KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GRADE 12

LIFE SCIENCES

REVISION DOCUMENT

Solutions

Teachers Resource

September 2023

CONTENTS

PAPER 1 TOPICS:

TOPIC: REPRODUCTIVE STRATEGIES AND HUMAN REPRODUCTION

Question 1

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

(12 x 2) **(24)**

BIOLOGICAL TERMS:

Question 2

	DESCRIPTION	TERM
2.1	The fusion of the sperm and egg outside the body	**External fertilization**✓
2.2	The development of the embryo inside an incubated egg that is laid.	**Internal fertilization**✓
2.3	The development of the embryo in the uterus and the young are born alive.	**Vivipary**✓
2.4	The complete development of the embryo inside an egg in the female body.	**Ovovivipary**✓
2.5	The development of the embryo in which very little energy is used and parental care is required.	**Altricial**✓
2.6	The development of the embryo in which a lot of energy is used and the young are able to move directly after hatching.	**Precocial**✓
2.7	Structure that provides nutrition to the embryo in the amniotic egg	**Yolk Sac**✓
2.8	Fluid filled bag around embryo	**Amnion**✓
2.9	Structure in the sperm cell that contains enzymes used to penetrate the ovum	**Acrosome**✓
2.10	The liquid that surrounds the human embryo	**Amniotic fluid**✓

2.11	A hollow ball of cells into which the fertilised ovum develops	**Blastula/blastocyst✓**
2.12	The lining of the uterus which is richly supplied with blood vessels	**Endometrium✓**
2.13	Coiled tubular structure outside the testis that stores sperms	**Epididymis✓**
2.14	The part of the female reproductive system in which fertilisation takes place	**Fallopian tube/Oviduct✓**
2.15	The name given to the embryo after it reaches 12 weeks	**Foetus✓**
2.16	The hormone produced by the pituitary which controls growth of the Graafian follicle	**Follicle Stimulating Hormone✓**
2.17	Layer within the ovary that is responsible for formation of ova through meiosis	**Germinal Epithelium✓**
2.18	Another name for the period of pregnancy	**Gestation✓**
2.19	The process by which the embryo becomes attached to the uterine wall	**Implantation✓**
2.20	The hormone which converts the ruptured follicle into a corpus luteum	**Luteinizing Hormone✓**
2.21	Type of cell division by which sperms are produced	**Meiosis✓**
2.22	The 28-day reproductive cycle in females involving changes in the ovary and uterus	**Menstrual cycle✓**
2.23	Tearing away of the endometrium lining of the uterine wall, accompanied by the loss of blood	**Menstruation✓**
2.24	The cell division by which the zygote becomes multicellular	**Mitosis✓**
2.25	Production of ova by meiosis	**Oogenesis✓**
2.26	The hormone which starts the preparation of the lining of the uterus for attachment of the fertilised ovum	**Oestrogen✓**
2.27	Process by which an ovum is released from the ovary in humans	**Ovulation✓**
2.28	Gland in the brain that produces FSH and LH	**Pituitary/hypophysis✓**
2.29	Combination of foetal and maternal tissue responsible for gas exchange, nutrition and excretion	**Placenta✓**
2.30	Hormone that maintains pregnancy	**Progesterone✓**
2.31	The stage when sexual maturity is reached in males and females	**Puberty✓**
2.32	Production of spermatozoa by meiosis	**Spermatogenesis✓**
2.33	Hormone responsible for secondary sexual characteristics in males	**Testosterone✓**
2.34	A hollow, rope-like tube which attaches the embryo to the placenta	**Umbilical cord✓**

2.35	The blood vessel that carries nitrogenous waste from the foetus to the placenta	**Umbilical artery**✓
2.36	The blood vessel that carries oxygenated blood from the placenta to the foetus	**Umbilical vein**✓
2.37	The structure where testosterone is produced	**Testes**✓
2.38	Sac-like structure that contains testes	**Scrotum**✓
2.39	A gland that lubricates end of penis	**Cowper's gland**✓
2.40	Common tube for sperm and urine	**Urethra**✓
2.41	A gland that produces alkaline medium of semen	**Prostate gland**✓
2.42	A gland that provides nutrients for the sperms	**Seminal vesicle**✓
2.43	A tube that transfers sperms to the urethra	**Vas deferens**✓
2.44	Finger-like projections that develop from the outer membrane of an embryo after implantation	**Chorionic villi**
2.45	The fluid that protects the developing foetus against mechanical injury	**Amniotic fluid**
2,46	The organelles found in large quantities in the neck region of a sperm cell	**Mitochondria**✓
2,47	The type of development in birds in which the young is born fully developed and able to move and feed itself	**Precocial**✓ **development**
2.48	The structure in the sperm that contains enzymes to dissolve the outer layer of the ovum	**Acrosome**✓
2.49	A blood vessel that transports carbon dioxide from the foetus to the placenta	**Umbilical artery**✓
	(49 x 1)	**(49)**

Question 3

3.1	Both A and B ✓✓
3.2	B only ✓✓
3.3	A only✓✓
3.4	None ✓✓
3.5	A only ✓✓
3.6	B only ✓✓
3.7	A only ✓✓
3.8	A only ✓✓
3.9	B only ✓✓
3.10	B only ✓✓
3.11	Both A and B ✓✓
3.12	None ✓✓
3.13	None ✓✓
3.14	Both A and B ✓✓
3.15	B only ✓✓
3.16	None ✓✓
3.17	B only ✓✓

3.18	None✓✓	
3.19	Both and B	
3.20	B only	
	(20 x 2)	**(40)**

Question 4

4.1 Internal ✓ fertilisation (1)

4.2 -Sperm are deposited inside the female body ✓
thereby increasing the chances of fertilisation ✓
- Gametes/zygotes are inside the body✓
therefore protected from the predators✓/ environmental dangers
(Mark first TWO only) (2 x 2) (4)

4.3 - The eggs hatch inside the female's body ✓
- and the young are born live ✓ (2)
(7)

Question 5

5.1 - The (amniotic) egg is retained inside the mother's body✓*
- to protect the embryo from predators✓
- The allantois✓protects the embryo
- by removing waste products✓
- The embryo is protected from shocks✓/sudden changes in temperature/dehydration by the:
    - Chorion✓
    - Amnion✓
    - Amniotic fluid✓ inside the amniotic membrane
    - Shell✓/outer covering
    - Air pocket✓

Compulsory 1* + Any 4

Nourishment (N)
- The embryo receives nutrients✓
- from the egg yolk✓ in the yolk sac
and from the albumen✓

(7)

Question 6

6.1 Internal fertilisation ✓ (1)

6.2 Internal fertilisation ✓
increases the chances of fertilisation ✓
Ovovivipary ✓/ eggs retained inside the female's body
where they are protected ✓
(Mark first TWO only) Any (2 x 2) (4)

6.3 To increase the chances of fertilisation✓/ the survival of the eggs/ number of offspring
- As eggs may be lost to predators✓/environmental factors etc.
- Since there is external fertilisation✓ Any 1 (1)

(7)

Question 7

7.1	External✓ fertilisation	(1)
7.2	- Their embryos develop inside eggs ✓that are - outside the body of the female✓	(2)
7.3	- The males release semen all around the female✓ - A large number of gametes/ ova are produced✓	(2)
7.4	Graph X✓	(1)
7.5	- They will have a higher number of surviving embryos✓/eggs/offspring - Because their fertilised eggs are attached to the vegetation✓ - where they are protected from predators✓/washing away	(3)
		(9)

Question 8

8.1	External✓ fertilisation	(1)
8.2	- To increase the chances of fertilisation✓ - since the gametes may be lost/✓not reach one another due to predation✓/water currents OR - To produce more zygotes✓/offspring - since many will be lost✓ - because they are preyed on✓/washed away/dry out	(3)
8.3	The embryos develop inside an egg, outside the female's body✓	(1)
		(5)

Question 9

9.1 Cervix ✓ (1)

9.2 - The site of fertilisation ✓
- The site of zygote division✓
- The transfer of the ovum/embryo to the uterus ✓

(Mark first ONE only) (1)

9.3 -Diploid cells in the ovary undergo mitosis✓
- to form numerous follicles✓
- Under the influence of FSH ✓
- one cell undergoes meiosis✓
- to form a (haploid) ovum ✓ Any (4)

9.4 -It is a hollow organ ✓
- It has a muscular wall✓
- It has a blood-rich lining✓/endometrium Any (1)

(Mark first ONE only)

9.5 - No follicle will develop ✓
- No oestrogen produced ✓
- and no progesterone produced✓
- Therefore, the endometrium will not develop✓* to be shed during menstruation

Compulsory mark✓*1 + Any 2 (3)

(10)

Question 10

10.1	Endometrium✓	(1)
10.2	Fertilisation ✓	(1)
10.3	The (nucleus of the) sperm fuses with (the nucleus of) the ovum✓	(1)
10.4	- Zygote divides by mitosis✓ - to form a (solid) ball of cells✓ - called the morula✓ - which develops into a hollow ball of cells✓ - called the blastula✓ /blastocyst	(4)
10.5	- It is muscular ✓ to protect the foetus from mechanical injury✓ /to allow for parturition/birth - It is flexible✓ /can expand to accommodate the growing foetus✓ - It is hollow✓ to accommodate the growing foetus✓ - The thickened endometrium✓ allows for implantation✓ /survival of the embryo **Mark first TWO only)** Any (2 x 2)	(4)
10.6	- The secretion is alkaline✓ which - neutralises the acidic conditions✓ of the vagina	(2)
		(13)

Question 11

11.1 (a) Vas deferens✓/sperm duct (1)
(b) Scrotum✓ (1)
(c) Penis✓ (1)

11.2 D✓ Epididymis✓ (2)
G✓Urethra✓ (2)
E✓ Testis✓ (2)

11.3 A✓
B✓
E✓ Any 2x1 (2)
(Mark first TWO only)

(11)

QUESTION 12

12.1 Vas deferens ✓ (1)

12.2
- Sperm storage✓
- Sperm maturation ✓ Any 1 x1 (1)

(Mark first ONE only)

12.3
- The semen will not contain sperm ✓ because
- they are not transported✓
- but will contain all other secretions of the accessory glands✓
- / examples thereof
- the vasectomy occurred before✓ the accessory glands (3)

12.4
- The temperature of the testes inside the body will be too high✓
- No/abnormal sperm will be produced✓
- The man will be infertile✓/not able to reproduce (3)

12.5
- Under the influence of testosterone✓
- diploid cells✓/germinal epithelial cells
- in the seminiferous tubules✓/testes
- undergo meiosis✓
- to form haploid sperm cells ✓ (4)

(12)

QUESTION 13

13.1	Seminal vesicle✓	(1)
13.2	Transports semen out of the body✓	(1)
13.3	- Transports its secretions in ducts✓/ secretion not directly in blood - Does not produce a hormone✓	(2)
13.4	Spermatogenesis✓	(1)
13.5	- The secretion is alkaline✓ to neutralise the acidity of the vagina✓ / urethra - The secretion contains nutrients✓ for the sperm to generate energy for movement✓ - The secretion is a fluid✓/mucus which facilitates the movement of the sperm cells✓ Any (2 x 2)	(4)
		(9)

Question 14

14.1	Acrosome✓	1
14.2	- Fuses with the nucleus of the ovum✓ - Carries genetic material✓	1
14.3	- Produce energy✓/ site for cellular respiration - which is needed for movement✓ of the sperm	2

14.4	- The oval/torpedo-shaped head✓ - will facilitate faster movement✓ - The presence of an acrosome✓/part A - enables the sperm to penetrate the ovum - A longer tail✓ - ensures faster movement✓ (**Mark first TWO only**) **Any (2 x 2)**	4
		8

Question 15

15.1
- Must have regular menstrual cycles✓
- They must not become pregnant✓
- Diet ✓ Any (2x1) (2)

(Mark first TWO only)

15.2
- 250 females per group were used✓/1000 females participated
- Measurement was done for 5 cycles✓

(Mark first TWO only) (2)

15.3 Older groups of women have a higher (average) FSH level than the younger groups✓✓ **OR**
Younger groups of women have a lower (average) FSH level than the older groups✓✓ Any (1x2)

(Mark first ONE only) (2)

15.4
- The Graafian/developing follicles secretes oestrogen✓but since the number of follicles are low✓/depleted
- less/no oestrogen will be secreted✓ (3)

15.5
- A high concentration of progesterone✓
- inhibits the pituitary gland✓/results in reduced FSH secretion
- This will decrease the validity of the investigation✓ (3)

(12)

Question 16

16.1 Male fertility✓ (1)

16.2 Measuring the sperm count✓ (1)

16.3 Age✓
- Diet✓
- Exercise✓
- Activity level✓
- Lifestyle✓
- Occupation✓ etc.

(Accept factors that are NOT related to health; race) (Any(2x1)

(Mark first TWO only) (2)

11.4 - TU inhibits the secretion of testosterone✓
- spermatogenesis cannot take place✓/no sperm will be produced (2)

11.5 - The higher temperature/pressure on the testes✓ due to the tight underwear
- could decrease the sperm count✓/sperm production/lead to the production of abnormal sperm. (2)

11.6 - To determine if TU is still effective after 12 months✓
- To see if the sperm count returns to normal✓ when the treatment stops Any
(Mark first ONE only) (1)

11.7 - No sperm will be transported✓
- from the epididymis to the urethra✓
- Semen without sperm will be released✓ (2)
Any

(11)

Question 17

17.1 Acrosome✓ (1)
17.2 mitochondrion✓ (1)

17.3 (a) 3✓ (1)
(b) 1✓ (1)
(c) 1✓ (1)

17.4 B✓- Nucleus✓ (2)
17.5 Mitosis✓ (1)
17.6 - After implantation the chorion✓
- develops many finger-like outgrowths✓
- called chorionic villi✓
- The endometrium✓
- together with the chorionic villi forms the placenta✓
- The umbilical artery✓
- and the umbilical vein✓develops
- inside a hollow tube✓to form the umbilical cord between the foetus and the placenta✓ Any (6)
(14)

Question 18

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

18.2 Remains low✓/decreases (1)

18.3 - stimulates ovulation✓
- stimulates the development of the corpus luteum✓
(Mark first ONE only) (1)

(6)

Question 19

19.1 -A✓
-B✓
-E✓
Mark first TWO only (2)

19.2 -The scar tissue✓
-may partially block the Fallopian tube✓
- preventing the embryo from reaching the uterus✓/resulting in implantation in the Fallopian tube (3)

19.3 - The other Fallopian tube is still present✓/not blocked
- Fertilisation may still take place in this Fallopian tube✓/the developing embryo can move along this Fallopian tube
OR
- During invitro fertilisation✓ (IVF)
- the resulting embryo is inserted into the uterus✓
OR
- The ovum can be placed after the blockage✓
- allowing fertilisation✓ (2)

19.4 - Insufficient space✓
- Poor/no placental development✓
- Decreased blood supply✓
- Insufficient nutrients✓/oxygen
(Mark first TWO only) Any (2)

(9)

Question 20

20.1	- Stimulates the development of ovarian follicles✓ - Initiates puberty ✓	(1)
20.2	- LH✓/Luteinising Hormone	(1)
20.3	- LH stimulates ovulation✓ - therefore, ovulation will not take place✓ - There will be no ovum to fertilise✓	(2)

20.4	- A Graafian follicle is not formed✓ - Since the Graafian follicle secretes oestrogen✓ - oestrogen levels will be reduced✓ therefore - the endometrium will not develop✓/ thicken - and no implantation can take place OR - There is no ovum produced✓/and Graafian follicle is not formed - Ovulation does not occur✓ - No fertilisation✓ occurs and - a zygote is not formed✓ - and no implantation can take place✓	(5)
		(9)

Question 21

21.1	- Under the influence of testosterone✓ - diploid cells/✓germinal epithelium cells - in the seminiferous tubules✓ of the testis - undergo meiosis✓ to form - haploid sperm ✓	
		(4)

QUESTION 22

22.1 Progesterone maintains/thickens the endometrium✓ and therefore, maintains the pregnancy✓ (2)

22.2 (a) Progesterone treatment ✓ (1)

(b) Development of gestational diabetes✓ (1)

22.3
- Glucose levels were taken daily✓
- When the glucose level of a pregnant woman remains high continuously it indicates the development of gestational diabetes. ✓ (2)

22.4 (Same) dosage/250 mg of progesterone✓
(Same) period of time for injection injections given between weeks 16 and 20 ✓
(Same) frequency of injections/weekly injections✓. Any 2 (2)
(Mark first TWO only)

22.5 Group B did not receive progesterone✓
If gestational diabetes develops in group A it would be due to the progesterone treatment✓ (2)

(10)

Question 23

23.1 Chorion✓ (1)

23.2 - Acts as a shock absorber✓
- It prevents desiccation✓/dehydration
- It helps to keep the temperature within a narrow range✓
- It facilitates free movement✓ of the foetus Any (2)
(Mark first TWO only)

23.3 - The zygote divides by mitosis✓
- to form a (solid) ball of cells✓
- called the morula✓
- which develops into a hollow ball of cells✓
- called the blastula✓/blastocyst (4)

23.4 - Acts as a micro-filter✓/protect against pathogens
- Removal of harmful metabolic waste✓
- Produces antibodies✓
- Maintains the endometrium✓ Any (2)
(Mark first TWO only)

23.5 Umbilical vein✓ (1)

23.6 -In humans the developing foetus receives nutrients from the mother's✓ blood
- via the placenta✓/umbilical vein
- In oviparous organisms the developing embryo receives nutrients from the yolk✓/albumen (3)
(13)

Question 24

24.1		- Stimulates ovulation✓ - Stimulates the development of the corpus luteum✓ (**Mark the first TWO only)**	(2)
24.2	(a)	- FSH✓/a high concentration of hormone A - will stimulate follicles to develop✓ - Therefore, ova will be produced✓ increasing the chances to fall pregnant	(3)
	(b)	- A peak in hormone B✓/LH - will indicate that ovulation is about to happen✓ - therefore, an ovum will be available for fertilisation✓ Any 2	(2)

24.3		- The levels will remain low✓ because - the high progesterone levels✓ during pregnancy - will inhibit the secretion of FSH ✓/hormone A	(3)
			(10)

QUESTION 25

	- The Graafian follicle✓ - secretes oestrogen✓ - causing- The corpus luteum✓ - secretes progesterone✓ - which (further) increases the thickness of the endometrium✓ - High levels of progesterone inhibit FSH secretionng✓ the endometrium to become thicker✓/more glandular or vascular	
		(5)

QUESTION 26

26.1 (a) Oestrogen✓ (1)

(b) Progesterone✓ (1)

26.2 - It increases✓
- the thickness✓ of the endometrium/the blood vessels in the endometrium/the amount of glandular tissue in the endometrium (2)

26.3 (a) Release of an ovum✓ from the ovary✓/Graafian follicle (2)

(b) Day 14 ✓ (1)

(c) LH/ Luteinising Hormone ✓ (1)

26.4 - High levels of hormone B/progesterone will inhibit✓
- the secretion of FSH✓
OR
- No new ova/mature follicles✓
- are required during pregnancy✓ (2)

