KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

CURRICULUM GRADE 10-12 DIRECTORATE NCS (CAPS)

LIFE SCIENCES

TEACHER SUPPORT DOCUMENT

GRADE 12

WINTER CLASSES

2025

CONTENTS

Topic: DNA Code of Life

Question 1

	DESCRIPTION	TERM
1.1	A tangled network of DNA and protein located within the nucleus	**Chromatin network**✓
1.2	The bonds that hold the two strands of a DNA molecule together.	**Hydrogen bonds**✓
1.3	The sugar found in DNA	**Deoxyribose sugar**✓
1.4	The analysis of DNA samples to identify individuals that may be related	**DNA Profiling**✓
1.5	The process whereby DNA makes an exact copy of itself	**DNA replication**✓
1.6	The monomers of nucleic acids	**Nucleotides**✓
1.7	The natural shape of a DNA molecule	**Double helix**✓
1.8	Sections of DNA that carry hereditary information	**Gene**✓
1.9	The sugar that forms part of a nucleotide in RNA	**Ribose**✓
1.10	The process whereby mRNA is formed from DNA	**Transcription**✓
1.11	Base triplets found on mRNA	**Codons**✓
1.12	The cell organelle to which mRNA attaches during protein synthesis	**Ribosome**✓
1.13	The process of arranging amino acids according to the sequence of bases on mRNA	**Translation**✓
1.14	The organelle in a cell where translation occurs	**Ribosome**✓
1.15	The triplet of bases found on a tRNA molecule	**Anticodon**✓
1.16	The type of RNA containing anticodons	**tRNA**✓
1.17	Bonds that join amino acids together	**Peptide bond**✓
		(17 X 1) **(17)**

Question 2

2.1 DNA/Deoxyribo-nucleic acid✓ (1)
2.2 (a) Hydrogen bond✓ (1)
(b) Phosphate✓ (1)
2.3 Ribose✓ (1)
2.4 (a) 1✓ (1)
(b) 1✓ (1)
(6)

Question 3

3.1 mRNA/messenger RNA (1)

3.2 -The DNA helix unwinds✓ and
-(the double strand) unzips✓ (weak) hydrogen bonds break
-to form two separate strands✓
-one strand is used as a template
-to form RNA✓
-using free RNA nucleotide✓ from the nucleoplasm
-the mRNA is complementary to the DNA/A complements U
-G complements C Any (6)

3.3 -Molecule X (DNA) is double stranded✓ (double helix)
-Molecule Y (RNA) is single stranded✓

OR

- Molecule X (DNA) has H-bonds✓
- Molecule Y (RNA) has no H-bonds✓

OR

- Molecule X (DNA) contains deoxyribose✓sugar
- Molecule Y (RNA) contain ribose✓sugar

OR

- Molecule X (DNA) has thymine✓/T as a nitrogenous base
- Molecule Y (RNA) has uracil✓/U as a nitrogenous base

OR

-- Molecule X (DNA) is longer✓
- Molecule Y (RNA) is shorter✓

(Mark first ONE only) Any (1x2) (2)

3.4 TAC✓ (1)

3.5 -Arginine✓
-Proline✓ (2)

(12)

Question 4

4.1 (a) **Y**✓ (1)
(b) **X**✓ (1)

4.2 4✓ (1)

4.3 A C T G (Must be in the correct order) ✓ (1)

4.4 (DNA) replication✓
Transcription (Protein synthesis) ✓ (2)

(6)

Question 5

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

Question 6

6.1 (a) DNA replication✓ (1)
(b) (Weak) hydrogen bond✓ (1)
6.2 (a) Nucleotide✓ (1)
(b) Thymine✓ (1)
6.3 Interphase✓ (1)
6.4 Nucleus✓ (1)
(6)

Question 7

7.1 Ribosome✓ (1)
7.2 - Brings the required/specific amino acid✓
- according to mRNA✓/codon to the ribosome (2)
7.3 (a) CCU✓ (1)
(b) GTA✓✓ (2)
7.4 -A mutation occurred✓
-that changed the sequence of nitrogenous bases on DNA from
-GGG to GAA✓/when A replaced by G
-mRNA codon changed from CCC to CUU✓/when U replaced C
-causing tRNA to bring a different amino acid✓
Any (3)
(9)

Question 8

8.1 Heila ✓and Leo ✓ (2)

8.2 - All the (DNA) bands from Heila and Leo ✓
- match with the DNA of the mother and father ✓
OR
- none of the (DNA) bands from Priya ✓
- match with the (DNA) bands of the mother and the father ✓ (2)

8.3 - Tracing missing persons✓
- Identification of genetic disorder's ✓
- Identification of suspects in a crime ✓
- matching tissues for organ transplants ✓
- Identifying dead persons ✓ (3)
(**Mark first THREE only)**

(7)

Question 9

9.1 DNA Profiling✓ (1)

9.2 Jennie✓ (1)

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

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

9.5 - Samples containing DNA can be planted✓/person was framed
- Human error✓ during DNA profiling process
- Costly procedure✓
- Invasion of privacy✓
(Mark first TWO only) any 2 (2)

(7)

Question 10

10.1 Mary✓✓ (2)

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

(4)

Question 11

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

11.2 44 – 25✓ = 19✓ (2)

11.3 – More criminals are found guilty when DNA evidence is included✓ in the investigation
– DNA found at crime scene✓
– can be compared to the DNA database✓
– making it easier✓/ Faster
– to identify suspects in the crime✓
(Mark first FOUR only) **any 4** (4)

(7)

Question 12

12.1 Nucleus ✓ (Nucleoplasm) (1)

12.2 (a) Deoxyribose✓ (1)

(b) Uracil ✓/U (1)

12.3

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

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

(8)

Question 13

13.1 (a) Amino acids ✓ (1)

(b) mRNA ✓ (1)

13.2 (a) TAC ✓✓ (2)

(b) GUA ✓ (1)

13.3 Translation ✓*
- Each RNA carries a specific amino acid ✓
- when the anticodon on tRNA ✓ / GUA
- matches the codon on mRNA ✓/ CAU
- then tRNA brings the required amino acid to the ribosome ✓
- amino acids become attached to each other by the peptide bonds ✓
- to form the required protein ✓ **1* compulsory + 6** (7)

(12)

Question 14

14.1 Transcription✓ (1)

14.2 mRNA✓ (1)

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

14.4

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

1 mark for table + 2 X 2 (5)

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

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

(18)

Question 15

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

(4)

Question 16

16.1 Gene ✓mutation (1)

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

16.3 (a) 5 ✓/Five (1)

(b) UAU ✓ (1)

(c) -The codon CCG changed to CUG ✓ / 4th codon has changed
- The anticodon/ tRNA sequence changed ✓

- The amino acids proline ✓
- Was replaced by Leucine ✓
- This resulted in a different protein✓/no protein being formed (4)

(8)

Question 17

17.1 The presence of thymine✓in the original sequence (1)

17.2 489 ✓✓ (2)

17.3 - A form of a gene✓
- that is carried on chromosome 1 to 22✓ and
- is always expressed in the phenotype✓ of an individual
- in a heterozygous✓ condition Any (3)

17.4 (a) - The changed from GAC to GUC ✓
- resulting in amino acid Leu replaced by Gln✓
- The other codon changed from AUA to AGA✓
- resulting in amino acid Try replaced by Argu✓
- This changed the sequence of amino acids ✓
- A different protein formed✓ Any (5)

(b) - Harmful effect✓
- The blood clot is not broken down✓
- Leading to blockage of arteries✓/oxygen and nutrients are not transported to cells.

Any (3)

(14)

Question 18

18.1 (a) GAC✓ (1)

(b) ACU✓✓ (2)

18.2 (Gene) mutation✓ (1)

18.3 - 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)

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

(10)

Question 19

19.1 (a) Transcription✓ (1)

(b) Translation✓ (1)

19.2 (a) Nucleus✓ (1)

(b) mRNA✓ (1)

19.3 Chloroplasts✓
Mitochondria✓ (2)

19.4 (a)
- The double helix DNA unwinds✓ and
- (the double-stranded DNA) unzips✓/weak hydrogen bonds break
- to form two separate strands✓
- One strand is used as a template✓
- to form mRNA✓
- using free (RNA) nucleotides✓ from the nucleoplasm
- The mRNA is complementary to the DNA✓/ (A-U, G-C)
- mRNA now has the coded message for protein synthesis✓ (7)

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

19.5 (a) TCG✓ (1)

(b) Tyrosine✓
Valine✓ (2)

19.6 Gene mutation✓ (1)

19.7
- 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)

(26)

TOPIC: MEIOSIS

Question 1

Give the correct **biological term** for EACH of the following descriptions.
Write only the term next to the question numbers (2.1 to 2.12) in the ANSWER BOOK.

1.1	None sex chromosomes in humans	**Autosomes**
1.2	The part of the plant where the male gametes are produced	**Anther**
1.3	The structure that holds the two chromatids of a chromosome together	**Centromere**
1.4	The chromosome condition of a cell that has a single set of chromosomes	**Haploid**
1.5	The phase of meiosis where paired chromosomes are arranged at the equator	**Metaphase I**
1.6	The division of the cytoplasm of a cell during a cell division	**Cytokinesis**
1.7	The structure formed by the centrioles during cell division	**Spindle fibres**
1.8	A genetic disorder caused by having an extra copy of chromosome number 21	**Down syndrome**
1.9	The failure of chromosome pairs to separate during meiosis	**Nondisjunction**
1.10	The phase in the cell cycle during which the cell growth occurs to doubles the genetic material	**Interphase**

1 x 10 **(10)**

Question 2

2.1
(a) Centromere✓ (1)
(b) Homologous chromosomes✓ (1)
(c) Spindle fibres / spindle threads✓ (1)
2.2 Anaphase II✓ (1)
2.3 2,1,3✓✓ (2)
2.4 In metaphase I , the chromosomes arrange at the equator in homologous pairs✓ (2)
Whereas in metaphase II, the chromosomes arrange at the equator singly✓
(8)

Question 3

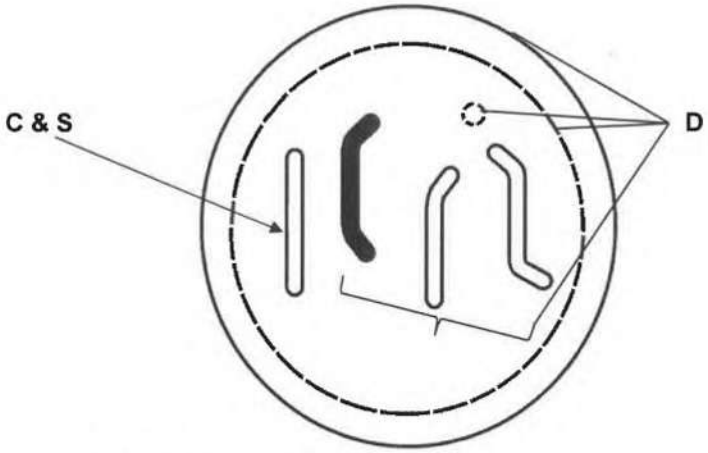
3.1 Chromosomal✓ mutation (1)
3.2 Sperm✓ (1)
(a) 22✓ (1)
(b) 2✓ (1)
3.4 XXY ✓✓ / XYX (2)
(6)

Question 4

4.1
(a) Crossing over✓ (1)
(b) Prophase I✓ (1)
4.2
(a) Chiasma✓ (1)
(b) Chromosome✓ (1)
4.3 C✓ - Centromere✓ (2)
4.4 TrDn✓ (1)
4.5
(a) 4✓ (1)
(b) 8✓ (1)
(9)

