



PROVINCE OF KWAZULU-NATAL
DEPARTMENT OF EDUCATION

GRADE 12

LIFE SCIENCES

REVISION DOCUMENT

Solutions

August 2022

&

Stanmorephysics

**CONTENT & METHODOLOGY
WORKSHOP**

Teachers Resource

August 2022

INTRODUCTION

This document has been prepared as revision material for the Final Examinations for Grade 12 Life Sciences.



The materials have been arranged in such a way that studying can be undertaken topic-wise. Within each topic, questions on the different sub-topics are arranged in the same sequence as that in the 2021 Examination Guideline Document.

Questions were selected such that all the core concepts and core skills are assessed.



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REVISION SOLUTIONS DOCUMENT

TOPIC: REPRODUCTIVE STRATEGIES AND HUMAN REPRODUCTION

Ques

tion 1

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



(14)

Question 2

BIOLOGICAL TERMS:

	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 ✓
	(43 x 1)	(43)

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 ✓✓

(18 x 2)

(36)**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

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- 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) (2 x 2) (4)

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 (2)
- (7)**



Question 7

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- 7.1 Cervix ✓ (1)
- 7.2 - The site of fertilisation ✓
- The site of zygote division ✓
- The transfer of the ovum/embryo to the uterus ✓

(1)

Any

(Mark first ONE only)

- 7.3 -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 ✓

(4)

Any

- 7.4 -It is a hollow organ ✓
- It has a muscular wall ✓
- It has a blood-rich lining ✓/endometrium

(1)

Any

(Mark first ONE only)

- 7.5 - 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 8

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

- 8.2 D ✓ Epididymis ✓ (2)
G ✓ Urethra ✓ (2)
E ✓ Testis ✓ (2)

- 8.3 A ✓
B ✓
E ✓
(Mark first TWO only)



Any

(2)

(11)

Question 9

- 9.1 Vas deferens ✓ (1)

8.2 - Sperm storage ✓
 - Sperm maturation ✓
 Any
 (1)

(Mark first ONE only)

- 9.3 - 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
 Any Two (2)

- 9.4 - 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)

- 9.5 - Under the influence of testosterone ✓
 - diploid cells ✓ / germinal epithelial cells
 - in the seminiferous tubules ✓ / testes
 - undergo meiosis ✓
 - to form haploid sperm cells ✓
 (4)
(7)

Question 10

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

(Mark first TWO only)

- 10.2 - 250 females per group were used ✓ / 1000 females participated
 - Measurement was done for 5 cycles ✓
(Mark first TWO only) (2)

- 10.3 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 (2)

(Mark first ONE only)

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

- 10.5 - 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 11

- 11.1 Male fertility ✓ (1)
 11.2 Measuring the sperm count ✓ (1)

11.3 Age✓
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 - Diet✓

- Exercise✓
- Activity level✓
- Lifestyle✓
- Occupation✓ etc.

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

(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✓
 Any (2)

(11)

Question 12

12.1 Acrosome✓ (1)
 12.2 mitochondrion✓ (1)

12.3 (a) 3✓ (1)
 (b) 1✓ (1)
 (c) 1✓ (1)

12.4 B✓ - Nucleus✓ (2)
 12.5 Mitosis✓ (1)

12.6 - 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



Question 13

- 13.1 (a) Pituitary ✓ gland/hypophysis (1)
- (b) Graafian follicle ✓ (1)
- (c) Ovulation ✓ (1)
- (d) Corpus luteum ✓ (1)
- 13.2 Remains low ✓ /decreases (1)
- 13.3 - stimulates ovulation ✓
- stimulates the development of the corpus luteum ✓

(Mark first ONE only) (1)
(6)

Question 14

- 14.1 -A ✓
- B ✓
- E ✓

Mark first TWO only (2)

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

- 14.3 - 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)

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



(9)

Question 15

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

- 15.2 (a) Progesterone treatment ✓ (1)
 (b) Development of gestational diabetes ✓ (1)
- 15.3
- Glucose levels were taken daily ✓
 - When the glucose level of a pregnant woman remains high continuously it indicates the development of gestational diabetes. ✓ (2)
- 15.4 (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 ✓. (2)
 Any 2
(Mark first TWO only)
- 15.5 Group B did not receive progesterone ✓
 If gestational diabetes develops in group A it would be due to the progesterone treatment ✓ (2)
(10)

Question 16

- 16.1 Chorion ✓ (1)
- 16.2
- 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 (2)
- Any
(Mark first TWO only)
- 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)
- 16.3
- Acts as a micro-filter ✓/protect against pathogens
 - Removal of harmful metabolic waste ✓
 - Produces antibodies ✓
 - Maintains the endometrium ✓ (2)
- Any
(Mark first TWO only)
- 16.5 Umbilical vein ✓ (1)
- 16.6
- 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

Question 17

- 17.1 (a) Oestrogen✓ (1)
 (b) Progesterone✓ (1)
- 17.2 - It increases✓
 - the thickness✓ of the endometrium/the blood vessels in the endometrium/the amount of glandular tissue in the endometrium (2)
- 17.3 (a) Release of an ovum✓ from the ovary✓/Graafian follicle (2)
 (b) Day 14 ✓ (1)
 (c) LH/ Luteinising Hormone ✓ (1)
- 17.4 - High levels of hormone B/progesterone will inhibit✓
 - the secretion of FSH✓
- OR
- No new ova/mature follicles✓
 - are required during pregnancy✓ (2)
- 17.5 The progesterone✓
 - levels decreased✓
 - because the corpus luteum degenerated✓ (3)
- 17.6 - 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 ✓ (4)
 - stimulate the Pituitary gland/ Hypophysis✓ to secrete a more FSH ✓
 -which stimulate the development of new follicles ✓
- (17)**

Question 18

- 18.1 Accept day 14✓ or day 15 (1)
- 18.2 Days 0 - 7✓ (1)
- 18.3 - Causes the follicle to burst open✓/stimulates ovulation
 - Stimulates the formation of corpus luteum✓
(Mark first ONE only) (1)
- 18.4 - LH levels remain low up to day 12/13✓
 - Then it increases sharply up to day 14✓



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- After which it decreases and remains low ✓ (3)
- 18.5 As the oestrogen level increases ✓
the thickness of the endometrium also increases ✓ (2)
- 18.6 Maintain the increase in the thickness of the endometrium ✓
for greater chance of implantation ✓ (2)
- 18.7 No ✓ (1)
- 18.8 The progesterone levels ✓ has dropped ✓ /not maintained/corpus
luteum has started to degenerate (2)
- (13)**