26.5 The progesterone✓
- levels decreased✓
- because the corpus luteum degenerated✓ (3)

26.6 - High levels of progesterone ✓
- stimulate the Pituitary gland/ Hypophysis✓ to secrete a less FSH ✓
To prevent the growth of a new follicle ✓/ ovulation during the pregnancy
OR
- Low levels of progesterone ✓
- stimulate the Pituitary gland/ Hypophysis✓ to secrete a more FSH ✓
-which stimulate the development of new follicles ✓ (4)

(17)

Question 27

27.1 Accept day 14✓ or day 15 (1)

27.2 Days 0 - 7✓ (1)

27.3 - Causes the follicle to burst open✓/stimulates ovulation
- Stimulates the formation of corpus luteum✓
(Mark first ONE only) (1)

27.4 - LH levels remain low up to day 12/13✓
- Then it increases sharply up to day 14✓
- After which it decreases and remains low✓ (3)

27.5 As the oestrogen level increases✓
The thickness of the endometrium also increases✓ (2)

27.6 Maintain the increase in the thickness of the endometrium✓ for greater chance of implantation✓ (2)

28.7 No✓ (1)

29.8 The progesterone levels✓ has dropped✓/ not maintain/corpus luteum has started to degenerate (2)

(13)

TOPIC: Human response to environment
(Brain, neurons and spinal cord)

Question1

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

(10x2) (20)

Question 2

	DESCRIPTION	TERM
2.1	The part of the brain that receives impulses from the maculae	**Cerebellum**✓
2.2	The structure that connects the left and right hemispheres of the brain	**Corpus callosum**✓
2.3	The part of the brain that controls body temperature	**Hypothalamus** ✓
2.4	The branch of the autonomic nervous system that restores an increased heart rate back to normal	**Parasympathetic** ✓
2.5	The part of the nervous system that is made up of cranial and spinal nerves	**Peripheral nervous system** ✓
2.6	A part of the nervous system that consist of sympathetic and parasympathetic section	**Autonomic** ✓
2.7	A functional gap between two consecutive neuron	**Synapse** ✓
2.8	Collective name for the membranes that the brain and spinal cord	**Meninges** ✓
2.9	Neurons that carry impulses from receptors	**Sensory**✓
2.10	The part of the skull that protects the brain	**Cranium**✓
2.11	The part of the brain that controls body temperature	**Hypothalamus**✓
2.12	The disease characterised by the degeneration of brain tissue, leading to memory loss	**Alzheimer's disease**✓
		(16)

Question 3

3.1 B Only ✓✓
3.2 A Only ✓✓
3.3 Both A and B ✓✓
3.4 B Only ✓✓
3.5 A only✓✓

(5x2) (10)

Question 4

4.1 B ✓- Cerebrum ✓ (2)
D ✓- Cerebellum ✓ (2)
A ✓ - Pituitary gland ✓/ Hypophysis (2)
C ✓- Corpus callosum ✓ (2)
E ✓- Spinal cord ✓ (2)

(5x2) (10)

Question 5

5.1 Cerebellum ✓ (1)
5.2 - High thought processes ✓ / (intelligence/ memory/ reasoning)
- Interpretation of all senses ✓
- Controls all voluntary actions ✓ (2)
(Mark the first TWO only)

5.3 Meninges ✓
Cranium ✓ (1)
(Mark the first ONE only)

5.4 Heart muscles ✓ (2)
Breathing muscles ✓ (intercostal and diaphragm)
(6)

Question 6

6.1 (a) Myelin sheath ✓ (1)
(b) Axon ✓ (1)

6.2 (a) A ✓ (1)
(b) C ✓ (1)

6.3 D ✓- Synapse ✓ (2)
(8)

Question 7

7.1 Motor✓ /efferent neuron (1)

7.2 C → B → A ✓✓ (Must be in the correct sequence) (2)

7.3 - Impulse will be transmitted faster in neuron 1✓✓ / slower in neuron 2
- because of the presence of myelin sheath in neuron 1✓ / absence of myelin sheath in neuron 2 (3)

7.4 - Impulses from the receptor✓/ sensory neuron
- will be transmitted to the central nervous system ✓ but
- the impulse will not reach the effector ✓ (3)
(9)

Question 8

(a) 1 ✓ and 4 ✓
(Mark first TWO only) (2)

(b) 1 ✓ and 3 ✓
(Mark first TWO only) (2)

(c) 2 ✓ and 3 ✓
(Mark first TWO only) (2)
(6)

Question 9

9.1 Reflex arc ✓ (1)

9.2 (a) B- Motor neuron/Multipolar neuron/efferent neuron (1)
(b) C - Interneuron ✓ (1)
(c) E – Sensory neuron/unipolar neuron/afferent neuron ✓ (1)

9.3 (a) F✓ (1)
(b) A✓ (1)

9.4 (c) D✓- Synapse ✓ (2)
(b) G ✓- Myelin sheath ✓ (2)
(10)

Question 10

10.1 A ✓ (1)

10.2 The Impulse does not travel to the brain ✓/ goes directly from receptor to effector via the spinal cord (2)

10.3 - Allows the person to respond rapidly ✓
- and without thinking ✓ /involuntary
- to a stimulus ✓
- to prevent damage to the body ✓*

1* compulsory + any other 2 (3)

10.4 Nerve ✓/ spinal cord (1)

10.5 - Its acts as the insulator
- and therefore, speed up the nerve impulse / prevents a short circuit (2)

10.6 - The person would be able to feel the stimulus ✓
- but would be unable to react ✓
- because the impulse would not be transmitted to the effector ✓

(Any two) (2)

10.7 - The receptor receives the stimulus ✓
- And convert it to an impulse✓
- which is transported by the sensory neuron✓ via the spinal cord
- to the brain✓*/ cerebrum
- the brain/cerebrum interprets the impulse ✓*
- the brain/ cerebrum sends an impulse to the motor neuron ✓
- which conducts impulse to the effector ✓
- to bring about response ✓

2* compulsory + any other 4 (6)

(16)

Question 11

11.1 - From the dendrites ✓
- to the axon ✓ (2)

11.2 0 to 1 ✓ ✓ um / 0 to 0,9 um (2)

11.3 As the axon diameter increase the speed of the impulse increases ✓✓

OR (2)

As the axon diameter decrease the speed of the impulse decrease ✓✓

11.4 - The speed of the impulse will decrease ✓ (3)
- resulting in it taking longer for impulse to reach the effectors ✓
- and the person will react more slowly ✓

(9)

Question 12

12.1 Corpus callosum✓ (1)

12.2 - It controls vital processes/✓heartbeat/breathing
- which will stop✓ when it is damaged (2)

12.3 (a) Spinal cord✓ (1)

(b) - The impulses from the cerebrum✓
- are not transmitted✓ to the skeletal muscles (2)

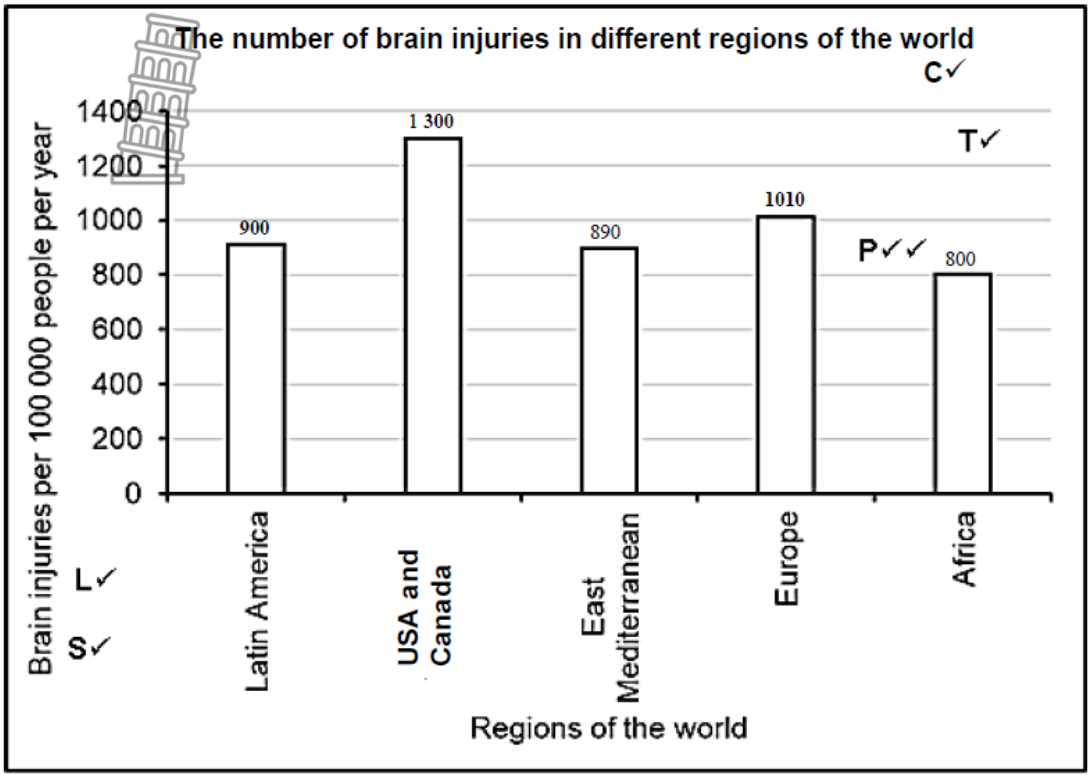
(6)

Question 13

13.1 Africa✓ (1)

13.2 - not all brain injuries are recorded✓
- due to poor health facilities✓ (2)

13.3



Criteria for marking graph:

Criteria	Mark allocation
Bar graph is drawn (T)	1
Caption of the graph includes both variables (C)	1
Correct labels on X-axis and Y-axis (L)	1
Correct scale for Y-axis Equal spaces between bars and equal width of bars for X-axis (S)	1
Plotting: (P) 1-4 co-ordinates plotted correctly All 5 co-ordinates plotted correctly	 1 2

(6)

(9)

Question 14

14.1 (a) Peripheral ✓nervous system (1)

(b) Autonomic nervous system✓ (1)

14.2 Spinal✓ nerves (1)

14.3 E ✓– Parasympathetic nervous system✓ (2)

14.4 Neurons✓ (1)

14.5 - Meninges✓
- Cranium/bone tissue✓
- Cerebrospinal fluid✓ **(Mark first TWO only)** **Any two** (2)

(8)

EYE

Question1

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

(9X2) **(18)**

Question 2

	DESCRIPTION	TERM
2.1	A type of vision in which both eyes are used together to focus on an object	**Binocular vision** ✓
2.2	The watery fluid that supports the cornea and the front chamber of the eye	**Choroid**✓
2.3	A structure in the eye that absorbs light to prevent internal reflection.	**Aqueous humor** ✓
2.4	The series of changes that take place in the shape of the lens and the eyeball in response to the distance of an object from the eye	**Accommodation**✓
2.5	A defect condition of the eye where a person can see nearby objects clearly while distant objects are blurred.	**Myopia** ✓
2.6	The visual defect characterised by a cloudy lens	**Cataract** ✓
2.7	The area of the retina that contains the highest concentration of cones	**Yellow spot ✓/fovea centralis**
2.8	The layer in the eye that is richly supplied with blood vessels	**Choroid** ✓
		(8)

Question 3

3.1 A only✓✓
3.2 Both A and B✓✓
3.3 Both A and B✓✓
3.4 Both A and B✓✓
3.5 B only✓✓

(5x2) **(10)**

Question 4

(a) A ✓**-** Iris✓ (2)
(b) E ✓– Optic nerve✓ (2)
(c) C ✓- choroid✓ (2)
(d) D ✓ - Fovea / yellow spot✓ (2)
(e) B ✓- Cornea✓ (2)

(10)

Question 5

5.1 (a) Sclera (1)
(b) Lens (1)
(c) Iris (1)

5.2 Pupillary mechanism✓
-In the bright light the circular muscles contract✓
-The radial muscles relax✓ and the pupil becomes constrict✓
-Less light enters the eye✓ (4)

(7)

Question 6

6.1 (a) Accommodation✓ (1)
(b) Pupillary mechanism✓/ pupillary reflex (1)

6.2 (a) B✓ and D ✓ ***(Mark the first TWO only)*** (2)
(b) A✓ and B✓ ***(Mark the first TWO only)*** (2)
6.3 (a) C✓ and D ✓ ***(Mark the first TWO only)*** (2)

(b) A ✓and C ✓ ***(Mark the first TWO only)*** (2)

(10)

Question 7

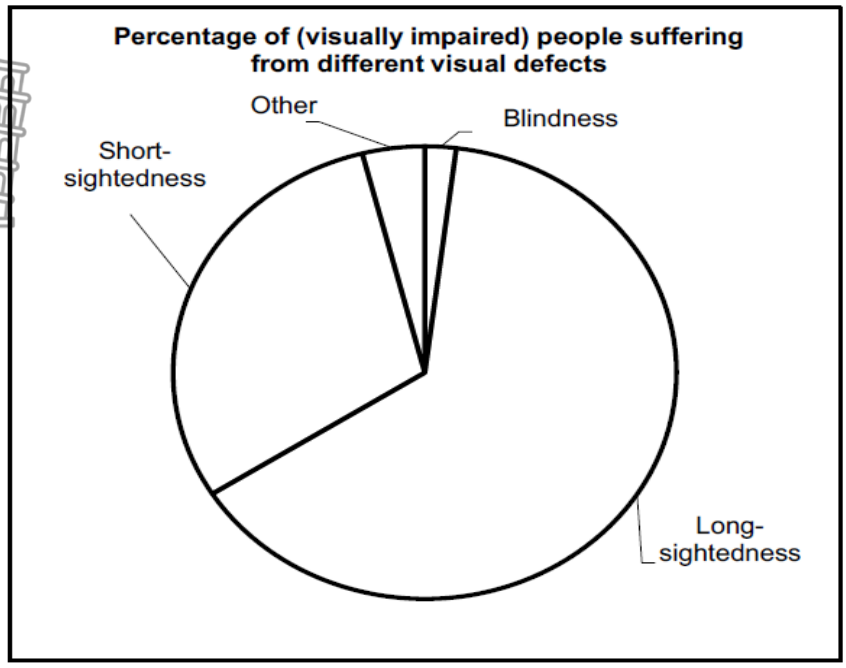
7.1 Long-sightedness✓ (1)

7.2 (a) The lens becomes cloudy/opaque/milky✓ and there it does not allows the light to pass through✓ (2)
(b) Surgery ✓ ***(Mark first ONE only)*** (1)

7.3 The lens is less convex✓ / the eye ball is too short / Cornea is flat.
This causes the light rays to fall behind the retina✓
Therefore light rays are focused on the retina to form a clear image✓
(3)

7.4 Astigmatism✓ (1)

7.5 **The percentage of (visually impaired) people suffering from different visual defects**



Rubric for assessing the graph	
Title of the graph shows the relation between the two variables (**H**)	**1**
Correct calculation to determine the proportion (**C**)	**2**:All 4 correct **1**:1-3 correct
Correct proportions for the labelled sectors (**P**)	**2**:All 4 sectors correct **1**:1-3 sectors correct

(6)
(14)

Question 8

8.1 (a) Curvature✓ of the lens (1)
(b) Distance✓ of the pencil (1)

8.2 Same light intensity✓
Same person doing experiment✓
Same person taking measuring✓
Using the same optic instrument✓
Time to focus on the pencil✓
Same eye✓ ***(Mark first TWO only)*** (2)

8.3 To improve the validity✓ of the procedure
To get results for the factors✓ that is being tested so the above factors do not interfere with the factors being tested✓
(Mark first TWO only) (2)

8.4 As the distance increases✓ curvature of the lenses decreases✓ (2)

8.5 Ciliary muscle ✓
Suspensory ligament✓ (2)
(10)

Question 9

9.1 (a) B✓- Iris✓ (2)
(b) A✓ - Sclera✓ (2)
9.2 (a) 2✓ (1)
(b) 3✓ (1)
9.3 (a) Circular✓ muscles (1)
(b) Circular ✓muscles (1)
(8)

Question 10

10.1 Iris✓ (1)
10.2 - Helps to maintain the shape of the eye✓
- Plays a role in refraction of light✓
- Allows the transmission of light✓
- Prevents desiccation✓ of structures in the eye
- Holds the retina in position✓
- Nourishment✓ of the eye
- Prevents mechanical injury✓ in the eye

(Mark first TWO only) (Any two) (2)
10.3 - Area B contains (a high concentration of) photoreceptors✓/ cones
- Area C contains no photoreceptors✓/ no rods & cones (2)
10.4 Astigmatism✓ (1)
10.5 - Because the lens will become cloudy✓/opaque
- no/less light will enter the eye✓

causing no sight ✓/weak sight (3)
10.6 - The ciliary muscle contracts✓
- The ciliary body moves closer to the lens✓
- The suspensory ligaments slacken✓
- Tension on the lens decreases✓
- The lens becomes more convex✓/rounded
- Light rays are refracted more✓
- To focus the light on the retina✓ **Any Six** (6)

(15)

EAR

Question1

1.1 A ✓✓
1.2 B ✓✓
1.3 C ✓✓
1.4 C ✓✓
1.5 B ✓✓

(5X2) **(10)**

Question 2

2.1	Receptors that provide information about the gravitational position of the head	**Maculae** ✓
2.2	A small device that is inserted in the ear to drain fluids caused by a middle-ear infection	**Grommet** ✓
2.3	A structure in the ear that contains receptors that converts pressure waves into nerve impulse in the ear	**Cochlea** ✓
2.4	A structure in the ear that absorbs excess pressure waves from the inner ear	**Round window** ✓
2.5	A structure in the ear that transmits the nerve impulse to the cerebellum for the balance of the body	**Auditory nerve** ✓
	1x6	**(10)**

Question 3
MATCHING COLUMNS

3.1 A only ✓✓
3.2 A only ✓✓
3.3 B only ✓✓
3.4 None✓✓

(4x2) **(8)**

Question 4

4.1 (a) Semi-circular canal ✓ (1)
(b) Auditory canal ✓ (1)
4.2 (a) E✓ - Oval window✓ (2)
(b) D✓ - Round window✓ (2)
4.3 (a) Cerebellum✓ (1)

(b) Hair cells/Organ of Corti✓ (1)
(8)

Question 5

5.1 (a) F✓ – Auditory nerve✓ (2)
(b) G✓ –Eustachian tube✓ (2)
5.2 (a) B✓ and C✓ (2)
(b) E✓ and F✓ (2)
5.3 -Grommet will be inserted in the tympanic membrane✓ (2)
-Antibiotics ✓

5.4 Auditory canal ✓ (1)
5.5 - The ear wax can be moved from the auditory canal ✓
- to allow sound to reach the tympanic membrane / which allows tympanic membrane to vibrate freely ✓ (2)
(13)

Question 6

6.1	(a)	A – Cerebrum	(1)
	(b)	B - Medulla oblongata✓	(1)
	(c)	H - Eustachian✓	(1)
6.2		G✓ – Round window✓	(2)
6.3		Hair cells/Organ of Corti✓	(1)
6.4		-Part B controls vital processes✓, /heartbeat/breathing - These processes will stop✓ leading to death	(2)
6.5		The impulses will be interpreted✓ and sent to the skeletal muscles✓ to maintain balance✓	(3)
6.6		The impulses will be interpreted✓ and sent to the skeletal muscles✓ to maintain balance✓	(4)
			(15)

