KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

CURRICULUM GRADE 10-12 DIRECTORATE

NCS (CAPS)

TEACHER SUPPORT WINTER DOCUMENT

GRADE 12

LIFE SCIENCES

JUST IN TIME

APRIL

2026

JIT Term 1 and 2

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JIT Term 1 and 2

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	The bond formed between two amino acids during protein synthesis	**Peptide bond**✓
1.18	An organelle that contains DNA which is used in tracing female ancestry	**Mitochondrion**✓
1.19	The DNA-containing cell organelle found only in plants	**Chloroplast**✓
1.20	A change in the sequence of nitrogenous bases resulting in the formation of a different protein	**Mutation**✓/ **Gene Mutation**✓
	(20 X 1)	**(20)**

Question 2

2.1	Both A and B ✓✓	
2.2	Both A and B ✓✓	
2.3	A only ✓✓	
2.4	B only✓✓	
2.5	None✓✓	
	(5 x 2)	**(10)**

Question 3

3.1 DNA✓ / Deoxyribonucleic acid (1)
3.2 (a) Hydrogen bond✓ (1)
(b) Phosphate✓ (1)
3.3 Ribose✓ (1)
3.4 (a) 1✓ (1)
(b) 1✓ (1)
(6)

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) DNA replication✓ (1)
(b) (Weak) hydrogen bond✓ (1)
5.2 (a) Nucleotide✓ (1)
(b) Thymine✓ (1)
5.3 Interphase✓ (1)
5.4 Nucleus✓ (1)
(6)

Question 6

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

Question 7

7.1 Nucleus ✓ (Nucleoplasm) (1)
7.2 (a) Deoxyribose✓ (1)
(b) Uracil ✓/U (1)
7.3

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 ✓

(5)
(Mark first TWO only) **1 mark for table + (Any 2 x2)**
(8)

Question 8

8.1 (a) Amino acid ✓ (1)
(b) mRNA ✓ (1)
8.2 (a) TAC ✓✓ (2)
(b) GUA ✓ (1)
8.3 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 9

9.1 (a) Translation✓ (1)
(b) tRNA✓ / Transfer RNA (1)
(c) Ribosome✓ (1)
9.2 (a) CGT✓ (1)
(b) CTA✓✓ (2)
9.3 P✓ (1)

(7)

Question 10

10.1 (a) Transcription✓ (1)
(b) Translation✓ (1)
10.2 (a) Nucleus✓ (1)
(b) mRNA✓ (1)
10.3 Chloroplasts✓
Mitochondria✓ (2)
10.4 (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)
10.5 (a) TCG✓ (1)
(b) Tyrosine✓ (2)
Valine✓
10.6 Gene mutation✓ (1)
10.7 - 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)

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✓
Occurs as a double helix/ helical✓	Is non- helical✓
Contains Thymine ✓	Contains Uracil✓

(5)

1 mark for table + 2 X 2

11.5 - 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)

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

(18)

Question 12

12.1 (a) Transcription✓ (1)
(b) DNA Replication✓ (1)

12.2 mRNA✓ (1)

12.3 (a) Double helix✓ (1)
(b) Interphase✓ (1)
(c) Uracil✓ (1)

12.4 (a) Ribose✓ sugar (1)
(b) Hydrogen✓ bond (1)

12.5 4✓ /Four (1)

(9)

Question 13

13.1 mRNA / messenger RNA✓ (1)

13.2 -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 (6)

13.3 -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 nitrogeneous base
- Molecule Y (RNA) has uracil✓/U as a nitrogeneous base

OR

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

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

13.4 TAC✓ (1)

13.5 -Arginine✓
-Proline✓ (2)

(12)

Question 14

14.1 (a) Translation✓ (1)
(b) Ribosome✓ (1)

14.2 Transfers amino acids✓ to the ribosome according to the (mRNA) codon✓ (2)

1.4.3 (a) GUA✓ (1)
(b) CAT✓ (1)

14.4 The sequence of bases on a DNA molecule changes✓
- from CCT to CGT✓ /second base in DNA triplet changed from C to G
- The codon GGA changed to GCA✓
- The tRNA molecule with the anticodon CCU✓
- is now replaced by a tRNA molecule with the anticodon CGU✓
- The sequence of amino acids changes✓ and
- a different protein is formed✓ (7)

(13)

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 Arg✓
- 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 Ribosome✓ (1)
19.2 Brings the required/specific amino acid✓
according to mRNA✓/codon to the ribosome (2)
19.3 (a) CCU✓ (1)
(b) GTA✓✓ (2)
19.4 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 20

20.1 DNA profiling (1)
20.2 Suspect 1 (1)
(Mark first ONE only)
20.3 The DNA profile / bands of suspect 1 is/are identical to the DNA profile of the sample from the crime scene (1)
(Mark first ONE only)
20.4 Samples containing DNA can be planted✓/person was framed
Suspect could have been at the crime scene before the crime was committed✓
Human error✓ might occur during DNA profiling process
Manipulation of results can occur✓
DNA sample may be too small✓

Suspect may have an identical twin✓
(Mark first TWO only) any 2 (2)

20.5 The DNA profiles of the child, mother and possible father are compared✓ since
the child inherits 50% of their DNA from each parent✓
all the DNA bands that are identical to the mother in the child's DNA profile are eliminated✓
the remaining DNA bands are checked against the possible fathers✓
for possible matches with the child. ✓ Any 4 (4)

(9)

21.1 Heila ✓and Leo ✓ (2)

21.2 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)

21.3 Tracing missing persons✓
Identification of genetic disorders ✓
Identification of suspects in a crime ✓
matching tissues for organ transplants ✓
Identifying dead persons ✓ (3)
(**Mark first THREE only)**

(7)

Question 22

22.1 DNA Profiling✓ (1)

22.2 Jennie✓ (1)

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

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

22.5 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 23

23.1 Mary✓✓ (2)

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

(4)

Question 24

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

24.2 44 – 25✓ = 19✓ (2)

24.3 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)

Topic : Meiosis

Question 1

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**
1.11	The representation showing the arrangement of a diploid set of chromosomes	**Karyotype**

1 x 10 **(10)**

QUESTION 2

2.1 Both A and B✓✓ (2)
2.2 B only✓✓ (2)
2.3 None✓✓ (2)
2.4 A only✓✓ (2)
2.5 Both A and B ✓✓ (2)
2.6 B only (2)

QUESTION 3

3.1
(a) Centromere✓ (1)
(b) Homologous chromosomes✓ (1)
(c) Spindle fibres / spindle threads✓ (1)
3.2 Anaphase II✓ (1)
3.3 2,1,3✓✓ (2)
3.4 - 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 4

4.1 Chromosomal✓ mutation (1)

4.2 Sperm✓ (1)

(a) 22✓ (1)