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

Question 1

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



(2x5)

(10)

Question 2

_____	DESCRIPTION	TERM
2.1	The part of the nervous system made up of cranial and spinal nerves	Peripheral nervous system
2.2	The part of the brain that receives impulses from the maculae	Cerebellum
2.3	The structure that connects the left and right hemispheres of the brain	Corpus callosum
2.4	The part of the brain that controls body temperature	Hypothalamus
2.5	The part of the brain that regulates breathing	Medulla oblongata
2.6	The branch of the autonomic nervous system that restores an increased heart rate back to normal	Parasympathetic
2.8	A part of the nervous system that consist of sympathetic and parasympathetic section	Autonomic
2.9	A functional gap between two consecutive neuron	Synapse
2.10	Collective name for the membranes that the brain and spinal cord	Meninges
2.11	Neurons that carry impulses from receptors	Sensory
2.12	A diseases characterized by the degeneration of brain cells and memory loss	Alzheimer
	(10x1)	(10)

Question 3

- 3.1 B Only ✓✓
- 3.2 A Only ✓✓
- 3.3 Both A and B ✓✓
- 3.4 B Only ✓✓



(4x2)

(8)

Question 4

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4.1

- (a) B✓ - Cerebrum✓ (2)
- (b) D✓ - Cerebellum✓ (2)
- (c) A✓ - Pituitary gland✓/Hypophysis (2)
- (d) C✓ - Corpus callosum✓ (2)
- (e) E✓ - Spinal cord✓ (2)
- (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✓ (2)
(b) Axon✓
- 6.2 (a) A✓ (2)
(b) C✓
- 6.3 D✓ Synapse✓ (2)

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 (3)
- because of the presence of myelin sheath in neuron 1✓ / absence of myelin sheath in neuron 2
- 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

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- 8.1 1✓ and 4✓ (2)
 (Mark first TWO only)
- 8.2 1✓ and 3✓ (2)
 (Mark first TWO only)
- 8.3 2✓ and 3✓ (2)
 (Mark first TWO only)
- (6)**



Question 9

- 9.1 Reflex arc✓ (1)
- 9.2 (a) B - Motor✓ neuron/multipolar neuron/efferent neuron (1)
 (b) C - Interneuron✓/connector neuron (1)
 (c) E - Sensory✓ neuron/unipolar neuron/afferent neuron (1)
- 9.3 (a) F✓ (1)
 (b) A✓ (1)
- 9.4 (a) D✓ - Synapse✓ (2)
 (b) G✓ - Myelin sheath✓ (2)
- (10)**



Question 10

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- 10.1 A✓ (1)
- 10.2 The impulse does not travel to the brain✓/goes directly from receptor to effector via the spinal cord (1)
- 10.3 - Allows the person to respond rapidly✓
 - and without thinking✓/involuntarily
 - to a stimulus✓
 - to prevent damage to the body✓*
 1* compulsory + any other 2 (3)
- 10.4 Nerve✓/spinal cord (1)
- 10.5 - It acts as an insulator✓
 - and therefore, speeds 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 (2)
- 10.7 - The receptor receives the stimulus✓
 - and converts it into an impulse✓
 - which is transported by a sensory neuron✓ via the spinal cord to the brain✓*/cerebrum
 - The brain/cerebrum interprets the impulse✓*
 - The brain/cerebrum sends an impulse to a motor neuron✓
 - which conducts the impulse to the effector✓
 - to bring about a response✓ 2* compulsory + any other 4 (6)
- (16)**



Question 11

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- 11.1 - From the dendrite✓
- to the axon✓ (2)
- 11.2 0 to 1✓✓ μm/ 0 to 0,9 μm (2)
- 11.3 As the axon diameter increases the speed of the impulse increases✓✓
OR
As the axon diameter decreases the speed of the impulse decreases✓✓ (2)
- 11.4 - The speed of the impulse will decrease✓
- resulting in it taking longer for impulses to reach the effectors✓
- and the person will react more slowly✓ (3)

(9)

EYE

Question 1

- 1.1 B✓✓
- 1.2 B✓✓
- 1.3 D✓✓
- 1.4 D✓✓
- 1.5 A✓✓

5X2

(10)

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	Accomodation
	2.5	A defect condition of the eye where a person can see nearby objects clearly while distant objects are blurred.	Myopia
		1x5	(5)



Question 3

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MATCHING COLUMNS

- 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 ✓✓

2x 5= 10

Question 4



4.1

- (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 constrict ✓

-The radial muscles relax ✓ and the pupil becomes small ✓

--Less light enters the eye ✓

(4)



5.3 Iris ✓
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(1)

5.4 Accommodation near vision

- Ciliary muscle contract ✓
- Suspensory ligament becomes slackens ✓
- Tension on the lens decreases ✓
- Refractive power increased ✓
- Image is formed on the retina ✓

(5)

(13)

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

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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✓ (2)

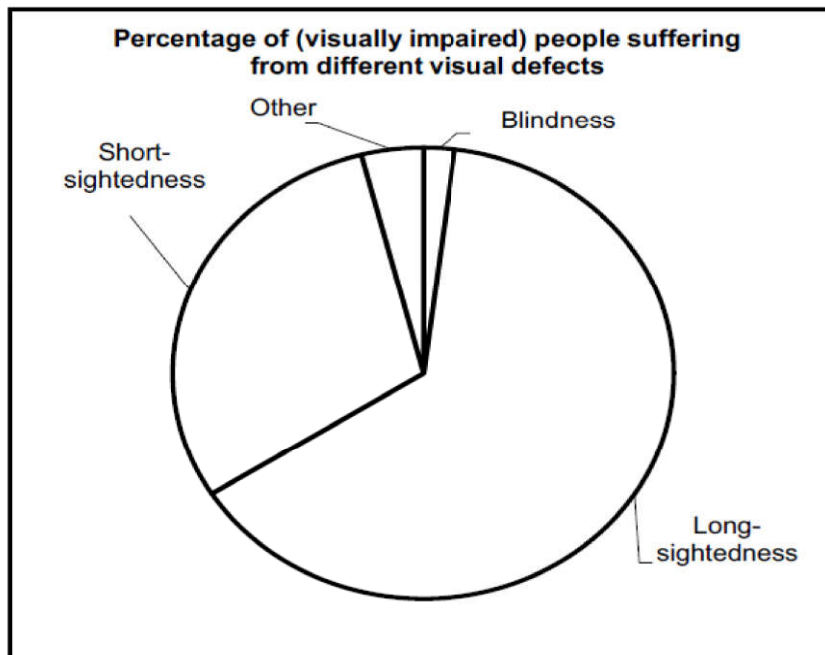
7. Astigmatism✓ (1)

4

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

7.