Question 5

5.1 Cell membrane✓ (1)
5.2 Produce spindle fibres✓ (1)
5.3 -Some chromatids have a mixture of genetic material✓ from its homologue
-as crossing over✓ took place during prophase I (3)
5.4 -A pair of chromosomes with the same structure ✓/ location of centromere/ length and same sequence of genes✓.
-One maternal origin and the other of paternal origin✓ (2)
5.5 48✓✓ (2)
5.6



Criteria for assessing the drawing

Criteria	Mark
Cell D copied correctly (**D**)	1
Missing chromosome drawn has a straight shape (**C**)	1
Missing chromosome is unshaded (**S**)	1

(3)

(12)

Question 6

6.1 Anaphase II✓ (1)

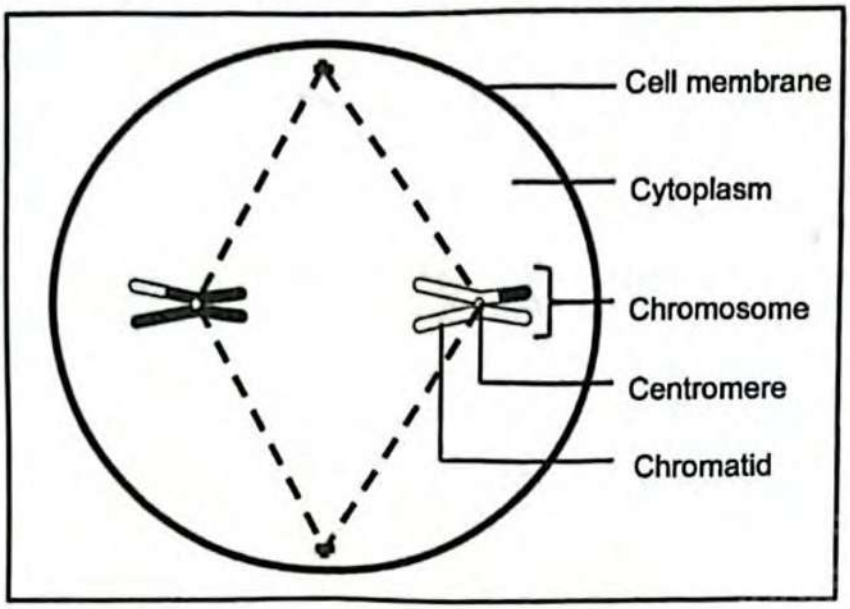
6.2 - Chromosome pairs separate during Anaphase I ✓/ chromosomes move to Poles.
-A chromosome separates during Anaphase II ✓/ chromatids move to the poles
OR
- Centromere do not split during Anaphase I✓
- Centromeres split during Anaphase II ✓ (2)

6.3
(a) Centriole ✓/ Centrosome (1)
(b) Spindle fibre✓ (1)

6.4 - Attaches to the centromere✓
-To pull chromatids / chromosomes towards the (opposite) poles
OR
-It contracts ✓/ shortens
-to pull chromatids / chromosomes towards the (opposite) poles✓ (2)

6.5

Diagram showing metaphase II



Guidelines for assessing the drawing

NO	Criteria	Codes	Marks
1.	Position: Chromosomes in a single row at the equator	(P)	1
2.	Number: 2 unpaired chromosomes drawn	(N)	1
3.	Shading of chromosomes: 1 shaded chromosome with an unshaded tip, 1 unshaded chromosome tip	(S)	1
4.	Any TWO correct labels (except centriole & spindle fibre)	(L)	2
	Total score	T	5

(5)
(12)

Question 7

7.1 Karyotype✓ (1)
7.2 Cones✓ (1)
7.3 Gonosome✓/ Sex chromosomes (1)
7.4 -Similar size✓
-Same location of centromere✓
-Position a gene✓ / alleles
-Genes coding for the same characteristics✓ (3)
7.5 46 chromosomes per cell ✓/ 23 pairs of chromosomes (1)
(7)

Question 8

8.1 Ages of the mother✓ in years (1)
8.2 45✓(years) (1)
8.3 -Likelihood of an egg containing an abnormal chromosome rises significantly as a woman gets older✓
-Higher chances of abnormal cell division during egg formation✓ (1)
8.4 -Decide on the sample size per age category✓
-Decide on the duration of the investigation✓
-Ask the permission to the mothers✓ and in hospital✓
-Decide on how to record and analyse data✓
(Mark the first two) (2)
8.5 -Increase number of hospitals✓
-Include all races in the research✓
-All ages between 25 and 45✓
(Mark the first one) (1)
8.6 - Same diet✓
- Same health status✓
- Each age group should have the same sample size✓
(Mark the first one) (1)
8.7 $\frac{1}{1250} x100$ ✓=0.08✓ (2)
8.8 As the age of the mothers increases ✓the greater the chances of getting the babies with a genetic disorder✓ (2)
(11)

TOPIC: REPRODUCTION SOLUTIONS

Question 1

	DESCRIPTION	TERM
1.1	A reproductive strategy where the young receives nutrients through the placenta	**Vivipary**✓
1.2	The duct that transports semen and urine to the outside of the body	**Urethra**✓
1.3	The structure that serves as a micro-filter during pregnancy	**Placenta**✓
1.4	The part of the male reproductive system which temporarily stores sperm until they mature	**Epididymis**✓
1.5	The fusion of the sperm and egg outside the body	**External fertilization**✓
1.6	The development of the embryo inside an incubated egg that is laid.	**Internal fertilization**✓
1.7	The development of the embryo in the uterus and the young are born alive.	**Vivipary**✓
1.8	The complete development of the embryo inside an egg in the female body.	**Ovovivipary**✓
1.9	The development of the embryo in which very little energy is used and parental care is required.	**Altricial**✓
1.10	The development of the embryo in which a lot of energy is used and the young are able to move directly after hatching.	**Precocial**✓
1.11	Structure that provides nutrition to the embryo in the amniotic egg	**Yolk Sac**✓
1.12	Fluid filled bag around embryo	**Amnion**✓
1.13	Structure in the sperm cell that contains enzymes used to penetrate the ovum	**Acrosome**✓
1.14	The liquid that surrounds the human embryo	**Amniotic fluid**✓
1.15	A hollow ball of cells into which the fertilised ovum develops	**Blastula/blastocyst**✓
1.16	The lining of the uterus which is richly supplied with blood vessels	**Endometrium**✓
1.17	Coiled tubular structure outside the testis that stores sperms	**Epididymis**✓
1.18	The part of the female reproductive system in which fertilisation takes place	**Fallopian tube/Oviduct**✓
1.19	The name given to the embryo after it reaches 12 weeks	**Foetus**✓
1.20	The hormone produced by the pituitary which controls growth of the Graafian follicle	**Follicle Stimulating Hormone**✓
1.21	Layer within the ovary that is responsible for formation of ova through meiosis	**Germinal Epithelium**✓
1.22	Another name for the period of pregnancy	**Gestation**✓
1.23	The process by which the embryo becomes attached to the uterine wall	**Implantation**✓

1.24	The hormone which converts the ruptured follicle into a corpus luteum	**Luteinizing Hormone**✓
1.25	Type of cell division by which sperms are produced	**Meiosis**✓
1.26	The 28-day reproductive cycle in females involving changes in the ovary and uterus	**Menstrual cycle**✓
1.27	Tearing away of the endometrium lining of the uterine wall, accompanied by the loss of blood	**Menstruation**✓
1.28	The cell division by which the zygote becomes multicellular	**Mitosis**✓
1.29	Production of ova by meiosis	**Oogenesis**✓
1.30	The hormone which starts the preparation of the lining of the uterus for attachment of the fertilised ovum	**Oestrogen**✓
1.31	Process by which an ovum is released from the ovary in humans	**Ovulation**✓
1.32	Gland in the brain that produces FSH and LH	**Pituitary/hypophysis**✓
1.33	Combination of foetal and maternal tissue responsible for gas exchange, nutrition and excretion	**Placenta**✓
1.34	Hormone that maintains pregnancy	**Progesterone**✓
1.35	The stage when sexual maturity is reached in males and females	**Puberty**✓
1.36	Production of spermatozoa by meiosis	**Spermatogenesis**✓
1.37	Hormone responsible for secondary sexual characteristics in males	**Testosterone**✓
1.38	A hollow, rope-like tube which attaches the embryo to the placenta	**Umbilical cord**✓
1.39	The blood vessel that carries nitrogenous waste from the foetus to the placenta	**Umbilical artery**✓
1.40	The blood vessel that carries oxygenated blood from the placenta to the foetus	**Umbilical vein**✓
1.41	The structure where testosterone is produced	**Testes**✓
1.42	Sac-like structure that contains testes	**Scrotum**✓
1.43	A gland that lubricates end of penis	**Cowper's gland**✓
1.44	Common tube for sperm and urine	**Urethra**✓
1.45	A gland that produces alkaline medium of semen	**Prostate gland**✓
1.46	A gland that provides nutrients for the sperms	**Seminal vesicle**✓
1.47	A tube that transfers sperms to the urethra	**Vas deferens**✓
1.48	Finger-like projections that develop from the outer membrane of an embryo after implantation	**Chorionic villi**
1.49	The fluid that protects the developing foetus against mechanical injury	**Amniotic fluid**

1.50	The organelles found in large quantities in the neck region of a sperm cell	**Mitochondria**✓
1.51	The type of development in birds in which the young is born fully developed and able to move and feed itself	**Precocial**✓ **development**
1.52.	The structure in the sperm that contains enzymes to dissolve the outer layer of the ovum	**Acrosome**✓
1.53	A blood vessel that transports carbon dioxide from the foetus to the placenta	**Umbilical artery**✓
		(53x 1) **(53)**

Question 2

2.1	Both A and B ✓✓	
2.2	B only ✓✓	
2.3	B only ✓✓	
2.4	A only✓✓	
2.5	None✓✓	
2.6	A only ✓✓	
2.7	B only ✓✓	
2.8	A only ✓✓	
2.9	A only ✓✓	
2.10	B only ✓✓	
2.11	B only ✓✓	
2.12	Both A and B ✓✓	
2.13	None ✓✓	
2.14	None ✓✓	
2.15	Both A and B ✓✓	
2.16	B only ✓✓	
2.17	None ✓✓	
2.18	B only ✓✓	
2.19	None✓✓	
2.20	Both and B✓✓	
2.21	B only✓✓	
		(21 x 2) **(42)**

Question 3

3.1 External ✓ fertilisation (1)

3.2 -The eggs will dry out ✓
- because they have no shells ✓/ are not amniotic eggs/ have no amnion (2)

3.3 - The male and the female bodies are in close contact✓
- so that sperms can be released directly onto the ova✓

OR

-Many/ up to 6000 ova are released ✓
-since fertilisation is external ✓
(Mark the first ONE only) (2)

3.4 - The male and the female bodies are in close contact✓
- so that sperms can be released directly onto the ova✓

OR

-Many/ up to 6000 ova are released ✓
-since fertilisation is external ✓
(Mark the first ONE only) (2)

(7)

Question 4

4.1 (a) They lay eggs✓
(Mark first ONE only) (1)

(b) - The eggs are protected✓ /incubated by the parents
- The young chicks are fed by the parents✓ /display parental care
(Mark first ONE only) Any (1)

4.2 - It increases the chance of fertilisation✓ /gametes are in close contact
- Gametes are protected from predation✓ /desiccation /environmental factors
- Water is not needed✓
- Fewer gametes are needed✓
(Mark first TWO only) Any (2)

4.3 - Eyes are closed✓ when they hatch
- Bodies do not have (down) feathers✓
- Unable to move✓ directly after hatching
- Dependent on parents for food✓ /protection Any
(Mark first TWO only) (2)

4.4 - The chicks are not fully developed when they hatched✓ since
- the eggs have less yolk✓ /there is high degree of parental care (2)