Question 7

7.1	(a)	Auditory canal✓	(1)
	(b)	Ossicles✓	(1)
7.2		- Collects the sound waves✓ - Directs the sound waves towards the auditory canal✓ **(Mark first ONE only)**	(1)
7.3		-Part D / the ossicles do not vibrate freely✓ - Fewer / no vibrations will be sent to oval window✓ / inner ear - Fewer / no pressure waves will be set up in the cochlea✓ -The receptors/organ of Corti will be stimulated less✓/ not stimulated - The cerebrum is stimulated differently/ not stimulated -which leads to hearing loss✓ **Any 4**	(4)
7.4		-Equalises pressure✓ -on the either side of the tympanic membrane✓	(2)
7.5		Grommet✓	(1)
7.6		C✓	(1)
7.7		- The cristae are stimulated✓ - To convert the stimuli to impulse✓ - The impulses are sent to the cerebellum ✓ where they are interpreted✓ - The cerebellum sends impulses to the skeletal muscles✓ to maintain balance Any 4	(4)
			(15)

Question 8

8.1 (a) Transmits sound waves to the tympanic membrane✓/Secretes ear wax (1)
(Mark first ONE only)

(b) Equalises pressure on either side of the tympanic membrane✓ (1)
(Mark first ONE only)

(c) Releases pressure from the inner ear✓ (1)
(Mark first ONE only)

8.2 (a) C✓ (1)

(b) D✓ (1)

8.3
- The receptors cannot convert the stimuli into impulses✓
- No impulses/fewer impulses are transmitted to the cerebrum✓
- and the person does not hear anything✓/hearing is impaired (3)

8.4
- The sound vibrations are transmitted from the large tympanic membrane✓
- to the smaller oval window✓
- through the ossicles✓
- which are arranged from largest to smallest✓
- This concentrates the vibrations✓, amplifying them Any (3)

8.5
- A change in speed/direction of movement✓
- stimulates the cristae✓
- The stimulus is converted to an impulse✓
- The impulse is transmitted to the cerebellum✓
- via the auditory nerve✓
- The cerebellum sends impulses to the muscles✓ to restore balance Any (4)

(15)

Question 9

9.1 (a) Auditory nerve✓ (1)

(b) Round window✓/Fenestra rotunda (1)

9.2 Cerebrum✓ (1)

9.3
- The cristae✓in the semi-circular canals
- are stimulated by changes in speed and direction✓
- when the endolymph moves✓
- The cristae convert the stimuli to nerve impulses✓
- The nerve impulses are transported along the auditory nerve✓
- to the cerebellum✓to be interpreted
- Impulses sent to muscles✓ to restore balance (Any 5) (5)

9.4
- The mucus will block the opening of the Eustachian tube✓
- Air cannot enter or leave✓the middle ear
- to equalise pressure✓/causing imbalance in pressure

OR

- Mucus may move through the Eustachian tube✓
- causing pressure in the middle ear✓
- pushing on the tympanic membrane✓/part E (3)

9.5
- The ossicles/structures at A will not be able to vibrate✓
- and hence no vibrations will be passed to the inner ear✓/cochlea will not be stimulated/no amplification (2)

(13)

Question 10

10.1 (a) Round window✓ (1)

(b) Cochlea✓ (1)

10.2 Cristae✓ (1)

10.3 (a)
- Impulses from the cochlea cannot be transmitted to the brain✓
- and therefore hearing will not occur✓ (2)

(b)
- Part A will not be able to vibrate✓
- The round window will not absorb the sound waves✓ from the cochlea
- and hearing will be affected✓ (Any 2) (2)

(7)

Question 11

11
-The pinna of the ear traps sound waves✓
-The auditory canal directs the sound waves to the tympanic membrane✓
-causing the tympanic membrane to vibrate✓
-which causes the ossicles to vibrate✓and
-pass the vibrations to the oval window✓/ amplify the vibrations
-(Pressure) waves are set up in the inner ear✓ / perilymph/endolymph
-The organ of Corti is stimulated✓
-and converts the stimuli into impulses✓
-which are transmitted by the auditory nerve✓
-to the cerebrum✓ for interpretation Any (7)

(7)

Question 12

12.1 Cochlea✓ (1)

12.2 (a) Absorbs excess pressure waves✓/releases pressure from the inner ear/ prevents an echo
(Mark first ONE only) (1)

(b) It converts stimuli/pressure waves into impulses✓
(Mark first ONE only) (1)

12.3 - Part A/tympanic membrane will not be able to vibrate✓/vibrate freely
- No/less vibrations will be carried to the middle ear✓/ossicles (2)

12.4 - Middle ear infections cause fluid build-up in the middle ear✓
- which can block the Eustachian tube✓
- The grommet will release the pressure✓that will build up in the middle ear/ drain the fluid from the middle ear
- The pressure on either side of the tympanic membrane is equalised✓
- preventing the tympanic membrane from rupturing✓ and
- allowing the ossicles to vibrate freely ✓ Any (4)

12.5 - The cristae are stimulated✓ and
- convert the stimuli into impulses✓
- The impulses are sent via the auditory nerve✓
- to the cerebellum✓
- which interprets the information✓ and
- sends impulses to the skeletal muscles ✓to restore balance Any (4)
(13)

Question 13

13.1 Semi-circular canals✓ (1)

13.2 Ossicles✓ (1)

13.3 (a) D✓ – Eustachian tube✓ (2)

(b) C✓ – Oval window✓ (2)

13.4 (a) Maculae✓ (1)

(b) Cristae✓ (1)
(8)

Question 14

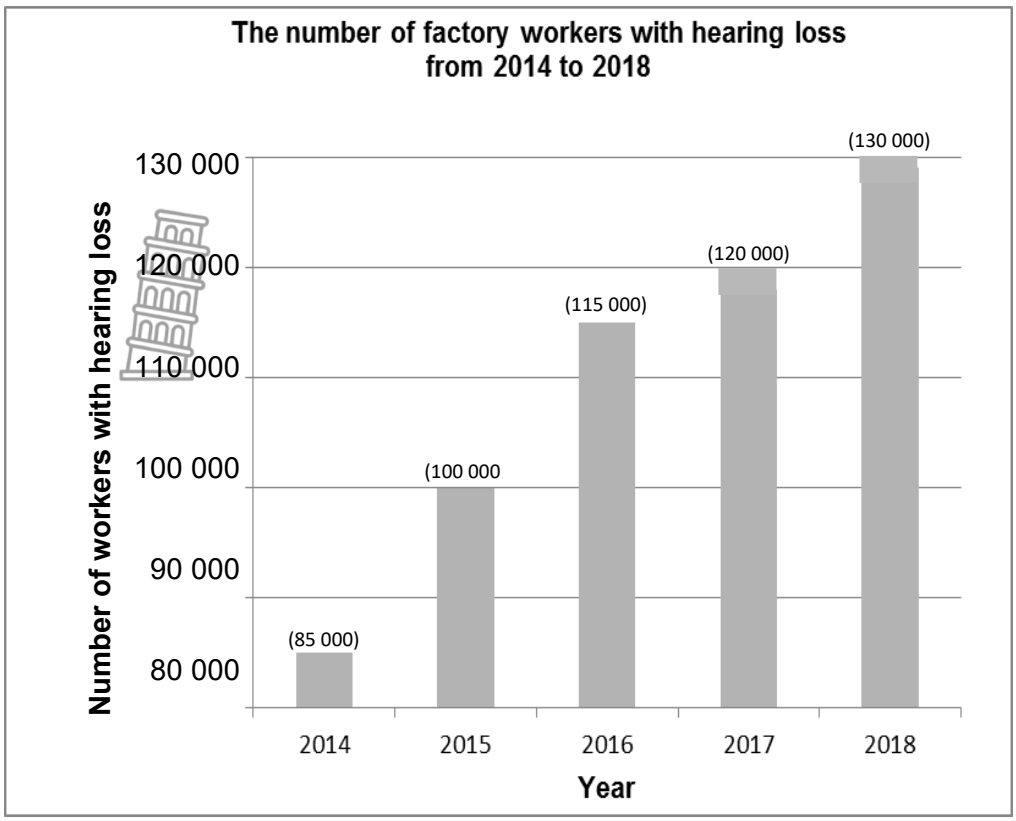
14.1 Cochlea✓ (1)

14.2 $\frac{(130\,000 - 85\,000)}{85\,000} \times 100 = 52.94\%$ ✓ ✓ ✓ (3)

14.3 - More factories✓ were built increase in supply and demand
- More workers✓ were employed
- Extended exposure to loud sounds✓
- Lack of precautionary measures✓
Any (1)

14.4 - The impulse will not be transmitted✓ to the cerebrum✓
- and will not be interpreted✓ Any 2 (2)

14.5



Criteria for marking graph:

Criteria	Mark allocation
Type: Bar graph is drawn (T)	1
Caption of the graph includes both variables (C)	1
Correct labels on X-axis and Y-axis (L)	1
Correct scale for Y-axis Equal width of bars and spaces (S)	1
Plotting: (P) 1- 4 co-ordinates are plotted correctly All 5 co-ordinates are plotted correctly	 1 2

Histogram or line graph drawn:
- Lose marks for type of graph and for scale

Transposed axes:
- Can get full credit if axes labels are also swapped and bars are horizontal
- If labels are not corresponding, then lose marks for labels and scale
- Check that the plotting is correct for the given labels (6)

(13)

Topic Plant Growth Hormones

Solutions

Question 1

1.1 B ✓✓ (2)
1.2 A ✓✓ (2)
1.3 B ✓✓ (2)
1.4 D ✓✓ (2)
(8)

Question 2

	DESCRIPTION	TERM
2.1	Growth or bending reaction by plants in response to light stimuli.	**Phototropism** ✓
2.2	The plant hormone that promote apical dominance	**Auxin** ✓
2.3	The plant hormone that causes leaves to fall off trees in Autumn	**Abscisic acid**✓
2.4	A chemical that is used by farmers to kill weeds	**Herbicides**✓
2.5	Promote sprouting of buds	**Gibberellins**✓
2.6	Inhibition of the growth of lateral buds by auxins present in apical buds	**Apical dominance**✓
2.7	A movement of part of a plant in response to gravity	**Geotropism**✓
2.8	Plant growth responses to external stimuli	**Tropism** ✓
2.9	A substance containing plant hormones used to kill unwanted plants	**Weed killer** ✓ **/herbicide**
2.10	Sharp structures found in plants for protection from herbivores	**Thorns** ✓
	(10X1)	**(10)**

Question 3

3.1 A only ✓✓ (2)
3.2 Both A and B ✓✓ (2)
3.3 B only ✓✓ (2)
3.4 B only ✓✓ (2)
(4x2) **(8)**

Question 4

4.1 -Rate of seed germination ✓
-Percentage of seed germination ✓ (2)

4.2 -Same amount of water ✓
-Same species!/type of seed ✓
-Same light intensity✓/darkness ✓
- Same temperature ✓
- Same time period (24 hours) for all 3 groups ✓
- Seed mixtures were treated in the same way ✓/filtered and rinsed with cold, distilled water for 2 minutes
(Mark first THREE only). (3)

4.3 Same volume ✓/amount of gibberellins that the seeds were soaked in (1)

4.4 - So that the average percentage and rate of seed germination could be calculated ✓
- in order to improve the reliability✓ of the results (2)

4.5 - Seeds usually germinate under the soil ✓ (2
- in the absence of light✓

(10)

Question 5

5.1 Gibberellins stimulates cell elongation✓/cell enlargement/ growth in stems/elongation of internodes
(Mark first ONE only) (1)

5.2 (120 – 80) ✓mm = 40 ✓mm✓ (3)

5.3 -Increase the number of plants used in each treatment✓
-Repeat the investigation✓
-Increase the period of the investigation✓
(Mark first TWO only) (2)

5.4 -Auxins diffused from the paste into the plants✓ inhibiting growth of the lateral branches✓
-Once all the auxins were used up✓ from the paste the growth of the lateral branches increased ✓ (4)

(10)

Question 6

6.1 -To ensure unilateral light ✓ / the plant receives light from one direction only (1)

6.2 -Auxins ✓ AA/ Indole acetic acid (1)

6.3 Differences between plants A and plants B after two weeks

T✓

Plant A	Plant B
The stem of the plant will bend towards the light✓	The stem of the plant will remain straight✓/will not bend towards the light
Does not have lateral branches✓/only lower lateral branches will start to grow	All the lateral branches will grow✓along the whole stem
The plant will be taller✓	The plant will be shorter✓

(**Mark first TWO ONLY**)

1 table (T) + (2 X 2) (5)

(7)

Question 7

7.1 (a) Amount of abscisic acid ✓
(b) Seed germination✓ (2)

7.2 -Promotes seed dormancy✓/inhibits growth (1)

7.3 -As the days increase the hormone concentration decreases✓✓ (2)

7.4 - Decrease in abscisic concentration✓
- which allows seed germination✓/growth. (2)

7.5 - Same type of seeds✓.
- Same age of seeds ✓
- Same measuring instrument✓.
- Same person taking measurements✓
(Mark the FIRST TWO only) (2)

7.6 - As the setup was placed in the dark cupboard✓
- there was no effect of light✓
- Force of gravity✓acts on the seedlings
- the stem is negatively geotropic ✓
- hence it grows straight upwards✓ (Any 4) (4)

(13)

Question 8

8.1 Geotropism✓/gravitropism (1)

8.2 - Auxins✓
- accumulate at the lower✓part of the stem
- because of gravity✓
- The higher concentration of auxins at the lower part of the stem stimulates cell elongation✓/growth on the lower side of the stem
- The lower concentration of auxins at the upper part of the stem inhibits cell elongation✓/growth on the upper side of the stem.

(Any 4) (4)

8.3 The leaves and stem will be carried in such a way that they receive maximum sunlight✓
- For photosynthesis✓
OR
- Exposes the flowers more favorably✓
- for pollination✓/seed dispersal (2)

8.4 The roots will grow downwards✓/towards gravity (1)
(8)

QUESTION 9

9.1 November ✓ (1)

9.2 -The concentration of abscisic acid increases ✓ (3)
-To stimulate the abscission/ falling of leaves ✓
-To prepare the tree for dormancy ✓

9.3 - Less sunlight ✓ / less water/ cold conditions therefore
- decreased photosynthesis✓ / reduced transpiration / lower energy demand / low growth rate Any (1x2) (2)
(Mark the first ONE only)
(6)

QUESTION 10

10.1 - Auxins promote the development of roots ✓
- It brings about root growth✓causing their downwards✓growth / positive geotropism
(3)

10.2 - In the stem, auxins stimulate growth ✓on the lower side causing the stem to grow / bend upwards✓
- In the roots , the auxins inhibit growth✓ on the lower side causing the root to grow / bend downwards✓ (4)
(7)

QUESTION 11

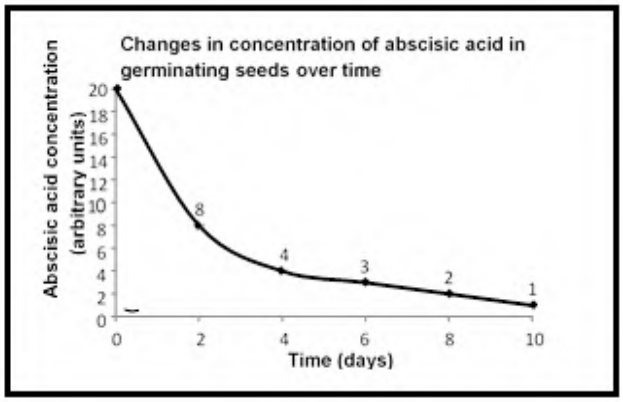
11.1 -(Apical) tip of the stem ✓/ apical bud
-(Apical) tip of the stem ✓
(Mark first TWO only) (2)

11.2 - Stimulate cell division ✓/ mitosis
- stimulate cell elongation✓
(Mark first TWO only) (2)

11.3 Gibberellins✓ (1)
11.4 -Increased plant growth✓ (2)
- Saves species that are facing extinction ✓
(7)

QUESTION 12

12.1



Mark allocation of the graph

Criteria	Mark Allocation
Correct type of graph including the joining of points	1
Title of graph	1
Correct scale, label and unit for X-axis	1
Correct scale, label and unit for Y-axis	1
Drawing of the graph	0: No points plotted correctly 1: 1 to 5 points plotted correctly 2: All 6 points plotted correctly

NOTE:

If the wrong type of graph is drawn: Marks will be lost for "correct type of graph".

