, Paper 1)*

Read the following extract.

South Africa has 3 000 km of coastline with ±10 000 marine species. This is 15% of all coastal marine species in the world. One area of spectacular beauty is the iSimangaliso Wetland Park, previously known as the Greater St Lucia Wetland Park.

Two species of sea turtle come ashore here to lay their eggs on the beach. A higher tide line would mean there would not be enough beach for the turtles to lay their eggs. This would result in a reduction, if not the extinction, of the sea turtle population.

The predators of the sea turtles include seagulls. A drop in the turtle population may result in a drop in the seagull population too. This in turn would result in a much higher level of decaying animal matter on the beaches because seagulls eat that too.

6.1 Explain how climate change can result in a higher tide line. (3)

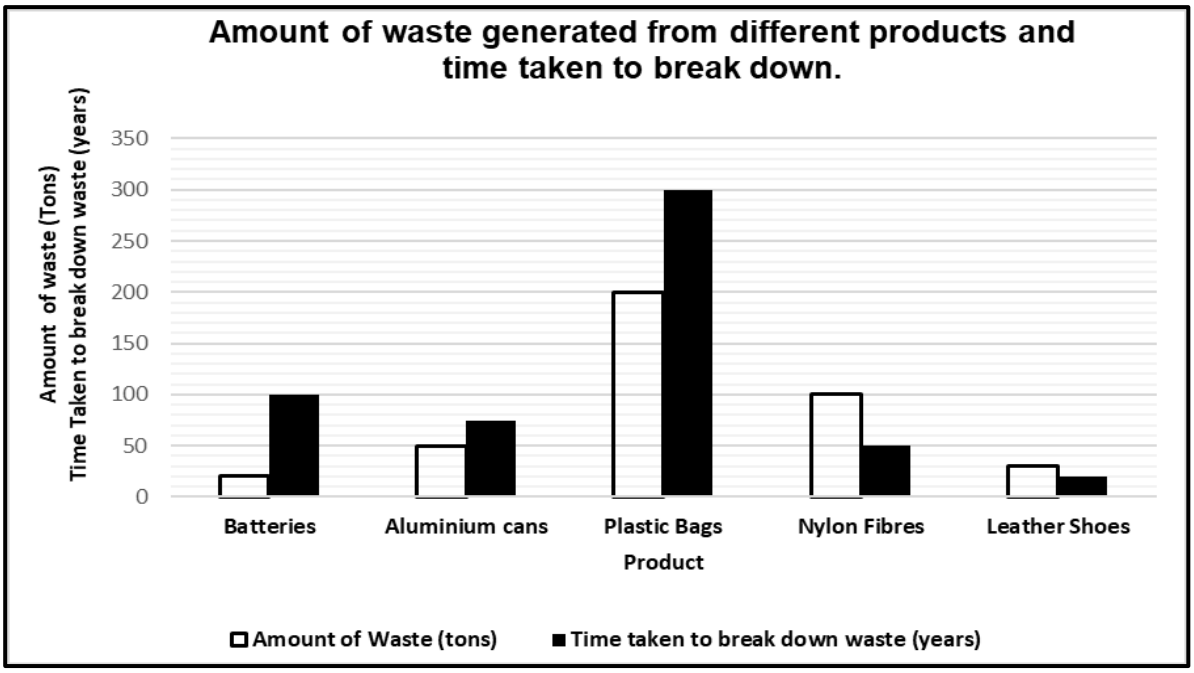
6.2 Sea turtles feed on jelly fish and jelly fish eat plankton. Suggest how the extinction of sea turtles may influence this food chain. (2)

6.3 Explain how a drop in the seagull population will influence food security in humans. (2)

(7)

QUESTION 7 *(GDE, Sept. 2019, Paper 1)*

The graph below shows the amount of waste generated from different products and the time taken for each product to break down.



7.1 From the graph identify ONE biodegradable product. (1)

7.2 According to the graph, how long do plastic bags take to break down? (1)

7.3 Calculate the percentage contribution of plastic bags to the total amount of waste generated from the products shown. Show ALL working. (3)

(5)

HUMAN IMPACT ON THE ENVIRONMENT ANSWERS

QUESTION 1

1.1	C	✓✓
1.2	A	✓✓
1.3	B	✓✓
1.4	A	✓✓
1.5	D	✓✓
1.6	C	✓✓
1.7	A	✓✓
1.8	A	✓✓
1.9	B	✓✓
1.10	A	✓✓

(20)

QUESTION 2

2.1 Monoculture ✓

2.2 Carbon footptint ✓

2.3 Deforestation ✓

2.4 Reforestation ✓

2.5 Aquifer ✓

2.6 Desertification ✓

2.7 Greenhouse effect ✓

2.8 Extinct ✓

2.9 Climate ✓

2.10 Methane ✓ **(10)**

QUESTION 3

3.1 Both A and B ✓✓

3.2 A only✓✓

3.3 Both A and B ✓✓

3.4 None ✓✓

3.5 None ✓✓

(10)

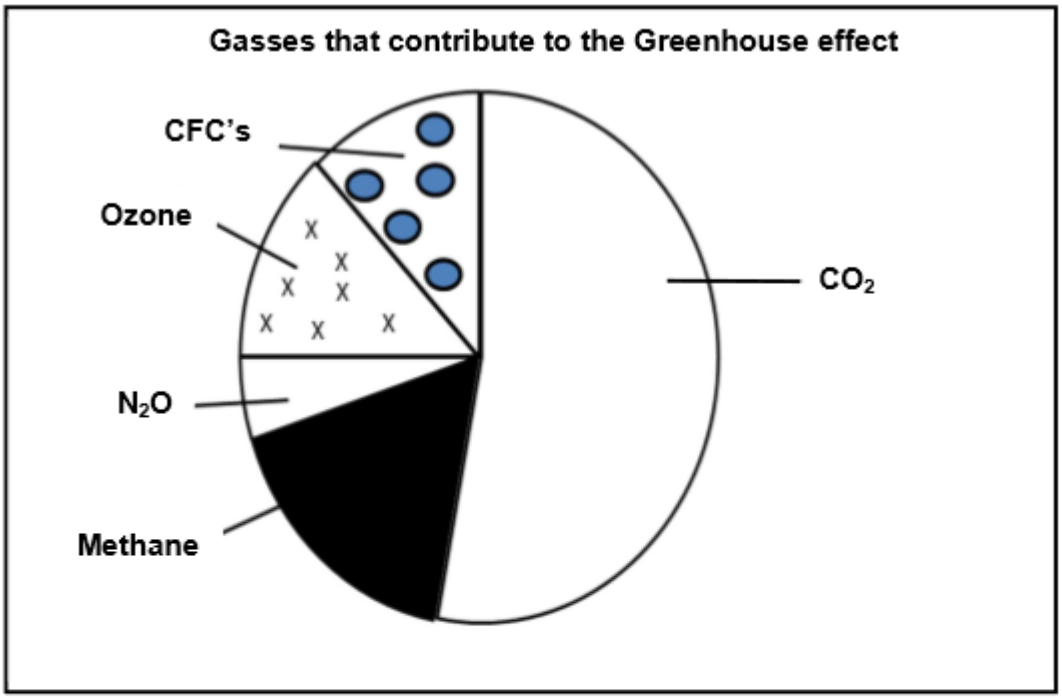
QUESTION 4

4.1 53 + 5 + 13 +12 = 83

= 100 - 83 ✓

= 17% ✓ (2)

4.2



MARK ALLOCATION FOR THE PIE CHART	
Title of graph □ both variables included	1
Pie chart drawn	1
1 □ 4 Sectors correctly indicated/labelled 5 Sectors correctly indicated/labelled	1 2
1 □ 4 Sectors correctly calculated 5 Sectors correctly calculated	1 2

NOTE: If wrong type of graph is drawn:
Mark will be lost for type of graph as well as for the drawing and labelling of sectors. (Max 4/6)

(6)
(8)

QUESTION 5

5.1 Underground permeable rock saturated with water ✓ (1)

5.2 - Increase food security✓

- Because there will be more water✓

- For irrigation of crops✓ (3)

5.3 - River downstream will dry up✓

- Plants and animals will die✓

- leading to loss of biodiversity✓ (3)

(7)

QUESTION 6

6.1 - Increased temperatures✓
- cause ice to melt in the glaciers✓
- which cause rising sea levels✓ (3)

6.2 - The numbers of the jelly-fish population is going to increase✓
- Causing the numbers of the plankton population to decrease✓ (2)

6.3 Decaying matter will pollute the sea water✓ which results in the dying of fish in the sea✓/Food security will decrease✓

OR

Decaying matter will increase global warming✓ which results in unstable weather patterns✓ which cause food crops to fail✓ (2)

(7)

QUESTION 7

7.1 Leather shoes ✓ (1)

7.2 300 years ✓ (1)

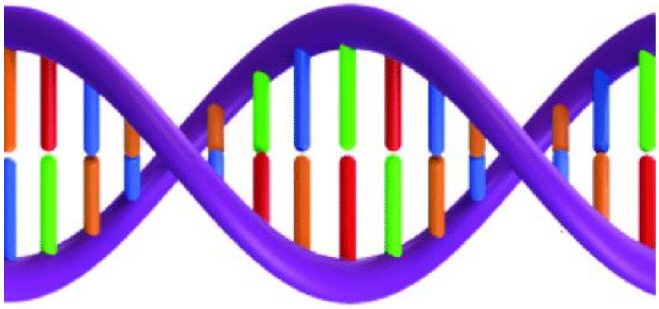
7.3 20 + 50 + 200 + 100 + 30 = 400 ✓

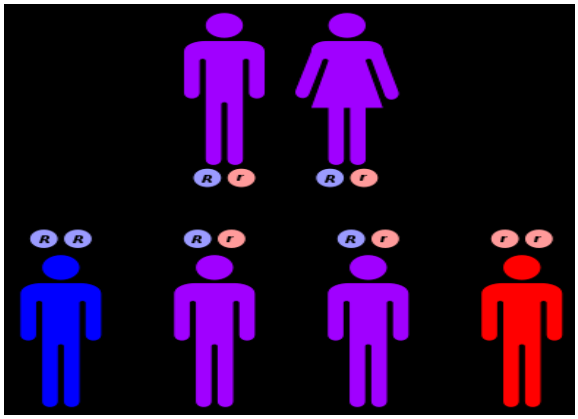
$\frac{200}{400}$ ✓ x $\frac{100}{1}$ = 50✓% (3)