(8)

Question 5

- 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 shock✓ /sudden changes in temperature /dehydration by the
  - Chorion✓
  - Amnion✓
  - Amniotic fluid✓ inside the amniotic membrane
  - Shell✓ /outer covering
  - Air pocket✓

Compulsory 1* + Any 4

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

(7)

Question 6

6.1 Internal fertilisation✓ (1)

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

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

(7)

Question 7

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

(9)

Question 8

8.1 External✓ fertilisation (1)

8.2 -To increase the chances of fertilisation✓
-since the gametes may be lost/✓not reach one another due to predation✓/water currents

OR

-To produce more zygotes✓/offspring (3)
-since many will be lost✓
-because they are preyed on✓/washed away/dry out

8.3 The embryos develop inside an egg, outside the female's body✓ (1)

(5)

Question 9

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

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

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

(11)

Question 10

10.1 a) C✓ - Urethra✓
OR
D✓ - Penis✓ (2)
b) B✓ -Epididymis✓ (2)
c) E✓ -Testes✓ (2)

10.2 a) Prostate gland✓ (1)
b) Spermatogenesis✓ (1)

(8)

QUESTION 11

11.1 Vas deferens ✓ (1)

11.2 - Sperm storage✓
- Sperm maturation ✓ Any 1 x1
(Mark first ONE only) (1)

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

11.4 - 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)

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

(12)

Question 12

12.1 Seminal vesicle✓ (1)

12.2 Transports semen out of the body✓ (1)

12.3 - Transports its secretions in ducts✓/ secretion not directly in blood (2)
- Does not produce a hormone✓

12.4 Spermatogenesis✓ (1)

12.5 - The secretion is alkaline✓
to neutralise the acidity of the vagina✓ / urethra
- The secretion contains nutrients✓
for the sperm to generate energy for movement✓
- The secretion is a fluid✓/mucus
which facilitates the movement of the sperm cells✓ Any (2 x 2) (4)

(9)

Question 13

13.1 (a) Mitochondria✓ (1)

(b) Acrosome✓ (1)

13.2 Seminiferous tubules✓ (1)

13.3 (a) - It fuses with the nucleus of the ovum✓ to form the zygote✓
- It carries genetic material✓/DNA/chromosomes which is transferred to the offspring✓
- Contains haploid number of chromosomes✓ which contributes to the formation of a diploid cell Any (1 x 2) (2)

(b) - It contains enzymes✓
that digest the outer membrane of the ovum✓ (2)

13.4 - Organelles in part B release energy✓
which enables movement✓of part **C** (2)

13.5 5 (mm/minute) x 45 (minutes) ✓
= 225✓ mm (2)

(11)

Question 14

14.1 Acrosome✓ (1)

14.2 - Fuses with the nucleus of the ovum✓ (1)
- Carries genetic material✓

14.3 - Produce energy✓/ site for cellular respiration
- which is needed for movement✓ of the sperm (2)

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

Any (2 x 2)

(8)

Question 15

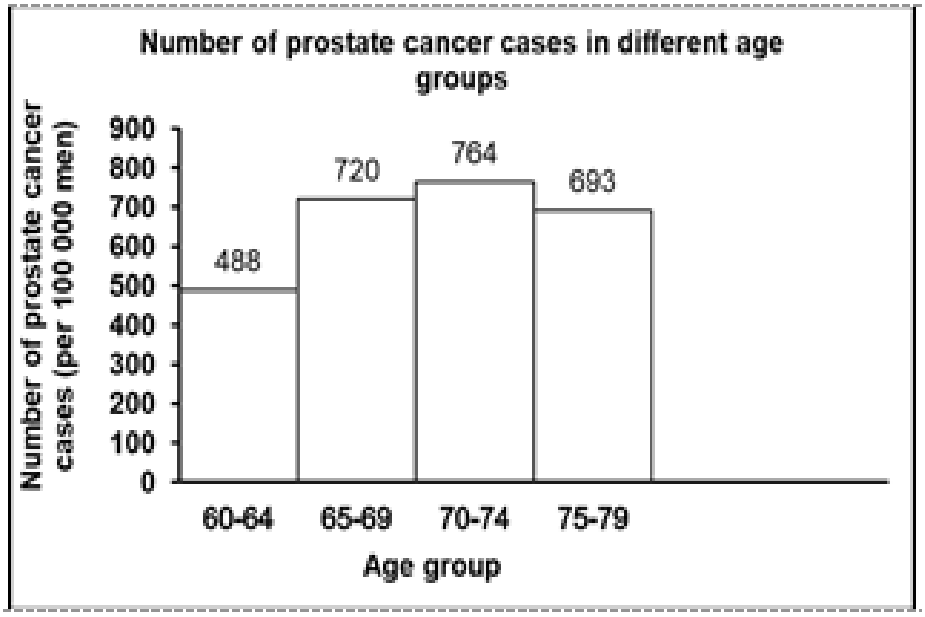
15.1 (a) Seminal visicle✓ (1)

(b) Testosterone ✓ (1)

15.2 -It is alkaline ✓
-to neutralize the acidic conditions of the vagina ✓
- It contains mucus✓/ provide medium/
to facilitate the movement of the sperm ✓
-it contains nutrients ✓
to supply the sperm with energy ✓ (2)
Mark the first ONE only

15.3 (a) (70 -74) ✓ (1)

b)



Criteria for marking of the graph:

Criteria	Mark allocation
Histogram is drawn (T)	1
Caption of the graph includes both variables (C)	1
Correct labels on the X-axis and Y-axis with correct unit on the Y-axis (L)	1
Correct scale for Y-axis and bars of equal width with no spaces for X-axis (S)	1
Plotting (P) correctly done for: 1- 3 age groups All 4 required age groups only	 1 2

If a bar graph or line graph is drawn, marks will be lost for:

- Type of graph
- Scale

If axes are transposed:

- Can get all marks if labels are also swopped and bars are horizontal
- If labels are not corresponding, then:
  - Marks will be lost for labels and scale
  - Plotting can get credit if coordinates are correct for given labels

(6)
(11)

Question 16

16.1 Male fertility✓ (1)

16.2 Measuring the sperm count✓ (1)

16.3 - Age✓
- Diet✓
- Exercise✓
- Activity level✓

- Lifestyle✓
- Occupation✓ etc.

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

(Mark first TWO only) (2)

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

16.5 - 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)

16.6 - To determine if TU is still effective after 12 months✓
- To see if the sperm count returns to normal✓ when the treatment stops

Any (1)

(Mark first ONE only)

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

(11)

Question 17

17.1 (a) Age✓ (1)
(b) Fertility✓ in men (1)

17.2 They determined the:
- sperm count✓/number of normal sperm per mℓ of semen
- progressive motility✓/ability of sperm to swim effectively in a straight line
- sperm necrosis✓/immature or dead sperm per fresh semen sample (3)

(Mark first THREE only)

17.3 - The investigation was conducted from 1999 to 2017✓/over 18 years
- 1 294 men✓ were tested

(Mark first TWO only) (2)

17.4 - So that age will be the only independent variable✓
- since high temperature can affect fertility✓/sperm count /sperm motility/ sperm necrosis
- therefore, decreasing the validity✓ of the investigation (3)

(10)

Question 18

18.1 Cervix ✓ (1)

18.2 - The site of fertilisation ✓
- The site of zygote division✓
- The transfer of the ovum/embryo to the uterus ✓
(Mark first ONE only) (1)

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

18.4 -It is a hollow organ ✓
- It has a muscular wall✓
- It has a blood-rich lining✓/endometrium Any
(Mark first ONE only) (1)

18.5 - No follicle will develop ✓
- No oestrogen produced ✓
- and no progesterone produced✓
- Therefore, the endometrium will not develop✓* to be shed during menstruation (3)
Compulsory mark✓*1 + Any 2

(10)

Question 19

19.1 Endometrium✓ (1)

19.2 Fertilisation ✓ (1)

19.3 The (nucleus of the) sperm fuses with (the nucleus of) the ovum✓ (1)

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

19.5 - It is muscular ✓to protect the foetus from mechanical injury✓/ to allow for parturition/birth
- It is flexible✓ /can expand to accommodate the growing foetus✓
- It is hollow✓ to accommodate the growing foetus✓
- The thickened endometrium✓ allows for implantation✓ /survival of the embryo
Mark first TWO only) Any (2 x 2) (4)

19.6 - The secretion is alkaline✓ which
- neutralises the acidic conditions✓ of the vagina (2)

(13)

Question 20

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

Any **(4)**

Question 21

21.1 Oogenesis✓ (1)

21.2 Amniotic✓ egg (1)

21.3
- It has a shell✓
  To prevent drying out✓ of the embryo /amniotic fluid
- It has amniotic fluid ✓
  To prevent drying out✓ of the embryo

Any (1x2) (2)

(Mark first ONE only)

21.4
- Females can reproduce without males✓
  increasing the chances of the species to survive✓ /therefore, less energy is used for reproduction

(2)

(Mark first ONE only)

(6)

Question 22

22.2
- 250 females per group were used✓/1000 females participated
- Measurement was done for 5 cycles✓

(Mark first TWO only) (2)

22.3 Older groups of women have a higher (average) FSH level than the younger groups✓✓

OR

Younger groups of women have a lower (average) FSH level than the older groups✓✓

Any (1x2) (2)

(Mark first ONE only)

22.4
- The Graafian/developing follicles secretes oestrogen✓but since the number of follicles are low✓/depleted
- less/no oestrogen will be secreted✓

(3)

22.5
- 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 23

23.1 Acrosome✓ (1)

23.2 mitochondrion✓ (1)

23.3 (a) 3✓ (1)

(b) 1✓ (1)

(c) 1✓ (1)

23.4 B✓- Nucleus✓ (2)

23.5 Mitosis✓ (1)

23.6
- After implantation the chorion✓
- develops many finger-like outgrowths✓
- called chorionic villi✓
- The endometrium✓
- together with the chorionic villi forms the placenta✓
- The umbilical artery✓
- and the umbilical vein✓develops
- inside a hollow tube✓to form the umbilical cord between the foetus and the placenta✓

Any (6)

(14)

Question 24

24.1 (1)

(a) Zygote ✓ (1)

(b) Morula ✓ (1)

(c) Blastocyst/blastula ✓ (1)

24.2

(a) Fertilisation ✓ (1)

(b) Endometrium✓ (1)

24.3 Mitosis ✓ (1)

24.4 23 ✓ (1)

24.5 Chorion ✓ (1)

(8)

Question 25

25.1 (a) Fallopian tube✓ (1)

(b) Ovary✓ (1)

25.2. (a)
- It has a rich blood supply ✓/ is vascular
- It is glandular✓
- It is thick✓

(Mark first TWO only) Any (2)

(b)
- Sperm cells are present in the fallopian tube ✓/ proximity of the ovum
- Ovulation has taken place✓ /an ovum has been released

(Mark first TWO only) (2)

25.3. - During oogenesis✓*
- diploid cells in the ovary undergo mitosis✓
- to form numerous follicles.✓
- At the onset of puberty✓
- under the influence of FSH✓
- one cell inside a follicle (enlarges and) undergoes meiosis.✓
- Of the four cells that are produced, only one survives to form a (mature), haploid ovum✓ (6)

Compulsory mark✓* (1) + Any (5)

25.4. - Part A /the fallopian tube is unable to provide the space✓
- and there is no endometrium✓ /blood supply
- to provide nutrients✓ /oxygen **OR** remove waste products
- in order for the embryo to develop✓ (3)

(15)

Question 26

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

26.2 Remains low✓/decreases (1)

26.3 - stimulates ovulation✓
- stimulates the development of the corpus luteum✓ (1)

(Mark first ONE only)