5



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)

(13)

Question 8

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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 measurement✓
 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 any first TWO)

(2)

8.4

As the distance increases✓ curvature of the lenses decreases✓

(2)

8.5

Ciliary muscle ✓

(2)

suspensory ligament✓

(10)

Question 1

- 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)

3. MATCHING

- 3.1 A only ✓✓
- 3.2 A only ✓✓
- 3.3 B only ✓✓

6

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*Downloaded from Stanmorephysics.com*

- 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✓
 -Antibiotics✓ (1)
- 5.4 Auditory canal✓ (1)
- 5.5 -The ear wax can be removed from the auditory canal✓
 -to allow sound to reach the tympanic membrane/which allow the tympanic membrane to vibrate freely. ✓ (2)
- (12)**

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 oval window /Part F will not vibrate✓ freely
 - Fewer / no vibrations will be carried to the cochlea✓ / inner ear
 - Fewer / no pressure waves will form✓ in the cochlea
 - There will be less / no stimulation of the organ of corti/hair cells✓ (4)

(15)**Question 7**

- 7.1 (a) Auditory canal✓ (1)
 (b) Ossicles✓ (1)

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- 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

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- 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

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- 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

- 11.1 -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)



Topic Plant Growth Hormones

Solution

Question 1

- 1.1 B ✓✓ (2)
 - 1.2 A ✓✓ (2)
 - 1.3 B ✓✓ (2)
- (6)**

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 Autum	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)
- (6)**

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

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- 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) Any (1)
- 5.2 $(120 - 80) \checkmark \text{ mm} = 40 \checkmark \text{ mm}$ ✓ (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) Any (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 (4)
- (Any 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 favourably ✓
- for pollination ✓ /seed dispersal (2)
- 8.4 The roots will grow downwards ✓ /towards gravity (1)

**(8)**

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TOPIC: ENDOCRINE AND HOMEOSTASIS
QUESTION1

- 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✓ (2)
D- Adrenal gland✓
- 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 ✓ (2)

(Mark first TWO only)

(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)

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Question 6

- 6.1 (a) Growth hormone ✓ (1)
 (b) Prolactin ✓ (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 $\frac{(25 - 5)}{5} \times 100 \checkmark$
 = 400 ✓ %

OR

$\frac{(24 - 5)}{5} \times 100 \checkmark$
 = 380 ✓ %

Accept a range between:

- 24 and 25 for the first value and
 - 380% and 400% for the answer (3)



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- 7.3 - Thyrotoxicosis 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 $\left. \frac{11-4}{4} \right\} \times 100 \checkmark = 175 \checkmark \% \quad \text{OR} \quad \left. \frac{7}{4} \right\} \times 100 \checkmark = 175 \checkmark \%$ (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)



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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✓ (1)

T✓

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)



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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)



Question 1

- 1.1 D✓✓
 1.2 D✓✓
 1.3 B✓✓
 1.4 C✓✓
 1.5 C✓✓

**(10)****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

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- 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 ✓ (1)
- Transcription (Protein synthesis) ✓ (2)

(6)

Question 5

- 5.1 (a) W – Nucleotide ✓ (1)
- U – DNA ✓ (2)
- (b) X - Phosphate ✓ / phosphate ion (1)
- Y - Deoxyribose ✓ sugar (2)
- (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

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- 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 DNA Profiling✓ (1)
- 8.2 Jennie✓ (1)
- 8.3 -Jennie's DNA profile✓ /bands
 matches DNA profile/ bands of the sample✓ from the crime scene (2)
- 8.4 -Proof of paternity✓
 - Tracing missing person✓
 - identification of genetic disorders✓
 -Establishing family relationships✓
 - Matching tissues for organ transplants✓
 - identifying dead persons✓/ animals. (1)
- 8.5 - Samples containing DNA can be planted✓/person was framed
 - Human error✓ during DNA profiling process
 - Costly procedure✓
 - Invasion of privacy✓ any 2 (2)
(7)



Question 9

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- 9.1 Mary ✓✓ (2)
 - 9.2 There are no matching bands ✓ / bars / patter / DNA profile with both parents ✓ and Mary (2)
- (4)**

Question 10

- 10.1 Number of people ✓ found guilty / convicted (1)
 - 10.2 $44 - 25 = 19$ ✓ (2)
 - 10.3 – 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 ✓
- any 4 (4)
- (7)**

Question 11

- 11.1 Transcription ✓ (1)
- 11.2 mRNA ✓ (1)
- 11.3 -makes up the genes which carry hereditary information
-contains coded information for protein synthesis (2)
- 11.4 ✓

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


- 11.5
 - The double helix DNA unwinds ✓ and
 - 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 ✓
 - The coded message for protein synthesis is thus copied onto mRNA ✓
 - 11.6
 - This will result in different tRNA molecules ✓
 - bringing different amino acids ✓
 - leading to the formation of a different protein. ✓
- Any 6 (6)
- (18)**

Question 12

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- 12.1 (a) GAC✓ (1)
 (b) ACU✓✓ (2)
- 12.2 (Gene) mutation✓ (1)
- 12.3 - 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)
- 12.4 - The cells will not receive enough oxygen✓
 - resulting in reduced cellular respiration✓/ a person lacking energy/becoming tired/ anaemia (2)
- (10)**

Question 13

- 13.1 (a) Transcription✓ (1)
 (b) Translation✓ (1)
- 13.2 (a) Nucleus✓ (1)
 (b) mRNA✓ (1)
- 13.3 Chloroplasts✓
 Mitochondria✓ (2)
- 13.4 (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) (7)
 - mRNA now has the coded message for protein synthesis✓
- (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✓ (6)
 - Amino acids become attached by peptide bonds✓
 - to form the (required) protein✓
- 

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- 13.5 (a) TCG✓ (1)
 (b) Tyrosine✓
 Valine✓ (2)
 13.6 Gene mutation✓ (1)
 13.7 - The anticodon will be GGA✓/not GAA
 - The last amino acid would be proline instead of leucine✓
 - resulting in a different protein✓/ no protein at all (3)
(20)



Question 14

- 14.1 Cytosine✓ (1)
 14.2 20✓✓% (2)
 14.3 G A A✓ U G U✓ (2)
 14.4 Glutamic acid✓ - Cysteine✓ (in that order) (2)
 14.5 U A C✓ (1)
(8)