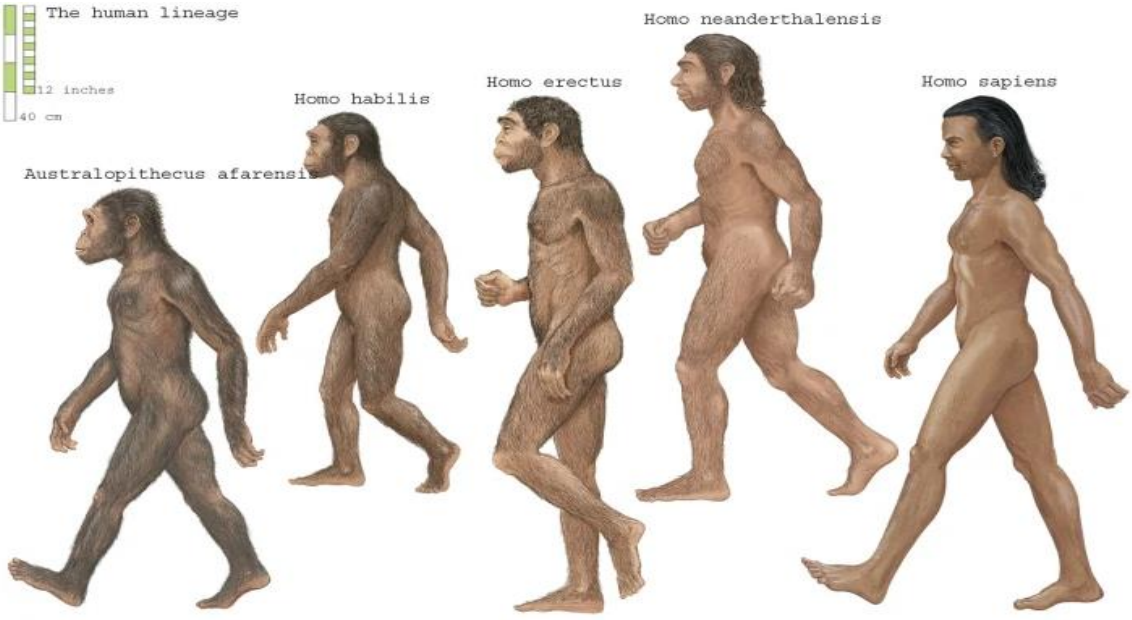
(5)

PAPER 2

TOPIC	MARK
Meiosis	12
DNA: Code of life	27
Genetics and Inheritance	45
Evolution	66
TOTAL	**150**







MEIOSIS (12 MARKS)

The topic 'MEIOSIS' is assessed in both papers. Please refer to p.3-9 of this booklet for questions on this topic.

DNA: CODE OF LIFE (27 MARKS)

TYPICAL EXAM QUESTIONS

QUESTION 1 *(Questions taken from various sources)*

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.10) in your ANSWER BOOK, for example 1.11 D.

1.1 A dye stains a particular type of nucleic acid red. When this dye was used to identify which organelles in a cell contain this nucleic acid, only the nucleus and ribosomes stained red.
This result shows that the dye stains structures that contain …

A DNA.
B RNA.
C DNA and protein.
D both DNA and RNA.

1.2 During translation, the type of amino acid that is added to the growing polypeptide depends on the …

A codon on the mRNA only.
B anticodon on the tRNA to which the amino acid is attached only.
C codon on the mRNA and the anticodon on the tRNA to which the amino acid is attached.
D anticodon on the mRNA only.

1.3 How many nitrogenous bases form a codon?

A 9
B 12
C 3
D 6

1.4 In an investigation it was found that 10% of the nitrogenous bases in a molecule of DNA was thymine. What was the ratio of thymine to guanine in the same molecule?

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

1.5 Study the table below showing various amino acids coded for by various mRNA codons.

mRNA codons	Corresponding amino acids
GCG	Alanine
AUG	Methionine
AUA	Isoleucine
AGG	Arginine

Which amino acid is coded by the DNA triplet of nitrogenous bases TAC?

A Alanine
B Arginine
C Isoleucine
D Methionine

1.6 A codon is a sequence of three nucleotides on a molecule of …

A rRNA.
B mRNA.
C tRNA.
D DNA.

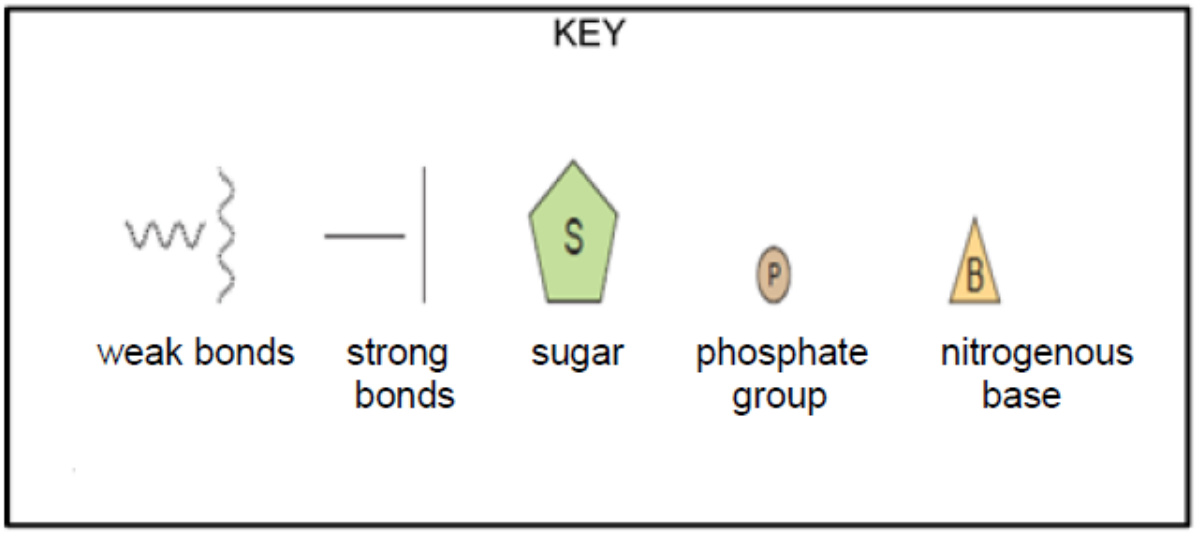
1.7 DNA was analysed and found to contain 14% T (thymine). What percentage of the molecule is cytosine?

A 14%
B 28%
C 36%
D 72%

1.8 A gene in a bacterium codes for a protein that has 120 amino acids. How many mRNA nucleotides code for this protein?

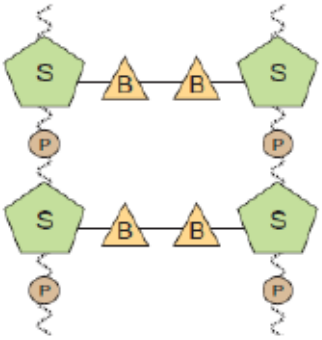
A 30
B 40
C 360
D 480

1.9 The key below shows the main components of a DNA molecule and the strength of the bonds that hold them together.

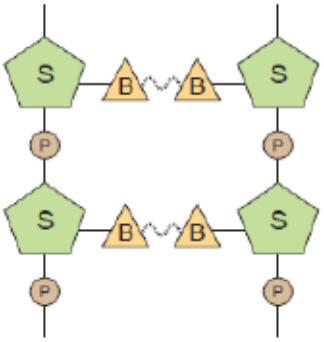


Which one of the following diagrams shows the correct combination of components of a DNA molecule?

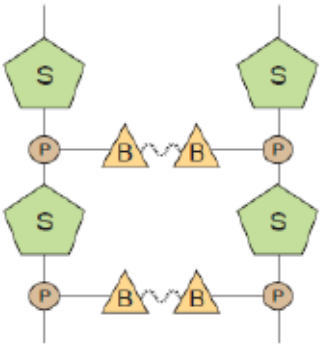
A



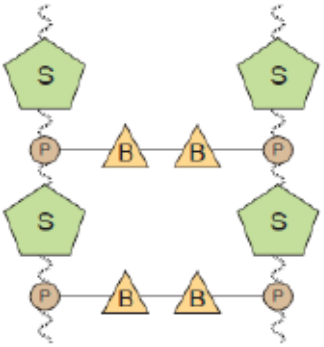
B



C



D



1.10 The table below shows the anti-codons of tRNA that code for different amino acids found in human protein.

ANTI-CODONS OF tRNA	AMINO ACIDS
CAA	Valine
CCC	Glycine
CGU	Alanine
AAA	Phenylalanine
UCG	Asparagine
UAC	Methionine
GGU	Proline
AGC	Tryptophan
UCA	Serine

What is the corresponding amino acid for the DNA base triplet TCG?

A Alanine
B Tryptophan
C Serine
D Asparagine

(20)

QUESTION 2 *(Questions taken from various sources)*

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.5) in your ANSWER BOOK.

2.1 The process whereby DNA makes an exact copy of itself
2.2 A segment of DNA coding for a particular characteristic
2.3 Bond joining amino acids in a protein
2.4 Synthesis of mRNA from DNA
2.5 The nitrogenous base found in RNA but not in DNA

(5)

QUESTION 3 *(Questions taken from various sources)*

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 (3.1 to 3.3) in the ANSWER BOOK.