(b) 2✓ (1)

4.4 XXY ✓✓ / XYX (2)

(6)

Question 5

5.1

(a) Crossing over✓ (1)

(b) Prophase I✓ (1)

5.2

(a) Chiasma✓ (1)

(b) Chromosome✓ (1)

5.3 C✓ - Centromere✓ (2)

5.4 TrDn✓ (1)

5.5

(a) 4✓ (1)

(b) 8✓ (1)

(9)

Question 6

6.1 Cell membrane✓ (1)

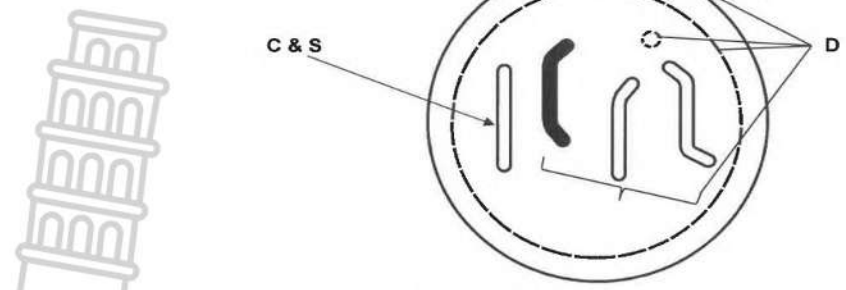
6.2 Produce spindle fibres✓ (1)

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

6.4 - 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)

6.5 48✓✓ (2)

6.6



(3)

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

(12)

Question 7

7.1 Anaphase II✓ (1)

7.2 - 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)

7.3 Centriole ✓/ Centrosome

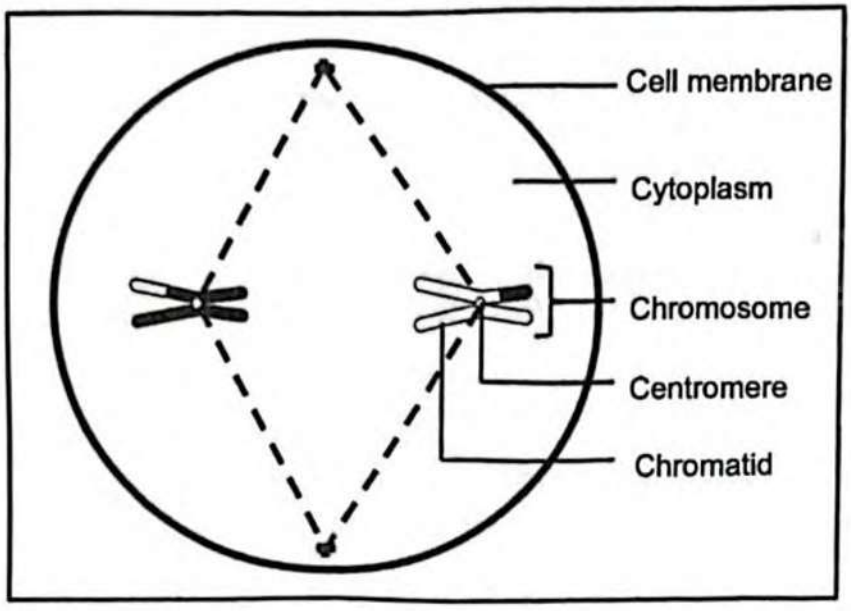
7.4 - Attaches to the centromere✓
-To pull chromatids / chromosomes towards the (opposite) poles

OR

-It contracts ✓/ shortens
-to pull chromatids / chromosomes towards the (opposite) poles✓ (2)

7.5

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 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 $\frac{1}{1250}$ 100 ✓=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)

Question 9

9.1 - Ovaries ✓ (1)
- Testes✓ Any
(Mark first ONE only)

9.2 (a) Spindle fibre ✓ (1)
(b) Centriole✓/centrosome (1)

9.3 Anaphase I✓ (1)

9.4 4✓/four (1)

9.5 - In diagram 1 the centromeres split✓
- In diagram 2 the centromeres do not split✓

OR

- In diagram 1 only chromatids (daughter chromosomes) move to the opposite poles✓/chromosomes separate
- In diagram 2 chromosomes move to the opposite poles✓/(homologous) chromosome pairs separate
(Mark first ONE only) Any (1 x 2) (2)

9.6 - Adjacent (non-sister) chromatids of homologous chromosomes overlap✓
- at points called chiasmata✓/chiasma
- There is an exchange of genetic material✓ (3)
(10)

Question 10

10.1 - Failure of a homologous pair 21 /chromosome 21 to separate✓
- during Anaphase✓I /II
- leads to a gamete with 24 chromosomes✓/ an extra chromosome
- The fertilisation of this gamete with a normal gamete✓/with 23 chromosomes
- results in a zygote with 47 chromosomes✓/an extra chromosome /Trisomy 21 **(5)**

QUESTION 11

11.1 (a) Cell membrane ✓ (1)
(b) Spindle fibre✓ (1)

11.2 (a) W✓ (1)
(b) Y✓ (1)
(c) V✓ (1)

11.3 (a) 6✓ (1)
(b) 3✓ (1)
(7)

QUESTION 12

12.1 Gonosomes ✓ (1)

12.2 There will be one X-chromosomes and one Y-chromosome✓ (1)

12.3 (a) Crossing over✓ (1)

(b) Prophase I✓ (1)

(c) Leads to (increased genetic variation✓ (1)

12.4 - They will appear as chromatids ✓

- due to the splitting of the centromere/chromosomes separating. ✓

OR

- Each chromosome will have some genetic material of the other chromosomes✓

- because of crossing over. ✓ (2)

12.5 - The zygote will have XXY chromosomes✓/XXX chromosomes/an extra gonosomes

- since the ovum with XX chromosomes ✓

- fused with a sperm with a Y-chromosome/X-chromosome ✓ (3)

(10)

QUESTION 13

13.1 (a) Chromosome ✓ (1)

(b) Cell membrane ✓ (1)

13.2 (a) 2✓ - metaphase II ✓ (2)

(b) 4✓ - prophase I ✓ (2)

(c) 1✓ - anaphase I✓ (2)

13.3 (a) 2✓ (1)

(b) 23✓ (1)

(c) 46✓ (1)

(11)

TOPIC: REPRODUCTIVE STRATEGIES AND HUMAN REPRODUCTION

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**✓
1.54	The structure that connects the foetus to the placenta	**Umbilical cord**✓
1.55	The ovarian hormone that is secreted by the corpus luteum	**Progesterone** ✓
1.56	The extra-embryonic membrane that plays a role in the formation of the placenta	**Chorion**✓
	(56x 1)	**(56)**

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 A and B✓✓
2.21	B only✓✓
2.22	Both A and B✓✓
	(22 x 2) **(44)**