If axes are transposed: Marks will be lost only for labelling of X-axis and Y-axis

(6)

12.2 (a) Decreased✓ (1)

(b) Increased✓ (1)

12.3 - Auxins are sensitive to light✓
- Light stimulus from one side causes auxins to move to the shaded side✓/destroyed on the illuminated side
- Auxin concentration is higher on the shaded side ✓
- This promotes cell elongation ✓on shaded side of plant
- resulting in more growth ✓on this side
- Stem grows towards the light stimulus✓
- This is called phototropism ✓ (Any 4) (4)

(12)

QUESTION 13

13.1 Auxins✓ (1)

13.2 -The growth movement of part of a plant in response to a unilateral light stimulus. ✓✓ (2)

13.3 - Auxins diffuse through the agar to the stem ✓
- Auxins are light sensitive ✓ /are destroyed by light/Auxins move away from light
- There is a higher concentration of auxins on the dark side of the stem✓
- Growth is stimulated✓ on the dark side which - grows faster✓
- causing the stem to grow/bend towards the light✓ (Any 6) (6)

13.4 - Light will not reach the tip of the stem ✓
- Therefore, auxins are distributed evenly✓ throughout the tip of the stem
- The stem will grow straight up ✓/ no bending towards the light (3)

(12)

QUESTION 14

14.1 -To expose the leaves to light for photosynthesis ✓ (1)

14.2 -Geotropism✓/ gravitropism (1)

14.3 -To eliminate the effect of gravity✓ / expose the stem to gravity on all sides (1)

14.4 - Auxins will move to the lower side of the growing tip ✓
- There will be a high concentration of auxin in the lower side✓stem
- Which will stimulate cell elongation / ✓growth
- Therefore, the lower side will grow faster✓
- This will cause the stem to bend upwards✓ (5)

14.5 - The auxins ✓
- produced at the tip of the stem ✓ will be removed
- Therefore, stem will not grow ✓
- Lateral branches will develop ✓
- In the absence of apical dominance ✓ (Any 4 x 1) (4)

(12)

TOPIC: ENDOCRINE AND HOMEOSTASIS

QUESTION1: MCQs

1.1	B ✓✓	
1.2	A ✓✓	
1.3	D ✓✓	
1.4	B ✓✓	
1.5	C ✓✓	
	(5x2)	**(10)**

QUESTION 2: BIOLOGICAL TERMS

	DESCRIPTION	TERM
2.1	A gland whose secretion are transported through blood streams.	**Endocrine gland**✓
2.2	A system that is responsible for chemical coordination in the body.	**Endocrine system**✓
2.3	A hormone that stimulates ovulation in humans	**LH**✓
2.4	The process of maintaining a constant internal environment in the human body	**Homeostasis**✓
2.5	A gland whose secretions are transported through ducts.	**Exocrine Gland**✓
2.6	A hormone that stimulates mammary gland to produce milk.	**Prolactin**✓
2.7	A hormone that is responsible for osmoregulation in the body.	**ADH**✓
2.8	Specialized cells in the pancreas that secretes insulin and glucagon	**Islets of Langerhans**✓
2.9	A hormone responsible for secondary sexual characteristics in males	**Testosterone**✓
2.10	A hormone that is responsible for maintaining salt balance in the blood.	**Aldosterone**✓
2.11	A gland that secretes FSH and LH in females.	**Pituitary**✓
2.12	Chemical messengers produced by endocrine glands.	**Hormone**✓
2.13	A gland located in the neck that secretes thyroxin hormone.	**Thyroid gland** ✓
2.14	A hormone that controls the metabolic rate in the body.	**Thyroxin**✓
2.15	A hormone that increases the blood glucose level in the body.	**Glucagon**✓
2.16	A hormone that lowers the blood glucose level in the body.	**Insulin**✓
2.17	Promotes the secretions of hormones produced by thyroid glands.	**TSH**✓
2.18	A mechanism that detects imbalances and restores balance in the internal environment	**Negative feedback**✓
2.19	A hormone responsible for growth and development in the body.	**Growth Hormone**✓
		(19x1) **(19)**

QUESTION 3

3.1	None✓✓	
3.2	A only✓✓	
3.3	A only✓✓	
3.4	A only✓✓	
3.5	B only✓✓	
	(5 x 2)	**(10)**

QUESTION 4

4.1	**A** – Pituitary gland✓ **D**- Adrenal gland✓	(2)
4.2	a) C✓ Pancreas✓ b) A✓ Pituitary gland✓ c) B✓ Thyroid gland✓ d) D✓ Adrenal gland✓	(8)
4.3	They respond to internal/external stimulus✓ They protect organisms ✓ (**Mark first TWO only)**	(2)
		(12)

Question 5

5.1	Sweat gland✓	(1)
5.2	- Structure A will constrict✓/vasoconstriction occurs - Less blood flows towards the surface✓of the skin - Less heat is lost✓ through the surface of the skin - Temperature increases✓ / returns to normal	(3)
5.3	- Enzymes function optimally✓ at normal body temperature✓/37° C - Enzymes/proteins will denature✓ at high temperatures✓ - Enzymes will become inactive✓ at low temperatures✓ **(Mark first ONE only)**	(2)
		(6)

Question 6	

6.1	(a) Growth hormone ✓ (b) Prolactin ✓	(1) (1)
6.2	(a) Adrenalin✓	(1)
	(b) - More air/oxygen will be inhaled✓ - Blood will be pumped faster✓ - therefore, transporting more oxygen and glucose✓ to the skeletal muscles - which will increase the rate of cellular respiration✓/metabolism	(4)
6.3	- Part B/the medulla oblongata is stimulated✓ - and sends impulses to the heart✓and to - the breathing muscles✓/ intercostal muscles and diaphragm - More blood is transported to the lungs✓ - and the carbon dioxide is exhaled faster✓ - and the carbon dioxide levels return to normal✓ Any	(4)
		(11)

Question 7		
7.1	5✓µg/dl	(1)
7.2	$\left[\frac{(25 - 5)}{5}\right]$ ✓ x 100 ✓ = 400✓% **OR** $\left[\frac{(24 - 5)}{5}\right]$ ✓ x 100 ✓ = 380✓% Accept a range between: - 24 and 25 for the first value and - 380% and 400% for the answer	(3)

7.3	- Thyroxin increases the metabolic rate/rate of cellular respiration - More glucose is used✓ - less glucose is stored✓ - fat is broken down✓ causing weight loss Any	(3)
7.4	- The high levels of thyroxin✓ in the blood - causes the pituitary gland✓/hypophysis - to secrete less TSH✓ into blood - causing the level of TSH to decrease✓	(4)
		(11)

Question 8

8.1	50✓°C	(1)
8.2	As the temperature increases the average rate of blood-flow to the skin increases✓✓	(2)
8.3	$\frac{11-4}{4}$ ✓ x 100✓ = 175✓% **OR** $\frac{7}{4}$ ✓ x 100✓ = 175✓%	(3)
8.4	- As the temperature increases✓ from 20 °C to 45 °C - vasodilation occurs✓/blood vessels dilate - to increase the rate of blood flow✓ /more blood flows to the skin - so that more heat✓/ sweat can be lost	(4)
8.5	- Less blood flows to the skin✓ at low temperatures - Less oxygen✓/nutrients reach the cells of the tissue and the cells may die **OR** - Less blood flows to the skin✓ at low temperatures - More carbon dioxide✓/waste products accumulate in the cells of the tissue and the cells may die	(2)
		(12)

Question 9

9.1	(a) Volume of urine✓	(1)
	(b) - Decide on a time✓ /date/place to conduct the investigation - Decide on the apparatus✓ /materials that need to be used - Decide how to record the data✓ - Decide on the number of participants to include✓ - Decide what factors to keep constant✓ /example of factor to be kept constant - Decide on the composition of the sample✓ - Develop an indemnity form for the participants to sign✓ - Recruit✓ /get permission from volunteers to participate **(Mark first TWO only)** Any	(2)
	c) - The same room✓ /environment/temperature - The same apparatus✓ - The same investigator✓ - No other liquid intake by both groups✓ - Same type of beer✓ **(Mark first TWO only)** Any	(2)
	d) - They used a large sample✓ /12 men/6 men in each group - The average volume of urine produced was calculated✓ **(Mark first TWO only)**	(2)
9.2	- Alcohol inhibits/reduces the secretion of ADH✓ - causing the renal tubules✓ /distal convoluted tubules and collecting ducts - to become less permeable to water✓ - Less water is reabsorbed✓ back into the blood - A larger volume of urine is produced✓ Any	(4)
		(11)

Question 10

10.1	- Body temperature increases✓ - Pulse rate increases✓ **OR** Both increase✓✓	(2)
10.2	30✓ minutes	(1)
10.3	**Vasoconstriction** - Less blood reaches the surface of the skin✓ - and less heat is lost✓ **OR** - Less blood reaches the sweat glands✓ - and less heat is lost✓ Any 1 x 2 **Increase in metabolism** - An increase in metabolism results in an increase in respiration✓ - which generates more heat✓	(4)
10.4	- Amount of energy drink✓ - Length of time when measurements were taken✓ - Amount of caffeine in the energy drink✓ - Type of energy drink✓ - The level of activity of all participants✓ - Gender✓/only men **(Mark first TWO only)** Any	(2)
		(9)

Question 11

11.1 The level increases✓

T✓ (1)

11.2

Fewer larger meals	More smaller meals
1. Maximum blood insulin concentration is higher✓/between 160-180 mg/dl	1. Maximum blood insulin concentration is lower✓/between 120-140 mg/dl
2. Minimum blood insulin concentration is lower✓/between 20-30 mg/dl	2. Minimum blood insulin concentration is higher✓/40 mg/dl
3. Blood insulin concentration rises and falls three times a day✓/less often	3. Blood insulin concentration rises and falls six times a day✓/more often
4. Large changes in insulin concentration✓/between 140-160 mg/dl	4. Small changes in insulin concentration✓/between 80-100 mg/dl
5. Insulin concentration drops below minimum glucose concentration✓	5. Insulin concentration varies above and below minimum glucose concentration✓

(Mark first TWO only) 1 for table + Any 2 x 2 (5)

11.3
- A diabetic may not produce sufficient insulin✓
- When eating many smaller meals, less glucose✓ enters the blood
- less insulin✓ is needed
- to return blood glucose to normal✓

OR

- A diabetic may not produce sufficient insulin✓
- When eating fewer larger meals, more glucose✓ enters the blood
- more insulin✓ is needed
- to return blood glucose to normal✓

(4)

(10)

Question 12

12.1
- The pituitary gland✓ is stimulated
- to secrete less TSH✓
- Low TSH levels causes the thyroid gland✓
- to secrete less thyroxin✓
- Thyroxin levels return to normal✓

(5)

12.2
- The rate of metabolism/respiration in the body decreases✓
- Less glucose will be broken down✓
- and more glucose will be converted and stored as fat✓/glycogen

(3)

(8)

Question 13

13.1 Adrenalin✓ (1)

13.2
- Increases the heart rate✓
- Increases blood pressure✓
- Stimulates the conversion of glycogen into glucose✓
- Increases the blood supply to the heart✓/skeletal muscles
- Decreases blood flow to the digestive system✓
- Decreases blood flow to the skin✓
- Increases muscle tone✓
- Increases the rate/depth of breathing✓
- Increases the rate of respiration✓/metabolism
- Dilates/increases the diameter of the pupils✓

(Mark first THREE only) (3)

13.3
- Blood glucose levels rise✓ above normal
- The pancreas✓/islets of Langerhans
- secretes insulin✓ into the blood
- which travels to the liver✓/muscle cells
- and stimulates them to absorb glucose✓ from the blood
- and to convert the excess glucose into glycogen✓
- which decreases the blood glucose levels✓ to normal

Any 5 (5)

(9)

Question 14

When the carbon dioxide levels rise above normal (C):

- Receptor cells in the (carotid) artery in the neck/aorta are stimulated✓
- to send impulses to the medulla oblongata✓
- The medulla oblongata sends an impulse to the breathing muscles✓
- to contract more actively✓
- and increase the rate/depth of breathing✓
- An impulse is also sent to the heart✓
- to beat faster✓
- More carbon dioxide is taken to the lungs✓/exhaled
- The carbon dioxide levels return to normal✓

Any (7) **(7)**

Question 15

Role of the endocrine system in providing energy (E)

- More adrenalin✓ is secreted
- by the adrenal glands✓
- increases blood glucose✓/increase heart rate/ increase breathing rate/dilate blood vessels to essential organs

- More glucagon✓ is secreted
- by the pancreas✓/islets of Langerhans
- increases blood glucose✓

- More TSH✓ is secreted
- by the pituitary gland✓
- to increase thyroxin production✓

- More thyroxin✓ is secreted
- by the thyroid gland✓
- to increase the body's metabolic rate✓/rate of respiration

Any (9) **(9)**

Paper 2 Topics:

Topic: DNA Code of Life

Question1

1.1 D✓✓
1.2 D✓✓
1.3 C✓✓
1.4 B✓✓
1.5 C✓✓
1.6 C✓✓
1.7 B✓✓

(14)

Question 2

	DESCRIPTION	**TERM**
2.1	A tangled network of DNA and protein located within the nucleus	**Chromatin network**✓
2.2	The bonds that hold the two strands of a DNA molecule together.	**Hydrogen bonds**✓
2.3	The sugar found in DNA	**Deoxyribose sugar**✓
2.4	The analysis of DNA samples to identify individuals that may be related	**DNA Profiling**✓
2.5	The process whereby DNA makes an exact copy of itself	**DNA replication**✓
2.6	The monomers of nucleic acids	**Nucleotides**✓
2.7	The natural shape of a DNA molecule	**Double helix**✓
2.8	Sections of DNA that carry hereditary information	**Gene**✓
2.9	The sugar that forms part of a nucleotide in RNA	**Ribose**✓
2.10	The process whereby mRNA is formed from DNA	**Transcription**✓
2.11	Base triplets found on mRNA	**Codons**✓
2.12	The cell organelle to which mRNA attaches during protein synthesis	**Ribosome**✓
2.13	The process of arranging amino acids according to the sequence of bases on mRNA	**Translation**✓
2.14	The organelle in a cell where translation occurs	**Ribosome**✓
2.15	The triplet of bases found on a tRNA molecule	**Anticodon**✓
2.16	The type of RNA containing anticodons	**tRNA**✓
2.17	Bonds that join amino acids together	**Peptide bond**✓
	(17 X 1)	**(17)**

Question 3

3.1 A only✓✓
3.2 Both A and B✓✓
3.3 A only✓✓
3.4 A only✓✓
3.5 B only✓✓

(10)

Question 4

4.1 (a) Y✓ (1)
(b) X✓ (1)
4.2 4✓ (1)
4.3 A C T G (Must be in the correct order) ✓ (1)
4.4 (DNA) replication✓
Transcription (Protein synthesis) ✓ (2)
(6)

Question 5

5.1 (a) W- Nucleotide ✓ (2)
U – DNA ✓
(b) X - Phosphate ✓ / phosphate ions (2)
Y – Deoxyribose ✓
(c) Hydrogen bond (1)
(d) V – Adenine (1)
5.2 Nucleus✓ (1)
5.3 Interphase✓ (1)
(8)

Question 6

6.1 DNA replication✓ (1)
6.2 (a) Sugar✓ (1)
(b) Phosphate✓ (1)
6.3 (a) Guanine✓ (1)
(b) Guanine✓ (1)
(5)

Question 7

7.1
- The DNA is located in the nucleus✓
- and mitochondria✓ and chloroplasts✓ any 2 (2)

7.2
- DNA is a double-stranded✓molecule that
- forms a double helix✓
- It is made up of nucleotides✓
- Each nucleotide has a deoxyribose sugar✓molecule
- a phosphate group✓ and
- a nitrogenous base✓
- The bases are A, T, C and G✓
- which join to form complementary pairs✓/ (A to T & C to G)
- held by hydrogen bonds✓ any 7 (7)

7.3
- The DNA (double helix) unwinds✓ and
- unzips✓/hydrogen bonds break
- to form two separate strands✓
- Both DNA strands serve as templates✓
- to build a complementary DNA✓/(A to T and C to G)
- using free (DNA) nucleotides✓ from the nucleoplasm
- This results in two identical (DNA) molecules✓
- Each consists of 1 original and 1 new strand✓

Any 6 (6)
(15)

Question 8

8.1 Heila ✓and Leo ✓ (2)
(Mark first TWO only)

8.2
- All the (DNA) bands from Heila and Leo ✓
- match with the DNA of the mother and father ✓

OR

- none of the (DNA) bands from Priya ✓
- match with the (DNA) bands of the mother and the father ✓ (2)

8.3
- Tracing missing persons✓
- Identification of genetic disorder's ✓
- Identification of suspects in a crime ✓
- matching tissues for organ transplants ✓
- Identifying dead persons ✓

(**Mark first THREE only**) (3)
(7)

Question 9

9.1 DNA Profiling✓ (1)

9.2 Jennie✓ (1)

9.3 -Jennie's DNA profile✓ /bands
matches DNA profile/ bands of the sample✓ from the crime scene (2)

9.4 -Proof of paternity✓
- Tracing missing person✓
- Identification of genetic disorders✓
- Establishing family relationships✓
- Matching tissues for organ transplants✓
- identifying dead persons✓/ animals. (1)

9.5 - Samples containing DNA can be planted✓/person was framed
- Human error✓ during DNA profiling process
- Costly procedure✓
- Invasion of privacy✓

(Mark first TWO only) any 2 (2)

(7)

Question 10

10.1 Mary✓✓ (2)

10.2 There are no matching bands✓/ bars/ patter/ DNA profile
with both parents✓ and Mary (2)

(4)

Question 11

11.1 Number of people✓ found guilty/ convicted (1)

11.2 44 – 25✓ = 19✓ (2)

11.3
- More criminals are found guilty when DNA evidence is included✓ in the investigation
- DNA found at crime scene✓
- can be compared to the DNA database✓
- making it easier✓/ Faster
- to identify suspects in the crime✓

(Mark first FOUR only) **any 4** (4)

(7)

Question 12

12.1 Nucleus ✓ (Nucleoplasm) (1)

12.2 (a) Deoxyribose✓ (1)

(b) Uracil ✓ /U (1)

12.3

Transcription	DNA replication
Only one strand acts as a template ✓	Both strands acts as a template ✓
(Free) RNA nucleotides are complementary ✓	(Free) DNA nucleotides are complementary ✓
Adenine complements with uracil / (A complements with U) ✓	Adenine complements with thymine / (a complements with T) ✓
Only a short section of DNA is used ✓	The whole DNA molecule is used
DNA unwinds and unzips partially ✓	DNA unwinds and unzips completely ✓

(Mark first TWO only) **1 mark for table + (Any 2 x2)** (5)

(8)

Question 13

13.1 (a) Amino acids ✓ (1)

(b) mRNA ✓ (1)

13.2 (a) TAC ✓✓ (2)

(b) GUA ✓ (1)

13.3 Translation ✓*

- Each RNA carries a specific amino acid ✓
- when the anticodon on tRNA ✓ / GUA
- matches the codon on mRNA ✓/ CAU
- then tRNA brings the required amino acid to the ribosome ✓
- amino acids become attached to each other by the peptide bonds ✓
- to form the required protein ✓ **1* compulsory + 6**

(7)

(12)

Question 14

14.1 Transcription✓ (1)

14.2 mRNA✓ (1)

14.3 -makes up the genes which carry hereditary information
-contains coded information for protein synthesis (2)

14.4 ✓

A (DNA)	B (RNA)
Double strand✓ / Paired bases✓	Single strand✓ Unpaired bases✓
Double helix/ helical✓	Non- helical✓
Thymine ✓	Uracil✓

1 mark for table + 2 X 2

(5)

14.5 - The double helix DNA unwinds ✓and
- unzips ✓/ weak hydrogen bonds break
- to form two separate strands ✓
- one strand acts as a template ✓
- to form mRNA ✓
- using free nucleotides from the nucleoplasm ✓
- the mRNA is complementary to the DNA ✓
- the copied message for protein synthesis is thus copied Onto mRNA✓ (6) **(Any 6)**

14.6 - This will result in different tRNA molecules ✓
- bringing different amino acids ✓
- leading to the formation of a different protein. ✓ (3)

(18)

Question 15

15 - Codon GAC ✓ (on mRNA)
- changed to GAU ✓
- Both these codons code for the same amino acids ✓/ Aspartic acid
- there for there will be no effect on the protein formed ✓ **(4)**

Question 16

16.1 Gene ✓mutation

16.2 - There is change in sequence (of nitrogenous bases) from CCG To CUG ✓ (1)

16.3 (a) 5 ✓/Five (1)

(b) UAU ✓ (1)

(c) -The codon CCG changed to CUG ✓ / 4th codon has changed
- The anticodon/ tRNA sequence changed ✓
- The amino acids proline ✓
- Was replaced by Leucine ✓
- This resulted in a different protein✓/no protein being formed (4)

(8)

Question 17

17.1 (a) GAC✓ (1)

(b) ACU✓✓ (2)

17.2 (Gene) mutation✓ (1)

17.3
- CTC on the DNA changed to CAC✓
- Codons (on the mRNA) changed✓/GAG changed to GUG
- Anticodons (on tRNA) changed✓/CUC replaced by CAC
- which resulted in a different amino acid✓/ Val (4)

17.4
- The cells will not receive enough oxygen✓
- resulting in reduced cellular respiration✓/ a person lacking energy/becoming tired/ anaemia (2)

(10)

Question 18

18.1 (a) Transcription✓ (1)

(b) Translation✓ (1)

18.2 (a) Nucleus✓ (1)

(b) mRNA✓ (1)