Question 15

- 15.1 Protein synthesis✓ (1)
 15.2 Peptide✓ bond (1)
 15.3 63✓ (1)
 15.4 15.4.1 Guanine✓ (1)
 15.4.2 (a) CAG✓ (1)
 (b) CCT✓ (1)
 15.4.3 CAU✓ (1)
(7)

Question 16

- 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)**



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Question 17

- 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

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Question 1

- 1.1 C ✓✓
 1.2 A ✓✓
 1.3 A ✓✓
 1.4 D ✓✓



(8)

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	Ovary
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
(16 x 1)		(16)



Question 3

MATCHING COLUMNS

- 3.1. None ✓✓
 3.2. B only ✓✓
 3.3. Both ✓✓
 3.4. 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 ✓ (2)

(Mark first ONE only)**(8)****Question 5**

- 5.1. Anaphase II ✓ (1)
- 5.2. (a) Centriole ✓ (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 (2)
(Mark first one only)

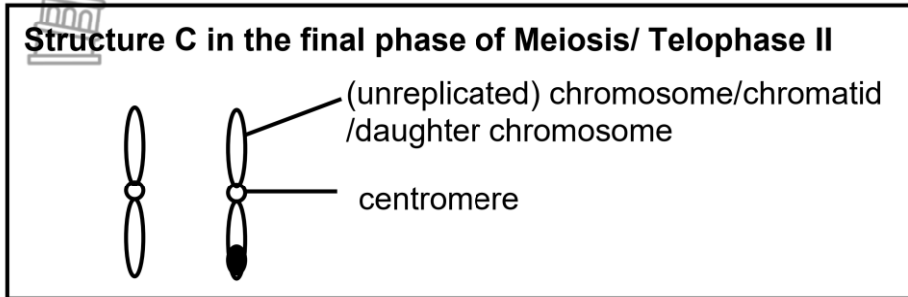


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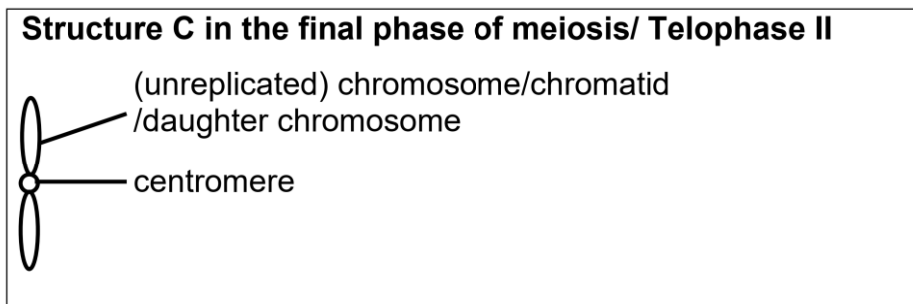
- 6.3. a) Cell membrane✓ (1)
- b) Spindle fibres✓ (1)

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

6.5



OR



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 OR one with shaded tip } - 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

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- 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)

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

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- and when it fertilises a normal ovum / gamete with 23 chromosomes
- the zygote will have 3 chromosomes at position 21 / 47 chromosomes (3)

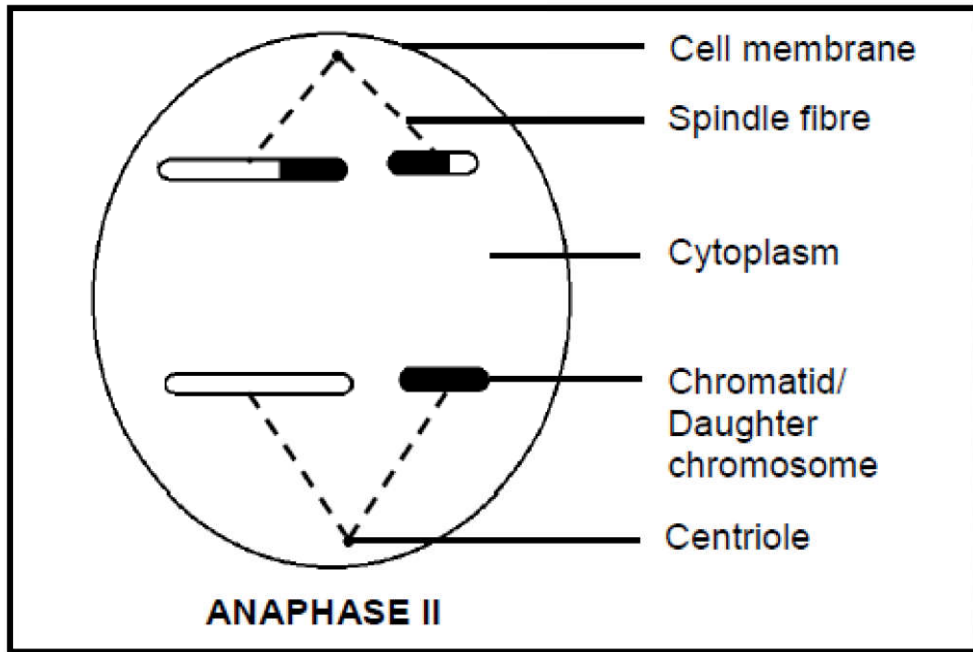
11.3. (a) Prophase I (1)

- (b) – Adjacent chromatids of homologous chromosomes cross ✓
- at a point called the chiasma ✓
- There is an exchange of DNA segments / genetic material (3)



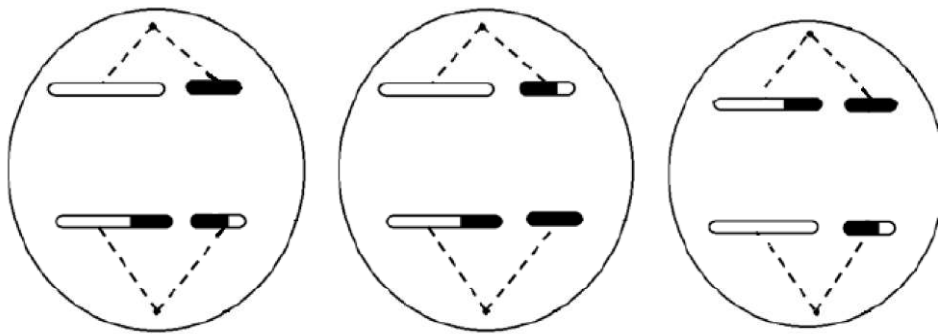
(10)

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)

Question 13

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- 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. Centriole✓ (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)
- 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) Centriole✓ (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)