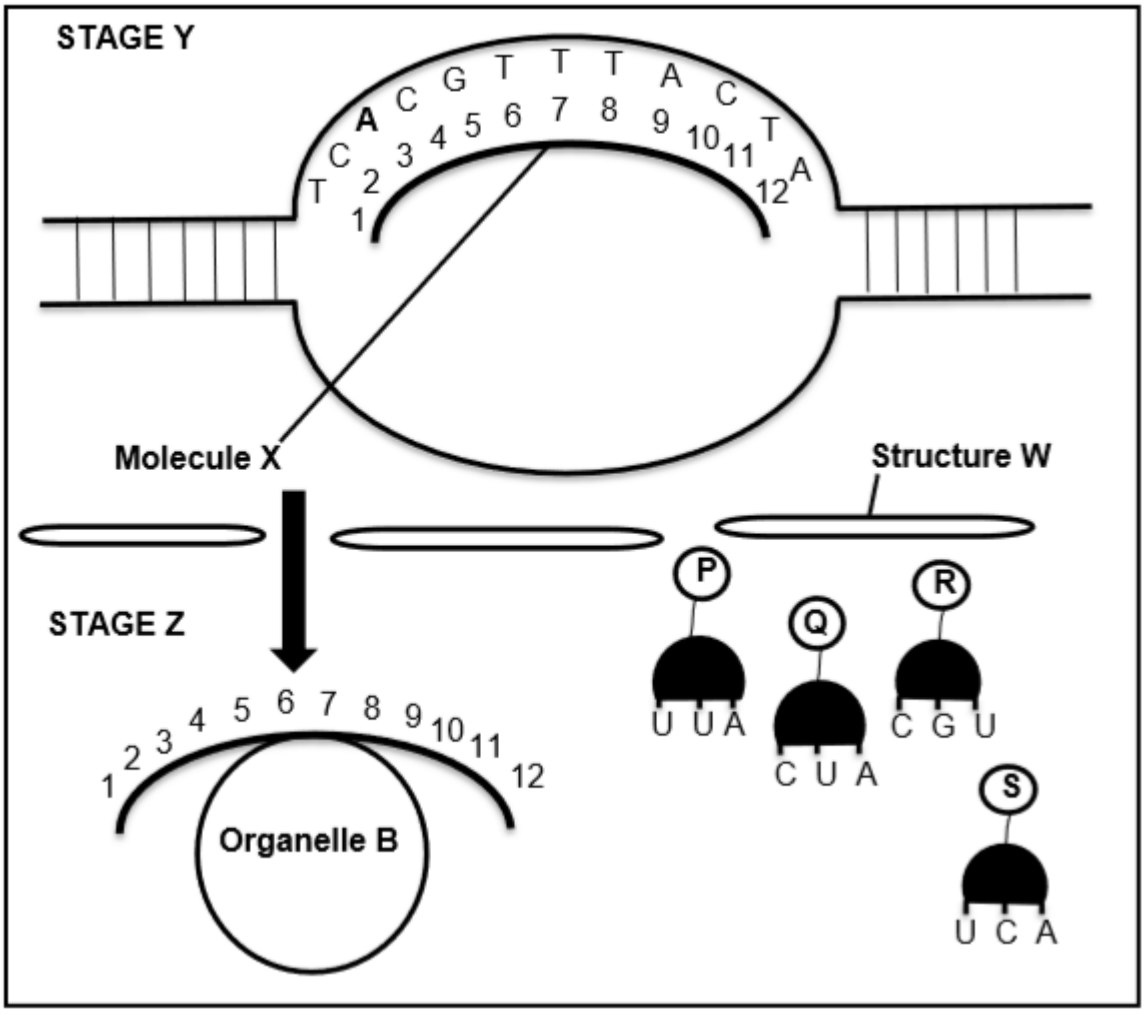
COLUMN I		COLUMN II	
3.1	Discovery of DNA	A B	Mendel Darwin

3.2	Plays a role in paternity testing	A B	Blood grouping DNA profiles
3.3	Location of DNA	A B	Genes on chromosomes Mitochondria

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

QUESTION 4 *(EC, Sept. 2019, Paper 2)*

Study the diagram below.



4.1 Name the process represented in the diagram above. (1)

4.2 Identify:

(a) Molecule **X** (1)

(b) Organelle **B** (1)

(c) Structure **W** (1)

4.3 Give the sequence of nitrogenous bases for the first codon on Molecule **X** (1, 2,

3) (1)

4.4 Give the correct order in which molecules **P, Q, R** and **S** would attach to molecule **X**. (From left to right). (2)

4.5 Where in a cell does stage **Z** occur? (1)

4.6 Describe the process of transcription as seen in stage **Y**. (5)

4.7 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)

(17)

QUESTION 5 *(GDE, Sept. 2019, Paper 2)*

Study the DNA base triplets **1**, **2** and **3** below.

Base triplet 1	Base triplet 2	Base triplet 3
GTC	**AAG**	**CCT**

The table below shows the RNA codons that code for different amino acids.

CODON	AMINO ACID
UUC	Phenylalanine
AUC	Isoleucine
AAU	Asparagine
GAA	Glutamic acid
GUA	Valine
CAG	Glutamine
CAU	Histidine
GGA	Glycine

5.1 Write down the three bases of the DNA base triplet that codes for glycine. (1)

5.2 In base triplet 2 the **first** adenine was replaced by **T** as a result of a mutation.

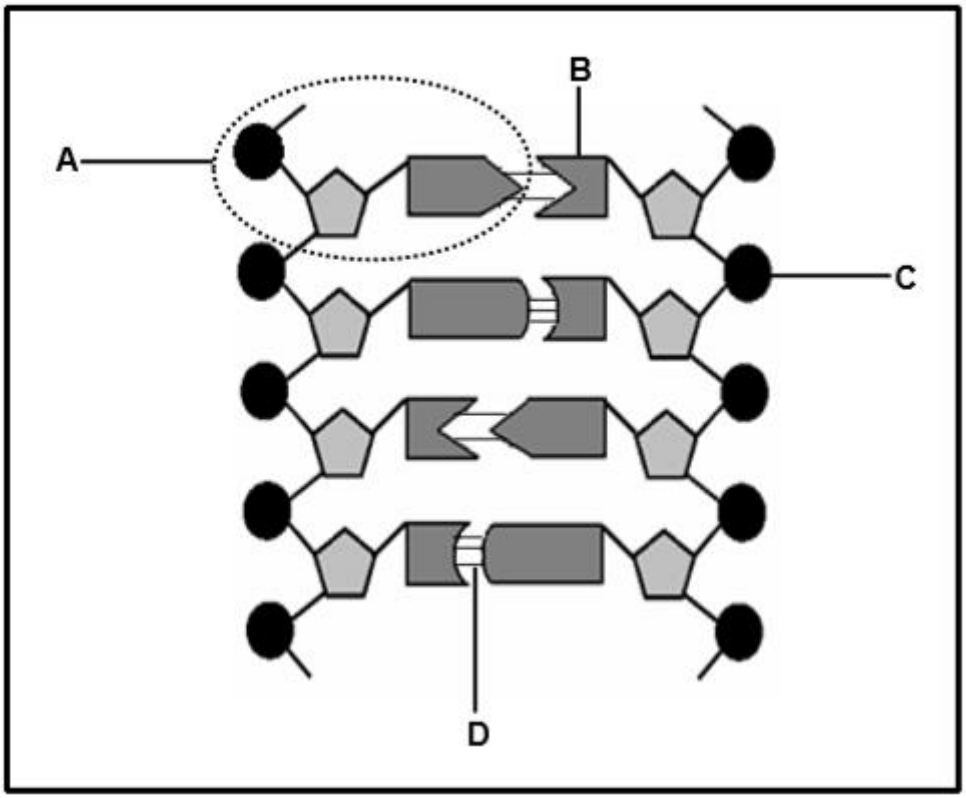
Describe how this mutation will affect the protein that will be formed. (3)

5.3 State TWO ways in which the events of transcription in protein synthesis are different from that of DNA replication. (2 x 2) (4)

(8)

QUESTION 6 *(GDE, Jun. 2019, Paper 2)*

The diagram below represents a portion of a DNA molecule.



6.1 Identify **B** and **C.** (2)

6.2 Name:

(a) Monomer **A** (1)

(b) TWO scientists who received a Nobel prize for discovering the DNA molecule **(**2)

(c) ONE organelle in a cell where DNA is located (1)

6.3 Describe how a mutation on DNA may change the structure of a protein (4)

6.4 Tabulate TWO structural differences between a monomer of RNA and a monomer of DNA (5)
(15)

DNA: CODE OF LIFE ANSWERS

QUESTION 1

1.1	B	✓✓
1.2	C	✓✓
1.3	C	✓✓
1.4	D	✓✓
1.5	D	✓✓
1.6	B	✓✓
1.7	C	✓✓
1.8	C	✓✓
1.9	B	✓✓
1.10	D	✓✓

(20)

QUESTION 2

2.1 (DNA) Replication ✓

2.2 Gene ✓

2.3 Peptide bond ✓

2.4 Transcription ✓

2.5 DNA profiling ✓ **(5)**

QUESTION 3

3.1 None ✓✓

3.2 Both A and B ✓✓

3.3 Both A and B ✓✓

(6)

QUESTION 4

4.1 Protein synthesis ✓ (1)

4.2 (a) mRNA ✓/ messenger RNA (1)

(b) Ribosome ✓ (1)

(c) Nuclear membrane ✓ (1)

4.3 A G U ✓ (1)

4.4 S – R – P – Q ✓✓ (2)

4.5 Cytoplasm ✓ (1)

4.6 - The DNA molecule unwinds ✓

- and unzips / weak hydrogen bonds break ✓
- one side of the DNA molecule forms a template ✓
- free floating RNA nucleotides from the nucleolus ✓
- join to their complementary base pairs ✓ (T-A; C-G)
- to form a new strand of mRNA ✓ **(Any 5 x 1)** (5)

4.7 - If nitrogenous base A was replaced by G it would mean that the codon would change to AGC ✓

- which may code for a different anticodon ✓/UCA instead of AGU
- and a different the amino acid ✓
- which may change the protein formed ✓ (4)

(17)

QUESTION 5

5.1 CCT✓ (1)

5.2
- Amino acid isoleucine will be coded for✓
- instead of phenylalanine✓
- A different protein may form✓ / nonsense protein formed / protein's function may be affected (3)