18.3 Chloroplasts✓
Mitochondria✓ (2)

18.4 (a)
- The double helix DNA unwinds✓ and
- (the double-stranded DNA) unzips✓/weak hydrogen bonds break
- to form two separate strands✓
- One strand is used as a template✓
- to form mRNA✓
- using free (RNA) nucleotides✓ from the nucleoplasm
- The mRNA is complementary to the DNA✓/ (A-U, G-C)
- mRNA now has the coded message for protein synthesis✓

(7)

(b) - Each tRNA carries an amino acid✓
- When the anticodon on the tRNA✓
- matches the codon on the mRNA✓
- the tRNA brings the (required) amino acid to the ribosome✓
- Amino acids become attached by peptide bonds✓
- to form the (required) protein✓ (6)

18.5 (a) TCG✓ (1)

(b) Tyrosine✓ (2)
Valine✓

18.6 Gene mutation✓ (1)

18.7 - The anticodon will be GGA✓/not GAA (3)
- The last amino acid would be proline instead of leucine✓
- resulting in a different protein✓/ no protein at all

(26)

Question 19

19.1 Cytosine✓ (1)
19.2 20✓✓% (2)
19.3 G A A✓ U G U✓ (2)
19.4 Glutamic acid✓ - Cysteine✓ (in that order) (2)
19.5 U A C✓ (1)
(8)

Question 20

20.1 Protein synthesis✓ (1)
20.2 Peptide✓ bond (1)

20.3 63✓ (1)

20.4 20.4.1 Guanine✓ (1)
20.4.2 (a) CAG✓ (1)
(b) CCT✓ (1)

20.4.3 CAU✓ (1)
(7)

Question 21

-RNA is single stranded✓
-and is made up of nucleotides✓which comprise:
-ribose✓ sugar
-phosphate✓group
-nitrogenous bases✓ which are
-adenine, uracil, guanine and cytosine✓/ (A, U, G and C)
-The phosphate group is attached to the ribose sugar✓
- and the nitrogenous base is attached to the ribose sugar✓
-Bases on RNA are arranged in triplets✓
-as codons on mRNA ✓
-and anticodons on tRNA✓
-tRNA has a clover-leaf✓/hairpin structure
-tRNA has a place of attachment for an amino acid✓ **Any (6)** **(6)**

Question 22

- mRNA✓ forms
- during transcription✓/by copying the coded message from DNA
- and moves out of the nucleus✓
- and attaches to the ribosome✓
- During translation✓
- the anticodon matches the codon✓
- tRNA✓
- brings the required amino acid✓ to the ribosome
- Amino acids become attached by peptide bonds✓
- to form the required protein✓ **Any (8)** **(8)**

TOPIC: MEIOSIS

Question1

1.1 C ✓✓
1.2 A ✓✓
1.3 A ✓✓
1.4 D ✓✓
1.5 D ✓✓
1.6 D ✓✓
1.7 D✓✓

(7X2) **(14)**

Question 2

BIOLOGICAL TERMS:

	DESCRIPTION	TERM
2.1	The point of crossing over between two adjacent chromosomes	**Chiasma**
2.2	The splitting of the cytoplasm during cell division	**Cytokinesis**
2.3	The failure of chromosome pairs to separate during meiosis	**Non-disjunction**
2.4	The structures in the cell that forms the spindle fibres.	**Centrioles**
2.5	The phase of meiosis when homologous chromosomes are aligned at the equator of the cell.	**Metaphase I**
2.6	The division of the nucleus	**Karyokinesis**
2.7	Exchange of genetic material between chromatids of homologous chromosomes	**Crossing over**
2.8	The point at which the two chromatids of a chromosome are joined together	**Centromere**
2.9	Site of meiosis in females	**Ovaries**
2.10	A genetic disorder caused by having an extra copy of chromosome number 21	**Down syndrome**
2.11	The Structure formed by the centrioles during cell division	**Spindle fibres**
2.12	The non-sex chromosomes in humans	**Autosomes**
2.13	The condition in a cell where there is only one set of Chromosomes	**Haploid**
2.14	The structure that is responsible for the formation of spindle fibres during cell division in animal cells and is made up of two centrioles	**Centrosomes**
2.15	The phase in the cell cycle during which the cell growth occurs	**Interphase**
2.16	Chromosomes that carry the same set of genes	**Homologous**
2.17	The structure that joins two chromatids of a chromosome	**Centromere**
2.18	The division of the cytoplasm of a cell during cell division	**Cytokinesis**
2.19	The process during meiosis where there is an exchange of genetic material between chromatids.	**Crossing over**
2.20	The structures in animal cells that give rise to spindle fibres during cell division.	**centrosome**

2.21	The phase in the cell cycle during which DNA replication takes place	**interphase**
2.22	The point where adjacent chromatids overlap during meiosis May June	**Chiasma /chiasmata**
2.23	The representation showing the arrangement of a diploid set of chromosomes	**karyotype**
	(23 x 1)	**(23)**

Question 3

MATCHING COLUMNS

3.1. None✓✓
3.2. B only✓✓
3.3. Both✓✓
3.4. B only✓✓
3.5 Both✓✓
3.6. B only✓✓

(6x2) **(12)**

Question 4

4.1. (a) Centromere✓ (1)
(b) Homologous chromosomes✓ (1)
(c) Spindle fibres✓/ spindle threads (1)

4.2. Anaphase II✓ (1)
4.3. 2, 1, 3✓✓ (2)
4.4. In metaphase I, the chromosomes arrange at the equator in homologous pairs✓ whereas in metaphase II, the chromosomes arrange at the equator singly✓
(Mark first ONE only)
(2)
(8)

Question 5

5.1. Anaphase II✓ (1)
5.2 (a) Centrosome✓ (1)
(b) Centromere✓ (1)
(c) Spindle fibre✓/ Spindle threads (1)

5.3 The chromatids separate✓/ centromere splits (1)
5.4 Crossing over✓ (1)
5.5 Reduces genetic variation✓ (1)

5.6 (a) Four✓/4 (1)
(b) 23✓ (1)
(08)

Question 6

6.1. Metaphase II✓ (1)

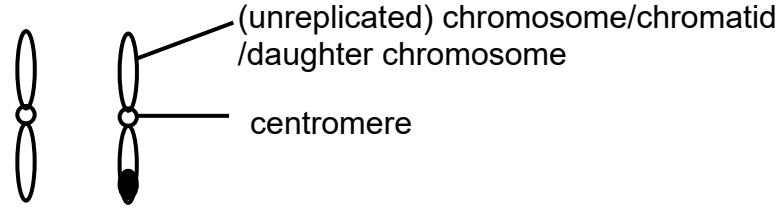
6.2. Individual chromosomes line up at the equator✓✓ of the cell
(Mark first one only) (2)

6.3. a) Cell membrane✓ (1)
b) Spindle fibres✓ (1)

6.4. - It contracts✓/shortens
- to pull the chromosomes✓/ daughter chromosomes/chromatids to opposite poles of the cell (2)

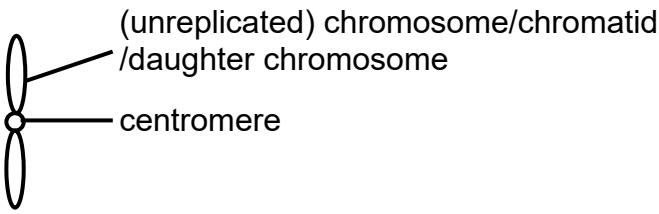
6.5

Structure C in the final phase of Meiosis/ Telophase II



OR

Structure C in the final phase of meiosis/ Telophase II



Guideline for assessing the drawing

CRITERIA	ELABORATION	MARK
Heading (H)	-Structure **C** in the final phase of meiosis/Telophase II	1
Correct drawing (D)	-Daughter chromosome/unreplicated chromosome/chromatid/s drawn from structure **C** only	1
Correct shading (S)	-One unshaded -One with shaded tip **OR** one unshaded	1
Labels (L)	-Any correct label	1

(4)

(11)

Question 7

7.1. (a) Metaphase I✓ (1)
(b) Telophase I✓ (1)
7.2. (a) B✓ (1)
(b) C✓ (1)
(c) D✓ (1)
7.3. Testis✓ (1)
(6)

Question 8

- in prophase I✓ of meiosis
- crossing over✓ occurs
- between homologous chromosomes✓
- resulting in the exchange of genetic material✓
- leading to chromosomes with a mixture of maternal and paternal genetic material✓

- In metaphase✓ of meiosis
- random arrangement of chromosomes occur✓
- leading to chromosomes moving into gametes in different combinations✓ Any 5

(5)

(5)

Question 9

9.1. Autosomes✓ (1)

9.2. a) – One chromosome comes from the sperm✓/father
- and other comes from the ovum✓/mother (2)

b) – Shape✓
- Size✓/length
- Position of genes✓/alleles
- Genes coding for same characteristic✓
- Location of centromere✓

(Mark the first THREE only) (3)

9.3. - Gonosomes are not identical✓/chromosomes at position 23 are not identical
- Individual 1 has XY gonosomes✓/is a male
- Individual 2 has XX gonosomes✓/ is a female (3)

(9)

Question 10

10.1. (a) Down syndrome✓ (1)
(b) Anaphase I/II✓ (1)
(c) Chromosomal aberration✓ (1)
(3)

Question 11

11.1. - Due to non-disjunction✓/ non-separation of a chromosome pair
- during Anaphase I✓
- Two chromosomes moved to the one pole✓ and
- none moved to the other pole✓

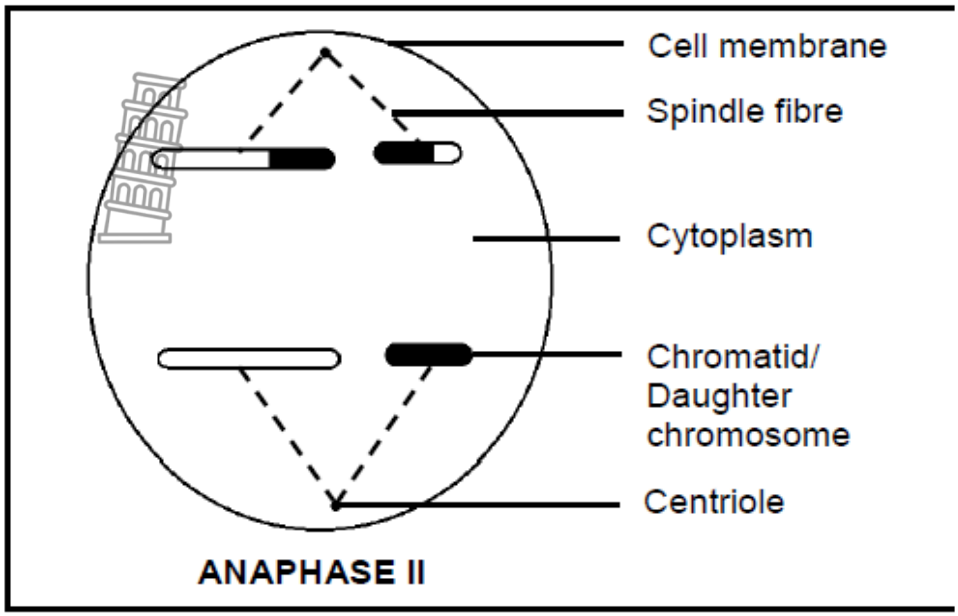
(3)

11.2. - Gamete **A** will have 24 chromosomes✓/ extra chromosome
- and when it fertilises a normal ovum✓/ gamete with 23 chromosomes
- the zygote will have 3 chromosomes at position 21✓/ 47 chromosomes

(3)

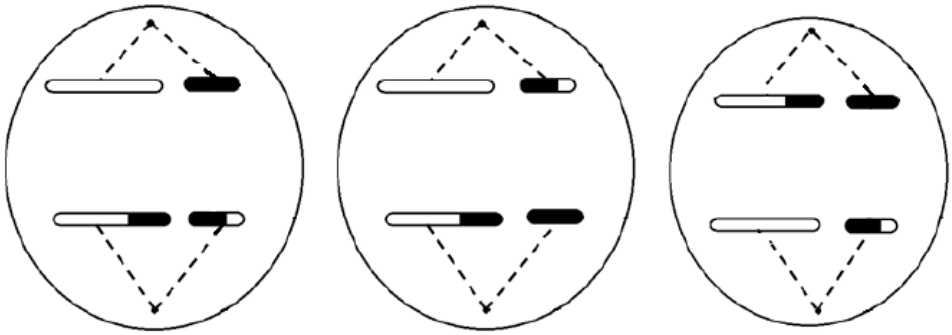
11.3. (a) Prophase I
(b) - Adjacent chromatids of homologous chromosomes cross✓
- At a point called the chiasma✓ (1)
- There is an exchange of DNA segments✓/genetic material (3)
(10)

Question 12



OR

ANY ONE OF THE FOLLOWING ARRANGEMENTS INCLUDING CORRECT LABELS



MARK ALLOCATION FOR DIAGRAM

Correct phase drawn/chromatids separating **(P)**	1
Correct shading of chromatids **(S)**	1
Correct number and size of individual chromatids/daughter chromosomes (2 short and 2 long) **(N)**	1
Any TWO correct labels	2
TOTAL	**5**

(5) (5)

(5)

Question 13

13.1. Centromere✓ (1)

13.2. Metaphase I✓ (1)

13.3. - A pair of chromosomes with the same structure✓/location of centromere/ length and
- the same sequence of genes✓
- One is of maternal origin and the other of paternal origin✓ (3)

13.4. - Some chromatids have a mixture of genetic material✓ from its homologue
- as crossing over✓ took place
- during Prophase I✓ (3)

13.5. 48✓✓ arbitrary units. (2)

(10)

Question 14

14.1. Centrosome✓ (1)

14.2. Anaphase I✓ (1)

14.3. - The spindle fibres contract✓
- The centromeres split✓
- Each chromatid is pulled to the opposite poles✓ Any 2 (2)

14.4. Crossing over✓ (1)

14.5. It leads to (genetic) variation✓
(Mark first ONE only) (1)

14.6. 46✓/23 pairs (1)\

14.7. Structure B consists of two DNA molecules✓/ contains a double thread/ is made up of two chromatids
-because of DNA replication✓
- Structure C consists of one DNA molecule✓/ contains a single thread/ chromatid
- because it is unreplicated✓/ as a result of splitting of the chromosome during anaphase 2 Any (3)

(10)

Question 15

15.1. a) Centrosome✓ (1)
b) Chromosome✓ (1)
c) Cell membrane✓ (1)

15.2. a) 2✓- Metaphase II✓ (2)
b) 4✓- Prophase I✓ (2)
c) 1✓- Anaphase I✓ (2)

15.3. a) 2✓ (1)
b) 23✓ (1)
c) 46✓ (1)
(12)

Question 16

16.1. a) Meiosis✓/ Meiosis I (1)
b) Prophase I✓ (1)
16.2. Ovary✓ (1)
16.3. C✓- centromere✓ (2)
16.4. 3✓/Three (1)
(6)

Question 17

17.1 (a) centromere✓ (1)
. (b) Chiasma✓/chiasmata (1)
(c) Homologous chromosomes✓/ -chromosome pair/bivalent (1)
(d) Chromatid✓/ sister chromatid (1)

17.2 - Similar shape✓/ similar centromeres
. - size✓ and
- genetic composition✓
(Mark first TWO only) (2)

17.3 - In prophase 1✓
. - Non-sister chromatids/ one chromatid of each homologous chromosome pair✓
- Touch✓/ overlap
- At a point called chiasma✓
- DNA/ genetic material is crossed over✓/ swopped at the chiasma.
(5)

17.4 (a) 21✓ (1)
.
(b) 42✓ (1)

(c) 21✓ (1)
(14)

Question 18

- When chromosome pair 21/chromosome 21 fail to separate✓
- during Anaphase✓
- the daughter cells (gametes) will have 24 chromosomes✓/an extra chromosome
- when this gamete is fertilised by a normal gametes✓ with 23 chromosomes.
- the zygote will have 47 chromosomes✓/3 chromosomes at position 21/Trisomy 21

(5)

QUESTION 19

19.1. (a) Prophase 1✓ (1)
(b) Twelve✓ (1)
(c) Three / 3✓ (1)
19.2 (a) Nuclear membrane✓ (1)
(b) Cell membrane✓ / plasmalemma / plasma membrane (1)
(c) Nuclear membrane✓ (1)
19.3 -Testes✓ (1)
-Ovaries✓ (1)

(8)

Question 20

20.1 5/ Five✓
20.2 Gonosomes✓ / sex chromosomes
20.3 (a) Down Syndrome✓ / Trisomy 21
(b) Non- disjunction✓
20.4 Male✓

TOPIC: GENETIC SOLUTIONS

Question1
Multiple choice questions:

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

(8x2) **(16)**

Question 2
Biological terms:

	DESCRIPTION	TERM
2.1	The study of heredity and variation in organisms	**Genetics**
2.2	All the genes that make up an organism	**Genome**
2.3	Two or more alternative forms of a gene at the same locus	**Alleles**
2.4	The position of a gene on a chromosome	**Locus**
2.5	The non-sex chromosomes in humans	**Autosomes**
2.6	An inherited disorder where blood fails to clot properly	**Haemophilia**
2.7	The number, shape and arrangement of all chromosomes in the nucleus of a somatic cell	**Karyotype**
2.8	A genetic cross involving one gene and its alleles	**Monohybrid**
2.9	A genetic disorder where blood does not clot	**Haemophilia**
2.10	The use of living organisms and their biological processes to improve the quality of human life	**Biotechnology**
2.11	The type of inheritance involving two alleles that are not dominant over one another	**Incomplete dominance**
2.12	Characteristics controlled by genes which are located on the sex chromosomes	**Sex-linked**
2.13	The type of inheritance involving alleles that equally determine the phenotype of heterozygous offspring	**Codominance**
2.14	An allele that is expressed phenotypically only in the homozygous condition	**Recessive**
2.15	The physical and functional expression of a gene	**Phenotype**
2.16	The production of a genetically identical copy of an organism using biotechnology	**Cloning**

2.17	The manipulation of the genetic material of an organism to get desired changes	**Genetic engineering**
2.18	A diagram showing the inheritance of genetic disorders over many generations	**Pedigree diagram**
2.19	An allele that does not influence the phenotype when found in the heterozygous condition	**Recessive**
2.20	Organisms having two identical alleles at a given locus	**Homozygous**
2.21	An allele that is always expressed in the phenotype	**Dominant**
2.22	An individual having two non-identical alleles for a characteristic	**Heterozygous**
2.23	A segment of a chromosome that codes for a particular characteristic	**Gene**
2.24	The type of inheritance which produces an intermediate phenotype	**Incomplete dominance**
		24 x1 = **(24)**

Question 3
Matching Columns

3.1 Both A and B✓✓
3.2 None✓✓
3.3 A only✓✓
3.4 B only✓✓
3.5 A only✓✓
3.6 None✓✓
3.7 A only ✓✓
3.8 B only✓✓

(8x2) **(16)**

Question 4

4.1 Incomplete dominance✓ (1)

4.2 - The pink flower colour is an intermediate phenotype✓/ a blend of red and white indicating that neither of the alleles is dominant✓ (2)