(6)

Question 27

27.1 20✓ (1)

27.2 FHS✓ (1)

27.3 - The progesterone level is decreasing✓ /goes from 5 to 0.8ng/ml therefore
- FHS secretion /the pituitary gland is no longer inhibited✓ (2)

27.4 $\left[\frac{280-70}{70}\right]$ ✓ x 100✓

= 300✓% (3)

27.5 It remains high✓ /will increase (1)

27.6 - The corpus luteum does not disintegrates✓
- and continues to secrete progesterone✓

OR

- The placenta develops✓
- Which secretes progesterone✓

Any (2)

(10)

Question 21

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

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

28.3 - 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)

28.4 - insufficient space✓
- poor/ no placental development✓
- decreased blood supply✓
- insufficient nutrients✓/ oxygen (2)
(Mark first TWO only)

(9)

Question 29

29.1 - Stimulates the development of ovarian follicles✓ (1)
- Initiates puberty ✓

29.2 - LH✓/Luteinising Hormone (1)

29.3 - LH stimulates ovulation✓
- therefore, ovulation will not take place✓
- There will be no ovum to fertilise✓ (2)

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

Question 30

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

30.2 (a) Progesterone treatment✓ (1)

(b) Development of gestational diabetes✓ (1)

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

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

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

(10)

Question 31

31.1

(a) Graafian follicle✓
Corpus Luteum✓
(Mark first TWO only) (2)

(b) (Intense) pain✓
(Internal) bleeding✓
(Mark first TWO only) (2)

31.2

(a) FSH✓ (1)

(b) Oestrogen✓
OR
LH✓
OR
FSH✓ (1)

31.3 The Graafian follicle keeps on producing oestrogen✓/ fails to rupture
.
OR
The increased secretion of oestrogen stimulates the secretion of LH✓
OR
Excess production of FSH can cause the failure to ovulate✓ / Graafian follicle to rupture (1)

31.4 -The corpus luteum does not degenerate✓ and
-keeps on secreting progesterone✓
-This will inhibit the pituitary gland✓
-from secreting FSH✓
- Therefore no follicles will develop✓ and
-no ovulation✓ will take place ANY (5)

(12)

Question 32

32.1 (a) Amniotic✓ fluid (1)
(b) Placenta✓ (1)
32.2 (a) Umbilical vein✓ (1)
(b) - Chorionic villi✓ /chorion
- Endometrium✓
(Mark first TWO only) (2)
(5)

Question 33

33.1 Chorion✓ (1)
33.2 - Acts as a shock absorber✓
- It prevents desiccation✓/dehydration
- It helps to keep the temperature within a narrow range✓
- It facilitates free movement✓ of the foetus Any
(Mark first TWO only) (2)
33.3 - The zygote divides by mitosis✓
- to form a (solid) ball of cells✓
- called the morula✓
- which develops into a hollow ball of cells✓
- called the blastula✓/blastocyst (4)
33.4 - Acts as a micro-filter✓/protect against pathogens
- Removal of harmful metabolic waste✓
- Produces antibodies✓
- Maintains the endometrium✓ Any
(Mark first TWO only) (2)
33.5 Umbilical vein✓ (1)
33.6 -In humans the developing foetus receives nutrients from the mother's✓ blood
- via the placenta✓/umbilical vein
- In oviparous organisms the developing embryo receives nutrients from the yolk✓/albumen (3)
(13)

Question 34

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

- the high progesterone levels✓ during pregnancy
- will inhibit the secretion of FSH ✓/hormone A (3)

(10)

Question 35

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

(5)

Question 36

36.1 (a) Oestrogen✓ (1)

(b) Progesterone✓ (1)

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

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

(b) Day 14 ✓ (1)

(c) LH/ Luteinising Hormone ✓ (1)

36.4 - High levels of hormone B/progesterone will inhibit✓
- the secretion of FSH✓

OR

- No new ova/mature follicles✓
- are required during pregnancy✓ (2)

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

36.6 - High levels of progesterone ✓
- stimulate the Pituitary gland/ Hypophysis✓ to secrete a less FSH ✓

To prevent the growth of a new follicle ✓/ ovulation during the pregnancy

OR

- Low levels of progesterone✓
- stimulate the Pituitary gland/ Hypophysis✓ to secrete a more FSH✓
-which stimulate the development of new follicles✓ (4)

(17)

Question 37

37.1 - Stimulates ovulation✓
- Stimulates the development of the corpus luteum✓ (2)
(Mark first TWO only)

37.2 Follicle stimulating hormone✓ /FSH (1)

37.3 Progesterone✓ (1)

37.4 - The (progesterone) levels will remain low✓
- The LH levels are low✓ therefore
- ovulation will not take place✓ and
- no corpus luteum will develop✓ (4)

37.5 Hormone X /progesterone levels remain high✓ (1)

(9)

Question 38

38.1 Accept day 14✓ or day 15 (1)

38.2 Days 0 - 7✓ (1)

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

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

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

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

38.7 No✓ (1)

TOPIC: GENETICS

Question 1

	DESCRIPTION	TERM
1.1	The study of heredity and variation in organisms	**Genetics**
1.2	All the genes that make up an organism	**Genome**
1.3	Two or more alternative forms of a gene at the same locus	**Alleles**
1.4	The position of a gene on a chromosome	**Locus**
1.5	The non-sex chromosomes in humans	**Autosomes**
1.6	An inherited disorder where blood fails to clot properly	**Haemophilia**
1.7	The number, shape and arrangement of all chromosomes in the nucleus of a somatic cell	**Karyotype**
1.8	A genetic cross involving one gene and its alleles	**Monohybrid**
1.9	A genetic disorder where blood does not clot	**Haemophilia**
1.10	The use of living organisms and their biological processes to improve the quality of human life	**Biotechnology**
1.11	The type of inheritance involving two alleles that are not dominant over one another	**Incomplete dominance**
1.12	Characteristics controlled by genes which are located on the sex chromosomes	**Sex-linked**
1.13	The type of inheritance involving alleles that equally determine the phenotype of heterozygous offspring	**Codominance**
1.14	An allele that is expressed phenotypically only in the homozygous condition	**Recessive**
1.15	The physical and functional expression of a gene	**Phenotype**
1.16	The production of a genetically identical copy of an organism using biotechnology	**Cloning**
1.17	The manipulation of the genetic material of an organism to get desired changes	**Genetic engineering**
1.18	A diagram showing the inheritance of genetic disorders over many generations	**Pedigree diagram**
1.19	An allele that does not influence the phenotype when found in the heterozygous condition	**Recessive**
1.20	Organisms having two identical alleles at a given locus	**Homozygous**
1.21	An allele that is always expressed in the phenotype	**Dominant**
1.22	An individual having two non-identical alleles for a characteristic	**Heterozygous**
1.23	A segment of a chromosome that codes for a particular characteristic	**Gene**
1.24	The type of inheritance which produces an intermediate phenotype	**Incomplete Dominance**

1.25	The position of a gene on a chromosome	**Locus**
1.26	The type of dominance which results in an intermediate phenotype in the heterozygous condition.	**Incomplete Dominance**
1.27	The production of a genetically identical copy of an organism using biotechnology	**Cloning**
1.28	Undifferentiated cells in animals that have the potential to become any type of tissue	**Stem cells**
1.29	A genetic disorder that results in a person who cannot distinguish between the colours red and green	**Colour blindness**
1.30	The biotechnological process that produces genetically identical organisms	**cloning**
		30 x1 = (30)

Question 2

2.1	Both A and B✓✓	
2.2	None✓✓	
2.3	A only✓✓	
2.4	B only✓✓	
2.5	A only✓✓	
2.6	None✓✓	
2.7	A only ✓✓	
2.8	B only✓✓	
2.9	None✓✓	
2.10	None✓✓	
2.11	None✓✓	
		(11x2) **(22)**

Question 3

3.1 Incomplete dominance✓ (1)

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

3.3

P_1	Phenotype	Pink	x	Pink✓	
	Genotype	RW	x	RW✓	
Meiosis					
	G/gametes	R, W	x	R, W✓	
Fertilisation					
F_1	Genotype	RR; RW; RW; WW✓			
	Phenotype	1 Red: 2 Pink: 1 White✓*			

P_1 and F_1✓
Meiosis and fertilisation✓

OR

P_1	Phenotype	Pink	x	Pink✓
	Genotype	RW	x	RW✓

Meiosis

Fertilisation

Gametes	R	W
R	RR	RW
W	RW	WW

1 mark for correct gametes
1 mark for correct genotypes

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

P_1 and F_1✓
Meiosis and fertilisation✓

1* compulsory + Any 5 (6)

(9)

Question 4

4.1

P_1	Phenotype	Male	x	Female✓	
	Genotype	XY	x	XX✓	
Meiosis					
	G/gametes	X, Y	x	X, X✓	
Fertilisation					
F_1	Genotype	XX; XX;		XY; XY✓	
	Phenotype	female	:	male✓	

P_1 and F_1✓
Meiosis and fertilisation✓

OR

P_1	Phenotype	Male	x	Female✓
	Genotype	XY	x	XX✓

Meiosis

Fertilisation

Gametes	X	Y
X	XX	XY
X	XX	XY

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype female: male✓
P_1 and F_1✓
Meiosis and fertilisation✓ Any (6)

4.2
- 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

OR (5)

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

2 XX : 2 XY
Female ✓ Male✓ (Any

(11)

Question 5

5.1 ffHh ✓ (1)
5.2 (a) (a) FfHh✓✓ (2)
(b) (b) 3✓ (1)
(c) (c) h ✓ (1)
(d) (d) Long fingers and continuous hairline ✓✓ (2)
(7)

Question 6

6.1 Dihybrid✓ cross (1)
6.2 TTrr✓✓ (2)
6.3 TR✓, Tr✓, tR✓, tr✓ (4)
(7)

Question 7

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

Question 8

8.1 Pedigree✓ diagram (1)
8.2 (a) 6✓ (1)
(b) 1✓ (1)
8.3 X^GX^g✓✓ (2)
8.4 Unaffected✓✓ / without Goltz syndrome (2)
8.5 - 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 9

9.1 A change in the sequence✓ of nitrogenenous bases✓/ nucleotides in a gene (2)
9.2 Nigeria ✓% (1)
9.3 $\frac{39\ 746}{305\ 733}$ ✓ x 100✓ =13✓ % (3)
9.4 (a) dd✓ (1)
(b) Dd✓ (1)
(8)

Question 10

10.1 (a) 4✓/ Four (1)
(b) 1✓/ One (1)
10.2 I^A i✓✓ (2)
10.3 (a) Son 1✓ (1)
(b) Mother✓ (1)
(c) Son 1✓ (1)
(7)

Question 11

11.1 - 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)

11.2 -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)

11.3 (Horse) S ✓ (1)

11.4 - 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 12

12.1 I^A✓ I^B✓i✓ (3)

12.2 2✓ (1)

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

12.4 - Each child✓
- has an equal✓/25% chance of having
- any blood group✓/A, B, AB, or O. (3)
(9)

Question 13

13.1 (a) I^BI^B✓ or I^Bi✓ (2)
(b) ii✓ (1)

13.2 - 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)

13.3 Blood type can be used to exclude a particular m✓an 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 14

14.1 3✓/ Three (1)

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

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

Meiosis

G/gametes I^A I^B x I^B i✓

Fertilisation

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

Phenotype: Blood group:
AB; A; B✓*

P_1 and F_1✓
Meiosis and fertilisation✓

Compulsory 2*+ Any 4

OR

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

Meiosis

Fertilisation

Gametes	I^A	I^B
I^B	I^AI^B	I^BI^B
i	I^Ai	I^Bi

1 mark for correct gametes
1 mark for correct genotypes*

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

P_1 and F_1✓
Meiosis and fertilisation✓

Compulsory 2*+ Any 4 (6)
(10)