5.3
- In replication DNA is formed✓ and in transcription mRNA is formed✓
- In replication 2 strands of DNA act as a template✓ and in transcription 1 strand of DNA is used as a template✓
- In replication thymine is complementary to adenine✓ and in transcription uracil is complementary to adenine✓

(Mark first TWO only) Any 2 x 2 (4)

(8)

QUESTION 6

6.1 B – Nitrogenous base ✓

C – Phosphate ✓ (2)

6.2 (a) Nucleotide ✓ (1)

(b) (James) Watson ✓
(Francis) Crick ✓
(Maurice) Wilkins ✓ **(**2)
(Mark first TWO only)

(c) Nucleus ✓/Mitochondrion/Chloroplast (1)
(Mark first ONE only)

6.3 - The DNA code will change ✓

- leading to different mRNA ✓/codons

- which will match with different tRNA ✓/anticodons

- resulting in different amino acids ✓ being brought to the ribosome leading to a different protein (4)

6.4

Monomer of RNA	Monomer of DNA
Contains the sugar ribose ✓	Contains the sugar deoxyribose ✓
Contains the nitrogenous base uracil ✓	Contains the nitrogenous base thymine ✓

(Mark first TWO only) ✓ **table** (5)

(15)

GENETICS & INHERITANCE (45 MARKS)

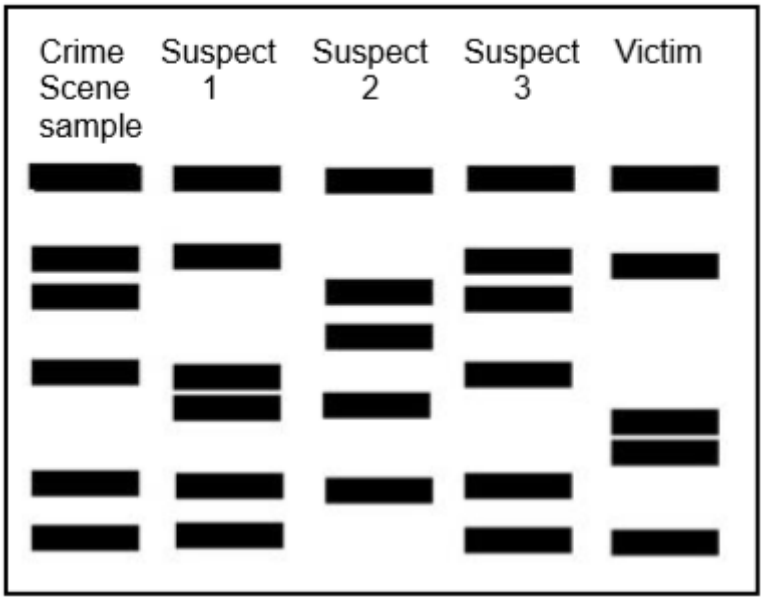
TYPICAL EXAM QUESTIONS

QUESTION 1 *(Questions taken from various sources)*

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.10) in your ANSWER BOOK, for example 1.11 D.

1.1 The police were called to a scene where a man was seriously injured in a fight. They found blood on the man's hands that was not his own. The police took a sample of this blood as well as samples from the victim and three suspects (1 to 3) who were suspected of injuring the man.

The results are shown below:



Which suspect was definitely at the crime scene?

A 1
B 2
C 3
D None of the suspects

1.2 When a red horse (**RR**) is crossed with a white horse (**WW**), the offspring are all roan (**RW** = red and white hairs together). This type of inheritance is known as …

A codominance.
B polygenic inheritance.
C multiple alleles.
D incomplete dominance.

1.3 In mice brown fur coat is dominant to white fur coat. If a heterozygous brown mouse is mated with a white mouse and 8 offspring are produced, how many would be expected to be white?

A 4
B 8
C 0
D 2

1.4 Which of the following is usually NOT possible for red-green colour blindness?

A A carrier mother passes the allele on to her daughter.
B A colour-blind father passes the allele on to his daughter.
C A colour-blind father passes the allele on to his son.
D A carrier mother passes the allele on to her son.

1.5 An extra finger in humans is rare but is due to a dominant gene. When one parent is normal and the other parent has an extra finger but is homozygous for the trait, what is the chance that their children will be normal?

A 0%
B 25%
C 50%
D 75%

1.6 Which statement concerning a pair of alleles for a gene controlling a single characteristic in humans is true?

A Both alleles come from the father.
B Both alleles come from the mother.
C One allele comes from the mother and another allele comes from the father.
D The alleles come randomly in pairs from either the mother or father

1.7 Haemophilia is a sex-linked recessive trait in humans. What will the result of mating between normal (non-carrier) female and a male with haemophilia be?

A Half of the daughters are normal and half of the sons have haemophilia.
B All daughters are carriers and all sons are normal.
C All daughters are normal and all sons are carriers.

D Half of the sons are normal, half have haemophilia and all daughters are carriers.

1.8 The diagram below shows the nucleus of a diploid cell with two pairs of homologous chromosomes.

Due to independent assortment, what is the possible genetic makeup of gametes produced by this organism?

A RrTt
B Rr, Tt
C R, r, T, t
D RT, Rt, rT, rt

1.9 A gene in cattle controls whether horns develop or not. When cattle without horns are mated together, none of the offspring ever have horns.

A male with horns is mated with a female without horns.

If half of the offspring have horns and half do not, what is the conclusion?

A The male is homozygous dominant
B The male is homozygous recessive
C The male is heterozygous
D Only males have horns

1.10 If the mother has blood group AB and the father blood group O the possible blood groups of the offspring will be ...

A A or B only.
B AB only.
C O only.
D A, B, AB or O. **(20)**

QUESTION 2 *(Questions taken from various sources)*

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.5) in your ANSWER BOOK.

2.1 Organisms that have two identical alleles for a particular characteristic
2.2 Undifferentiated animal cells that have the ability to change into any cell type
2.3 The physical / functional expression of an organism's genes
2.4 Allele that is only expressed in the homozygous state
2.5 Having more than two different alleles for the same gene **(5)**

QUESTION 3 *(Questions taken from various sources)*

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 (3.1 to 3.3) in the ANSWER BOOK.

COLUMN I		**COLUMN II**	
3.1	Blood types	A B	Incomplete dominance Multiple alleles
3.2	Heterozygous condition expresses both alleles in gene pair	A B	Co-dominance Incomplete dominance
3.3	All the genes in all the chromosomes of a species	A B	Genome Genotype

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

QUESTION 4 *(EC, Sept. 2019, Paper 2)*

In sheep, the allele for black wool (**B**) is dominant over the allele for white wool (**b**). Similarly, the allele for horns (**H**) is dominant over the allele for being hornless (**h**). A horned sheep with black wool was crossed with a pure breeding hornless sheep with white wool.

The punnett diagram below shows the result of this cross.

SHEEP 1 → / SHEEP 2 ↓	BH	Bh	bH	bh
bh	Y			
bh		X		
bh				
bh				

4.1 State why the example above represents a dihybrid cross. (1)

4.2 Give the genotype for the horned sheep with black wool used in this cross. (1)

4.3 Give the:

(a) Genotype of offspring **X** (1)

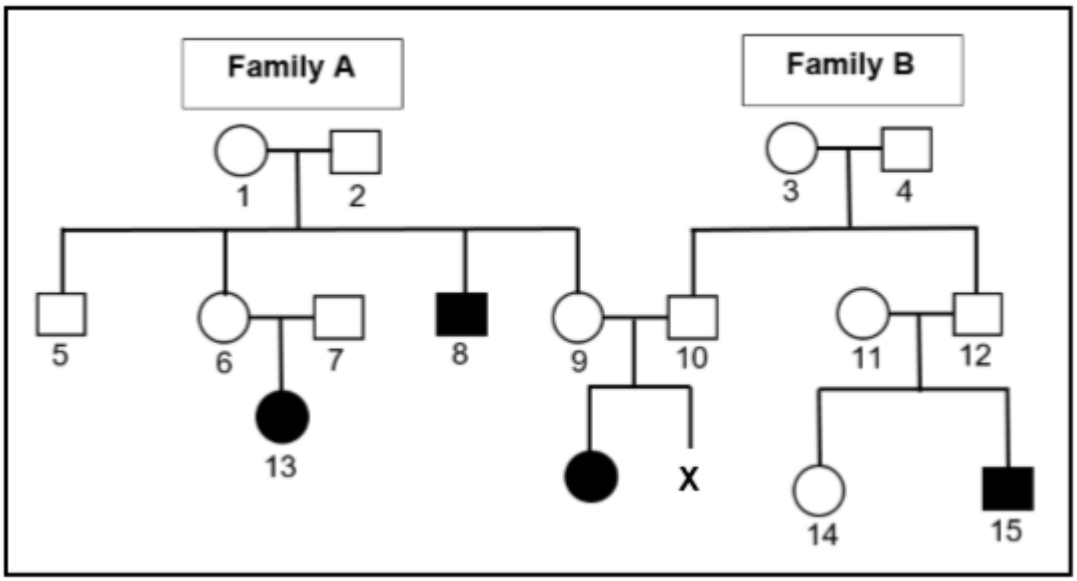
(b) Phenotype of offspring **Y** (1)

4.4 If 32 offspring are produced, how many offspring are expected to have horns and white wool. (2)

(6)

QUESTION 5 *(EC, Sept. 2019, Paper 2)*

Cystic fibrosis is a genetic condition that causes a build-up of thick sticky mucus in the lungs, pancreas, liver and intestines.
Study the diagram below of two families that carry the cystic fibrosis gene. The letters **N** and **n** are used to represent the two alleles.



5.1 Define a *gene mutation*. (1)

5.2 Name the type of diagram shown above. (1)

5.3 How many generations are shown in the diagram? (1)

5.4 Using evidence from the diagram, explain why the gene for cystic fibrosis is a recessive allele. (3)

5.5 Individual **9** and individual **10** are expecting their second child **X.**

Use a genetic cross to show the percentage chance of them having a child with cystic fibrosis (6)
(12)

QUESTION 6 *(EC, Sept. 2019, Paper 2)*

Read the following extract.