4.3

P_1 Phenotype: Pink x Pink✓
Genotype: RW x RW✓

Meiosis

G/gametes: R, W x R, W✓

Fertilisation

F_1 Genotype: RR; RW; RW; WW✓

Phenotype: 1 Red: 2 Pink: 1 White✓*

P_1 and F_1✓
Meiosis and fertilisation✓

OR

P_1 Phenotype: Pink x Pink✓
Genotype: RW x RW✓

Meiosis

Fertilisation

Gametes	R	W
R	RR	RW
W	RW	WW

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype: 1 Red: 2 Pink: 1 White✓*

P_1 and F_1✓
Meiosis and fertilisation✓

1* **compulsory** + Any 5 (6)

(9)

Question 5

5.1

P_1 Phenotype: Male x Female✓
Genotype: XY x XX✓

Meiosis

G/gametes: X, Y x X, X✓

Fertilisation

F_1 Genotype: XX; XX; XY; XY✓

Phenotype: female : male✓

P_1 and F_1✓
Meiosis and fertilisation✓

OR

P_1 Phenotype: Male x Female✓
Genotype: XY x XX✓

Meiosis

Fertilisation

Gametes	X	Y
X	XX	XY
X	XX	XY

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype: female: male✓

P_1 and F_1✓
Meiosis and fertilisation✓

Any (6)

5.2 - Normal females have two X ✓chromosomes
- Normal males have one X and one Y✓
- The female always provides X in the egg✓
- If an egg cell is fertilized by an X bearing sperm ✓a female/girl✓ is formed
- If an egg is fertilized by a Y bearing sperm
- a male/boy✓ is formed

Any (5)

OR

Gametes		male gamete✓	
		X	Y
female gamete✓	X	XX✓	XY✓

2 XX : 2 XY
Female ✓ Male✓ (Any

(11)

Question 6

6.1 Purple✓ (1)

6.2 -When purple-flowering plants and white-flowering plants are crossed ✓
− all the offspring have purple flowers ✓/have no white flowers (2)

6.3 The two alleles for a characteristic✓
− separate during meiosis✓ so that
− each gamete contains only one allele✓ for that characteristic (3)

6.4

P₁	Phenotype	Purple	x	Purple✓
	Genotype	Dd	x	Dd✓
Meiosis				
	G/gametes	D, d	x	D, d✓
Fertilisation				
F₁	Genotype	DD; Dd; Dd		dd✓
	Phenotype	Purple : White✓*		

P₁ and F₁✓

Meiosis and fertilisation✓

*Compulsory 1 + Any 5

OR

P₁	Phenotype	Purple	x	Purple✓
	Genotype	Dd	x	Dd✓

Meiosis

Fertilisation

Gametes	D	d
D	DD	Dd
d	Dd	dd

1 mark for correct gametes
1 mark for correct genotypes

F₁ Phenotype Purple: White✓*

P₁ and F₁✓

Meiosis and fertilisation✓

(6)
(12)

Question 7

7.1 ffHh ✓ (1)

7.2 (a) (a) FfHh✓✓ (2)

(b) (b) 3✓ (1)

(c) (c) h✓ (1)

(d) (d) Long fingers and continuous hairline ✓✓ (2)

(7)

Question 8

8.1 Dihybrid✓ cross (1)

8.2 TTrr✓✓ (2)

8.3 TR✓, Tr✓, tR✓, tr✓ (4)

(7)

Question 9

-An individual inherits one allele from each parent✓
- The Y chromosome was inherited from the father✓✓
- and the recessive allele/X^h was inherited from the mother✓✓
- since the mother has two recessive alleles/X✓^{h} X^h
- A son only needs to get one recessive allele to be haemophiliac✓since the
- Y-chromosome does not carry any allele to mask the haemophilia allele✓ Any **(4)**

Question 10

10.1 Pedigree✓ diagram (1)

10.2 (a) 6✓ (1)

(b) 1✓ (1)

10.3 X^GX^g✓✓ (2)

10.4 Unaffected✓✓ / without Goltz syndrome (2)

10.5 - Pilusa is affected ✓ X^GY
- Anju is unaffected✓ X^gX^g
- Males inherit the Y chromosome from Pilusa✓
- and inherit X^g from Anju✓ (4)

(11)

Question 11

11.1 (a) Normal female✓ (1)

(b) X^HX^h✓✓ (2)

11.2
- Haemophilia is caused by a recessive allele✓
- Carried on the X chromosome✓
- Females have two X chromosomes✓/ Males only have one X chromosome
- Females must inherit two copies of the recessive allele✓/ females who inherit only one of the recessive allele are still normal

Any (3)

11.3

P_1/P_3 Phenotype Normal male x Haemophiliac female✓

Genotype X^HY x X^hX^h✓

Meiosis

G/gametes X^H, Y x X^h, X^h✓

Fertilisation

F_1/F_3 Genotype X^HX^h; X^HX^h; X^hY; X^hY✓

Phenotype 2 normal daughters : 2 haemophiliac sons✓

- **50%✓ chance of having a haemophiliac son**

~~P_1 and~~ F_1✓

Meiosis and fertilisation✓

***1 compulsory** +any 6

OR

P_1/P_3 Phenotype Normal male x Haemophiliac female ✓

Genotype X^HY x X^hX^h✓

Meiosis

Fertilisation

Gametes	X^h	X^h
X^H	X^HX^h	X^HX^h
Y	X^hY	X^hY

1 mark for correct gametes
1 mark for correct genotypes

F_1/F_3 Phenotype 2 normal daughters : 2 haemophiliac sons✓

- **50%✓ chance of having a haemophiliac son**

P_1 and F_1✓

Meiosis and fertilisation✓ ***1 compulsory**+any 6

(7)

(13)

Question 12

12.1 A change in the sequence✓ of nitrogenenous bases✓/ nucleotides in a gene (2)

12.2 Nigeria ✓% (1)

12.3 $\frac{39\ 746}{305\ 733}$ ✓ x 100✓ =13✓ % (3)

12.4 (a) dd✓ (1)

(b) Dd✓ (1)

(8)

Question 13

13.1 The dominant allele is always expressed (in the phenotype) when in the heterozygous condition✓✓

OR

- The dominant allele masks/hides the (phenotype of the) recessive allele ✓✓ (2)

13.2 (a) N✓ (1)

(b) Tt✓ (1)

13.3
- J is a taster and therefore must have one dominant allele✓/ T
- Individual K is tt✓
- Individual O is a non-taster✓/ is homozygous recessive/tt
- She must have inherited a recessive allele/t from each parent✓
- Therefore, J must have one recessive allele✓ /t

OR

- J is a taster and therefore must have one dominant allele✓ /T
- If J is homozygous dominant✓ /TT
- and K is homozygous recessive✓ /tt
- then it is not possible to have child (O) who is homozygous recessive✓ / tt
- as she must have inherited a recessive allele/t from each parent✓

Any (4)

(8)

Question 14

14.1 (a) 3✓ /Three (1)

(b) 2✓ /Two (1)

14.2 Hearing✓ (1)

14.3
- Bob and Ann can both hear✓
- They have a child who is deaf✓ /who has the genotype aa
- This means that each parent carries an allele for deafness✓ /are heterozygous/Aa
- but it is masked✓ by the dominant allele /which is for hearing (4)

14.4 AA✓ and Aa✓ (2)

(9)

Question 15

15.1
- Spine✓
- Hips✓

(Mark first TWO only) (2)

15.2
- A change in the sequence✓
- of nitrogenous bases✓ /nucleotides in DNA (2)

15.3
- To check for the gene mutation✓
- and if it results in the high bone density✓ (2)

15.4 Produces high bone density✓ /reduces the risk of bone fractures (1)

15.5 $\frac{13}{20}$✓ x 100✓ = 65✓% **OR** $\frac{7}{20}$ x 100✓ = 35%
(100 – 35)✓ = 65✓% (3)

(10)

Question 16

16.1 (a) 4✓/Four (1)

(b) 1✓/One (1)

16.2 I^Ai✓✓ (2)

16.3 (a) Son 1✓ (1)

(b) Mother✓ (1)

(c) Son 1✓ (1)

(7)

Question 17

17.1 - The nucleus of the somatic cell is diploid✓/ has a full set of chromosomes/has all the genetic material whereas
- the nucleus of the sperm cell is haploid✓/contains half the set of chromosomes/ has half the genetic material
- The somatic cell carries the desired characteristic✓/straight hair

(3)

17.2 -To ensure that:
- The DNA (of the ovum)/characteristic of curly hair is removed✓
- Only the desired DNA is present in the clone✓
- Correct number of chromosomes is present in the clone✓ Any (2)

17.3 (Horse) S ✓ (1)

17.4 - To produce organisms with desired traits✓e.g. health, appearance, nutritious, yield, shelf life etc.
- Conservation of threatened species✓
- To create tissue/organs for transplant✓ Any (2)

(Mark first TWO only)

(8)

Question 18

18.1 I^A✓ I^B✓ i✓ (3)

18.2 2✓ (1)

18.3 - Any individual inherits one allele✓ (2)
- from each parent✓

18.4 - Each child✓
- has an equal✓/25% chance of having
- any blood group✓/ A, B, AB, or O. (3)

(9)

Question 19

19.1 (a) I^BI^B✓ of I^Bi✓ (2)
(b) ii✓ (1)

19.2 - The baby inherited one allele for type O blood/i from each parent✓ since
- her genotype is ii✓
- Mr Phonela does not have an allele for O blood✓ (3)

19.3 Blood type can be used to exclude a particular ✓man as the parent
but it cannot confirm that a particular man is the father✓
Since a large portion of the population have the same blood type✓ Any (2)
(8)

Question 20

20.1 3✓/ Three (1)

20.2 - Complete dominance✓
- The allele for blood group B/ IB is dominant✓✓and
- the allele for blood group O/ i is recessive✓✓ (3)

20.3

P_1 Phenotype: Blood group AB x Blood group B✓
Genotype: I^AI^B x I^Bi✓

Meiosis

G/gametes I^A I^B x I^B i✓

Fertilisation

F_1 Genotype: I^AI^B I^Ai I^BI^B I^Bi✓*

Phenotype: Blood group:
AB; A; B✓*

P_1 and F_1✓

Meiosis and fertilisation✓

Compulsory 2*+ Any 4

OR

P_1 Phenotype: Blood group AB x Blood group B✓
Genotype: I^AI^B x I^Bi✓

(6)

Meiosis

Fertilisation

Gametes	I^A	I^B
I^B	I^AI^B	$I^B I^B$
i	I^A i	I^B i

1 mark for correct gametes
1 mark for correct genotypes*

(10)

F_1 Phenotype: Blood group:
AB; A; B✓*

P_1 and F_1✓
Meiosis and fertilisation✓

Compulsory 2*+ Any 4

Question 21

- The blood group of a child is determined by the alleles received from both parents✓
- The blood group of the mother, the child and the possible father is determined✓
- If the blood group of the mother and possible father cannot lead to the blood group of the child✓
- the man is not the father✓
- If the blood group of the mother and the possible father can lead to the blood group of the child✓
- the man might be the father✓
- This is not conclusive✓
- because many men have the same blood group✓ Any 6 (6)

Question 22

22.1	Dihybrid✓ cross		(1)
22.2	(a)	Smooth✓ stem	(1)
	(b)	Elongated✓ fruit	(1)
22.3	(a)	nnrr✓✓/nrnr/ rrnn	(2)
	(b)	Smooth stem round fruit✓✓	(2)
			(7)

Question 23

23.1	- The disorder is controlled by alleles✓/genes that - are located on the autosomes✓	(2)
23.2	One✓/1	(1)
23.3	- Individuals 3 and 4 are both without Tay-Sachs disease✓ - The child has Tay-Sachs✓/Individual 7 has Tay-Sachs - which is only expressed in the phenotype in a homozygous condition✓ - Each parent must carry a recessive allele✓/be heterozygous - The child has two recessive alleles✓ - One was received from each parent✓ **OR** - Individuals 3 and 4 are both without Tay-Sachs disease✓ - If it was caused by a dominant allele✓ - then individual 3 or 4 would *have* Tay Sachs✓ - and still have a child with Tay-Sachs✓/individual 7 has Tay-Sachs - who could be heterozygous✓ Any	(5)
23.4	TT✓ tt✓	(2)
		(10)

Question 24

	P_1	Phenotype	Woman without haemophilia	x	Man with haemophilia✓	
		Genotype	X^HX^h	x	X^hY✓	
	Meiosis					
		G/gametes	X^H, X^h	x	X^h, Y✓	
	Fertilisation					
	F_1	Genotype	X^HX^h, X^HY, X^hX^h, X^hY✓			
		Phenotype	1 daughter without haemophilia, 1 daughter with haemophilia, 1 son without haemophilia, 1 son with haemophilia✓			
			0%✓*chance of a daughter homozygous for normal blood clotting			
	P_1 and F_1✓ Meiosis and fertilisation✓ ***1 compulsory mark** + any 6					

OR

P_1	Phenotype	Woman without haemophilia	x	Man with haemophilia✓
	Genotype	X^HX^h	x	X^hY✓

Meiosis

Fertilisation

Gametes	X^H	X^h
X^h	X^HX^h	X^hX^h
Y	X^HY	X^hY

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype 1 daughter without haemophilia, 1 daughter with haemophilia, 1 son without haemophilia, 1 son with haemophilia✓

0%✓* chance of a daughter homozygous for normal blood clotting

P_1 and F_1✓
Meiosis and fertilisation✓

***1 compulsory mark**+ any 6 **(7)**

Question 25

25.1	To determine which blood group was the most common in their community✓✓		(2)
25.2	(a)	- Obtain permission from the school✓/clinic to conduct the investigation - Decide on the sample size✓ - Decide on the method for recording results✓ - Decide on time✓/date to collect data from the clinic **(Mark first THREE only)**	(3)
	(b)	- Sampled 3✓/all blood donor clinics in the community - 200 donors per clinic sampled✓/600 donors Any **(Mark first ONE only)**	(1)
	(c)	First time donors' blood groups are not known yet✓/ not in the database	(1)
	25.3	$\frac{15}{100}$ ✓x 600✓= 90✓ participants	(3)
	25.4 (a)	(Blood group) O✓	(1)
	(b)	(Blood group) AB✓	(1)
	25.5	$I^A I^A$ ✓ I^A i✓	(2)
			(14)

Question 26

26.1	3✓/Three		(1)
26.2	(a)	H✓	(1)
	(b)	Rr✓	(1)
	(c)	C✓and F✓	(2)
			(5)

Question 27

27.1	Dihybrid✓cross		(1)
27.2	(a)	Brown✓ fur and long ears✓	(2)
	(b)	bbee✓✓	(2)
	(c)	Be✓ be✓	(2)
			(7)

Question 28

28.1	954 000✓	(1)
28.2	1 800 000✓ – (954 000 + 180 000 + 54 000)✓ = 612 000✓people **OR** 1 800 000✓ - 1 188 000✓ = 612 000✓people **OR** $\frac{34}{100}$✓ x 1 800 000✓ = 612 000✓people	(3)
28.3	- The allele for blood group A/ I^A is inherited from one parent✓ and - the allele for blood group B/ I^B is inherited from the other parent✓ therefore - the child has blood group AB✓/genotype I^AI^B	(3)
		(7)

Question 29

29.1	- Males have only one X chromosome✓/The Y-chromosome does not have this allele and - have to inherit only one recessive allele✓ to have white teeth - whereas females have two X chromosomes✓ and have to inherit two recessive alleles to have white teeth✓	(4)

29.2	**P_1** Phenotype: Male with brown teeth x Female with white teeth✓ Genotype: X^BY x X^bX^b✓ *Meiosis* **G**/gametes: X^B, Y x X^b, X^b✓ *Fertilisation* **F_1** Genotype: X^BX^b, X^BX^b, X^bY, X^bY✓ Phenotype: 1 female with brown teeth: 1 male with white teeth✓* P_1 and F_1✓ Meiosis and fertilisation✓ ***1 compulsory mark** + Any 5 **OR** **P_1** Phenotype: Male with brown teeth x Female with white teeth✓ Genotype: X^BY x X^bX^b✓ *Meiosis* *Fertilisation* Gametes: X^B, Y; X^b, X^bY; X^b, X^bY 1 mark for correct gametes 1 mark for correct genotypes **F_1** Phenotype: 1 female with brown teeth: 1 male with white teeth✓* P_1 and F_1✓ Meiosis and fertilisation✓ ***1 compulsory mark** + Any 5	(6)
		(10)

Question 30

30.1	- Embryos✓ - Umbilical cord✓ - Bone marrow✓ **(Mark first THREE only)**	(3)
30.2	- Stem cells are undifferentiated✓ - and have the potential to develop into any type of cell✓ - to replace affected/defective cells✓ causing a disorder Any	(2)
30.3	- Stem cells are undifferentiated✓ - and have the potential to develop into any type of cell✓ to replace affected/defective cells✓ causing a disorder Any	(1)
		(6)

TOPIC: EVOLUTION

Question1

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

(10 x 2) **(2 0)**

Question 2

	DESCRIPTION	TERM
2.1	A type of variation where there is a range of phenotype for the same characteristics	**Continuous variation**
2.2	Present day distribution of living organisms	**Biogeography**
2.3	The selection of desirable characteristics by humans	**Artificial selection/ selective breeding**
2.4	The process whereby new species are formed	**Speciation**
2.5	The type of variation in a population with no intermediate phenotype	**Discontinuous variation**
2.6	An explanation describing evolution as consisting of long phases of little change alternating with short phases of rapid change	**Punctuated Equilibrium**
2.7	The permanent disappearance of species from earth	**Extinction**
2.8	An explanation for something that has been observed in nature and which can be supported by facts, laws, and tested hypothesis	**Theory**
2.9	Organisms with similar characteristics, able to interbreed randomly and produce fertile offspring	**Species**
2.10	Structured in different organism that have similar basic plan which suggest that they share common ancestor	**Homologous structures**
2.11	The process that enables organisms with desirable characteristics to survive and reproduce in a particular environment	**Natural selection**
2.13	Remains of life forms preserved in rocks, ice, and dried sap trees	**Fossils**
2.14	Change in the characteristics of species over time	**Biological evolution**
2.15	Large, pointed teeth in African apes that are used for tearing food	**Canine**
2.16	The part of the skull that houses the brain	**Cranium**
2.17	Having a protruding jaw	**Prognathous**

2.18	A diagrammatic representation showing possible evolutionary relationships between different species	**Phylogenetic tree/ Cladogram**
2.19	The opening in the base of the skull through which the spinal cord passes	**Foramen magnum**
2.20	Family to which humans belong	**Hominidae**
2.21	An upright posture and walking only on two legs	**Bipedalism**
2.22	The type of vision shared by apes and humans that allows for depth perception	**Stereoscopic vision**
2.23	The act of walking on all four limbs	**Quadrupedal**
2.27	Similar structures that are inherited from a common ancestor and are modified for different functions	**Homologous structures**
2.28	The formation of new species	**Speciation**
	(28 X 1)	**(28)**