Question 15

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

Question 16

16.1 Dihybrid✓ cross (1)

16.2 (a) Smooth✓ stem (1)

(b) Elongated✓ fruit (1)

16.3 (a) nnrr✓✓/nrnr/ rrnn (2)

(b) Smooth stem round fruit✓✓ (2)

(7)

Question 17

17.1 - The disorder is controlled by alleles✓/genes that
- are located on the autosomes✓ (2)

17.2 One✓/1 (1)

17.3 - Individuals 3 and 4 are both without Tay-Sachs disease✓
- The child has Tay-Sachs✓/Individual 7 has Tay-Sachs
- which is only expressed in the phenotype in a homozygous condition✓
- Each parent must carry a recessive allele✓/be heterozygous
- The child has two recessive alleles✓
- One was received from each parent✓

OR

- Individuals 3 and 4 are both without Tay-Sachs disease✓
- If it was caused by a dominant allele✓
- then individual 3 or 4 would *have* Tay Sachs✓
- and still have a child with Tay-Sachs✓/individual 7 has Tay-Sachs
- who could be heterozygous✓ Any (5)

17.4 TT✓

tt✓ (2)

(10)

Question 18

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

Meiosis

G/gametes X^H, X^h x X^h, Y✓

Fertilisation

F_1 Genotype X^HX^h, X^HY, X^hX^h, X^hY✓

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

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

P_1 and F_1✓
Meiosis and fertilisation✓

***1 compulsory mark** + any 6

OR

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

Meiosis

Fertilisation

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

1 mark for correct gametes
1 mark for correct genotypes

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

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

P_1 and F_1✓
Meiosis and fertilisation✓

***1 compulsory mark**+ any 6

(7)

Question 19

19.1 To determine which blood group was the most common in their community✓ (2)

19.2 (a) - Obtain permission from the school□/clinic to conduct the investigation
- Decide on the sample size✓
- Decide on the method for recording results✓
- Decide on time/date to collect data from the clinic
(Mark first THREE only) (3)

(b) - Sampled 3/all blood donor clinics in the community✓
- 200 donors per clinic sampled✓ /600 donors Any
(Mark first ONE only) (1)

(c) First time donors' blood groups are not known yet✓/
not in the database (1)

19.3 $\frac{15}{100}$ x ✓600✓= 90✓ participants (3)

19.4 (a) (Blood group) O✓ (1)

(b) (Blood group) AB✓ (1)

19.5 $I^A I^A$ ✓
I^A i✓ (2)
(14)

Question 20

20.1 3✓/Three (1)

20.2 (a) H✓ (1)

(b) Rr✓ (1)

(c) C✓and F✓ (2)
(5)

Question 21

21.1 Dihybrid✓cross (1)

21.2 (a) Brown✓ fur and long ears✓ (2)

(b) bbee✓✓ (2)

(c) Be✓ be✓ (2)
(7)

Question 22

22.1 954 000✓ (1)

22.2 1 800 000✓ – (954 000 + 180 000 + 54 000)✓
= 612 000✓people

OR

1 800 000✓ - 1 188 000✓
= 612 000✓people

OR

$\frac{34}{100}$ ✓ x 1 800 000✓ = 612 000✓people (3)

22.3 - The allele for blood group A/ I^A is inherited from one parent✓ and

- the allele for blood group B/ I^B is inherited from the other parent✓ therefore
- the child has blood group AB✓/genotype I^AI^B (3)

(7)

Question 23

23.1
- Males have only one X chromosome✓/The Y-chromosome does not have this allele and
- have to inherit only one recessive allele✓ to have white teeth
- whereas females have two X chromosomes✓ and have to inherit two recessive alleles to have white teeth✓ (4)

23.2

P_1	Phenotype	Male with brown teeth	x	Female with white teeth✓
	Genotype	X^BY	x	X^bX^b✓

Meiosis

G/gametes X^B, Y x X^b, X^b✓

Fertilisation

F_1 Genotype X^BX^b, X^BX^b, X^bY, X^bY✓

Phenotype 1 female with brown teeth: 1 male with white teeth✓*****

P_1 and F_1✓

Meiosis and fertilisation✓

***1 compulsory mark** + Any 5

OR

P_1	Phenotype	Male with brown teeth	x	Female with white teeth✓
	Genotype	X^BY	x	X^bX^b✓

Meiosis

Fertilisation

Gametes	X^B	Y
X^b	X^BX^b	X^bY
X^b	X^BX^b	X^bY

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype 1 female with brown teeth: 1 male with white teeth✓*****

P_1 and F_1✓

Meiosis and fertilisation✓

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

(10)

Question 24

24	24.1	Pedigree✓diagram	(1)
	24.2	3✓/Three	(1)
	24.3	3✓/Three	(1)
	24.4	I^Ai I^Bi ✓✓ ii	(2)
	24.5	ii✓	(1)
	24.6	Ann✓✓	(2)
			(8)

Question 25

25

P_1 Phenotype With polydactyly x Without polydactyly✓
Genotype Rr x rr✓

Meiosis

G/gametes R , r x r, r✓

Fertilisation

F_1 Genotype Rr, Rr, rr, rr✓

Phenotype 2 polydactyly ; 2 without polydactyly✓

50✓***%** chance of polydactyl child

P_1 and F_1✓
Meiosis and fertilisation✓

***1 compulsory mark** + Any 5

OR

P_1 Phenotype With polydactyly x Without polydactyly✓
Genotype Rr x rr✓

Meiosis

Fertilisation

Gametes	R	r
r	Rr	rr
r	Rr	rr

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype 2 polydactyly ; 2 without polydactyly✓

50✓***%** chance of polydactyl child

P_1 and F_1✓
Meiosis and fertilisation✓

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

Question 26

26.1 (a) BBDD✓
bbdd✓ (2)

(b) White, round fruit✓✓ (2)

26.2 (a) BD
bD ✓✓
Bd
bd (2)

(b) One✓/1 (1)

26.3 BBdd and BBdd✓✓

OR

BBdd and Bbdd✓✓

OR

BBdd and bbdd✓✓ (2)
(9)

Question 27

27.1 - Embryos✓
- Umbilical cord✓
- Bone marrow✓
(Mark first THREE only) (3)

27.2 - Stem cells are undifferentiated✓
- and have the potential to develop into any type of cell✓
- to replace affected/defective cells✓ causing a disorder Any (2)

27.3 - Stem cells are undifferentiated✓
- and have the potential to develop into any type of cell✓ to replace affected/defective cells✓ causing a disorder Any (1)
(6)

Question 28

28.1 Three✓/3 (1)

28.2 bb✓ (1)

28.3 - Both parents (5 and 6) have a dominant and a recessive allele✓/Bb
- since they do not have cystic fibrosis✓.
- They have children 8 and 9 with cystic fibrosis✓/who are homozygous recessive/bb
- who received one recessive allele from each parent✓ (4)

28.4

P_1	Phenotype	(Male) without cystic fibrosis	x	(Female) without cystic fibrosis✓
	Genotype	Bb	x	Bb✓
Meiosis				
	G/gametes	B , b	x	B , b✓
Fertilisation				
F_1	Genotype	BB , Bb , Bb, bb✓		
	Phenotype	3 without cystic fibrosis: 1 with cystic fibrosis✓		

P_1 and F_1✓
Meiosis and fertilisation✓ Any 6

OR

P_1	Phenotype	(Male) without cystic fibrosis	x	(Female) without cystic fibrosis✓
	Genotype	Bb	x	Bb✓

Meiosis

Fertilisation

Gametes	B	b
B	BB	Bb
b	Bb	bb

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype 3 without cystic fibrosis: 1 with cystic fibrosis✓

P_1 and F_1✓
Meiosis and fertilisation✓

Any 6 (6)

(12)

Question 29

29.1 Dihybrid✓ cross (1)

29.2 Red spots✓ and black eyes✓ (2)

29.3 (a) RRee✓✓ and Rree✓✓ (4)

(b) Red spots, black eyes ✓ (1)

(c) re✓ (1)

(9)

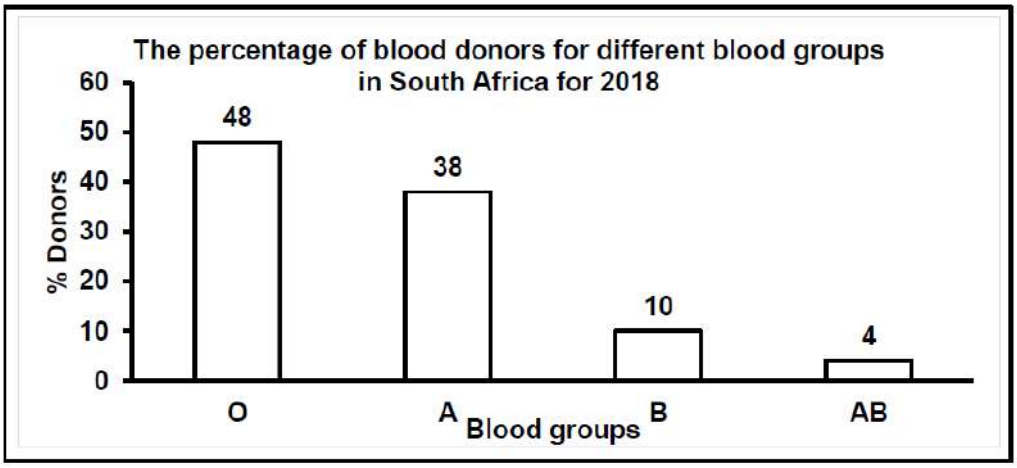
Question 30

30.1 O✓ (1)

30.2 Complete✓dominance (1)

30.3 -The man is heterozygous✓ /is I^Ai for blood group A
-The woman has an allele for blood group B✓/is I^AI^B
-The child inherits the I^B allele from the mother✓
-and the i allele from the father✓
-Therefore, the child will be heterozygous✓ for blood group B/ the genotype will be I^Bi (5)

30.4



Guideline for assessing the graph

CRITERIA		ELABORATION	MARK
Correct type of graph	(T)	Bar graph drawn	1
Caption of graph	(C)	Both variables, SA and 2018 included	1
Axes labels	(L)	X- and Y axis correctly labelled with units	1
Scale for X- and Y-axis	(S)	- Equal space and width of bars for X-axis and - Correct scale for Y-axis	1
Plotting of co-ordinates	(P)	- 1 to 3 co-ordinates plotted correctly - All 4 co-ordinates plotted correctly	1 2

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

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

(13)

Question 31

31

31.1 Three✓/3 (1)

31.2

(a) Male without muscular dystrophy✓ (1)

(b) X^DX^d✓ (1)

31.3 -Males only have one X chromosome✓/XY and
-need only one recessive allele to have muscular dystrophy✓
-The Xd allele on a male cannot be masked by a dominant allele✓
-Females have two X-chromosomes✓ and
-need two recessive alleles to have muscular dystrophy✓/ X^dX^d
-In females, a dominant allele on one X chromosome would mask the effect of the recessive allele✓/X^D masks X^d

Any (5)

31.4

P_2	Phenotype	Female without muscular dystrophy	x	Male without muscular dystrophy✓
	Genotype	X^DX^d	x	X^DY✓
Meiosis				
	Gametes	X^D, X^d	x	X^D, Y✓
Fertilisation				
F_2	Genotype	$X^D X^D$ $X^D Y$, $X^D X^d$, X^dY ✓		
	Phenotype	(50%) females without muscular dystrophy (25%) male without muscular dystrophy (25%) male with muscular dystrophy ✓		
		25✓*% chance of muscular dystrophy child		