> Duchenne's muscular dystrophy is a genetic disorder in which the skeletal muscles progressively weaken. It is a sex-linked disorder. The recessive mutated gene codes for a weak form of protein which cause the muscle fibres to weaken and break down.
> Duchenne's muscular dystrophy mostly affects boys and causes their muscles to weaken from the age of about 3. By the time they are teenagers they will be using a wheelchair and eventually their heart and respiratory muscles will also be affected.

6.1 Define a sex-linked disorder. (1)

6.2 According to the extract, when will parents first notice the changes in the muscles of their child? (1)

6.3 Explain why it is more common for boys to suffer from Duchenne's muscular dystrophy than girls? (4)
(6)

QUESTION 7 *(KZN, Sept. 2018, Paper 2)*

A group of Grade 12 learners in a school were asked to conduct a survey to determine whether right handedness or left handedness is more common amongst learners in the FET phase.

Handedness is the dominance of one hand over the other.

As part of planning, the learners did the following:
- Asked permission from the principal
- Collected recording material
- Decided on the recording method

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

	Handedness			
	Right handedness		**Left handedness**	
Gender	BOYS	GIRLS	BOYS	GIRLS
Number of learners	120	160	80	40

7.1 State any other TWO planning steps for this investigation. (2)

7.2 State a conclusion for this investigation. (2)

7.3 Draw a bar graph to represent the information in the table. (6)

(10)

QUESTION 8 *(KZN, Sept. 2018, Paper 2)*

A female who is not colour blind but who has one allele for colour blindness marries a male who is not colour blind.
Use a genetic cross to show all possible genotypes and phenotypes of their children. Use the alleles **N** for normal and **n** for colour-blindness.

(6)

GENETICS & INHERITANCE ANSWERS

QUESTION 1

1.1	C	✓✓
1.2	A	✓✓
1.3	A	✓✓
1.4	C	✓✓
1.5	A	✓✓
1.6	C	✓✓
1.7	C	✓✓
1.8	D	✓✓
1.9	C	✓✓
1.10	A	✓✓

(20)

QUESTION 2

2.1 Homozygous ✓

2.2 Stem cells ✓

2.3 Phenotype ✓

2.4 Recessive ✓

2.5 Multiple alleles ✓ **(5)**

QUESTION 3

3.1 B only ✓✓

3.2 A only ✓✓

3.3 B only ✓✓

(6)

QUESTION 4

4.1 Two characteristics ✓ are involved in the cross (1)

4.2 BbHh ✓ (1)

4.3 (a) Bbhh ✓ (1)

(b) Black, horned ✓ (1)

4.4 8 ✓✓ (2)

(6)

QUESTION 5

5.1 A sudden change in the DNA sequence ✓/ structure of a gene leading to altered characteristics (1)

5.2 Pedigree ✓ diagram (1)

5.3 3 ✓ (1)

5.4 - Because individual 8/13/15 has the disease ✓

- therefore his/her parents must both be carriers of the disease ✓
- but they do not express the characteristic ✓
- therefore, it must be recessive

(3)

5.5

P_1	Phenotype	Normal male	x	Normal female ✓		
	Genotype	Nn	x	Nn ✓		
Meiosis						
	G/gametes	N ,	n	x	N ,	n ✓
Fertilisation						
F_1	Genotype	NN ;	Nn ;	Nn ;	nn ✓	
	Phenotype	3 Normal and 1 cystic fibrosis				

They have a **25%**✓* chance of having a child with cystic fibrosis

P_1 and F_1 ✓
Meiosis and fertilisation ✓

(**1*** **compulsory +** Any 5)

OR

P_1	Phenotype	Normal male	x	Normal female ✓
	Genotype	Nn	x	Nn ✓
Meiosis				
	G/gametes	N , n	x	N , n ✓

Fertilisation

F_1

Gametes	**N**	**n**
N	NN	Nn
n	Nn	nn
Correct genotypes ✓		

(6)
(12)

Phenotype 3 Normal and 1 cystic fibrosis

They have a **25%** ✓* chance of having a child with cystic fibrosis

P_1 and F_1 ✓
Meiosis and fertilisation ✓

(**1* compulsory +** Any 5)

QUESTION 6

6.1 Any disease or abnormal condition that is determined by a gene/allele that is carried on the gonosomes ✓ /sex chromosomes/ X or Y chromosomes. (1)

6.2 At the age of 3 ✓ years old (1)

6.3 - The gene is found on the X chromosome ✓

- Boys only have one X chromosome ✓
- If that X chromosome carries the Duchenne's gene ✓
- the boy will have Duchenne's muscular dystrophy ✓
- as there is no other allele to mask it. ✓ (Any 4 x 1) (4)

(6)

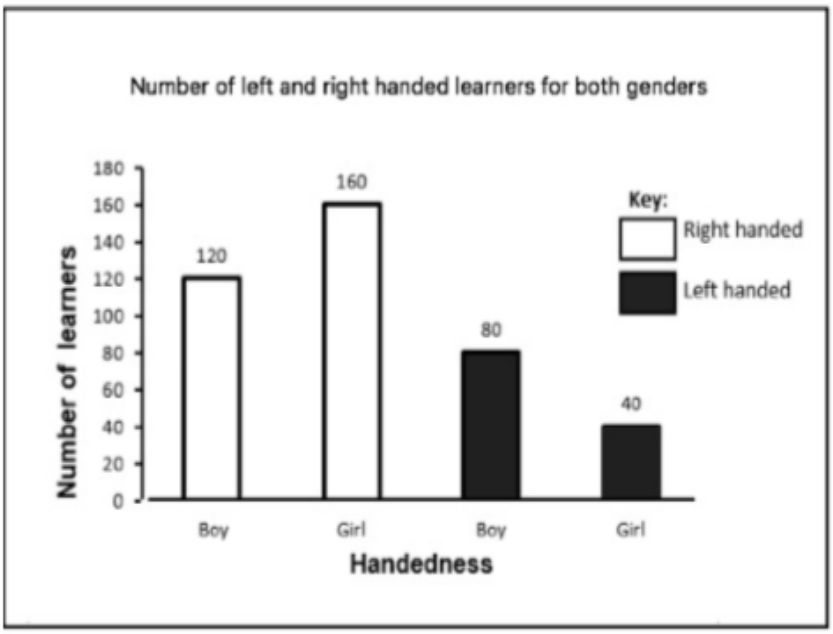
QUESTION 7

7.1 - Ask for permission from participants✓ (2)
- Decide on the sample size✓
- Decide on the method to collect the information✓
- Decide on the venue to be used✓
- Decide on the date and time to conduct the investigation✓

(Mark the first TWO only)

7.2 There are more right handed than left handed learners✓✓ (2)

7.3



Mark allocation for the graph

Criteria	Mark allocation
Correct type of graph (bars not in contact)	1
Title/Caption of the graph	1
Correct scale for X-axis and Y-axis	1
Correct label for X-axis and Y-axis	1
Drawing of the graph	0: No bars plotted correctly 1: 1 to 3 bars plotted correctly 2: All 4 bars plotted correctly

(6)
(10)

QUESTION 8

P_1	Phenotype	Normal female	×	Normal male ✓			
	Genotype	X^NX^n	×	X^NY ✓			
Meiosis							
	G/Gametes	X^N, X^n	×	X^N, Y ✓			
Fertilisation							
F_1	Genotype	X^NX^N	X^NY	X^NX^n	X^nY ✓		
	Phenotype	normal female	normal male	normal female	colour-blind male ✓		

P_1 and F_1✓
Meiosis and fertilisation✓

Any 6

OR

P_1 Phenotype Normal female × Normal male ✓

Genotype X^NX^n × X^NY ✓

Meiosis

Fertilisation

F_1 Phenotype

Gametes	X^N	X^n
X^N	X^NX^N	X^NX^n
Y	X^NY	X^nY

✓(correct gametes)

✓ (correct genotype)

2 normal females, 1 normal male and 1 colour-blind male✓

P_1 and F_1✓

Meiosis and fertilisation✓

Any 6

(6)

EVOLUTION (66 MARKS)

TYPICAL EXAM QUESTIONS

QUESTION 1 *(Questions taken from various sources)*

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.15) in your ANSWER BOOK, for example 1.16 D.

1.1 The first primate to use tools consistently was …

A *Homo erectus.*
B *Homo habilis.*
C *Homo floresiensis.*
D *Homo neanderthalensis.*

1.2 Scientists recovered the body of a woolly mammoth from the frozen soil of Siberia. The DNA sequence of the woolly mammoth was very similar to the DNA sequence of the African elephant. Which of the following is a conclusion for this data?

A The woolly mammoth and African elephant have a common ancestor
B The woolly mammoth is not related to the African elephant
C The woolly mammoth has the same number of chromosomes as the African elephant
D The woolly mammoth and the African elephant should be classified as the same species

1.3 Which one of the following statements is a correct description of a hypothesis and a theory?

A An accepted theory becomes a hypothesis
B An accepted hypothesis becomes a theory
C Hypotheses and theories are different names for the same concept
D Theories can be tested experimentally, whereas hypotheses cannot

1.4 Scientists visiting a group of four islands **P**, **Q**, **R** and **S** found similar spiders on each island. They carried out investigations to see if the spiders from the different islands belonged to the same species.

The results are in the table below (✓ indicates successful interbreeding. **X** indicates unsuccessful interbreeding)

	Spiders from			
	P	Q	R	S
P	✓	✓	X	X
Q	✓	✓	X	X
R	X	X	✓	X
S	X	X	X	✓

Which two populations belong to the same species?

A Q and R
B R and S
C Q and S
D P and Q

1.5 What is *biogeography*?

A The study of fossil organisms in order to learn about earlier forms of life.
B The idea that worldwide disasters have caused the widespread extinction of species.
C The idea that Earth and all living things have been created in their present forms and are unchangeable.
D The observed patterns of distribution of species.

1.6 Study the following list of concepts in evolution.

(i) Similarities in protein synthesis
(ii) Evidence for evolution
(iii) Common ancestry

Which ONE of the following combinations can be deduced by studying the percentage DNA between species?