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 - The egg has a high percentage (%) of yolk✓* therefore it
- contains more energy✓/nutrients
- The hatchling will be well developed✓ making it
- (more) independent✓ Compulsory mark✓* 1 + Any 2 (3)

9.2 - Eagle✓
- Vulture✓
- Pigeon✓ (3)

(Mark first THREE only)

9.3 - The eggs have a lower percentage (%) of yolk✓ therefore
- the hatchlings will not be fully developed✓ (2)

(8)

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)

(Mark first ONE only)

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 ✓ (2)
- Contains haploid number of chromosomes ✓ which contributes to the formation of a diploid c Any (1 x 2)

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

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

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✓ Any (2 x 2) (4)

(**Mark first TWO only)**

(8)

Question 15

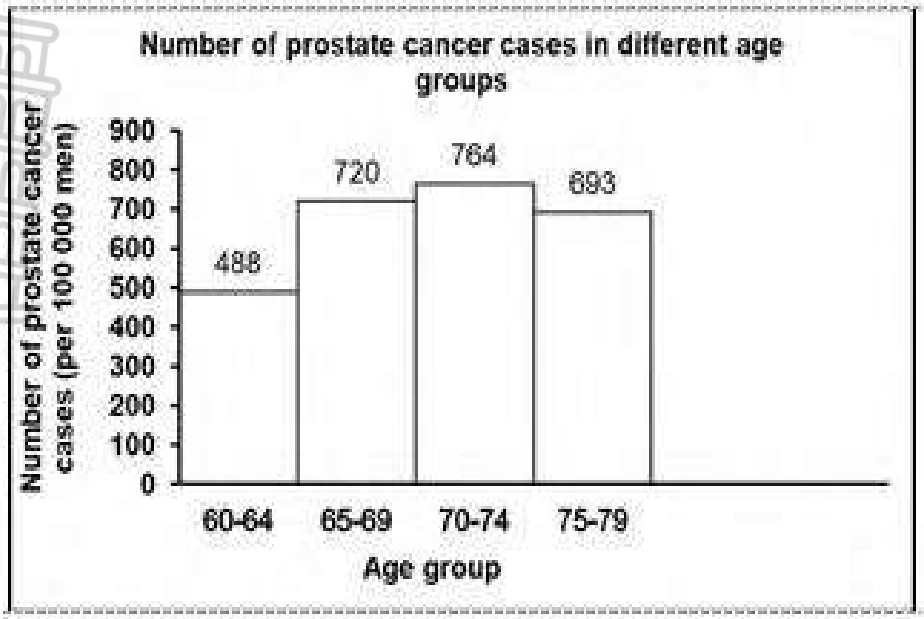
15 15.1 (a) Seminal visicle✓ (1)

(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

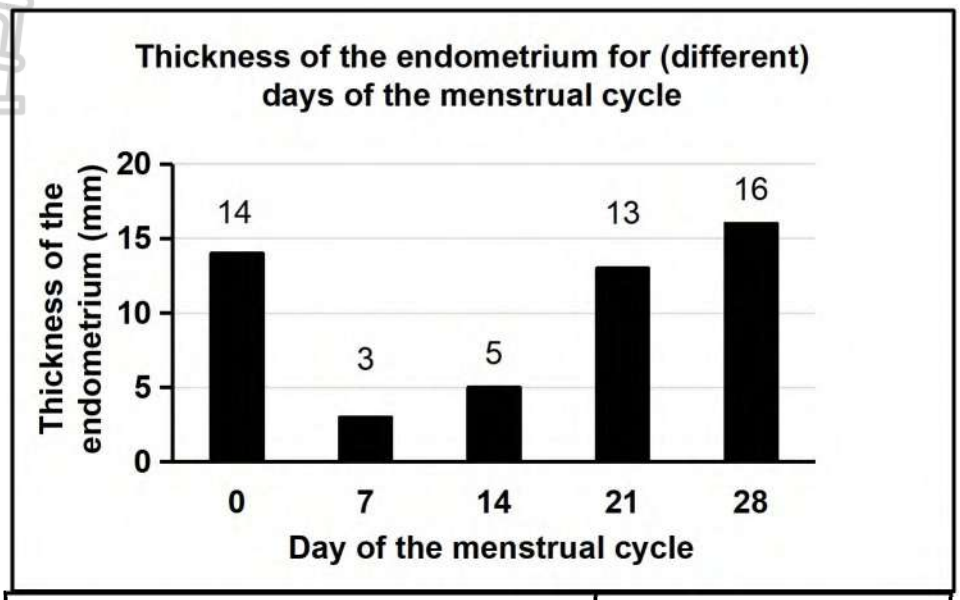
16 16.1 (a)
- The corpus luteum degenerates✓ therefore
- the progesterone levels decrease✓
- The endometrium is no longer maintained✓/menstruation occurs
- the Graafian follicle✓ secretes (3)

(b)
- oestrogen✓ which increases endometrium thickness

(2)

16.2 - It becomes more vascular✓and
- more glandular✓ (2)
- It allows for implantation✓ of the embryo/the development of the placenta/increased blood supply for nutrition of the developing embryo (1)

16.3



Criteria for marking the graph:

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

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

- Type of graph
- Scale

(6)
(14)

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

Question 17

17.1 Male fertility✓ (1)

17.2 Measuring the sperm count✓ (1)

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

(Accept factors that are NOT related to health; race) Any (2)
(Mark first TWO only)

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

17.5 - 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)

17.6 - 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)

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

(11)

Question 18

18.1 (a) Age✓ (1)

(b) Fertility✓ in men (1)

18.2 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)

18.3
- The investigation was conducted from 1999 to 2017✓ /over 18 years
- 1 294 men✓ were tested

(2)
(Mark first TWO only)

18.4
- So that age will be the only independent variable✓
- since high temperature can affect fertility✓ /sperm count /sperm motility/

sperm necrosis (3)

- therefore, decreasing the validity ✓ of the investigation

(10)

Question 19

19.1 Cervix ✓ (1)

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

(Mark first ONE only) (1)

19.3 -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)

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

(Mark first ONE only) (1)

19.5 - 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 20

20.1 Ovarian cycle✓ (1)
20.2 (a) Graafian follicle✓ (1)
(b) Ovum✓ (1)
(c) Corpus luteum✓ (1)
20.3 (a) FSH✓/Follicle stimulating hormone (1)
(b) Oestrogen✓ (1)
(c) LH✓/Luteinising hormone (1)

(7)

Question 21

- 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 22

22.1 Oogenesis✓ (1)

22.2 Amniotic✓ egg (1)

22.3
- 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)

(Mark first ONE only) (2)

22.4
- Females can reproduce without males✓
  increasing the chances of the species to survive✓ /therefore, less energy is used for reproduction

(Mark first ONE only) (2)