P_2 and F_2✓

Meiosis and fertilisation✓

***1 compulsory mark** + Any 5

OR

P_2	Phenotype	Female without muscular dystrophy	x	Male without muscular dystrophy✓
	Genotype	X^DX^d	x	X^DY✓

Meiosis

Fertilisation

Gametes	X^D	X^d
X^D	$X^D X^D$	$X^D X^d$
Y	$X^D Y$	X^dY

1 mark for correct gametes
1 mark for correct genotypes

F_2 Phenotype (50%) females without muscular dystrophy
(25%) male without muscular dystrophy
(25%) male with muscular dystrophy ✓

25✓*% chance of muscular dystrophy child

P_2 and F_2✓
Meiosis and fertilisation✓

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

(13)

Question 32

32

32.1 - It is harmful✓ /prevents clotting of blood
- and leads to excessive bleeding✓ /internal bleeding/ swelling of joints/ bruising (2)

32.2 $\left[\frac{25}{100} \times 25\,000\right]$✓ = 6250✓

OR

25% x 25000✓ / (0,25 x 25000) = 6250✓

OR

$\frac{25000}{4}$ ✓ = 6250✓

(2)

32.3 - Males have only one X-chromosome✓/XY
- If this chromosome carries the recessive allele the male will have haemophilia✓
- as there is no other allele that could mask the effect of the recessive allele✓ (3)

(7)

Question 33

33

33.1 -The Bt producing gene is cut from the bacterial DNA✓ and
-inserted into maize DNA✓
-This recombinant DNA✓
-causes the maize plant to produce the Bt toxin✓

Any (3)

33.2 -Fewer crops damaged✓leads to increased yield✓/more food for people/increased food security/healthier crops/more profit
-Reduced need for pesticides✓,farmers save money✓/less toxins to consumers/environment

(Mark first TWO only) (2 x 2) (4)
(7)

TOPIC: HUMAN RESPONSE TO ENVIRONMENT SOLUTIONS

Question 1

	DESCRIPTION	TERM
1.1	The part of the brain that receives impulses from the maculae	**Cerebellum**✓
1.2	The structure that connects the left and right hemispheres of the brain	**Corpus callosum**✓
1.3	The part of the brain that controls body temperature	**Hypothalamus** ✓
1.4	The branch of the autonomic nervous system that restores an increased heart rate back to normal	**Parasympathetic** ✓
1.5	The part of the nervous system that is made up of cranial and spinal nerves	**Peripheral nervous system** ✓
1.6	A part of the nervous system that consist of sympathetic and parasympathetic section	**Autonomic** ✓
1.7	A functional gap between two consecutive neuron	**Synapse** ✓
1.8	Collective name for the membranes that the brain and spinal cord	**Meninges** ✓
1.9	Neurons that carry impulses from receptors	**Sensory**✓
1.10	The part of the skull that protects the brain	**Cranium**✓
1.11	The part of the brain that regulates breathing	**Medulla oblongata**✓
1.12	The disease characterised by the degeneration of brain tissue, leading to memory loss	**Alzheimer's disease**✓
		(12x1) **(12)**

Question 2

2.1 B Only ✓✓
2.2 A Only ✓✓
2.3 Both A and B ✓✓
2.4 B Only ✓✓
2.5 B only✓✓

(5x2) **(10)**

Question 3

3.1

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

(5x2) **(10)**

Question 4

4.1	(a)	Spinal cord✓	(1)
	(b)	Pituitary gland✓/hypophysis	(1)
4.2		A✓	(1)
4.3		Between the two hemispheres of the cerebrum✓✓	(2)
4.4	(a)	- Part **D**/ medulla oblongata which controls breathing✓ - was not injured✓	(2)
	(b)	- The learner (occasionally) lost balance✓ - due to no coordination of voluntary movements✓ by part **B**	(2)
	(c)	- The loss of memory indicates a possible injury to part **A**✓/the cerebrum - which is also responsible for hearing ✓/ (interpretation of) sound	(2)
			(11)

Question 5

5.1	(a)	Myelin sheath ✓	(1)
	(b)	Axon ✓	(1)
5.2	(a)	A ✓	(1)
	(b)	C ✓	(1)
5.3		D ✓- Synapse ✓	(2)
			(8)

Question 6

6.1	Motor✓ /efferent neuron	(1)
6.2	C → B → A✓✓ (Must be in the correct sequence)	(2)
6.3	- Impulse will be transmitted faster in neuron 1✓✓/ slower in neuron 2 - because of the presence of myelin sheath in neuron 1✓/ absence of myelin sheath in neuron 2	(3)
6.4	- 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 7

7.1		Reflex arc✓	(1)
7.2	(a)	B- Motor neuron/Multipolar neuron/efferent neuron	(1)
	(b)	C - Interneuron✓	(1)
	(c)	E – Sensory neuron/unipolar neuron/afferent neuron✓	(1)
7.3	(a)	F✓	(1)
	(b)	A✓	(1)
7.4	(c)	D✓- Synapse✓	(2)
	(b)	G ✓- Myelin sheath✓	(2)
			(10)

Question 8

8.1 A ✓ (1)

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

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

1* compulsory + any other 2 (3)

8.4 Nerve ✓/ spinal cord (1)

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

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

(Any two) (2)

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

2* compulsory + any other 4 (6)

(16)

Question 9

9.1 - A rapid involuntary/automatic response✓
- to a stimulus✓ (2)

9.2 (a) It ensures that the impulse is transmitted in one direction✓ (1)

(b) It is important for balance✓/movement (1)

9.3 - The impulse is transmitted from the receptors in the patellar tendon✓ through the
- sensory neuron✓ and the
- synapse✓to the
- motor neuron✓ and to the
- quadriceps✓muscle

(Correct sequence is required) (5)

(9)

Question 10

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

10.2 0 to 1 ✓ ✓ um / 0 to 0,9 um (2)

10.3 As the axon diameter increase the speed of the impulse increases ✓✓
OR (2)
As the axon diameter decrease the speed of the impulse decrease ✓✓

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

(9)

Question 11

11.1 - Degeneration✓/wasting away of nerve tissue
- Plaque/proteins formed around the nerve tissue✓

(Mark first ONE only) Any (1)

11.2 (a) Worsening ability to remember new information✓ (1)
(Mark first ONE only)

(b) Family history✓ (1)

(c) - Learning ability✓
- Orientation✓ (2)

(Mark first TWO only)

11.3 They:
- Were all females✓/considered gender
- Were between the ages of 65 and 75✓/considered age group/age
- Did not show symptoms of Alzheimer's disease✓ Any (2)

(Mark first TWO only)

11.4 They:
- Used 37 participants✓
- Conducted the investigation three times a week✓
- Conducted the investigation for three months✓ Any (2)

(Mark first TWO only)

11.5 - Investigation did not establish the relationship between exercise and development of Alzheimer's disease✓
- since no changes in the nervous tissue were measured✓/ period was short

OR

- There was no control group✓
- to show that it is the exercise that improve blood flow✓/higher order-thinking abilities

OR

- People who did not show symptoms of Alzheimer's disease were used✓
- therefore, results do not show prevention of development of Alzheimer's disease✓ Any (1 x 2) (2)

11.6
- Exercise can improve blood flow to the brain✓ and
- it can maintain the volume of the hippocampus✓ which will
- prevent a decrease in higher order thinking✓/cognitive abilities/learning abilities (3)

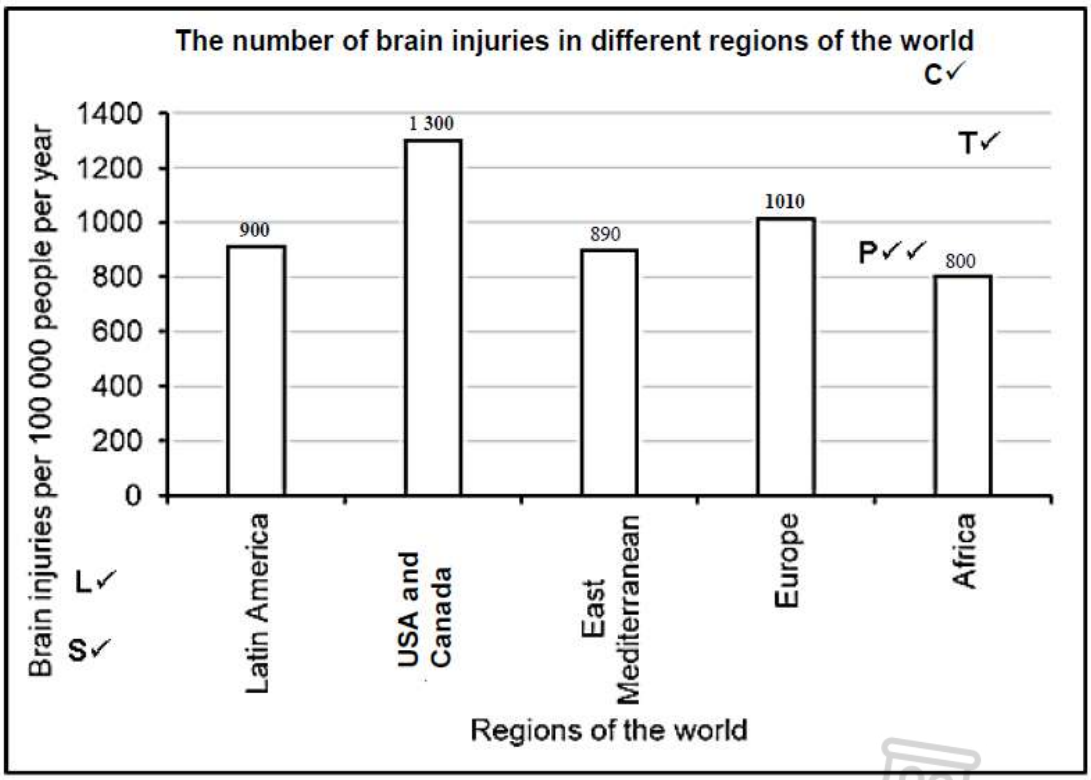
(14)

Question 12

12.1 Africa✓ (1)

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

12.3



Criteria for marking graph:

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

(6)

(9)

Question 13

13.1 (a) Peripheral ✓nervous system (1)
(b) Autonomic nervous system✓ (1)
13.2 Spinal✓ nerves (1)
13.3 E ✓– Parasympathetic nervous system✓ (2)
13.4 Neurons✓ (1)
13.5 - Meninges✓
- Cranium/bone tissue✓
- Cerebrospinal fluid✓ **(Mark first TWO only)** Any (2)
(8)

Question 14

14 14.1 - The pathway along which impulses are transmitted✓ (1)
- to bring about a reflex action✓ (1)

14.2 (a) Guillain-Barre syndrome✓
(Mark first ONE only) (1)
(b) Damage to the motor neurons✓
(Mark first ONE only) (1)
(c) The skeletal muscles have a decreased reflex response✓
(Mark first ONE only) (1)

14.3 - In hyporeflexia damage is between the spinal cord and the skeletal muscles✓ while
- in hyperreflexia damage is between the brain and the spinal cord✓
(Mark first ONE only) (2)

14.4 Myelin sheath✓ (1)

14.5 - Axon is no longer insulated✓
- This causes the speed of transmission of nerve impulses to decrease✓
- which can lead to a delayed response✓and
- therefore, loss of muscle control ✓ Any (3)
(11)

Question 15

15 15.1 Motor✓neuron

15.2 - The neuron has many dendrites✓/is multipolar
- The cell body is located at one end✓
- The axon is long and the dendrites are short✓
(Mark first ONE only) (1)

15.3 -It transmits impulses✓
-from the central nervous system✓ /interneuron
-to the effector✓ (3)