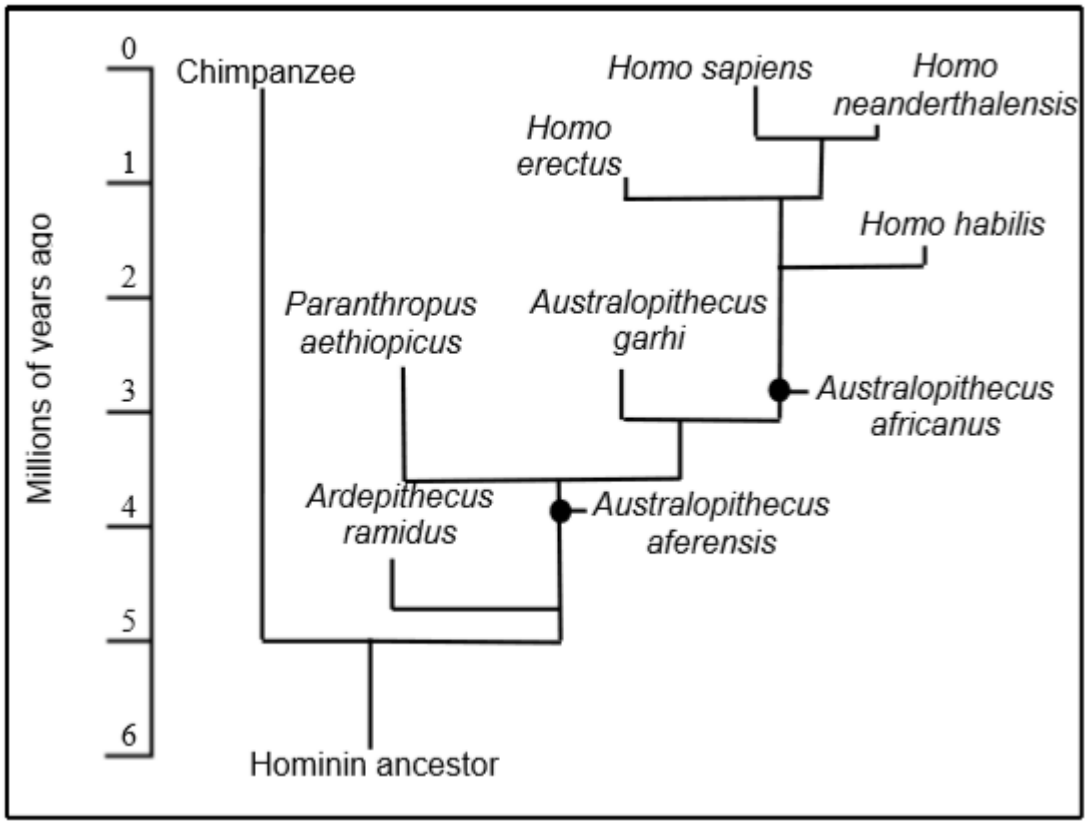
A (i), (ii) and (iii)
B Only (i) and (ii)
C Only (ii) and (iii)
D Only (i) and (iii)

1.7 Which of the following supports the 'Out of Africa' theory?

A *Homo habilis* was the first hominin to use tools
B The African Apes share many characteristics with humans
C Comparing mutations on mitochondrial DNA
D *Homo erectus* fossils found in Europe

1.8

Study the diagram below.



Which conclusion can be drawn from the above diagram?

A *Homo sapiens* is a direct descendant of *Ardipithecus ramidus*
B *Homo sapiens* evolved from chimpanzees
C *Australopithecus africanus* is a common ancestor of all *Homo* species
D *Homo sapiens* and *Homo erectus* have the most recent common ancestor

1.9 Two individuals are most likely members of the same species if they …

A have a different number of chromosomes.
B can mate and produce fertile offspring.
C breed at different times during the year.
D are phenotypically different.

1.10 Which ONE of the following involves short periods of time where rapid changes occur alternating with long periods of little or no change?

A Gradualism
B Punctuated equilibrium
C Speciation
D Natural selection

1.11 Study the list of processes below.

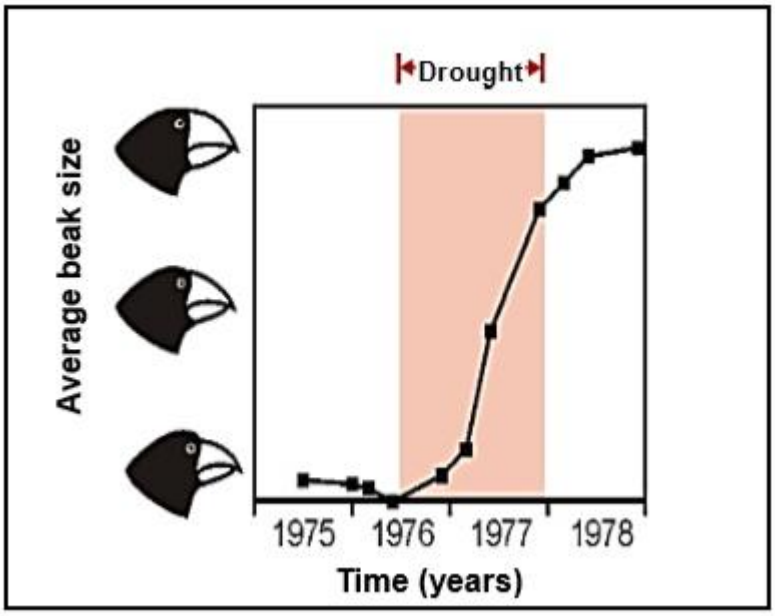
(i) Mutation
(ii) DNA replication

(iii) Meiosis
(iv) Random fertilisation

Which of the following processes are regarded as a source of variation for evolution?

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

1.12 During an investigation, researchers measured the beak size of a certain species of finch on the Galapagos Islands. The type of food available before and after a drought was a factor in the study of the evolution of the beaks of finches



Which factor is the dependent variable?

A The amount of rain
B The type of food available
C The beak size of finches
D The year

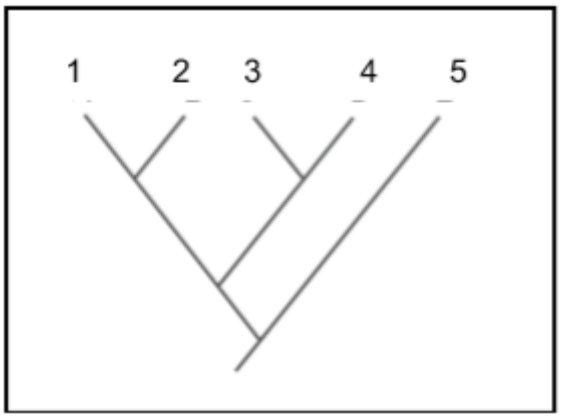
1.13 Which one of the following serves as evidence of cultural evolution in early *Homo* species?

A A skull of *Homo erectus* close to a *Homo sapiens* skeleton
B Remains of ancient tools
C Male and female skeletons in the same area
D Many *Homo* skeletons in an area

1.14 The wings of a bat and the human arm are examples of …

A vestigial structures.
B homologous structures.
C different ancestry.
D hindlimbs.

1.15 Study the phylogenetic tree below.



Which ONE of the following is a reasonable conclusion based on the phylogenetic tree?

A **1** and **2** belong to the same species
B **3** is more closely related to **4** than to **5**
C **1** and **5** do not have a common ancestor
D The DNA of **1** will be more similar to **4** than to **2** **(30)**

QUESTION 2 *(Questions taken from various sources)*

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.10) in your ANSWER BOOK.

2.1 The preserved remains of ancient organisms
2.2 The death of the last individual of a species
2.3 Having a face with protruding jaws
2.4 A diagram showing evolutionary relationships amongst species
2.5 An opening in primate skulls through which the spinal cord passes
2.6 Factors that prevent members of different species from producing fertile offspring
2.7 Having an upper or lower jaw that projects abnormally forward
2.8 Group of organisms of the same species occupying the same habitat
2.9 The theory involving the inheritance of acquired characteristics **(10)**
2.10 The first hominid that used stone tools for cutting meat

QUESTION 3 *(Questions taken from various sources)*

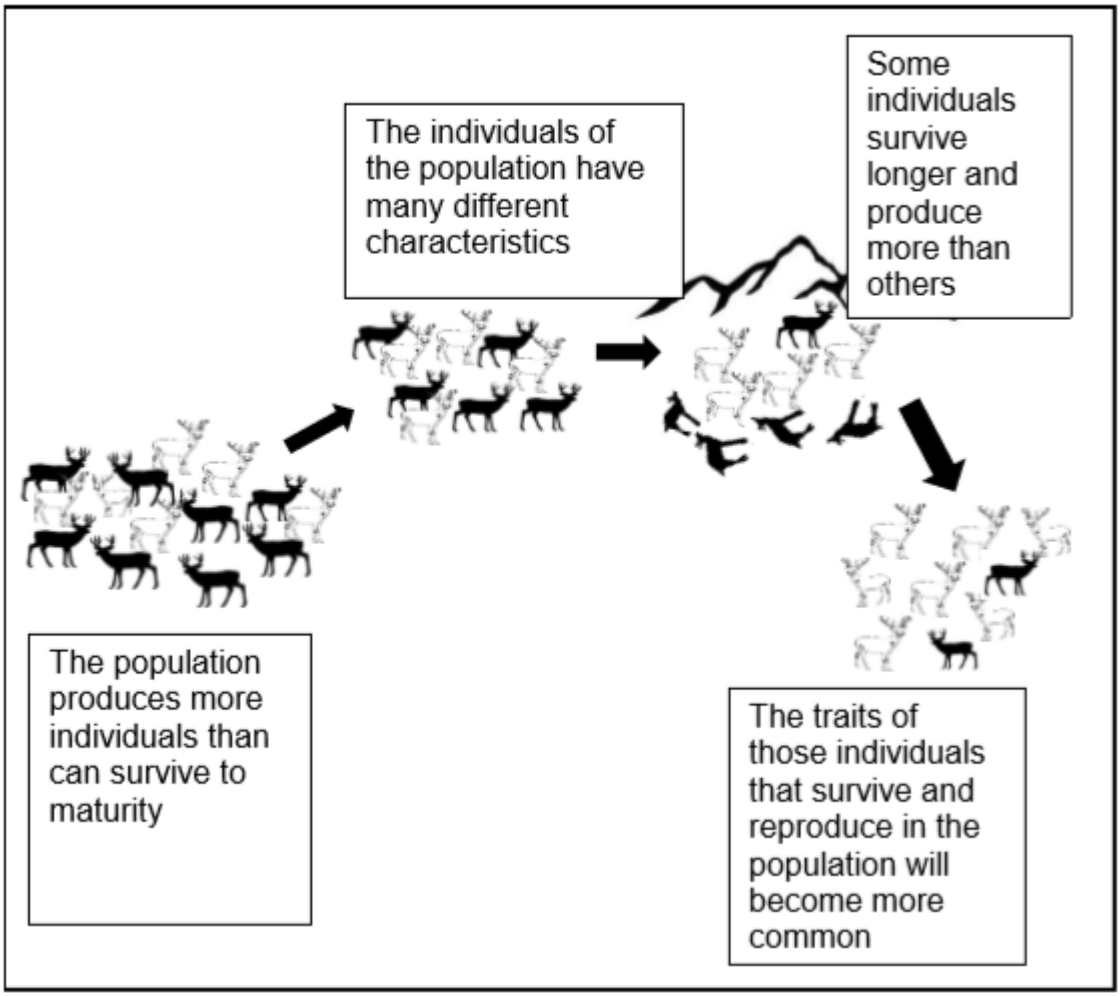
Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B or NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B,** or **none** next to the question number (3.1 to 3.5) in the ANSWER BOOK.