(6)

Question 23

23.1
- 250 females per group were used✓/1000 females participated
- Measurement was done for 5 cycles✓
- **(Mark first TWO only)** (2)

23.2 Older groups of women have a higher (average) FSH level than the younger groups✓✓ **OR**
Younger groups of women have a lower (average) FSH level than the older groups✓✓ Any (1x2)
(Mark first ONE only) (2)

23.3
- The Graafian/developing follicles secretes oestrogen✓but since the number of follicles are low✓/depleted
- less/no oestrogen will be secreted✓ (3)

23.4
- A high concentration of progesterone✓
- inhibits the pituitary gland✓/results in reduced FSH secretion
- This will decrease the validity of the investigation✓ (3)

(10)

Question 24

24.1 Acrosome✓ (1)

24.2 mitochondrion✓ (1)

24.3 (a) 3✓ (1)
(b) 1✓ (1)
(c) 1✓ (1)

24.4 B✓- Nucleus✓ (2)

24.5 Mitosis✓ (1)

24.6
- 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 25

25.1 (1)

(a) Zygote ✓ (1)

(b) Blastocyst✓/blastula (1)

25.2
- Cell A is haploid✓/has 23 chromosomes /contains the genetic material of the female
- Cell B is diploid✓/ has 46 chromosomes /contains the genetic material of both parents
- Cell A is not fertilised✓/Cell B is fertilised

OR
- Cell A is haploid✓/has 23 chromosomes
- Cell B is diploid✓/has 46 chromosomes
- Cell A contains the genetic material from the female✓/ Cell B contains the genetic material of both parents (3)

25.3 Amniotic✓ fluid (1)

25.4
- Allows for free movement✓ of the foetus
- Protects the foetus against mechanical injury✓/acts as a shock absorber
- Prevents dehydration✓ of the foetus
- Prevents temperature changes✓ Any (3)

(Mark first THREE only)

(9)

Question 26

26.1 (a) Fallopian tube✓ (1)

(b) Ovary✓ (1)

26.2. (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)

26.3.
- 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✓

Compulsory mark✓* (1) + Any (5) (6)

26.4.
- 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 27

27.1 (a) Pituitary✓ gland/hypophysis ✓ (1)

(b) Graafian follicle ✓ (1)

(c) Ovulation ✓ (1)

(d) Corpus luteum✓ (1)

27.2 Remains low✓/decreases (1)

27.3 - stimulates ovulation✓

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

(Mark first ONE only) **(6)**

Question 28

28.1 20✓ (1)

28.2 FHS✓ (1)

28.3
- The progesterone level is decreasing✓ /goes from 5 to 0.8ng/ml therefore
- FHS secretion /the pituitary gland is no longer inhibited✓

(2)

28.4 $\left[\frac{280-70}{70}\right]$ ✓ x 100✓

= 300✓% (3)

28.5 It remains high✓ /will increase (1)

28.6
- The corpus luteum does not disintegrates✓
- and continues to secrete progesterone✓

OR

- The placenta develops✓
- Which secretes progesterone✓

Any (2)

(10)

Question 29

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

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

29.3
- 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)

29.4
- Insufficient space✓
- Poor/no placental development✓
- Decreased blood supply✓
- Insufficient nutrients✓/oxygen

(Mark first TWO only) Any (2)
(9)

Question 30

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

30.4 - 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 31

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

31.2 (a) Progesterone treatment ✓ (1)

(b) Development of gestational diabetes✓ (1)

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

31.4 (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)

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

(10)

Question 32

32.1

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

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

32.2

(a) FSH ✓ (1)

(b) Oestrogen ✓
OR
LH ✓
OR
FSH✓ (1)

32.3 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)

32.4 -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 33

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

(5)

Question 34

34.1 Chorion✓ (1)
34.2 - Acts as a shock absorber✓
- It prevents desiccation✓/dehydration
- It helps to keep the temperature within a narrow range✓
- It facilitates free movement✓ of the foetus Any (2)
(Mark first TWO only)
34.3 - 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)
34.4 - Acts as a micro-filter✓/protect against pathogens
- Removal of harmful metabolic waste✓
- Produces antibodies✓
- Maintains the endometrium✓ Any (2)
(Mark first TWO only)
34.5 Umbilical vein✓ (1)
34.6 -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 35

35.1 (a) 36,2 ✓˚C (1)

(b) Day 16✓ (1)

35.2 - Body temperature increased above basal body temperature✓ / 36.2˚C
- (immediately) after day 16✓ (2)

35.3 - The corpus luteum is formed✓ after ovulation and
- it secretes progesterone✓ (2)

35.4 - Physical activity /increased cellular respiration changes body temperature✓✓

OR

- Low physical activity /cellular respiration prevents a change in body temperature✓✓ (2)

(8)

QUESTION 36

- 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 37

37.1 (a) Oestrogen✓ (1)

(b) Progesterone✓ (1)

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

(2)

37.3 (a) Release of an ovum✓ from the ovary✓/Graafian follicle (1)

(b) Day 14 ✓ (1)

(c) LH/ Luteinising Hormone ✓

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

OR

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

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

37.6 - 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 38

38.1 - Stimulates ovulation✓
- Stimulates the development of the corpus luteum✓ (2)

(Mark first TWO only)

38.2 Follicle stimulating hormone✓ /FSH (1)

38.3 Progesterone✓ (1)

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

38.5 Hormone **X** /progesterone levels remain high✓ (1)

(9)

JIT Term 1 and 2

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 masked in the phenotype when found in the heterozygous 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 biotechnological process that produces genetically identical organisms	**Cloning**
1.28	Undifferentiated cells in animals that have the potential to become any type of tissue	**Stem cells**
1.29	The deliberate breeding of organisms for desirable characteristics selected by humans	**Artificial selection**
1.30	The biotechnological process that produces genetically identical organisms	**cloning**
	(30x1)	**(30)**

Question 2

2.1	Both A and B ✓✓	
2.2	B ✓✓	
2.3	None ✓✓	
2.4	A only ✓✓	
2.5	B only ✓✓	
2.6	A ✓✓	
2.7	A only ✓✓	
2.8	None ✓✓	
2.9	None ✓✓	
	(9x2)	**(18)**

Question 3

3.1 -Both alleles for black feathers and white feathers ✓
- are equally dominant ✓ /expressed in the phenotype of the erminette chicken ✓ (2)

3.2 (Blood group) AB✓ (1)

3.3

P_1	Phenotype	White	x	Erminette✓
	Genotype	WW	x	BW✓
Meiosis				
	G/gametes	W, W	x	B, W✓
Fertilisation				
F_1	Genotype	BW , WW , BW , WW✓		
	Phenotype	Erminette, white✓*		