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✓ / swapped 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)

TOPIC: GENETICS

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Question 1

Multiple choice questions:

1.1 C✓✓

1.2 C✓✓

1.3 C✓✓

1.4 B✓✓

1.5 A✓✓



(5x2) (10)

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
		23 x1 = (23)

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 ✓✓

(4x2) **(8)****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)



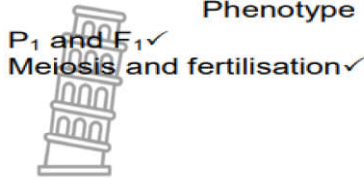
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4.3 P₁ Phenotype Pink x Pink✓
 Genotype RW x RW✓

Meiosis G/gametes R, W x R, W✓

Fertilisation F₁ Genotype RR; RW; RW; WW✓

Phenotype 1 Red: 2 Pink: 1 White✓*



P₁ and F₁✓
 Meiosis and fertilisation✓

OR

P₁ 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

F₁ Phenotype 1 Red: 2 Pink: 1 White✓*
 P₁ and F₁✓
 Meiosis and fertilisation✓

1* compulsory + Any 5

(6)
 (9)

Question 5

5.1 P₁ Phenotype Male x Female✓
 Genotype XY x XX✓

Meiosis G/gametes X, Y x X, X✓

Fertilisation F₁ Genotype XX; XX; XY; XY✓

Phenotype female : male✓

P₁ and F₁✓
 Meiosis and fertilisation✓

OR

P₁ 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

F₁ Phenotype female: male✓
 P₁ and F₁✓
 Meiosis and fertilisation✓


Any (6)

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- 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 Co-dominance ✓

(1)

6.2

P₁	Phenotype	Black	x	White ✓
	Genotype	BB	x	WW ✓
	Meiosis			
	G/gametes	B,B	x	W,W ✓
	Fertilisation			
F₁	Genotype	BW ,BW ,BW ,BW ✓		
	Phenotype	All black with patches of white ✓		

P₁ and F₁ ✓

Meiosis and fertilization ✓

Any

Punnet square can also be used

(6)

(7)

Question 7

7.1 Purple ✓

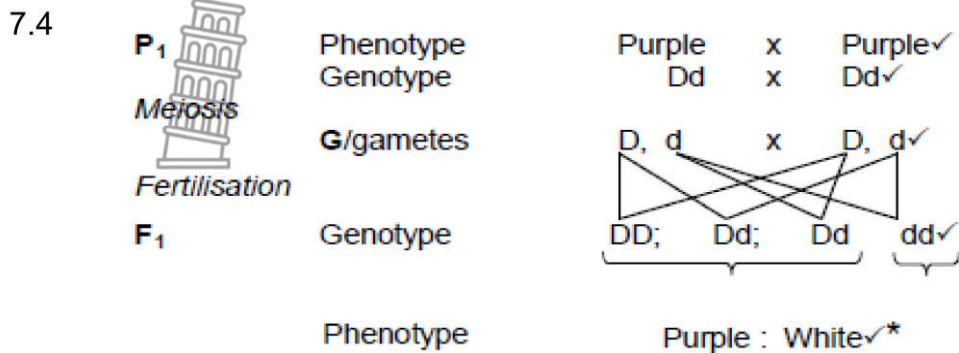


(1)

- 7.2 -When purple-flowering plants and white-flowering plants are crossed ✓
- all the offspring have purple flowers ✓/have no white flowers

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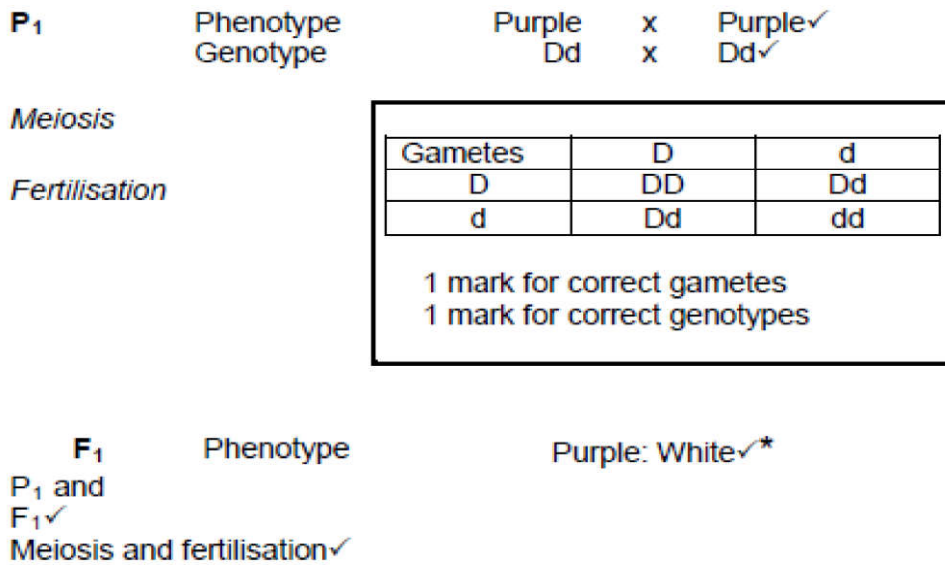
- 7.3 The two alleles for a characteristic ✓
 – separate during meiosis ✓ so that
 – each gamete contains only one allele ✓ for that characteristic (2)
- (3)



P₁ and F₁ ✓
 Meiosis and fertilisation ✓

*Compulsory 1 + Any 5

OR



(6)
 (12)

Question 8

- 8.1 ffHh ✓
 8.2 (a) FfHh ✓✓
 (b) 3 ✓
 (c) h ✓
 (d) Long fingers and continuous hairline ✓✓



(1)
 (2)
 (1)
 (1)
 (2)
 (7)

Question 9

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- 9.1 Dihybrid[✓] cross (1)
 - 9.2 TTrr^{✓✓} (2)
 - 9.3 TR[✓], Tr[✓], tR[✓], tr[✓] (4)
- (7)**

Question 10

- 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^hX^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 11

- 11.1 Pedigree[✓] diagram (1)
 - 11.2 (a) 6[✓] (1)
 - (b) 1[✓] (1)
 - 11.3 X^GX^g^{✓✓} (2)
 - 11.4 Unaffected[✓] /without Goltz syndrome (2)
 - 11.5 - 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 12

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12.1 (a) Normal female ✓ (1)

(b) $X^H X^h$ ✓ ✓ (2)

- 12.2
- 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)