COLUMN I		COLUMN II	
3.1	Evidence of evolution	A B	Biogeography Modification by descent
3.2	A possible explanation for an observation that can be tested by an experiment	A B	Hypothesis Theory
3.3	The scientist who discovered *Australopithecus sediba*	A B	Tim White Lee Berger
3.4	A difference between humans and African apes	A B	Opposable thumbs Flattened face
3.5	Introduces variation to a species	A B	Random mating Mutation

(5 x 2) **(10)**

QUESTION 4 *(EC, Sept. 2019, Paper 2)*

Study the diagram below showing evolution by natural selection in deer.



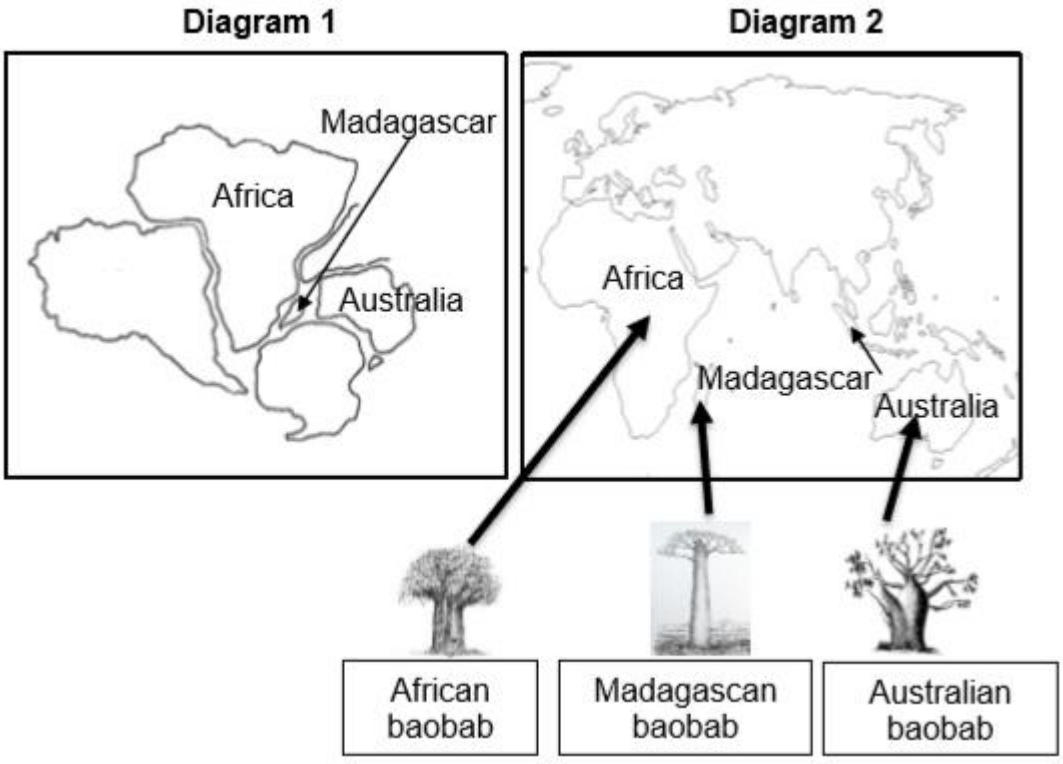
4.1 List THREE sources of variation in a species. (3)

4.2 Explain why the above example represents discontinuous variation. (2)

4.3 Both Darwinism and Punctuated Equilibrium explains evolution in terms of natural selection. Tabulate TWO differences between Darwinism and Punctuated Equilibrium. (5)
(10)

QUESTION 5 *(EC, Sept. 2019, Paper 2)*

The baobab tree belongs to the genus *Adansonia*. Different species are found in Madagascar, Africa and Australia as shown in the diagram below. Originally these three continents formed part of Gondwanaland as seen in diagram **1**. Today the continents are separated by large oceans as seen in diagram **2.**



Explain how the different species of baobab could have evolved on the different continents. **(6)**

QUESTION 6 *(GDE, Sept. 2019, Paper 2)*

As a result of a mutation, bacteria with three varieties of cell wall exist as shown below.

An antibiotic destroys the bacteria by binding with it. The antibiotic has two binding sites, one triangular and the other square.

Use Darwin's theory of evolution through natural selection to explain why the bacteria with round spikes on their cell walls will increase in proportion in future generations. **(6)**

QUESTION 7 *(GDE, Sept. 2019, Paper 2)*

Read the following extract following a survey done by naturalist Colin Donihue on the effects of hurricane Irma on the populations of an endemic species of lizard on two islands in the West Indies.

Colin and his team visited the islands after hurricane Irma had struck. They captured as many as possible of the endemic lizards, *Anolis scriptus*.

The captured lizards all had the following features: Bigger toepads, longer arms and shorter hind legs. The first two observations made sense as these were known to increase clinging ability in *Anolis* but the third did not. Wouldn't longer hind legs cling to vegetation better? – So why did more lizards with shorter hind legs survive? Colin realized that the longer hind legs of the lizards, once they lost their grip on a branch, acted as 'sails', catching the wind, and thus carrying the lizard away into the sea.

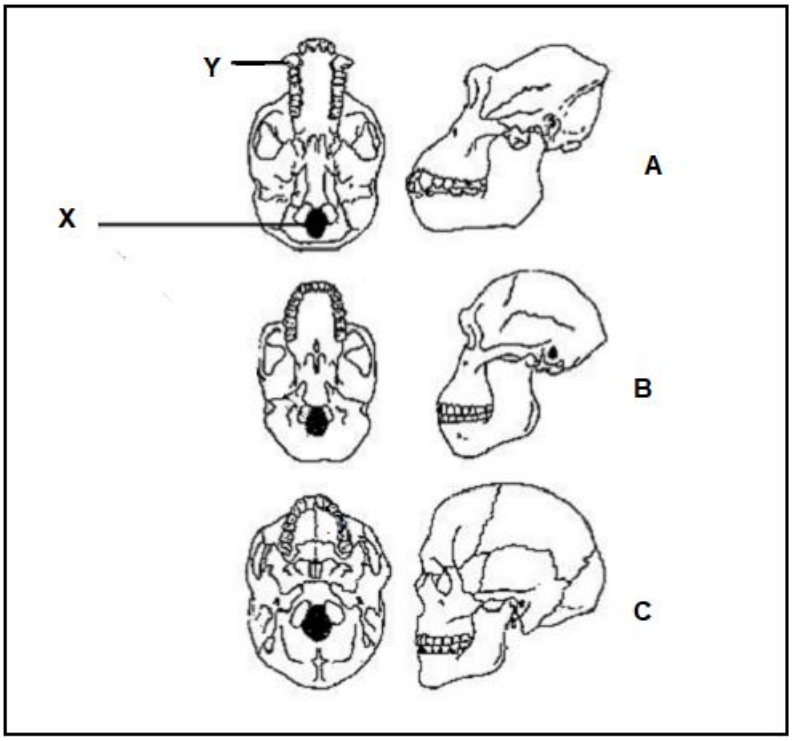
7.1 What is the scientific name of the lizard that was studied? (1)

7.2 Give TWO characteristics that were favourable for the survival of the lizard. (2)

7.3 Explain ONE characteristic that was unfavourable for the survival of the lizard. (2)
(5)

QUESTION 8 *(GDE, Sept. 2019, Paper 2)*

The diagram below shows the skulls of three organisms.



8.1 Label part **X** and the type of teeth at **Y.** (2)

8.2 Explain the significance of the location of structure **X** in organism **C**. (3)

8.3 Which of the skulls (**A**, **B** or **C**) belongs to:

(a) An australopithecine (1)
(b) A quadripedal primate (1)

8.4 Explain how the change in the skull from **B** to **C** could indicate a change in intelligence. (3)

8.5 Describe the significance of the shape of each of the following as a trend in human evolution:

(a) Spine (2)
(b) Shape of the pelvis (2)

8.6 Describe the significance of *Homo erectus* to the 'Out of Africa' hypothesis. (2)

(16)

QUESTION 9 *(DBE, Jun. 2019, Paper 2)*

The table shows the evolution of cranial capacity in some species.