P_1 and F_1✓
Meiosis and fertilisation✓

***1 compulsory mark** + any 5

OR

P_1	Phenotype	White	x	Erminette✓
	Genotype	WW	x	BW✓

Meiosis

Fertilisation

Gametes	W	W
B	BW	BW
W	WW	WW

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype Erminette, white✓*

P_1 and F_1✓
Meiosis and fertilisation✓

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

(9)

Question 4

4.1

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✓	

P_1 and F_1✓
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✓
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 (5)

Any

OR

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

2 XX : 2 XY
Female ✓ Male✓ (Any

(11)

Question 5

5.1 Plant height ✓
Flower colour ✓ (2)

5.2 TRr✓✓ (1)

(a) TtRr (2)

(b) ✓✓ (2)

Tall plant, white flower

(7)

Question 6

6.1 Three✓/3 (1)

bb✓ (1)

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)

(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 7

7.1 (a) Pedigree ✓diagram (1)
(b) Y-✓chromosome (1)

7.2 - Low levels of phosphate✓
- can cause rickets✓
(Mark first TWO only) (2)

7.3 3✓/Three (1)

7.4 (a) XhY✓ (1)
(b) XHXh✓ (1)

7.5

Individual 1 is a male with hypophosphatemia✓
and has the genotype X^HY✓
The daughters inherit the dominant allele/X^H from their father✓

Individual 2 is a female who does not have hypophosphatemia✓
and has the genotype X^hX^h✓
The daughters inherit one recessive allele/X^h from their mother✓

The X^h from the mother/individual 2 is masked by the X^H from the father✓/ all daughters will have X^HX^h genotype Any

(6)
(13)

Question 8

8.1 Pedigree diagram✓ (1)
8.2 1 ✓/One (1)
(a) Female with CADISIL✓ (1)
8.3 (b) dd✓ (1)
8.4 -Both individual 1 and 2 have CADISIL✓ (4)
-indicating that they have a dominant allele ✓/the genotype/Dd
-but have children who do not have CADISIL✓ /are homozygous Recessive✓
-indicating that they inherited a recessive allele from each parent✓
8.5 50%✓ (1)
(9)

Question 9

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

305 733 (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^Ai ✓✓ (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 (3)

- the child has blood group AB✓/genotype I^AI^B

(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 **(6)**

P_1 and F_1✓
Meiosis and fertilisation✓

***1 compulsory mark** +

Any 5

Question 26

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)

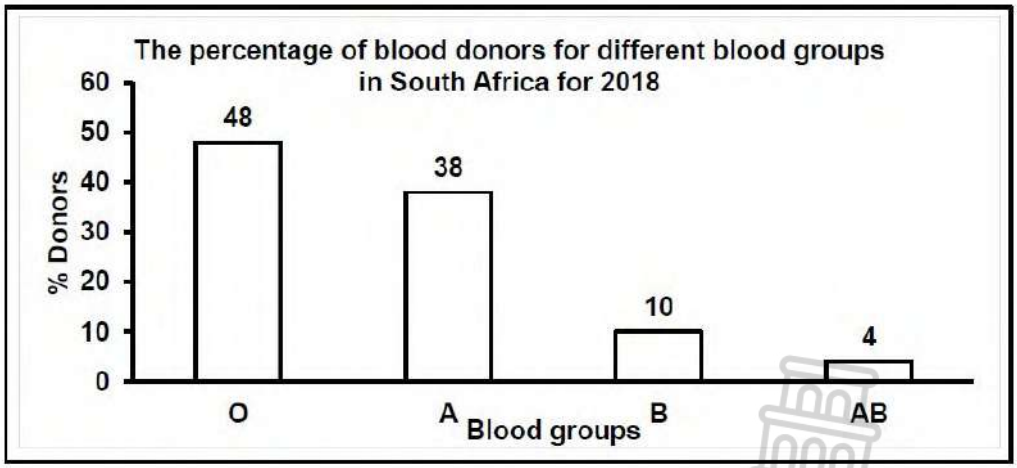
Question 30

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)

3.12 (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 (6)

P_2 and F_2✓
Meiosis and fertilisation✓

***1 compulsory mark** + Any 5

(13)

Question 32

32.1 (a) (Blood group) O (1)
(b) (Blood group) A (1)

32.2 - $I^B I^B$
- $I^B i$ (2)

32.3 (Blood group) B (2)

32.3 - Allele I^A /allele for blood group A is inherited from one parent✓ and
- allele I^B / the allele for blood group from the other parent✓
- the alleles are co-dominant✓/equally dominant and are
-equally expressed in the phenotype✓/ the child will have the genotype $I^A I^B$

Any (3)

(9)

Question 33

33.1 Animals:

- The nucleus is removed from an ovum✓
- The nucleus of a donor somatic cell is removed✓
- and inserted into the ovum✓
- Electric shock is used to activate mitosis✓
- An embryo develops✓
- and is implanted into the surrogate mother✓

OR

Plants:

- A plant with the desired characteristics is selected✓
- A vegetative part of the 'parent' plant structure is removed✓
- and placed inside a growth medium✓
- to supply nutrients✓ /hormones
- to stimulate growth✓

- (Exact copies) of the most productive livestock a✓re made
- (Exact copies) of animals with desired characteristics a✓re made
- Conservation of endangered species ✓
- Replacement of damaged tissues/organs ✓Any

(Mark first THREE only)

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) Brain✓ (1)
(b) Spinal cord✓ (1)
3.2 (a) Corpus callosum✓ (1)
(b) Cerebellum✓ (1)
3.3 (a) C✓ Medulla oblongata✓ (2)
(b) A ✓Cerebrum✓ (2)
(8)

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)
(a) - Part **D**/ medulla oblongata which controls breathing✓ (2)
- was not injured✓
(b) - The learner (occasionally) lost balance✓ (2)
- due to no coordination of voluntary movements✓ by part **B**
(c) (2)
- The loss of memory indicates a possible injury to part **A**✓/the cerebrum
-which is also responsible for hearing ✓/ (interpretation of) sound

(11)

Question 5

5.1 (a) B✓ (1)

(b) A✓ (1)

5.2 (a) - It is a rapid ✓/automatic reaction to a stimulus (2)
- that protects the body✓ from damage

(b) - No impulse will be transmitted from the receptor✓ (3)
- to the spinal cord ✓/interneuron and
- the effector will not be stimulated✓