Question 3

3.1 A only✓✓
3.2 B only✓✓
3.3 Both A and B✓✓
3.4 A only✓✓
3.5 Both A and B✓✓
3.6 A only✓✓
3.7 B only ✓✓

(6 x 2) **(10)**

Question 4

4.1 Genetic✓ evidence (1)

4.2 1 – **A**✓ **C**

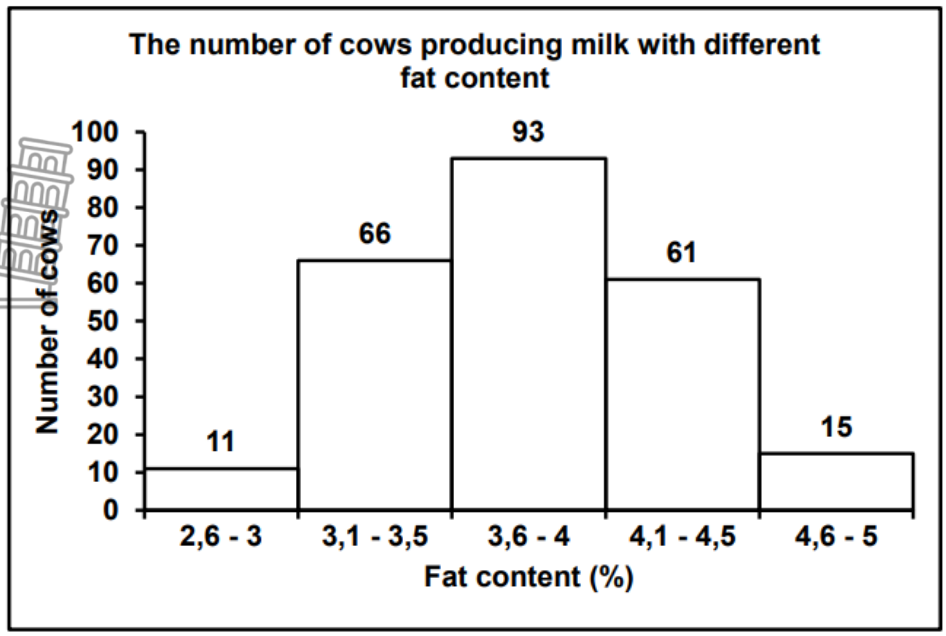
2 – **C**✓ OR **A**

3 – **B**✓ **B** (3)

(4)

Question 5

5.1



Guideline for assessing the graph

CRITERIA	ELABORATION	MARK
Correct type of graph **(T)**	Histogram drawn	1
Caption of graph **(C)**	Both variables included	1
Axes labels **(L)**	X- and Y-axis correctly labelled with units	1
Scale for X- and Y-axis **(S)**	- Same width of bars for X-axis and - Correct scale for Y-axis	1
Plotting of bars **(P)**	1 to 4 bars plotted correctly All 5 bars plotted correctly	1 2

(6)

5.2 $\frac{11}{246}$ ✓ x 100✓ = 4,47✓ % (Accept 4,5) (3)

5.3 Continuous✓ variation (1)

5.4 There is range of intermediate phenotypes✓ /the fat content % is a range (1)

(11)

Question 6

6.1
- Crossing over ✓
- Random arrangement of chromosome ✓
- Random fertilisation ✓
- Chromosomal mutation ✓
- Random mating ✓ (3)

6.2 (a) Mutant gene✓/ inherited from their ancestors (1)

(b) Influenced by altitude ✓/ level of oxygen (1)

6.3
- More haemoglobin present ✓ (2)
- to allow for maximum absorption of the available oxygen ✓

OR
- more oxygen will be available ✓
- to ,meet their energy need ✓

6.4
- Originally the amount of red blood cells was similar in all humans ✓/ the Tibetans did not produce the number of red blood cells
- as a result of low oxygen content at high altitudes ✓
- the red blood cells tried to increase the amount of oxygen absorbed ✓
- as a result ancestral Tibetans produce more red blood cells ✓/ developed ways of using oxygen more efficiently to increase the availability of oxygen to the body
- this acquired characteristics ✓
- was passed on to their offspring ✓
- all Tibetans now produce more red blood cells✓/ use oxygen more efficiently to survive at high altitude. (5) (Any five)

(12)

Question 7

7.1 (a) Gall size (1)

(b) Percentage of gallfly larvae killed (1)

7.2
- nutrition / food (1)
- protection
- space (Any one)

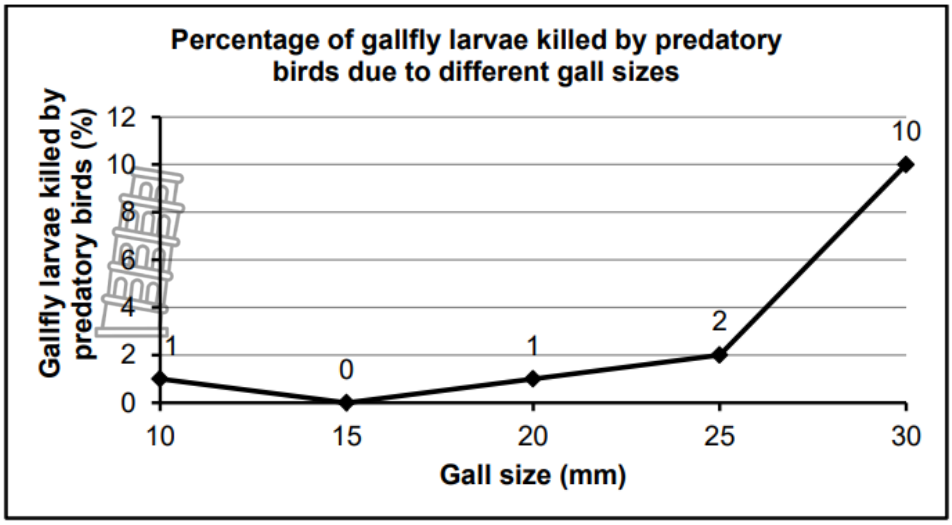
(Mark the first ONE only)

7.3
- There is a range of (intermediate) values in gall size (1)

7.4
- Larvae in 30 mm galls are eating more (3)
- since there are more visible to birds and
- contain more/ larger larvae

OR
- larvae in galls that are 25 mm and smaller are eaten less
- since they are less visible to birds and
- contain fewer / smaller larvae

7.5



Guideline for the assessing of the graph

CRITERIA	ELABORATION	MARK
Correct type of graph **(T)**	Line graph drawn	1
Caption of graph **(C)**	Both variables included	1
Axes labels **(L)**	Correct labels and units on X- and Y-axes	1
Scale for X- and Y-axes **(S)**	Equal spacing between intervals for each axis	1
Plotting of points **(P)**	1 to 4 points plotted correctly All 5 points plotted correctly	1 2

(6)
(13)

Question 8

8

- Organisms produce a large number of offspring✓
- There is variation✓ amongst the offspring
- Some have favourable characteristics and some do not✓
- When there is a change in the environmental conditions✓/ there is competition
- organisms with favourable characteristics, survive✓
- whilst organisms with unfavourable characteristics, die✓
- The organisms that survive, reproduce✓
- and pass on the allele for the favourable characteristic to their offspring✓
- The next generation will therefore have a higher proportion of individuals with the favourable characteristic✓ Any

(7)

Question 9

9.1
- He would use his of use and disuse✓
- and law of iheritance of acquired characteristics✓
- The ancestor of spider monkeys had short tails✓
- to be able to hold onto tree branches✓
- As a result their tails became longer✓
- and this characteristic was passed on to the next generation✓ Any (6)

9.2
- Evolution occurs by natural selection✓
- There was variation in the ancestral population
- Some spider monkeys had short tails✓
- and some had long tails✓
- The spider monkeys with long tails were able to hold onto tree branches✓ /did not
- fall to the ground
- and survived✓ /were not attacked by predators
- Those with short tails could not hold onto tree branches✓ /fell on the ground
- They died✓ /were attacked by predators
- The characteristic for long tails was passed to the offspring✓ Any (8)

(14)

Question 10

10

	Lamarckism		Darwinism
1	Variation of the offspring occurs when individuals in the population change. ✓	1	Variation in the offspring is inherited. ✓
2	Change occurs because of adaptation to the environment/ Law of use and disuse.✓	2	Natural selection – individuals best suited to the environment survive.✓
3	Individuals in the population change.✓	3	The population as a whole changes.✓
4	Acquired characteristics are inherited by offspring.✓	4	Characteristic are passed on from generation to generation to enable individuals to survive in the environment.✓

(Mark first THREE only) (Any (3 x 2) + 1 for table) **(7)**

11.2 - Breeding at different times of the year✓
- Species-specific courtship behaviour✓
- Adaptations to different pollinators✓
- Infertile offspring✓
- Prevention of fertilisation✓

(Mark first THREE only) Any (3)
(7)

Question 11

11.1 - As the wings were used less✓
- they became reduced in size✓/less developed
- and could not be used for flying✓
- This acquired characteristic was passed on to the offspring✓ (4)

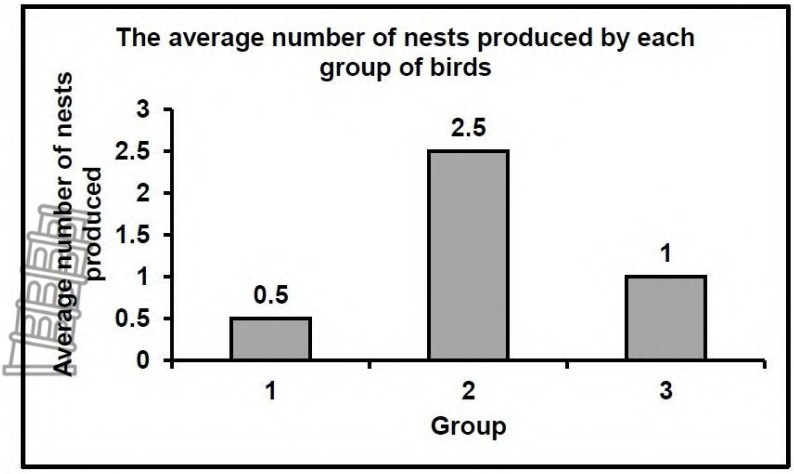
Question 12

12.1 (a) (Species-specific) courtship behaviour✓ (1)
(b) Length of the (male long-tailed widowbird's) tails✓ (1)

12.2 - A larger sample size✓
- Increases the reliability✓ of the investigation (2)

12.3 - To serve as a control✓
- so that it can be compared✓ with the other groups
- and show that the tails length is the only factor that affects the results✓ /improves the validity of the investigation Any (2)

12.4



Guideline for assessing the graph

CRITERIA	ELABORATION	MARK
Correct type of graph **(T)**	Bar graph drawn	1
Caption of graph **(C)**	Both variables included	1
Axes labels **(L)**	X- and Y-axis correctly labelled	1
Scale for X- and Y-axis**(S)**	- Equal space between bars and width of bars for X-axis and - Correct scale for Y-axis	1
Plotting of bars **(P)**	1 to 2 bars plotted correctly All 3 bars plotted correctly	1 2

(6)

12.5 The longer the (male long-tailed widowbird's) tail, the higher the mating success✓✓

OR

The shorter the (male long-tailed widowbird's) tail, the lower the mating success✓✓ (2)

(14)

Question 13

13.1
- The mating call can be easily heard✓/can be heard over a distance
- to ensure that a mate is attracted✓ (2)

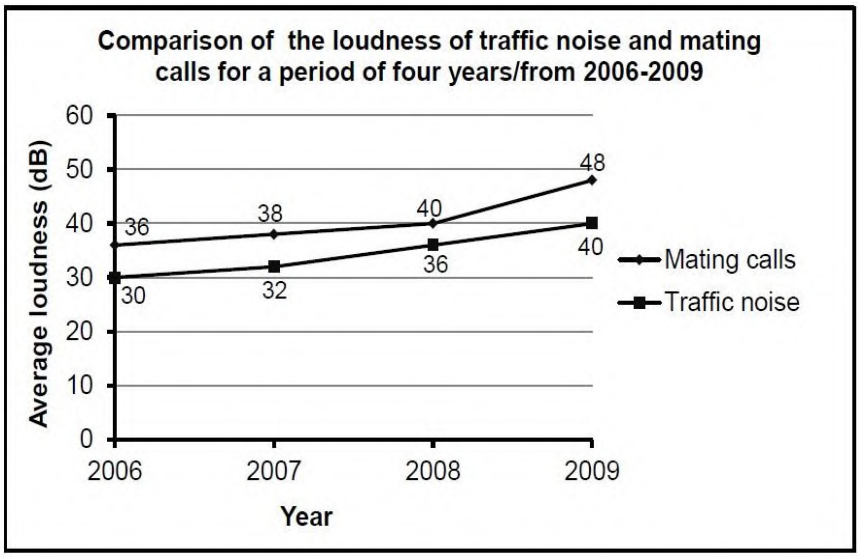
13.2
- The investigation was done over a long period✓/6 years
- Many recordings were done in each year✓/ an average was calculated Any 1 (1)

13.3 As the traffic noise increased, the loudness of frogs' mating calls increased✓✓ (2)

13.4
- Type of apparatus used✓
- Time of recordings✓
- Distance recordings are taken from✓
- Person taking measurements✓ Any 2 (2)

(Mark first TWO only)

13.5



CRITERION	ELABORATION	MARKS
TYPE	Two line graphs on the same set of axes (T)	1
KEY	A key or labels for each graph is present (K)	1
TITLE	Title of graph includes 3 variables	1
SCALE	Correct scale for X-axis and Y-axes (S)	1
LABELS	Correct label and unit for X-axis and Y-axis (L)	1
PLOTTING	Correct plotting of points	1: 1 to 7 points plotted correctly 2: Graph drawn for **required years** only, with all 8 points plotted correctly.

(7)

(14)

Question 14

14.1 Survival of the owls✓ (1)

14.2 The brown owls are less suited to survive than the white owls✓✓

OR

14.3 The white owls are more suited to survive than the brown owls✓✓ (2)

14.4
- There is a decrease in the number of white owls✓ because
- there is less snow✓ and
- white owls will not be camouflaged✓/will be more visible to predators (3)

14.5
- They counted/sampled the number of owls at the beginning✓ of the 4-month period
- and again, at the end✓
- Then they calculated the difference✓between the two numbers (3)

14.6 (Same):
- Time period✓/4 months
- Population✓
- Season✓/winter
- Method of calculation✓ Any (1)

(Mark first ONE only)

(10)

Question 15

15.1
- They measured the jaw size of lizards on both islands✓ and
- determined the average jaw size for each population✓
- They calculated the difference✓ between the two (3)

15.2
- A larger jaw allows for better muscle attachment✓
- Thereby increasing the bite force✓/ability
- to break down the fibrous plant material✓ (3)

15.3
- They allowed the lizards of the two islands to mate✓
- and determined if they were able to interbreed✓ and
- give rise to fertile offspring✓ Any (2)

15.4
- Biodiversity remains the same✓/there is no effect
- because the number of species remains the same✓/a new species has not been formed

OR

- Biodiversity decreases✓
- because some species of plants eaten on Island **B** could become extinct✓ (2)

15.5
- There is variation in the size of the lizards' jaws✓
- Some have small jaws and others have large jaws✓
- Due to the larger supply of plants✓/fewer insects
- the lizards with the larger jaws will have more food✓
- and survive✓
- while those with smaller jaws will be unable to feed✓
- and die✓
- The lizards that survive will reproduce✓ and
- the allele for larger jaws will be passed on to the offspring✓
- The next generation will have a higher proportion of lizards with larger jaws✓ Any (7)

(17)

Question 16

16.1 1900✓ (1)

16.2 $\left\{\frac{80}{20}\right\}$✓ x 100✓ = 400✓%

OR

$\left\{\frac{(100-20)}{20}\right\}$✓ x 100✓ = 400✓% (3)

16.3

Natural selection	Artificial selection
The environment or nature is the selective force✓	Humans represent the selective force✓
Selection is in response to suitability to the environment✓	Selection is in response to satisfying human needs✓
Occurs within a species✓	May involve one or more species✓ (as in cross breeding)

(Mark first TWO only) 1 for Table + Any 2 x 2 (5)

(9)

Question 17

17.1 - It is characterised by long periods of little or no change✓
- alternating with short periods of rapid change✓
- during which new species may form✓ (3)

17.2 They contain toxins✓which kill the snakes
OR
Too large✓to be swallowed Any (1)

17.3 - Having a small jaw✓
- means cane toads cannot be consumed✓
- thereby protecting the snakes from ingesting the toxins✓ (3)

17.4 Since the snake's jaws were used less✓ /not used
the snakes developed smaller jaws✓
This characteristic (of a smaller jaw) was inherited by the offspring✓
Over many generations the jaw of the snake became smaller✓
(4)
(11)

Question 18

18
- A population of a particular species becomes separated✓
- by a geographical barrier✓
- There is no gene flow between the separated populations✓
- Natural selection occurs independently in each population✓
- due to exposure to different environmental conditions✓/selection pressures
- The populations become very different✓from each other
- genotypically and phenotypically✓
- Even if the populations were to mix again✓
- they will not be able to interbreed✓
- The different populations are now new species✓

(6)

Any

Question 19

19.1 - There was once one large continent✓ and
- the common ancestor existed throughout this continent✓
- When Madagascar separated✓
- the common ancestor was found in both✓ regions (4)

19.2
- The common ancestor became separated into two **groups** by the ocean✓*
- There was no gene flow between the two **groups**✓
- Each **group** experienced different environmental conditions✓
- and underwent natural selection independently✓
- The individuals in each **group** became different✓
- genotypically and phenotypically✓
- to form the pottos and lemurs✓*
- Eventually if the two groups are mixed again, they cannot interbreed✓/produce fertile offspring. *2 **Compulsory** + Any 4

(6)

Question 20

20.1 Biogeography✓ (1)

20.2
- Similar organisms✓
- that can interbreed✓
- to produce fertile offspring✓ (3)

20.3
- The original population /common ancestor once lived on a large continent✓
- and became separated by continental drift✓/oceans - There was no gene flow amongst the three populations✓*
- Each population experienced different environmental conditions✓ - and underwent natural selection independently✓
- The individuals in each population became different✓ - genotypically and phenotypically✓
- Even if the (three) populations are mixed again✓
- they would not be able to interbreed✓/produce fertile offspring - forming the different species, the coyote, jackal, and dingo✓ *

2 compulsory* + any 5 (7)

(11)

Question 21

21 **MUTATIONS AND EVOLUTION IN PRESENT TIMES**
- In a population of insects✓/bacteria/Hi viruses/Galapagos finches
- mutations are a source of variation✓
- which may make some organisms more resistant✓/better suited
- to insecticides✓/antibiotics/antiretroviral medication/drought
- Those individuals that are not resistant/suited will die✓ whereas
- those that are resistant/well suited, will survive✓
- This is known as natural selection✓
- As a result, individuals of the future generations will be resistant to the
- insecticides✓/antibiotics/antiretroviral/adapted to drought

Any **(8)**

Question 22

22.1
- It decreases the number of harmful bacteria the most✓
- thereby preventing disease in cattle✓/resulting in less medical expenses
- Decreasing mortality✓/maintaining the number of cattle
- to sell✓/breed /increase profit (4)

22.2
- Natural selection✓ occurs - There is variation✓/mutation in the population of bacteria
- Some are resistant to antibiotics, some are non-resistant ✓
- When antibiotic is added✓ to the animal feed
- The bacteria that are non-resistant are killed by the antibiotic✓
- Those that are resistant survive and reproduce✓
- The characteristic for resistance to antibiotics is passed on to the offspring✓
- The next generation will have a higher proportion of antibiotic resistant bacteria✓ (6)