SPECIES	PERIOD OF EXISTENCE (MILLION YEARS AGO)	AVERAGE CRANIAL CAPACITY (cm^3)
Sahelanthropus	7,0–6,0	450
Australopithecus africanus	3,0–2,0	480
Homo habilis	2,2–1,6	650
Homo erectus	2,0–0,4	900
Homo neanderthalensis	0,4–0,04	1 500
Homo sapiens	0,2–0	1 450

9.1 Name:

(a) TWO hominid genera in the table above (2)

(b) TWO fossils of *A. africanus* that were found in South Africa (2)

(c) The genus that appeared first on Earth as shown in the table (1)

9.2 Which hominid had a cranial capacity closest to that of *Homo sapiens*? (1)

9.3 Give the smallest cranial capacity (in cm3) of a *Homo* species. (1)

9.4 When did *Australopithecus africanus* become extinct? (1)

9.5 Fossils are used as evidence of hominid evolution.

Name TWO other lines of evidence. (2)

(10)

QUESTION 10 *(NW, Sept. 2018, Paper 2)*

Study the extracts and the graph given below.

Zika-fever is a mosquito-borne viral disease caused by the Zika virus which is suspected of leading to the birth of deformed babies. The virus is transmitted to humans when an infected *Aedes* mosquito stings a person. Direct human to human transmission through sex has also been reported.

[Adapted from https://theconversation.com]

Company A produces an insect repellent, called PICARDIN, that has been tested and proved affective against the *Aedes* mosquito species which transmits the Zika-virus.

Company B produces a mosquito repellent, called PERMETHRIN.

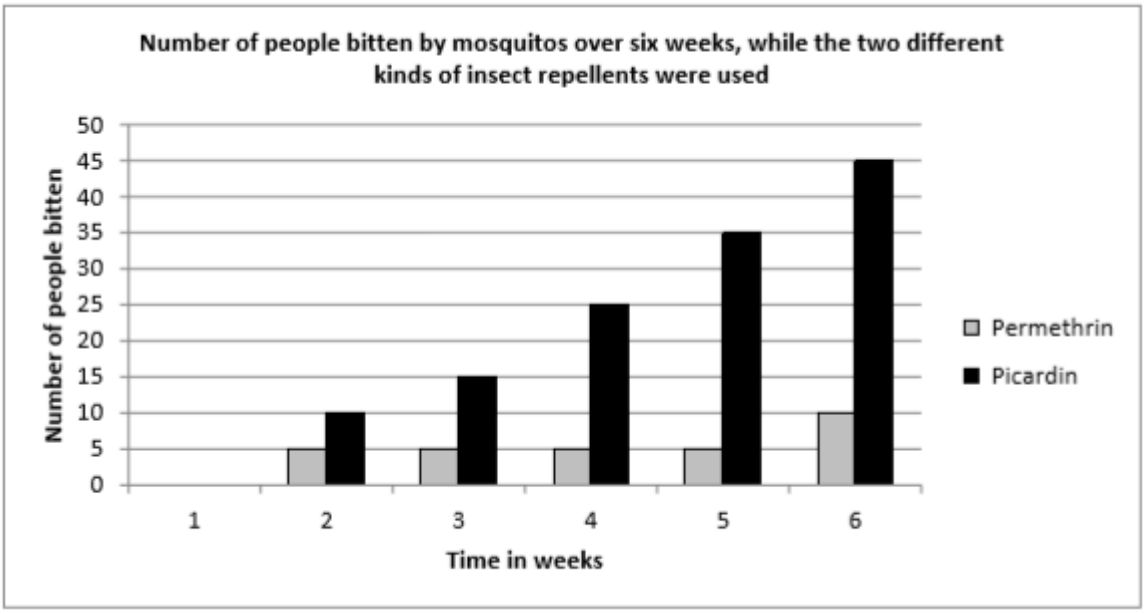
Both of them are designed for use on clothing and gear and may last for six weeks of washings.

[Adapted from https://Google.com]

The graph below represents the results of an investigation conducted by a group of learners to test the long term effectiveness of the two types of insect repellents mentioned above.

- 60 people were given Permethrin to spray on their clothes
- 60 people were given Picardin to spray on their clothes

Both insect repellents were sprayed at the start of the investigation. Both these groups had to wear these clothes for 6 weeks, the duration of the investigation.



10.1 Formulate a hypothesis for this investigation. (2)

10.2 State the independent variable. (1)

10.3 What percentage of people who participated in the survey were bitten by mosquitos during week **6**? Show all calculations. (3)

10.4 State TWO ways in which the learners could have improved the validity of the investigation. (2)

10.5 *Aedes* mosquitos may develop resistance towards Picardin and Permethrin. Explain this phenomenon in terms of evolution in present times. (5)

(13)

EVOLUTION ANSWERS

QUESTION 1

1.1	B	✓✓
1.2	A	✓✓
1.3	B	✓✓
1.4	D	✓✓
1.5	D	✓✓
1.6	A	✓✓
1.7	C	✓✓
1.8	C	✓✓
1.9	B	✓✓
1.10	B	✓✓
1.11	B	✓✓
1.12	C	✓✓
1.13	B	✓✓
1.14	B	✓✓
1.15	B	

(30)

QUESTION 2

2.1 Fossils ✓

2.2 Extinction ✓

2.3 Prognathous ✓

2.4 Phylogenetic tree ✓

2.5 Foramen magnum ✓

2.6 Reproductive isolating mechanisms✓

2.7 Prognathous ✓

2.8 Population ✓

2.9 Lamarckism ✓

2.10 *Homo habailis* ✓ **(10)**

QUESTION 3

3.1 Both A and B ✓✓

3.2 A only ✓✓

3.3 B only ✓✓

3.4 B only ✓✓

3.5 Both A and B ✓✓

(10)

QUESTION 4

4.1
- Random arrangement of chromosomes ✓ } OR Meiosis ✓
- crossing over ✓
- random mating ✓
- random fertilisation ✓
- mutations ✓ **Mark first THREE only** (Any 3 x 1) (3)

4.2
- The deer are either black or white. ✓
- There is no intermediate characteristic ✓ /grey (2)

4.3

Darwinism	Punctuated Equilibrium
Gradual change ✓	Rapid change ✓
Takes place over a long period of time ✓	takes place with in a relatively short period of time ✓
Change is continuous ✓	Long periods of no change ✓

Mark first TWO only Table ✓ + Any 4 (5)

(10)

QUESTION 5

- The common ancestor ✓original baobab population
- was separated✓into different populations
- by the sea ✓*/due to continental drift
- There was no gene flow ✓between the populations
- Each population was exposed to different environmental conditions ✓/ different selection pressures.
- Natural selection occurred independently ✓in each population.
- the individuals in the two populations became different ✓from each other over time
- genotypically and phenotypically ✓
- Even if the two are to mix again ✓
- they will not be able to interbreed ✓
- forming different baobab species (1* compulsory + Any 5)

(6)

QUESTION 6

- There was variation in the spike shape of the cell wall✓ of the bacteria population.
- Bacteria with triangle spikes and square spikes✓
- were not antibiotic resistant✓/ antibiotics were able to bind to the surface
- and were killed by the antibiotics ✓/ did not survive
- The bacteria with the round spikes✓

- were resistant to the antibiotics✓/ antibiotics were unable to bind to the surface
- and they survived✓
- and reproduced, passing the characteristic of round spikes to the next generation✓ increasing the proportion of these bacteria

Any **(6)**

QUESTION 7

7.1 *Anolis scriptus*✓ (1)

7.2
- Short hind limbs✓
- Bigger toepads✓
- Longer arms✓

(Mark first TWO only) Any (2)

7.3 Longer hind legs acted as sails✓catching the wind✓ / carrying the lizard away into the sea (2)

(5)

QUESTION 8

8.1 **X** – foramen magnum✓
Y – canines✓ (2)

8.2
- The more forward position of the foramen magnum✓/ X
- allows the spinal cord to exit the skull directly downwards✓
- This acts as an axis for the skull✓
- making it favourable for bipedalism✓/ an upright position

Any (3)

8.3 (a) **B**✓ (1)
(b) **A**✓ (1)

8.4
- There is an increase✓
- in the cranium size✓from organism **B** to organism **C**
- This will allow it to house a larger brain✓/ cerebrum which suggests greater intelligence

(3)

8.5 (a)
- The spine changed from C-shaped to more curved ✓/ s-shape,
- which provides better support for bipedalism✓

(2)

(b)
- The pelvis changed from being long and narrow to shorter and wider✓, to support the body weight in an upright position✓

(2)

8.6
- The oldest fossils of *Homo erectus* were found in Africa✓,
- while the younger fossils were found in other parts of the world✓ suggesting that *Homo erectus* originated in Africa✓ Any (2)

(16)

QUESTION 9

9.1	(a) *Sahelanthropus* ✓ *Australopithecus* ✓ *Homo*✓ **(Mark first TWO only)**	Any 2	(2)
	(b) Taung child ✓ Mrs Ples ✓ (Little foot) ✓ **(Mark first TWO only)**	Any 2	(2)
	(c) *Sahelanthropus* ✓		(1)
9.2	*Homo neanderthalensis* ✓		(1)
9.3	650 ✓cm^3		(1)
9.4	2,0 mya✓/2 000 000 years ago		(1)
9.5	Genetic ✓ evidence Cultural ✓ evidence		(2)
			(10)

QUESTION 10

10.1	-Permethrin is more/less effective as a long-term mosquito repellent than Picardin✓✓. **OR** -Picardin and Permethrin are equally effective as long-term mosquito repellents. ✓✓	(2)
10.2	- Type of insect repellent✓	(1)
10.3	45 + 10=55✓ 55 /120 x 100✓ = 45,8 ✓%	(3)
10.4	- People must be exposed to the same environmental conditions✓ - Same concentration/dose ✓of the insect repellents must be applied - The clothes must be washed the same number of times. ✓ **(Mark first TWO only**	(2)
10.5	- *Aedes* mosquitos show variation. ✓ - Some are resistant to insecticides and some are not ✓ - When insecticides are sprayed ✓ some will survive, and others will die✓ - The mosquitoes that survive will reproduce✓ thus - pass on the allele for resistance ✓to their offspring. - The next generation will have a higher proportion of individuals with the ability to survive insecticides✓ **Any 5**	(5)
		(13)