5.3

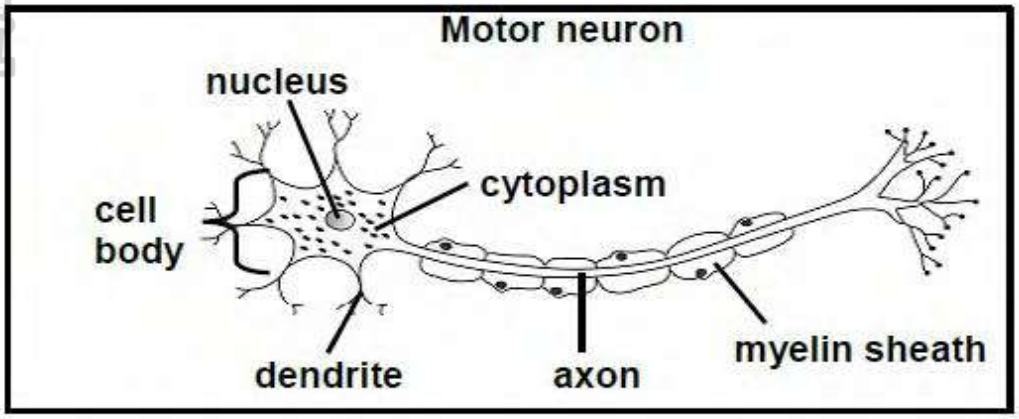


Diagram of a motor neuron	(D)	1
Correct caption		1
Any three correct labels		3

(5)

5.5 It ensures that nerve impulses are transmitted in one direction✓ (1)

(13)

Question 6

6.1 - The pathway along which impulses are transmitted✓ (2)
- to bring about a reflex action✓

6.2 (a) Guillain-Barre syndrome✓ (1)
(Mark first ONE only)

(b) Damage to the motor neurons✓ (1)
(Mark first ONE only)

(c) The skeletal muscles have a decreased reflex response✓ (1)
(Mark first ONE only)

6.3 - In hyporeflexia damage is between the spinal cord and the skeletal muscles (2)
✓while
- in hyperreflexia damage is between the brain and the spinal cord✓

6.4 Myelin sheath✓ (1)

6.5 - Axon is no longer insulated✓ (3)
- 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 Three

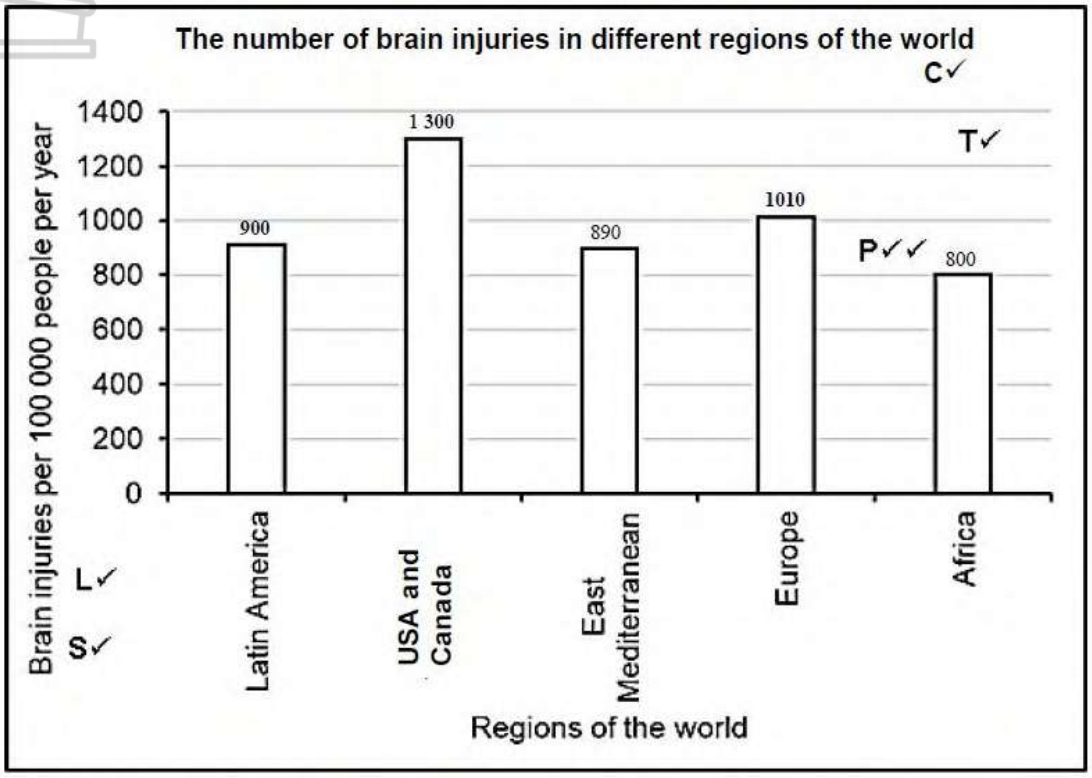
(11)

Question 7

7.1 Africa✓ (1)

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

7.3



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 8

8.1 Sensory✓ neuron (1)

(a) Axon✓ (9)

(b) Cell body✓ (1)

(c) Dendrite✓ (1)

8.2 (a) C✓ (1)

(b) F✓ (1)

(c) A✓ (1)

8.3 Multiple sclerosis✓ (1)

Question 9

9.1 (a) 5✓ µm (1)
(b) 800 ✓µm (1)

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

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

(6)

Question 10

10 10.1 Motor✓neuron (1)

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

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

10.4 C→ A → B✓✓ (2)

10.5 Multiple sclerosis✓ (1)

(8)

THE EYE

Question 1

	DESCRIPTION	TERM
1.1	The type of vision in which both eyes are used to see one image	**Binocular✓/stereoscopic 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	**Myopia ✓**

	nearby objects clearly while distant objects are blurred.	
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** ✓
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**✓
1.10	The part of the retina that contains no rods and cones	**Blind spot**✓
	(10X1)	**(10)**

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✓✓
2.6 A only✓✓
2.7 B only✓✓

(7x2) **(14)**

Question 3

3.1 (a) Blind spot✓ (1)
(b) Cornea✓ (1)
(c) Sclera✓ (1)

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

3.3 Accommodation✓ (1)

3.4 - 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 4

4.1 (a) Pupil✓ (1)
(b) Cornea✓ (1)
4.2 (a) F✓ (1)
(b) C✓ (1)
4.3 - Rods✓ (2)
-Cone✓
(Mark first TWO only)
4.4 -B✓ (3)
-G✓
-H✓
(Mark first THREE only)

(9)

Question 5

5.1 (a) Accommodation✓ (1)

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

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

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

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

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

(10)

Question 6

6

6.1 Sub-capsular ✓cataracts (1)

6.2 -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)

6.3 -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)

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

(11)

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 (a) Curvature✓ of the lens (1)

(b) Distance✓ of the pencil (1)

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

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

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

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

Question 9

9.1 (a) Aqueous humour✓ (1)
(b) Pupil✓ (1)
(c) Iris✓ (1)

9.2 -It is not evenly curved✓/rounded (1)

9.3 -Light is refracted evenly ✓/in different directions and (3)
-does not focus on the retina✓
-forming the blurred image✓