12.3

P₁/P₃ Phenotype Normal male x Haemophiliac female ✓
 Genotype $X^H Y$ x $X^h X^h$ ✓

Meiosis

G/gametes X^H, Y x X^h, X^h ✓

Fertilisation

F₁/F₃ Genotype $X^H X^h; X^H X^h; X^h Y; X^h Y$ ✓
 Phenotype 2 normal daughters : 2 haemophiliac sons ✓
 • 50% ✓ chance of having a haemophiliac son

P₁ and F₁ ✓
 Meiosis and fertilisation ✓

*1 compulsory +any 6

OR

P₁/P₃ Phenotype Normal male x Haemophiliac female ✓
 Genotype $X^H Y$ x $X^h X^h$ ✓

Meiosis

Fertilisation

Gametes	X^h	X^h
X^H	$X^H X^h$	$X^H X^h$
Y	$X^h Y$	$X^h Y$

1 mark for correct gametes
 1 mark for correct genotypes

F₁/F₃ Phenotype 2 normal daughters : 2 haemophiliac sons ✓
 • 50% ✓ chance of having a haemophiliac son

P₁ and F₁ ✓
 Meiosis and fertilisation ✓

*1 compulsory +any 6

(7)

(13)

Question 13

13.1 A change in the sequence ✓ of nitrogenous bases ✓ / nucleotides in a gene



(2)

13.2 Nigeria ✓ %

(1)

13.3 $\frac{39\,746}{305\,733} \times 100 = 13\%$
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(3)

- 13.4 (a) dd ✓ (1)
 (b) Dd ✓ (1)
(8)

Question 14

14.1 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)

- 14.2 (a) N ✓ (1)
 (b) Tt ✓ (1)

- 14.3 - 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 15

- 15.1 (a) 3 ✓ / Three (1)
 (b) 2 ✓ / Two (1)

15.2 Hearing ✓ (1)

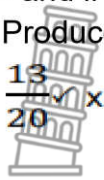
- 15.3 - Bob and Ann can both hear ✓
 - They have a child who is deaf ✓ / who has the genotype aa
 - This means that each parent carries an allele for deafness ✓ / are heterozygous / Aa
 - but it is masked ✓ by the dominant allele / which is for hearing (4)



- 15.4 AA ✓ and Aa ✓ (2)
(9)

Question 16


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- 16.1 - Spine ✓
 - Hips ✓
(Mark first TWO only) (2)
- 16.2 - A change in the sequence ✓
 - of nitrogenous bases ✓ / nucleotides in DNA (2)
- 16.3 - To check for the gene mutation ✓
 - and if it results in the high bone density ✓ (2)
- 16.4 Produces high bone density ✓ / reduces the risk of bone fractures (1)
- 16.5  $\frac{13}{20} \times 100 = 65\%$ ✓ **OR** $\frac{7}{20} \times 100 = 35\%$ ✓
 $(100 - 35) = 65\%$ ✓ (3)
- (10)**

Question 17

- 17.1 (a) 4 ✓ / Four (1)
 (b) 1 ✓ / One (1)
- 17.2 |A_i ✓ ✓ (2)
- 17.3 (a) Son 1 ✓ (1)
 (b) Mother ✓ (1)
 (c) Son 1 ✓ (1)
- (7)**

Question 18

- 18.1 - 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)
- 18.2 -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)
- 18.3 (Horse) S ✓ (1)
- 18.4 - 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 19

- 19.1 I^A ✓ I^B ✓ i ✓ (3)
- 19.2 2 ✓ (1)

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

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

(3)

(9)

Question 20



- 20.1 (a) $I^B I^B$ ✓ of $I^B i$ ✓
- (b) ii ✓

(2)

(1)

- 20.2 - 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)

- 20.3 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 21

- 21.1 3✓/ Three

(1)

- 21.2 - Complete dominance✓
- The allele for blood group B/ I^B is dominant✓ and
- the allele for blood group O/ i is recessive✓

(3)



21.3 **P** Downloaded from Stammorephysics.com

Phenotype: Blood group AB x Blood group B ✓
 Genotype: $I^A I^B$ x $I^B i$ ✓

Meiosis

G/gametes I^A I^B x I^B i ✓

Fertilisation



Genotype: $I^A I^B$ $I^A i$ $I^B I^B$ $I^B i$ ✓*

Phenotype: Blood group:
 AB; A; B ✓*

P₁ and F₁ ✓

Meiosis and fertilisation ✓

Compulsory 2*+ Any 4

OR

P₁ Phenotype: Blood group AB x Blood group B ✓
 Genotype: $I^A I^B$ x $I^B i$ ✓

Meiosis

Fertilisation

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

1 mark for correct gametes
 1 mark for correct genotypes*

F₁ Phenotype: Blood group:
 AB; A; B ✓*

P₁ and F₁ ✓

Meiosis and fertilisation ✓

Compulsory 2*+ Any 4 (6)

(10)



Question 22

22

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- 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)



TOPIC: EVOLUTION

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Question 1

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



(6 x 2) (12)

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
		(23 x 1) (23)

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 ✓✓

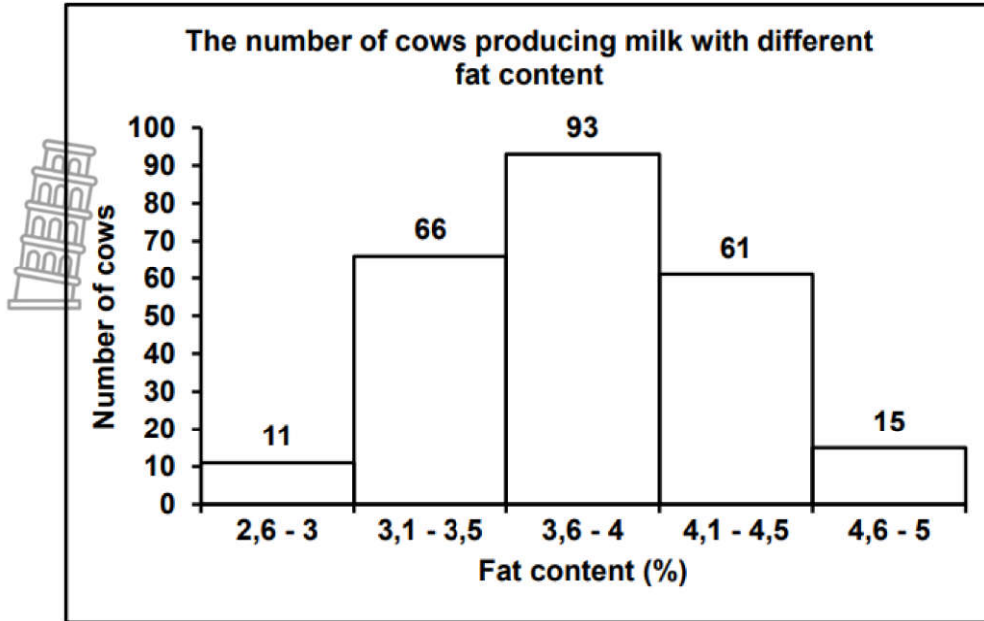
(6 x 2) **(10)**

Question 4

- 4.1 Genetic ✓ evidence (1)
 - 4.2 1 – **A** ✓ **C**
 - 2 – **C** ✓ OR **A**
 - 3 – **B** ✓ **B**
- (3)
- (4)