15.4 C→ A → B✓✓ (2)

15.5 Multiple sclerosis✓ (1)
(8)

Question 16

16 16.1 (a) 5✓µm (1)

(b) 800✓µm (1)

16.2 (a) (The impulse speed) is faster in a myelinated neuron than in an unmyelinated neuron✓✓

OR

(The impulse speed) is slower in an unmyelinated neuron than in a myelinated neuron✓✓ (2)

(b) As the axon diameter increases, the impulse speed is faster ✓✓ (2)

(6)

THE EYE

Question 1

	DESCRIPTION	TERM
1.1	A type of vision in which both eyes are used together to focus on an object	**Binocular vision** ✓
1.2	The watery fluid that supports the cornea and the front chamber of the eye	**Aqueous humor**✓
1.3	The pigmented layer of the eye that absorbs excess light	**Choroid**✓
1.4	The series of changes that take place in the shape of the lens and the eyeball in response to the distance of an object from the eye	**Accommodation**✓
1.5	A defect condition of the eye where a person can see nearby objects clearly while distant objects are blurred.	**Myopia** ✓
1.6	The visual defect characterised by a cloudy lens	**Cataract** ✓
1.7	The area of the retina that contains the highest concentration of cones	**Yellow spot ✓/fovea centralis**
1.8	The layer in the eye that is richly supplied with blood vessels	**Choroid** ✓
1.9	Photoreceptors that react to low light intensity and are responsible for black and white vision	**Rods**
		(9x1) **(9)**

Question 2

2.1 A only✓✓
2.2 Both A and B✓✓
2.3 Both A and B✓✓
2.4 Both A and B✓✓
2.5 B only✓✓

(5x2) **(10)**

Question 3

(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 4

4.1 (a) Accommodation✓ (1)

(b) Pupillary mechanism✓/ pupillary reflex (1)

4.2 (a) B✓ and D ✓ (2)
(Mark the first TWO only)

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

4.3 (a) C✓ and D ✓ (2)
(Mark the first TWO only)

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

(10)

Question 5

5.1 Long-sightedness✓ (1)

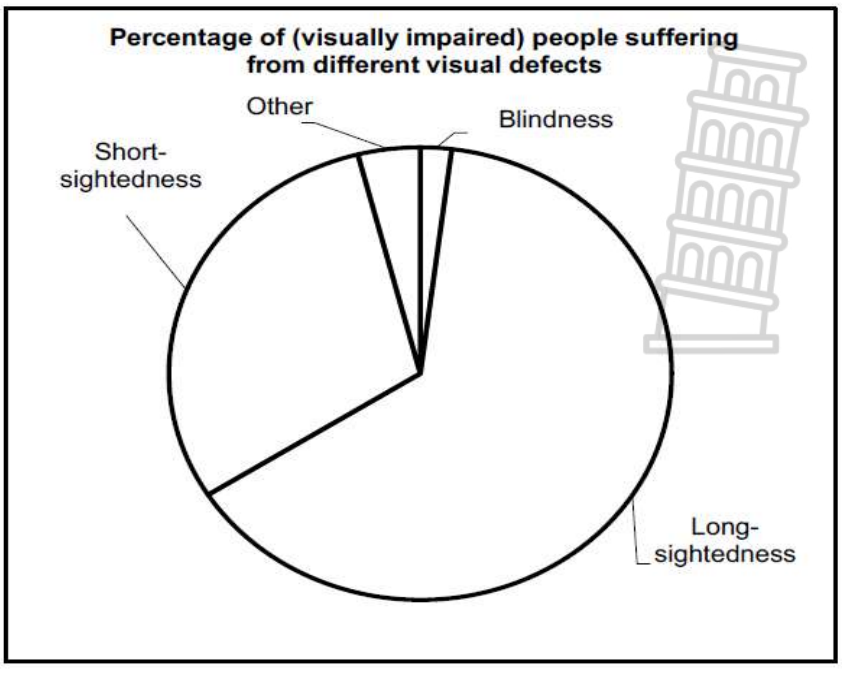
5.2 (a) The lens becomes cloudy/opaque/milky✓ and there it does not allows the light to pass through✓ (2)

(b) Surgery ✓ ***(Mark first ONE only)*** (1)

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

5.4 Astigmatism✓ (1)

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



(6)
(14)

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

Question 6

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

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

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

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

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

Question 7

7.1 (a) B✓- Iris✓ (2)
(b) A✓ - Sclera✓ (2)

7.2 (a) 2✓ (1)
(b) 3✓ (1)

7.3 (a) Circular✓ muscles (1)
(b) Circular ✓muscles (1)
(8)

Question 8

8.1 Iris✓ (1)

8.2
- Helps to maintain the shape of the eye✓
- Plays a role in refraction of light✓
- Allows the transmission of light✓
- Prevents desiccation✓ of structures in the eye
- Holds the retina in position✓
- Nourishment✓ of the eye
- Prevents mechanical injury✓ in the eye

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

8.3 - Area B contains (a high concentration of) photoreceptors✓/ cones
- Area C contains no photoreceptors✓/ no rods & cones (2)

8.4 Astigmatism✓ (1)

8.5 - Because the lens will become cloudy✓/opaque
- no/less light will enter the eye✓
causing no sight ✓/weak sight (3)

8.6 - The ciliary muscle contracts✓
- The ciliary body moves closer to the lens✓
- The suspensory ligaments slacken✓
- Tension on the lens decreases✓
- The lens becomes more convex✓/rounded
- Light rays are refracted more✓
- To focus the light on the retina✓ Any 6 (6)

(15)

Question 9

9

9.1 (a) Blind spot✓ (1)

(b) Cornea✓ (1)

(c) Sclera✓ (1)

9.2 - Radial muscles contract ✓and
- circular muscles relax✓
- The pupil widens✓/dilates
- More light enters the eye✓ (4)

9.3 Accommodation✓ (1)

9.4 - It is more convex✓
- so that light rays are refracted (bent) more✓
- to focus on the retina✓ /to form a clear image on the retina (3)

(11)

Question 10

10

10.1 Sub-capsular✓cataracts (1)

10.2 -Protein structures in the lens start to disintegrate and clump together✓
-The lens becomes opaque✓/milky and
-less/no light passes through✓ the lens
-onto the retina✓
-therefore less/no stimuli will be converted to impulses✓ (5)

10.3 -The eyeball is too short✓
-The image forms behind the retina✓
-causing blurred vision✓

OR

-The cornea is less convex✓
-Less refraction occurs✓/the image forms behind the retina
-causing blurred vision✓ (3)

10.4 -The light rays will be refracted more✓causing the image to fall
-on the retina✓ (2)

(11)

Question 11

11	11.1	(a)	Pupil✓	(1)
		(b)	Iris✓	(1)
	11.2		-It is a rapid✓ -involuntary□ response -to light✓	(3)
	11.3		-Radial✓ muscles -Circular✓ muscles **(Mark first TWO only)**	(2)
	11.4		-The pupil dilated✓/enlarged so that -more light will enter the eye✓ -to improve vision✓ -in dim light✓	(4)

(11)

EAR

Question 1

1.1	Receptors that provide information about the gravitational position of the head	**Maculae** ✓
1.2	A small device that is inserted in the ear to drain fluids caused by a middle-ear infection	**Grommet** ✓
1.3	A structure in the ear that contains receptors that converts pressure waves into nerve impulse in the ear	**Cochlea** ✓
1.4	A structure in the ear that absorbs excess pressure waves from the inner ear	**Round window** ✓
1.5	A structure in the ear that transmits the nerve impulse to the cerebellum for the balance of the body	**Auditory nerve** ✓
1.6	The part of the ear that receives sound waves from the auditory canal	**Tympanic membrane**✓
1.7	Receptors in the ear that detect changes in speed and direction of movement of the head	**Crista**✓
1.8	The ossicle that transfers vibrations to the oval window	**Stapes/ stirrup**✓
1.9	The part in the inner ear where the organ of Corti is located	**Cochlea**✓
		(1x9) (9)

Question 2

2.1 Both A and B only ✓✓
2.2 A only ✓✓
2.3 B only ✓✓
2.4 None✓✓

(4x2) **(8)**

Question 3

3.1 (a) Semi-circular canal ✓ (1)
(b) Auditory nerve✓ (1)
3.2 (a) E✓ - Oval window✓ (2)
(b) D✓ - Round window✓ (2)
3.3 (a) Cerebellum✓ (1)
(b) Hair cells/Organ of Corti✓ (1)
(8)

Question 4

4.1	(a)	Semi-circular canals✓	(1)
	(b)	Round window✓	(1)
4.2	(a)	D✓ Eustachian tube✓	(2)
	(b)	C✓ Cochlea✓	(2)
4.3	(a)	F✓	(1)
	(b)	A✓	(1)
			(8)

Question 5

5.1 (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)

5.2 (a) C✓ (1)

(b) D✓ (1)

5.3
- 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)

5.4
- 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)

5.5
- 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 6

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

(7)

Question 7

7.1 Cochlea✓ (1)

7.2 (a) Absorbs excess pressure waves✓/releases pressure from the inner ear/ prevents an echo

(Mark first ONE only) (1)

(b) It converts stimuli/pressure waves into impulses✓

(Mark first ONE only) (1)

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

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

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

(13)

Question 8

8

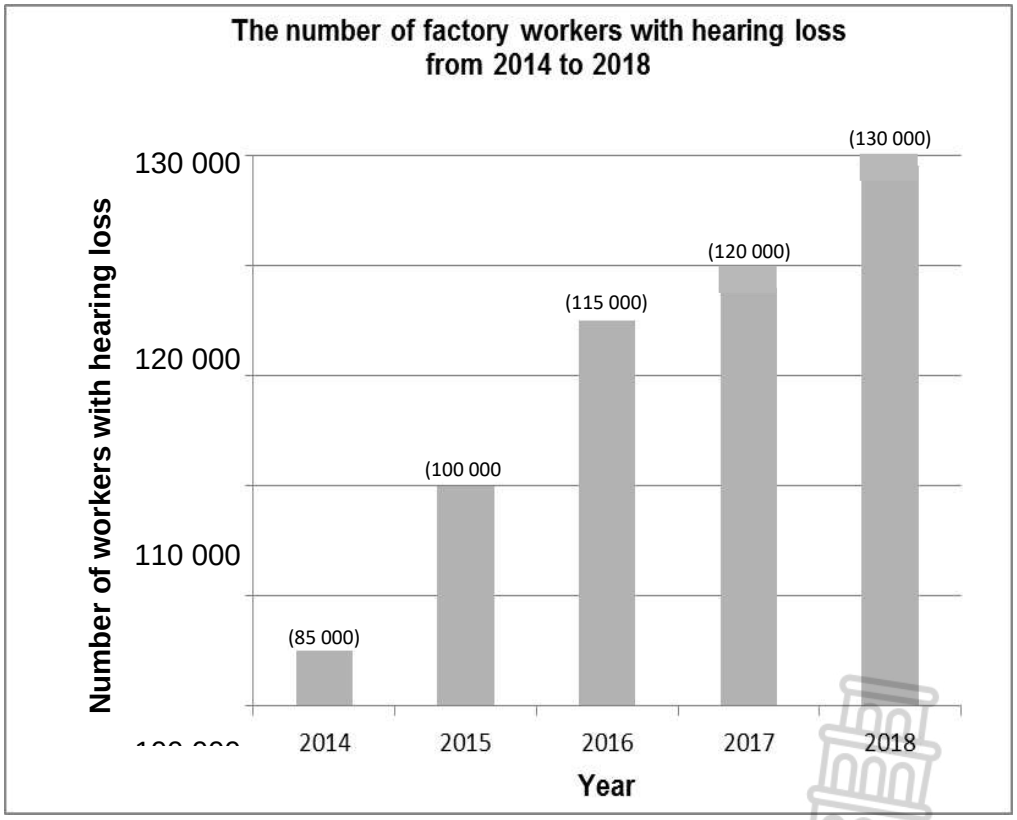
8.1 Cochlea✓ (1)