9.4 -Laser✓ (1)
-Surgery✓
-Glasses✓ / spectacles /lenses
(Mark the first One only)
(8)

THE 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✓✓	
2.5	A only✓✓	
	(5x2)	**(10)**

Question 3

3.1 (a) Semi-circular canals✓ (1)

(b) Round window✓ (1)

3.2 (a) D✓ Eustachian tube✓ (2)

(b) C✓ Cochlea✓ (2)

3.3 (a) F✓ (1)

(b) A✓ (1)

(8)

Question 4

4.1 (a) Auditory nerve✓ (1)

(b) Cochlea✓ (1)

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

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

4.3 - The person will suffer from hearing loss✓ */be deaf because (4)
- 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✓ * + Any 3

Question 5

Cristae✓ (6)
- 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)

Question 6

6.1 (a) Pinna✓ (1)

(b) Ossicles✓ (2)

6.2

C✓ and D✓
(Mark the first Two only) (3)

6.3 -Cristae are stimulated ✓and
-convert the stimulus to an impulse✓ which
-is sent via the auditory nerve✓
-to the cerebellum✓ for interpretation
-impulses are then sent to the skeletal muscles✓ to restore balance (3)

6.4 (a) -Fewer/no stimuli will be converted into impulses✓ (2)
-Fewer/no impulses was sent to the cerebrum✓ to be interpreted

(b) -The ear plug limit the sound waves in the auditory canal✓ (3)
Reaching the tympanic membrane/ossicles
-Fewer vibrations are formed in the middle ear✓
-Fewer pressure waves are formed in the cochlea✓ to prevent damage

(14)

Question 7

7.1 -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
-hearing occurs ✓ Any 7
(7)

Question 8

8.1 Cochlea✓ (1)

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

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

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

8.4 - Middle ear infections cause fluid build-up in the middle ear✓ (4)
- 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

8.5 - The cristae are stimulated✓ and (4)
- 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 **(13)**

Question 9

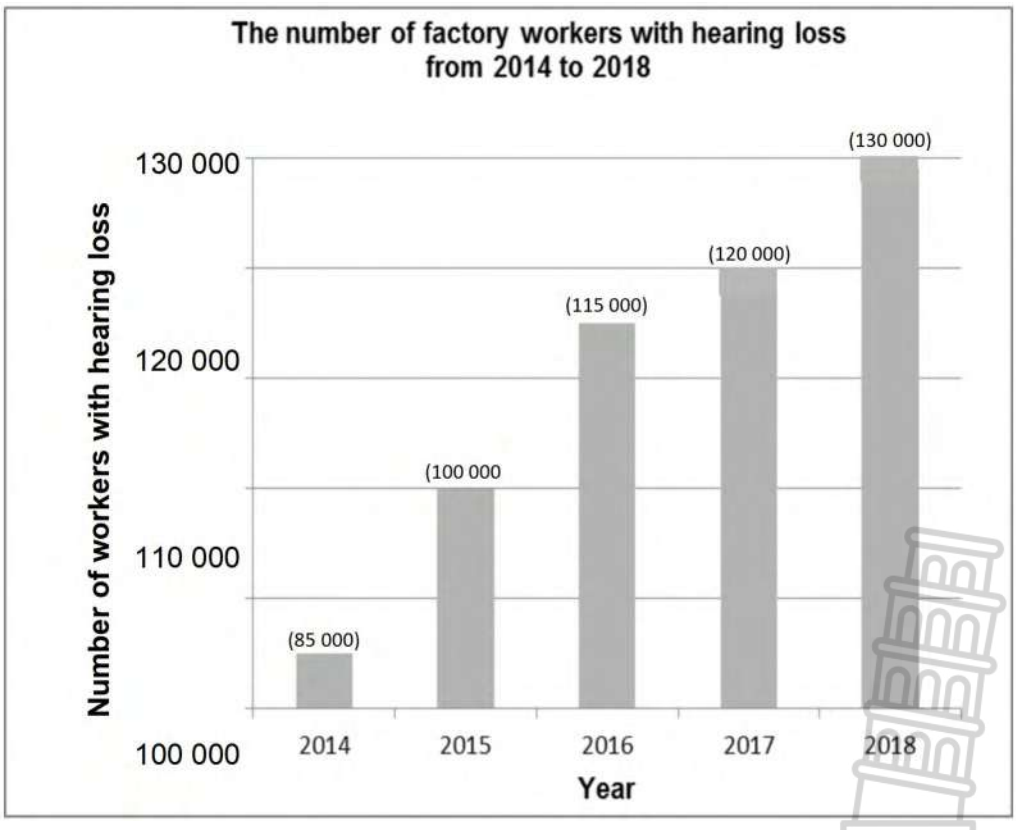
9.1 Cochlea✓ (1)

9.2 $\frac{(130\,000 - 85\,000)}{85\,000}$ ✓x 100 ✓= 52.94✓% (3)

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

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

9.5



Criteria for marking graph:

Criteria	Mark allocation
Type: Bar graph is drawn (T)	1
Caption of the graph includes both variables (C)	1
Correct labels on X-axis and Y-axis (L)	1
Correct scale for Y-axis Equal width of bars and spaces (S)	1

Plotting: (P) 1- 4 co-ordinates are plotted correctly All 5 co-ordinates are plotted correctly	 1 2

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

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

(6)
(13)

Question 10

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

Question 11

11.1 P✓ and T✓ (2)
(Mark first TWO only)
11.2 S✓ and R✓ (2)
(Mark first TWO only)
11.3 Cochlea✓ (1)
11.4 - They convert the stimulus /pressure waves to an impulse✓ and (2)
- transfer it to the auditory nerve✓
11.5 Ossicles will not vibrate freely✓ /fewer /no vibrations will be carried to the oval window (4)
- There is decreased amplification✓ of sound
- Fewer /no pressure waves will form in the cochlea✓
- Receptors in the cochlea will not be stimulated ✓/stimulated less
- Less/no impulses will reach the cerebrum ✓ *

***1 Compulsory + Any 3**

(11)

TOPIC: ENDOCRINE AND HOMEOSTASIS SOLUTIONS

Question 1

	DESCRIPTION	TERM
1.1	A gland whose secretions 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 maintenance of a constant internal environment within narrow limits.	**Homeostasis**✓
1.5	A gland whose secretions are transported through ducts.	**Exocrine Gland**✓
1.6	A hormone that stimulates the production of milk in humans.	**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**✓
	(20 x 1)	**(20)**

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

3.1.1 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)

3.2.1 **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 (3)
- temperature increases✓/ returns to normal

5.3 - Enzymes function optimally✓
at normal body temperature✓
- enzymes/proteins will denature✓
at high temperatures✓
- enzymes will become inactive✓
at low temperatures✓ (2)
(Mark first TWO only)

(6)