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	1
	All 5 bars plotted correctly	2

(6)

5.2 $\frac{11}{246} \times 100 = 4,47\%$ (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

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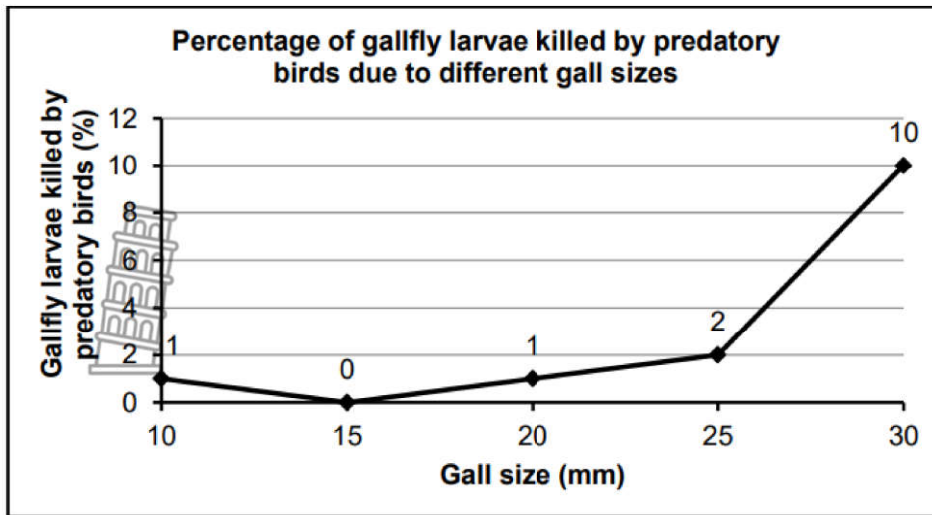
- 6.1 - Crossing over✓
 - Random arrangement of chromosomes✓
 - Random mating✓
 - Random fertilisation✓
 - Chromosomal mutations✓
(Mark first THREE only) (3)
- 6.2 (a) Mutant gene✓ /inherited from their ancestors (1)
 (b) Influenced by altitude✓ /level of oxygen (1)
- 6.3 - More haemoglobin present✓
 - to allow for maximum absorption of the available oxygen✓
OR
 - More oxygen will be available✓
 - to meet their energy needs✓ (2)
- 6.4 - Originally the amount of red blood cells was similar in all humans✓ /the Tibetans did not produce a large 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 produced more red blood cells✓ /developed ways of using oxygen more efficiently to increase the availability of oxygen to the body
 - This acquired characteristic✓
 - was passed on to their offspring✓ (5)
 - All Tibetans now produce more red blood cells✓ /use oxygen more efficiently to survive at high altitudes Any (12)

Question 7

- 7.1 (a) Gall size✓ (1)
 (b) Percentage of gallfly larvae killed✓ (1)
- 7.2 - Nutrition✓ /food
 - Protection✓
 - Space✓ Any
(Mark first ONE only) (1)
- 7.3 - There is a range of (intermediate) values✓ in gall size (1)
- 7.4 - Larvae in 30mm galls are eaten more✓
 - since they are more visible✓ to birds and
 - contain more/larger larvae✓
OR
 - Larvae in galls that are 25mm and smaller are eaten less✓
 - since they are less visible✓ to birds and
 - contain fewer/smaller larvae✓ (3)



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	1
	All 5 points plotted correctly	2

(6)
(13)

Question 8

- 8.1
- 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

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- (a) - He would use his of use and disuse✓
 - and law of inheritance 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)
- (b) - 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

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)

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)



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

(Mark first THREE only)

Any (3)
(7)

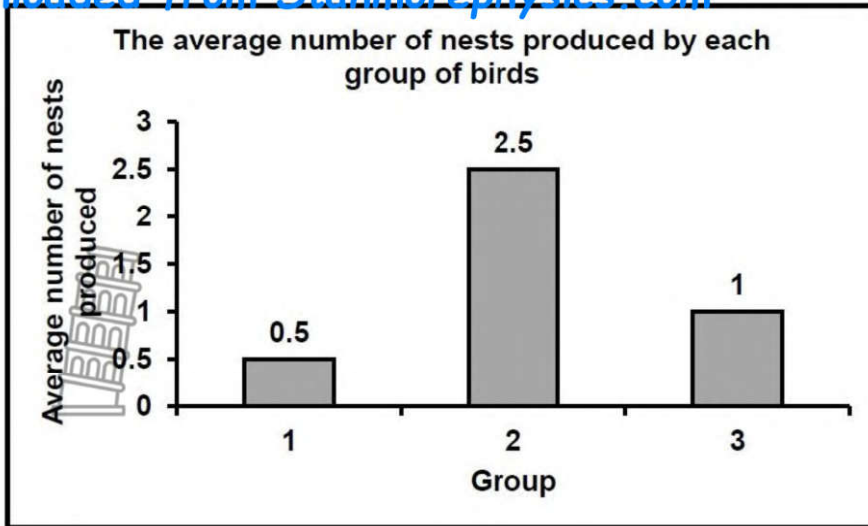
Question 12



- 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
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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	1
	All 3 bars plotted correctly	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