8.2 (130 000 – 85 000) ✓x 100 ✓= 52.94✓%
85 000 (3)

8.3
- More factories✓ were built increase in supply and demand
- More workers✓ were employed
- Extended exposure to loud sounds✓
- Lack of precautionary measures✓ Any 1 (1)

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

8.5



(6)

Criteria for marking graph:

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

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

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

(13)

Question 9

9

9.1 (a) Auditory nerve✓ (1)

(b) Cochlea✓ (1)

9.2 (a) Absorbs (excess) pressure waves✓ from the inner ear/prevents echo (1)

(b) Equalises pressure on either side of the tympanic membrane✓ (1)

9.3
- The person will suffer from hearing loss✓*/be deaf because
- no/less vibrations will be transmitted to the oval window✓ and
- no/less pressure waves will form in the cochlea✓/inner ear
- Therefore, there will be less/no stimulation of the organ of Corti✓/ hair cells
- Less/no impulses will reach the cerebrum✓

Compulsory mark✓* 1 + Any 3 (4)

9.4
- Cristae✓
- are stimulated by a change in speed/direction of (movement) of the head✓
- Maculae✓
- are stimulated by a change in the position of the head✓
- to generate an impulse✓
- which is transmitted by the auditory nerve✓
- to the cerebellum✓ for interpretation

Any 6 (6)

(14)

TOPIC: ENDOCRINE AND HOMEOSTASIS SOLUTIONS

Question 1

	DESCRIPTION	TERM
1.1	A gland whose secretion are transported through blood streams.	**Endocrine gland**✓
1.2	A system that is responsible for chemical coordination in the body.	**Endocrine system**✓
1.3	A hormone that stimulates ovulation in humans	**LH**✓
1.4	The process of maintaining a constant internal environment in the human body	**Homeostasis**✓
1.5	A gland whose secretions are transported through ducts.	**Exocrine Gland**✓
1.6	A hormone that stimulates mammary gland to produce milk.	**Prolactin**✓
1.7	A hormone that is responsible for osmoregulation in the body.	**ADH**✓
1.8	Specialized cells in the pancreas that secretes insulin and glucagon	**Islets of Langerhans**✓
1.9	A hormone responsible for secondary sexual characteristics in males	**Testosterone**✓
1.10	A hormone that is responsible for maintaining salt balance in the blood.	**Aldosterone**✓
1.11	A gland that secretes FSH and LH in females.	**Pituitary**✓
1.12	Chemical messengers produced by endocrine glands.	**Hormone**✓
1.13	A gland located in the neck that secretes thyroxin hormone.	**Thyroid gland** ✓
1.14	A hormone that controls the metabolic rate in the body.	**Thyroxin**✓
1.15	A hormone that increases the blood glucose level in the body.	**Glucagon**✓
1.16	A hormone that lowers the blood glucose level in the body.	**Insulin**✓
1.17	Promotes the secretions of hormones produced by thyroid glands.	**TSH**✓
1.18	A mechanism that detects imbalances and restores balance in the internal environment	**Negative feedback**✓
1.19	A hormone responsible for growth and development in the body.	**Growth Hormone**✓
1.20	The blood vessel in the neck that contains receptors which are sensitive to carbon dioxide levels in the blood	**Carotid artery**✓
1.21	A hormone that stimulates the production of milk in humans	**Prolactin**✓
		(21 x 1) **(21)**

Question 2

2.1 None✓✓
2.2 A only✓✓
2.3 A only✓✓
2.4 A only✓✓
2.5 B only✓✓
2.6 A only✓✓ (6 x 2) **(12)**

Question 3

3.1

3.1.1 A✓ F✓ (2)

3.1.2 B✓ - Capillaries✓/blood vessel
C✓ - Sweat gland✓ (4)

3.1.3 (a) ADH✓/antidiuretic hormone/vasopressin (1)
(b) Kidney✓ (1)
(8)

3.2

3.2.1 **1** – Pituitary gland✓
4 - Adrenal gland✓ (2)

3.2.2 a) C✓ Pancreas✓
b) A✓ Pituitary gland✓
c) B✓ Thyroid gland✓
d) D✓ Adrenal gland✓ (8)

3.2.3 - They respond to internal/external stimulus✓
- They protect organisms ✓
(**Mark first TWO only)** (2)
(12)

Question 4

4.1

(a) Hypothalamus✓ (1)
(b) Pituitary✓ gland (1)
(c) ADH✓/ antidiuretic hormone (1)
(d) Nephron✓ (1)

4.2 Decrease✓ (1)
(5)

Question 5

5.1 Sweat gland✓ (1)

5.2 - Structure B 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✓
- enzymes/proteins will denature✓
at high temperatures✓
- enzymes will become inactive✓
at low temperatures✓
(Mark first TWO only) (2)

(6)

Question 6

6.1 (a) Thermoregulation✓ (1)

(b) Hypothalamus✓ (1)

6.2 (a) Sweat gland✓ (1)

(b) Capillary✓/blood vessel (1)

6.3 $\left.\frac{(37,4 - 35,4)}{37,4}\right\}$ ✓ x 100✓ = 5,35✓% (3)

6.4
- Skin temperature decreased✓/lowers from 37,4 ºC to 35,4 ºC
- because part **Q** dilated✓/vasodilated
- more blood to flow to the (surface of the) skin✓
- causing **P** to became (more) active✓/produced more sweat
- causing more heat to be lost✓ to the environment
- through evaporation✓/ radiation/ convection (6)

(13)

Question 7

7.1	(a) - insulin✓ - glucagon✓ **(Mark first TWO only)**		(1) (1)
	(b) Pancreas✓		(1)
7.2	08:00 and 09:00✓		(1)
7.3	- Blood glucose levels increased✓ - to above 7,1✓ mmol/L to 8,4 mmol/L		(2)
7.4	- blood glucose levels decreased to below 3,9✓ mmol/L at 14:00 - stimulating the islets of Langerhans✓/ pancreas - to secrete glucagon✓ - which stimulates the conversion of glycogen to glucose✓ - therefore, increasing blood glucose levels✓ at 15:00	Any	(4)
7.5	- levels would have remained high✓ - for a longer period✓		(2) **(12)**

Question 8

8.1.1	Adrenal gland✓		**(1)**
8.1.2	On top of the kidneys✓		(1)
8.1.3	- it stimulates the breathing muscles✓ - and this increase the rate/depth of breathing✓ so that - more oxygen is inhaled✓ - it stimulates the heart✓ muscle - causing an increase in heart rate✓/ blood pressure so that - oxygen and glucose are transported faster✓	Any	(5)

Question 9

9.1	(a) Kidney✓		(1)
	(b) Endocrine✓ system		(1)
9.2	- It releases hormones✓ - directly into the blood✓/and it is ductless **(Mark first TWO only)**		(2)
9.3	- Low salt levels are detected by receptor cells✓ in the kidney - Adrenal glands are stimulated✓ to secrete - more aldosterone✓ - which stimulates the renal tubules✓ - to be more permeable to salt✓ - This increases the reabsorption of salt✓ and		

- the salt levels in the blood increase✓/return back to normal

Any (5)

9.4
- The secretion of ADH✓
- will increase✓
- which will increase the permeability✓
- of the renal tubules✓ in **X**
- so that more water is reabsorbed✓ from the filtrate (5)

(14)

Question 10

10.1 (a) Growth hormone ✓ (1)

(b) Prolactin✓ (1)

10.2 (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

Any (4)

10.3
- 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)

Question 11

11.1 50✓ (1)

11.2 $\frac{(25 - 5)}{5}$ ✓ x 100 ✓
= 400✓%

OR

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

Accept a range between:
- 24 and 25 for the first value and
- 380% and 400% for the answer (3)

11.3
- Thryotoxicosis 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)

11.4
- 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 12

12.1 50°C (1)

12.2 As the temperature increases the average rate of blood-flow to the skin increases (2)

12.3 $\frac{11-4}{4}$ ✓ x 100✓ = 175✓% **OR** $\frac{7}{4}$ ✓ x 100✓ = 175✓% (3)

12.4
- 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)

12.5
- 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 cells may die (2)

Question 13

13.1
- Body temperature increases✓
- Pulse rate increases✓ (2)

13.2 30✓ minutes (1)

13.3 **Vasoconstriction**
- Less blood reaches the surface of the skin✓
- and less heat is lost✓

OR

- Less blood reaches the sweet glands✓
- and less heat is lost✓

Increase in metabolism
- an increase in metabolism results in an increase in respiration✓
- which generates more heat✓ (4)

13.4
- amount of energy drink✓
- length of time when measurements were taken✓
- amount of caffeine in the energy drink✓
- type of energy drink✓ Any (2)

(9)

Question 14

14.1 The level increases✓ (1)

14.2

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

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

14.3 - a diabetic may not produce sufficient insulin✓
- when eating many smaller meals, less glucose✓ enters the blood
- less insulin✓ is needed
- to return blood glucose to normal✓

OR

- a diabetic may not produce sufficient insulin✓
- when eating fewer larger meals, more glucose✓ enters the blood
- more insulin✓ is needed
- to return blood glucose to normal✓ (4)

(10)

Question 15

15.1 - 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)

15.2 - 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 16

16.1 Adrenalin✓ (1)

16.2 - 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
- increases the diameter of the pupils✓

(Mark first THREE only) Any (3)

16.3 - blood glucose levels rise✓ above normal
- the pancreas✓/ Islets of Langerhans
- secretes insulin✓into the blood
- which travels to the liver✓/muscles 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)

(9)

Question 17

17.1 To ensure that the change in blood glucose levels was due to insulin only✓✓ (2)

17.2 - It stimulates the absorption of glucose✓from the blood into the cells✓
- It stimulates the liver✓/muscles to convert glucose to glycogen✓
- It causes increased cellular respiration✓/metabolic rate which utilises glucose

Any (2 x 2) (4)

(Mark first TWO only)

17.3 Group Y✓ (1)

17.4 - At **0 mins, the blood glucose** level for group **Y** was within the normal range✓/the blood glucose level for group **X** was high

- At **90 minutes the blood glucose** level for group **Y** returned to normal✓/the blood glucose levels for group **X** remained high

- After the ingestion of glucose, **the insulin level** for group **Y** increased✓/the insulin level for group **X** decreased (3)

(10)

Question 18

18.1	(a)	Negative feedback✓ mechanism		(1)
	(b)	Thyroid✓ gland		(1)
	(c)	Goitre✓		(1)
18.2	-	It regulates the metabolic rate✓		
	-	It affects the growth and functioning of the heart✓/nervous system		
	-	It influences bone development✓/muscle control **(Mark first ONE only)**	Any	(1)
18.3	-	The thyroxin level is low✓		
	-	The pituitary gland is stimulated✓		
	-	More TSH✓ is secreted		
	-	which stimulates gland Y✓/the thyroid gland		
	-	to secrete more thyroxin✓	Any	(4)
18.4	-	A lower metabolic rate✓/less cellular respiration		
	-	causes decreased usage of nutrients✓/glucose and		
	-	excess nutrients/fat will be stored in the body✓	Any	(2)
				(10)

Question 19

19.1 **When the carbon dioxide levels rise above normal:**

- Receptor cells in the (carotid artery) in the neck/aorta are stimulated✓
- to send impulses to the medulla oblongata✓
- the medulla oblongata send an impulses to the breathing muscles✓
- to contract more actively✓
- and increase rate 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)

Question 20

20.1 **Role of the endocrine system in providing energy:**

- 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
- increase 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)