Question 6

6.1 (a) Thermoregulation✓ (1)

(b) Hypothalamus✓ (1)

6.2 (a) Sweat gland✓ (1)

(b) Capillary✓/blood vessel (1)

6.3

$$\left[\frac{(37,4 - 35,4)}{37,4}\right] \checkmark \times 100 \checkmark = 5,35 \checkmark \%$$ (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✓ (1)
- glucagon✓ (1)
(Mark first TWO only)

(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. Adrenal gland✓ (1)

8.2 On top of the kidneys✓ (1)

8.3
- 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)

(7)

Question 9

9.1 (a) Kidney✓ (1)
(b) Endocrine✓ system (1)

9.2
- It releases hormones✓
- directly into the blood✓/and it is ductless (2)

(Mark first TWO only)

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)
(11)

Question 11

11.1 50✓ (1)

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

OR

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

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

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 $\left[\frac{11-4}{4}\right]$ ✓ x 100✓ = 175✓% **OR** $\left[\frac{7}{4}\right]$ ✓ 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)

(12)

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 Any (1)

(Mark first ONE only)

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)

Question 21

21.1 (a) Islets of Langerhans✓ (1)
(b) A high concentration of glucose in the blood✓ (1)
21.2 - They secrete hormones✓ /insulin /glucagon
- directly into the blood✓ /has no ducts (2)
21.3 - It stimulates the conversion of glucose to glycogen✓ and it (2)
- promotes the absorption /usage of glucose by the cells✓
21.4 - It delivers insulin specifically according to the glucose level✓
- to allow for better blood glucose management✓ /regular dosing (2)
(8)

Question 22

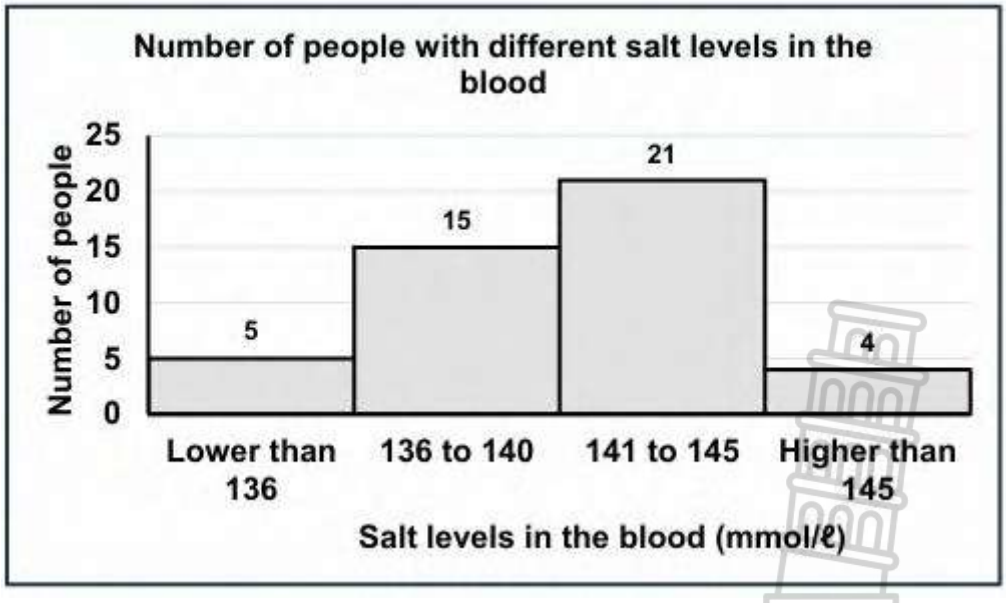
- (Cold) receptors in the skin convert the stimulus to an impulse✓which
- is sent to the hypothalamus✓ that
- stimulates vasoconstriction in the skin✓ /stimulates blood vessels of the skin to constrict
- Less blood flows to the skin✓ /sweat glands
- Less heat is lost✓ (from the skin) through radiation
- The sweat glands are stimulated to produce less sweat✓ and
- less heat is lost through evaporation✓ of sweat Any **(6)**

Question 23

23.1 (a) 4✓ (1)
(b) 36✓ (1)

23.2 - Receptor cells detect the low salt level✓
- The adrenal glands are stimulated✓ and
- more aldosterone is secreted✓
- In the renal tubules✓
- the reabsorption of salt /sodium is increased✓
- into the surrounding blood capillaries✓
- Less salt is excreted✓ Any (6)

23.3



(6)
(14)

Criteria for the assessing of 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 and correct unit for X-axis	1
Scale for X- and Y-axes (**S**)	X-axis - equal width of bars with no spaces Y-axis – correct scale	1
Plotting (**P**)	1 to 3 coordinates plotted correctly All four coordinates plotted correctly	1 2

If a bar 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 with axes, then:
  - Marks will be lost for labels and scale
  - Plotting can get credit if coordinates are correct for given labels

Question 24

24.1 Hypothalamus✓ (1)

24.2 (Diagram) X✓ (1)

24.3 - The arteriole dilates✓/vasodilation took place
- More blood flows to the (surface of) then skin✓ and
- more heat is lost✓/ more radiation occurs to
- decrease/regulate the body temperature✓ (4)

Question 25

25.1 Height✓ (1)

25.2 - Gender✓/only boys participated
- All (the boys) had ISS✓
- Age✓/all (the boys) were 2-years old
- Duration of investigation✓ Any (3)

(Mark first THREE only)

25.3 To prove that it is the added growth hormone that caused the change in the height of the boys and not any other factor✓✓ (2)

25.4 (25 x 0,028) ✓
= 0,7✓mg✓ (3)

25.5 Added growth hormone causes an increase in height of children with ISS✓✓ (2)

(11)

Question 26

26.1 Pancreas✓ (1)

26.2 Three✓/nine (1)

26.3

LONG-ACTING INSULIN TREATMENT	RAPID-ACTING INSULIN TREATMENT
One injection✓ is given over 23 hours	Three injections✓ are given over 23 hours
The injection is given at 23:00✓	An injection is given before every meal✓
The injection causes a lower concentration of insulin✓/10 international units	The injection causes a higher concentration of insulin✓/30 international units
The concentration of insulin in the blood remains constant for long periods of time✓/20 hours	The concentration of insulin in the blood fluctuates✓/increases and drops
Long lasting effect✓	Lasts a shorter amount of time✓
Insulin concentration takes 1 hour to increase to its peak✓	Insulin concentration takes 2 hours to increase to its peak✓

(Mark first TWO only) Table (1) plus any (2 x 2) (5)

26.4 Rapid-acting✓ insulin (1)

26.5 - The insulin will reduce the glucose level even further✓/glucose is
- converted to glycogen/increased glucose uptake by cells
- There is less glucose available for cellular respiration✓ (2)

(10)