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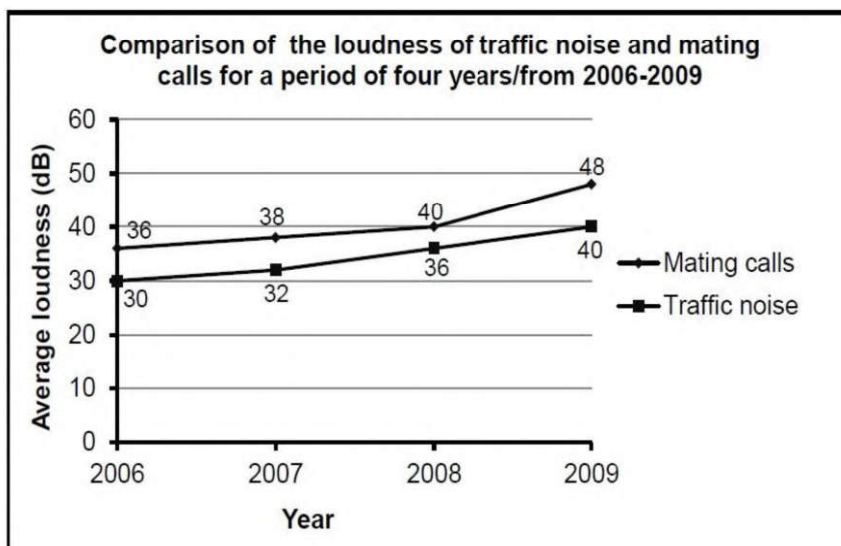
13.1 - The mating call can be easily heard ✓ / can be heard over a distance
 - to ensure that a mate is attracted ✓ (2)

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-axis (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

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- 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 (3)
 - determined the average jaw size for each population✓
 - They calculated the difference✓ between the two
- 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 $\left\{ \frac{80}{20} \right\} \times 100 = 400\%$

OR

$\left\{ \frac{(100-20)}{20} \right\} \times 100 = 400\%$ (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

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- 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

- 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✓

Any (6)

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)

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

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)

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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 ✓

(Mark the first TWO only)

Any (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

(Mark the first TWO only)

Any (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)

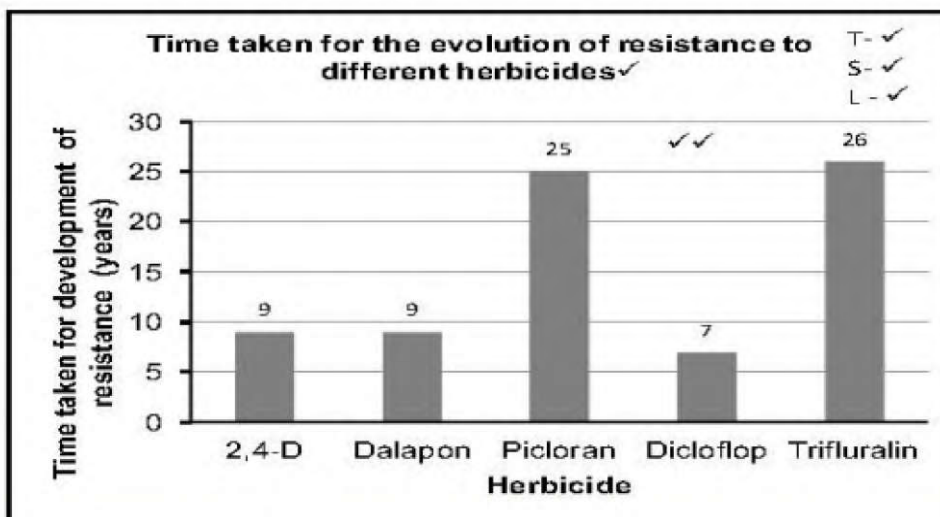
24.2 (a) Type of herbicide ✓ (1)
 (b) Time taken for development of resistance✓ (1)

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 - Bare fingertips✓/nails instead of claws
 - Opposable thumbs✓/ gripping ability
 - Fingerprints✓
 - Five fingers✓
- Any (1)
- (Mark first ONE only)**

25.2

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)

- 25.3 - Short✓ and
 - wide✓/broad
 - Cup-shaped✓
- Any (2)
- (Mark first TWO only)**

(10)

Question 26

26.1 Walking on two legs✓✓ (2)

26.2 (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 27

27.1

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)

27.2

- 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✓
- (Mark first FOUR only)

Any (4)

27.3

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

(3)

(14)

Question 28

28.1

B✓

(1)

28.2

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

(2)

28.3

	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)

28.4

- The spine is S-shaped✓*
- for flexibility✓ and
- shock absorption✓



1* compulsory + Any 1

(2)

(10)

Question 29

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

(b) C✓ (1)

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

29.3 - 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 30

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

30.2 - 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)

30.3 (a) B✓ (1)

(b) A✓ (1)

30.4 - There is an increase✓
- in the cranium size✓ from organism B to organism C
- This will allow it to house a larger brain✓/cerebrum which suggests greater intelligence (3)

(10)



Question 31

- 31.1
- 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)**

- 31.2
- The diet changed from eating raw food✓ in *Australopithecus*
 - to a diet of cooked food✓ in *Homo sapiens*
- (2)

- 31.3 (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 32

- 32.1 (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)

- 32.2 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 33

- 33.1 (a) - *Sahelanthropus*✓
 - *Australopithecus*✓
 - *Homo*✓ Any (2)
 (Mark first TWO only)
- (b)  Taung child✓
 Mrs Ples✓
 (Little foot)✓ Any (2)
 (Mark first TWO only)
- (c) *Sahelanthropus*✓ (1)
- 33.2 *Homo neanderthalensis*✓ (1)
- 33.3 650✓ cm³ (1)
- 33.4 2,0 mya✓ / 2 000 000 years ago (1)
- 33.5 Genetic✓ evidence
 Cultural✓ evidence (2)
 (Mark first TWO only)
- (10)**


Question 34

- 34.1 Phylogenetic✓ (1)
- 34.2 (a) 5✓ (1)
 (b) 4✓ (1)
- 34.3 (*Paranthropus*) *robustus*✓ and (*Paranthropus*) *boisei*✓ (2)
- 34.5 (a) Accept any value in the range 4,3 to 4,5 million years ago✓ / mya (1)
- (b) 1 mya✓ (1)
- 34.6 (a) *Homo neanderthalensis*✓ (1)
 (b) *Homo habilis*✓ (1)



(9)

Question 35

- 35.1 *Hominidae*✓ (1)
- 35.2 - Evidence such as tools✓ /weapons/ language/ artefacts
- is used to show advances✓ in human development (2)
- 35.3 3 mya✓  (1)
- 35.4 - *H. ergaster* shows characteristics of both✓ *A. afarensis*
and *H. heidelbergensis*
- therefore it is a transitional✓ species (2)
- (6)

Question 36

- 36.1 - Modern humans originated in Africa✓ and
- then migrated to other continents✓ (2)
- 36.2 *Hominidae*✓ (1)
- 36.3 Mitochondrial DNA✓ (1)
- 36.4 - 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)