(10)

Question 23

23.1 Type of antibiotic✓ (1)

23.2 Same:

- Environmental conditions✓/example
- Amount of antibiotic✓
- Concentration of antibiotic✓
- Time of initial injection of antibiotics✓
- Age of the piglets✓
- Species of piglets✓
- Type food given to piglets✓
- Amount of food given to piglets✓
- Size/mass of piglets✓
- Size of petri dishes✓
- Growth medium in both sets of petri dishes✓
- Sample size of *E. coli* ✓
- Method of measurement✓
- Person doing the measurements✓
- Time interval for measurements✓

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

23.3

- Investigation was done over a period of six months✓
- Took many measurements✓/calculated the average resistance
- Used a large sample size✓/100 piglets

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

23.4 Antibiotic **B**✓ (1)

23.5

- The average percentage resistance of *E.coli* to antibiotic **B** is lower✓ than its resistance to antibiotic **A** therefore
- more *E. coli* bacteria die in the presence of antibiotic **B**✓

(2)

23.6

- There was variation✓ in the population of *E. coli* bacteria
- Some were resistant to antibiotic **A**✓
- others were not resistant✓
- Those *E. coli* bacteria which were not resistant to antibiotic **A** were killed✓
- Those which were resistant to antibiotic **A** survive✓/reproduced
- passing on the alleles for resistance to their offspring✓
- Over time, the resistance to antibiotic **A** increased✓/the percentage of *E. coli* bacteria dying decreased

Any (5)

(13)

Question 24

24.1
- They invade farm fields✓
- They outcompete the crop plants for space✓ Any (1)

24.2
(a) Type of herbicide ✓ (1)
(b) Time taken for development of resistance✓ (1)

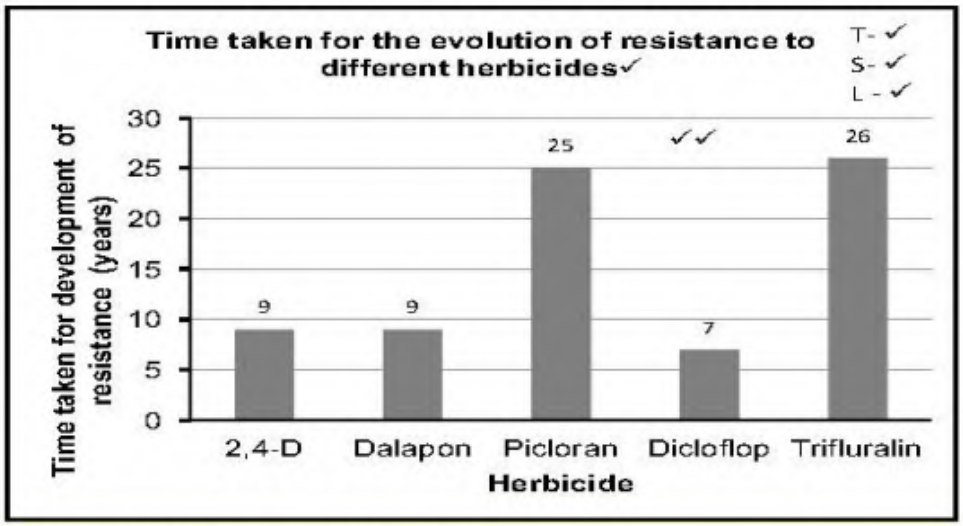
24.3
(a) Dicloflop✓ (1)
(b) Trifluralin✓ (1)

24.4
(a)
- They would apply the herbicide to the weed✓ and
- observe if the weed survives✓ over many generations (2)

(b)
- They used the same weed species as other weed species may have developed resistance to that herbicide✓
- Each weed species may respond differently✓ to a herbicide

OR

- It allows for a single variable✓
- to which all results can be attributed✓ (2)



Guideline for assessing the graph

Type: Bar graph drawn (T)	1
Title of graph	1
Correct: – **Scale** for Y-axis and (S) – Width and interval of bars on X-axis	1
Correct: – **Label** for X-axis and – **Label** and unit for Y-axis (L)	1
Plotting of bars	1- 1 to 4 bars plotted correctly 2- All 5 bars plotted correctly

(6)
(15)

Question 25

25.1 Ambulocetus✓ (1)

25.2 It had flipper-like large feet and a tail✓✓ (2)
(Mark first ONE only

25.3 - They share characteristics/have intermediate characteristics
- of the ancestor/Pakicetu✓s and the present-day species/ ✓
Balaena
OR
- They have legs like Pakicetus a✓and
- flippers of the present day Balaena✓ (2)

25.4 - Ancestral species of whales all had legs✓/lived on land
- As more time was spent in the water✓in search of food
- the legs were used less a✓and disappeared
- the acquired characteristic was passed on to the next generation✓
Any 3 (3)
(8)

Question 26

26.1 - A group of organisms of the same species✓
- occupying the same habitat✓
- at the same time✓ (3)

26.2 They produce infertile offspring✓
(Mark first ONE only) (1)

26.3 - Breeding at different times of the year✓
- Species-specific courtship behaviour✓
- Adaptation to different pollinators ✓
- Prevention of fertilisation✓ Any (3)
(Mark first THREE only)
(7)

Question 27

27.1 Artificial selection✓ /selective breeding (1)

27.2 -They chose dogs with desirable traits✓
-and interbred✓ them to
-produce offspring with these traits✓ (3)

27.3 -Allow them to interbreed with each other✓
-and see whether they produce fertile offspring✓
OR
-Analysis of DNA✓
-to check for matching sequences✓
(2)

27.4 -Rhodesian ridgeback✓
-is strong, athletic and fast✓
-is able to catch the prey✓ Any (2)

27.5 -Due to reduction in gene pool✓/variation
-they will not be able to hunt✓/find shelter/defend themselves
-as well as wolves are able to✓ (3)
-therefore unable to survive in the wild✓

(11)

Question 28

28. -if a population of a single species is separated by a geographic barrier✓(sea, river,mountain,lake)
-then the population splits into two✓
-There is now no gene flow between the two populations✓
-Since each population may be exposed to different environmental conditions✓/ the selection pressure is different
-natural selection occurs independently in each of the to populations✓
-such that individuals of the two populations become(very) different✓ from each other
-genotypically and phenotypically✓
-Even if the two populations were to mix again✓
-they would not be able to interbreed✓
-The two populations are now different species✓ (7)

Any

(7)

Question 29

29.1 - They measured the jaw size of lizards on both islands and✓ (3)
- determined the average jaw size for each population✓
- They compared the difference ✓between the two

29.2 - A larger jaw allows for better muscle attachment/m✓ore teeth /larger teeth
- Thereby increasing the bite force✓/ability
- to break down✓the fibrous plant material (3)

29.3 - They allowed the lizards of the two islands to mate✓
- and determined that they were able to interbreed✓ and
- give rise to fertile offspring✓ (2)

29.4 - Biodiversity remains the same/t✓here is no effect
- because the number of species remains the same/✓a new species has not been formed

OR

- Biodiversity decreases✓
- because some species of plants eaten on Island B could become extinct✓ (2)

29.5 - There is variation in the size of the lizards' jaws✓
- Some have small jaws and others have large jaws✓
- Due to the larger supply of (fibrous) plants✓/fewer insects
- those with smaller jaws will be unable to feed✓
- and die✓
- The lizards with the larger jaws will have more food✓
- and survive✓
- to reproduce✓
- The allele for larger jaws will be passed on to the offspring✓
- The next generation will have a higher proportion of lizards with larger jaws✓

Any (7)

(17)

Question 30

30.1 (a) Probability of developing resistance to antiretroviral drugs✓ (1)
(b)Number of missed treatments✓ (1)

30.2 Treatment must not be missed✓ (1)

30.3 The probability of HIV developing resistance to antiretroviral drugs increases with the increase in the number of missed treatments✓✓
OR
The more the days of missed treatment, the greater the probability of the virus developing resistance to antiretroviral drugs✓✓ (2)

30.4 - There is variation in the resistance ✓ of the HI virus to antiretroviral drugs
- Some viruses are resistant✓to the drugs and
- others are not resistant✓
- Those that are not resistant do not survive✓
- When treatments are missed ✓
- the resistant viruses survive and reproduce✓
- passing the resistance to their offspring✓ (5)

Any

(10)

Question 31

31.1 - Bare fingertips✓/nails instead of claws
- Opposable thumbs✓/ gripping ability
- Fingerprints✓
- Five fingers✓

(Mark first ONE only)

Any (1)

31.2

Differences between African apes and humans	
African apes	**Humans**
- Small cranium✓	- Large cranium✓
- Brow ridges are well developed✓	- Brow ridges are not well developed✓
- Large canines✓	- Small canines✓
- Palate is long and rectangular✓ / U-shaped	- Palate is small and semi-circular✓/ C-shaped
- Large jaws✓	- Small jaws✓
- More protruding jaws✓/ prognathous	- Less protruding jaws✓/non-prognathous
- Cranial ridges present✓	- No cranial ridge✓
- Foramen magnum in a backward position✓	- Foramen magnum in a forward position✓
- Sloping face✓	- Flat face✓
- Less developed zygomatic arch✓	- More developed zygomatic arch✓
- Less developed chin✓	- More developed chin✓
- Diastema between the teeth✓	- No diastema between the teeth✓

(Mark first THREE only) Table 1 + (3 x 2) (7)

31.3
- Short✓ and
- wide✓/broad
- Cup-shaped✓ Any

(Mark first TWO only) (2)

(10)

Question 32

32.1 Walking on two legs✓✓ (2)

32.2 (a)
- Foramen magnum moved to a more forward position✓
- to allow the spinal cord to enter vertically✓ (2)

(b)
- Pelvic girdle is short and wide✓/broad
- to support the upper body✓ (2)

(c)
- Spine is more curved✓/S shaped
- to absorb shock✓/allow flexible movement/support (2)

(8)

Question 33

33.1
- To show a possible common ancestor✓
- To identify trends in evolution✓ (1)

33.2
- Both have opposable thumbs✓
- to allow for a power grip✓ /precision grip/ any example thereof (2)

33.3 - Humans have small teeth✓ /canine whereas African apes have large teeth✓ /canines (2)
- There are no gaps✓ /diastema between the teeth in humans whereas African apes have gaps✓/ diastema between the teeth

(5)

Question 34

34.1

Skull 1	Skull 2
Brow ridges pronounced✓	Brow ridges less pronounced✓
More protruding jaws✓/prognathous	Less protruding jaws✓/non-prognathous
Larger jaws✓	Smaller jaws✓
Smaller cranium size✓	Larger cranium size✓
Larger teeth✓/ canines	Smaller teeth✓/canines
Poorly developed chin✓	Well developed chin✓
Sloping face✓	Flat face✓

(Mark first THREE only) Table 1 + (3 x 2) (7)

34.2
- Freely rotating arms✓
- Long upper arms✓
- Rotation around elbow joints✓
- Rotation around the wrists✓
- Opposable thumbs✓
- Bare fingertips✓/ nails instead of claws
- Five fingers✓/pentadactyl limb
- Fingerprints present✓

Any (4)

(Mark first FOUR only)

34.3
- Since the cranium houses the brain✓
- a large cranial volume indicates a larger brain✓/more brain cells
- which suggests greater intelligence✓ (3)

(14)

Question 35

35.1 B✓ (1)

35.2 - The foramen magnum is in a more forward position✓✓ (2)
(Mark first ONE only)

35.3

	A		B
1	Larger canines✓	1	Smaller canines✓
2	Jaws with teeth in a rectangular/U shape✓	2	Jaws with teeth on a gentle/round curve✓
3	More protruding jaw✓/ prognathous	3	Less protruding jaw✓/non-prognathous

(Mark first TWO only) Table 1 + Any (2 x 2) (5)

35.4 - The spine is S-shaped✓*
- for flexibility✓ and
- shock absorption✓ 1* compulsory + Any 1 (2)

(10)

Question 36

36.1 (a) X✓, Z✓ **(in any order)**
(Mark first TWO only) (2)

(b) C✓ (1)

36.2 - The pelvis is long✓
- and narrow✓ (2)

36.3 - The spine✓
- is S-shaped for the bipedal organism✓
- and C-shaped for the quadrupedal organism✓

OR

- The foramen magnum✓
- is in a more forward position in bipedal organisms✓
- and in a backward position in quadrupedal organisms✓

(Mark first ONE only) (3)

(8)

Question 37

37.1 X - Foramen magnum✓
Y - Canine✓ (2)

37.2
- The foramen magnum is located in a more forward position✓ below the skull
- showing that organism C is bipedal✓
- This allows for the vertebral column/spine to extend vertically✓ from the base of the skull
- to balance the body weight in upright walking✓ Any (3)

37.3 (a) B✓
(b) A✓ (1)

37.4
- There is an increase✓ (1)
- 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)

(10)

Question 38

38.1
- The jaw is large in the chimpanzee✓ and small in *Homo sapiens*✓
- The jaw/ palate is rectangular in the chimpanzee✓ and rounded in *Homo sapiens*✓
- Large spaces between the teeth in the chimpanzee✓ and small/no spaces in *Homo sapiens*✓
- Large canines/teeth in the chimpanzee✓ and small canines/teeth in *Homo sapiens*✓ Any 1 x 2 (2)

(Mark first ONE only)

38.2
- The diet changed from eating raw food✓ in *Australopithecus*
- to a diet of cooked food✓ in *Homo sapiens* (2)

38.3 (a) A transitional species shows intermediate characteristics between two genera/species✓

OR

It has characteristics common to both the ancestor species and the species that follows✓ (1)

(b) The jaw is smaller than that of the chimpanzee but larger than that of *Homo sapiens*✓✓

OR

The canines/ teeth are smaller than those of the chimpanzee but larger than those of *Homo sapiens*✓✓

OR

The jaw/ palate shape is more rounded than that of the chimpanzee but less rounded than that of *Homo sapiens*✓✓

Any 1 x 2 (2)

(Mark first ONE only)

(7)

Question 39

39.1 (a) -The foramen magnum was in a backward position✓ in the ape-like beings
- but in more forward position✓ in modern humans (2)

(b) - Modern humans have larger cranium✓ than ape-like beings
- Modern humans have less sloping forehead✓ than ape-like being
- Modern humans have cranium that is more rounded✓ than ape- like being Any 2 (2)

39.2 Foramen magnum
- This shows a change from quadrupedalism in ape-like beings to bipedalism in humans✓*
- This creates increased awareness of the environment in sensing danger✓/food
- Freeing hands to use implements✓/carry offspring
- Exposure of large surface area for thermoregulation✓
- Display of sex organs/breast as part of courtship behaviour✓

1* compulsory + Any 1 (2)

Cranium
- This allows space for larger brain✓* in humans than ape-like beings which makes the following possible:
- Better co-ordination of movement✓
- Processing of large amount of information✓
- Processing of information faster✓
- Development of spoken and written languages to communicate

1* compulsory + Any 1 (2)

(8)

Question 40

40.1 (a)
- *Sahelanthropus*✓
- *Australopithecus*✓
- *Homo*✓

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

(b)
- Taung child✓
- Mrs Ples✓
- (Little foot)✓

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

(c) *Sahelanthropus*✓ (1)

40.2 *Homo neanderthalensis*✓ (1)

40.3 650✓ cm^3 (1)

40.4 2,0 mya✓/2 000 000 years ago (1)

40.5 Genetic✓ evidence
Cultural✓ evidence
(Mark first TWO only) (2)

(10)

Question 41

41.1 Karabo✓ (1)

41.2 Australopithecus africanus✓ (1)

41.3 a) (Lee) Berger✓ (1)

b) (Raymond) Dart✓ (1)

(4)

Question 42

42.1 Phylogenetic✓ (1)

42.2 (a) 5✓ (1)

(b) 4✓ (1)

42.3 *(Paranthropus) robustus*✓ and *(Paranthropus) boisei*✓ (2)

42.5 (a) Accept any value in the range 4,3 to 4,5 million years ago✓/mya (1)

(b) 1 mya✓ (1)

42.6 (a) *Homo neanderthalensis*✓ (1)

(b) *Homo habilis*✓ (1)

(9)

Question 43

43.1 Hominidae✓ (1)

43.2
- Evidence such as tools✓ /weapons/ language/ artefacts
- is used to show advances✓ in human development

(2)

43.3 3 mya✓ (1)

43.4
- *H. ergaster* shows characteristics of both✓ *A. afarensis* and *H. heidelbergensis*
- therefore it is a transitional✓ species

(2)

(6)

Question 44

44.1 Phylogenetic tree✓/cladogram (1)

44.2 2✓/Two (1)

44.3 (a) Homo habilis✓ (1)

(b) (Homo) naledi✓ (1)

44.4 (Homo) sapiens✓ (1)

44.5
- Fossil✓ evidence
- Cultural✓ evidence
- Genetic✓ evidence

(Mark first TWO only) Any 2 (2)

44.6
- A large cranial capacity✓ in Homo sapiens
- indicates a larger brain✓
- leading to greater intelligence✓

OR

- A small cranial capacity✓ in Australopithecus africanus
- indicates a smaller brain✓
- leading to lower intelligence✓

(3)

44.7
- Fossils of Australopithecus spp. were found in Africa only✓ and
- fossils of species X/Homo habilis were found in Africa only✓
- The oldest fossils of Homo erectus were found in Africa✓ /the younger fossils were found elsewhere
- indicating that modern humans originated in Africa and migrated out of Africa✓

(4)
(14)

Question 45

45.1 Phylogenetic tree✓/ cladogram (1)

45.2 (a) P✓ (1)

(b) R✓ (1)

45.3 (a) Bonobo✓

Chimpanzee✓ (2)

(Mark first TWO only)

(b) Orang-utan✓
Gorilla✓
Bonobo✓
Chimpanzee✓ Any 2 (2)

45.4 - Foramen magnum at a more backward position✓
- C-shaped spine✓
- Pelvis long and narrow✓
(**Mark first THREE only**) (3)
(10)

Question 46

46.1 - Modern humans originated in Africa✓ and
- then migrated to other continents✓ (2)

46.2 Hominidae✓ (1)

46.3 Mitochondrial DNA✓ (1)

46.4 - Fossils of *Ardipithecus* were found in Africa only✓
- Fossils of *Australopithecus* were found in Africa only✓
- Fossils of *Homo habilis* were found in Africa only✓
- The oldest fossils of *Homo erectus* were found in Africa✓
- The oldest fossils of *Homo sapiens* were found in Africa✓

Any (4)
(8)

Question 47

47.1 (Modern) humans originated in Africa and migrated to other parts of the world (2)

47.2 - Fossils of Ardipithecus were found in Africa only✓
- Fossils of Australopithecus were found in Africa only✓
- Fossils of Homo habilis were found in Africa only✓
- The oldest fossils of Homo erectus were found in Africa✓ / while the younger fossils of Homo erectus were found in other parts of the world✓
- The oldest fossils of Homo sapiens were found in Africa✓ / while the younger

fossils of Homo sapiens were found in other parts of the world✓ (6)

Any 6

(8)