



KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

GRADE 12

LIFE SCIENCES

REVISION DOCUMENT

Solutions

Teachers Resource

JIT TERM 1 and 2

2024

CONTENTS

No	Topic	Page
1.	DNA: Code of Life	2 - 9
2.	Meiosis	10 - 17
3.	Reproduction	18 - 32
4.	Genetics	33 - 45
5.	Human Response to the Environment	46 - 58
6.	Endocrine System & Homeostasis	59 - 67

Topic: DNA CODE OF LIFE SOLUTIONS**Question 1**

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

Question 2

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

(10)

Question 3

- | | | | |
|-----|-----|--------------------|------------|
| 3.1 | (a) | Transcription | (1) |
| | (b) | mRNA/messenger RNA | (1) |
| | (c) | Ribosomes | (1) |
| 3.2 | | Anticodon✓ | (1) |
| 3.3 | | AGT✓ | (1) |
| 3.4 | | 1✓ | (1) |
| 3.5 | | 4✓ | (1) |
| 3.6 | | Ribose✓ | (1) |
| | | | (8) |

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✓ | (2) |
| | | Transcription (Protein synthesis) ✓ | |
| | | | (6) |

Question 5

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

Question 6

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

Question 7

- 7.1 - The DNA is located in the nucleus✓
 - and mitochondria✓ and
 chloroplasts✓ any 2 (2)
- 7.2 - DNA is a double-stranded✓molecule that
 - forms a double helix✓
 - It is made up of nucleotides✓
 - Each nucleotide has a deoxyribose sugar✓molecule
 - a phosphate group✓ and
 - a nitrogenous base✓
 - The bases are A, T, C and G✓
 - which join to form complementary pairs✓/ (A to T & C to G)
 - held by hydrogen bonds✓ any 7 (7)
- 7.3 - The DNA (double helix) unwinds✓ and
 - unzips✓/hydrogen bonds break
 - to form two separate strands✓
 - Both DNA strands serve as templates✓
 - to build a complementary DNA✓/(A to T and C to G)
 - using free (DNA) nucleotides✓ from the nucleoplasm
 - This results in two identical (DNA) molecules✓
 - Each consists of 1 original and 1 new strand✓ Any 6 (6)
(15)

Question 8

- 8.1 Heila ✓and Leo ✓ (2)
- (Mark first TWO only)**
- 8.2 - All the (DNA) bands from Heila and Leo ✓
 - match with the DNA of the mother and father ✓
OR
 - none of the (DNA) bands from Priya ✓
 - match with the (DNA) bands of the mother and the father ✓ (2)
- 8.3 - Tracing missing persons✓
 - Identification of genetic disorder's ✓
 - Identification of suspects in a crime ✓
 - matching tissues for organ transplants ✓
 - Identifying dead persons ✓
(Mark first THREE only) (3)
(7)

Question 9

- 9.1 DNA Profiling✓ (1)
- 9.2 Jennie✓ (1)
- 9.3 -Jennie's DNA profile✓ /bands
matches DNA profile/ bands of the sample✓ from the crime scene (2)
- 9.4 -Proof of paternity✓
- Tracing missing person✓
- Identification of genetic disorders✓
- Establishing family relationships✓
- Matching tissues for organ transplants✓
- identifying dead persons✓/ animals. (1)
- 9.5 - Samples containing DNA can be planted✓/person was framed
- Human error✓ during DNA profiling process
- Costly procedure✓
- Invasion of privacy✓
(Mark first TWO only) any 2 (2)
(7)

Question 10

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

Question 11

- 11.1 Number of people✓ found guilty/ convicted (1)
- 11.2 $44 - 25 = 19$ ✓ (2)
- 11.3 – More criminals are found guilty when DNA evidence is included✓ in the investigation
– DNA found at crime scene✓
– can be compared to the DNA database✓
– making it easier✓/ Faster
– to identify suspects in the crime✓
(Mark first FOUR only) any 4 (4)
(7)

Question 12

- 12.1 Nucleus ✓ (Nucleoplasm) (1)
- 12.2 (a) Deoxyribose ✓ (1)
- (b) Uracil ✓ /U (1)

12.3

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

(Mark first TWO only)**1 mark for table + (Any 2 x2)****(5)****(8)****Question 13**

- 13.1 (a) Amino acids ✓ (1)
- (b) mRNA ✓ (1)
- 13.2 (a) TAC ✓✓ (2)
- (b) GUA ✓ (1)

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

(7)**(12)**

Question 14

14.1 Transcription✓ (1)

14.2 mRNA✓ (1)

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

14.4 ✓

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

1 mark for table + 2 X 2

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

14.6 - This will result in different tRNA molecules ✓
- bringing different amino acids ✓
- leading to the formation of a different protein. ✓ (3)
(18)

Question 15

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

Question 16

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

- 16.3 (a) 5 ✓/Five (1)
 (b) UAU ✓ (1)
 (c) -The codon CCG changed to CUG ✓ / 4th codon has changed
 - The anticodon/ tRNA sequence changed ✓
 - The amino acids proline ✓
 - Was replaced by Leucine ✓
 - This resulted in a different protein✓/no protein being formed (4)
(8)

Question 17

- 17.1 The presence of thymine✓in the original sequence (1)
 17.2 489 ✓✓ (2)
- 17.3 - A form of a gene✓
 - that is carried on chromosome 1 to 22✓ and
 - is always expressed in the phenotype✓ of an individual
 - in a heterozygous✓ condition Any (3)
- 17.4 (a) - The changed from GAC to GUC ✓
 - resulting in amino acid Leu replaced by Gln✓
 - The other codon changed from AUA to AGA✓
 - resulting in amino acid Try replaced by Argu✓
 - This changed the sequence of amino acids ✓
 - A different protein formed✓ Any (5)
- (b) - Harmful effect✓
 - The blood clot is not broken down✓
 - Leading to blockage of arteries✓/oxygen and nutrients are not transported to cells Any (3)
- (14)**

Question 18

- 18.1 (a) GAC✓ (1)
 (b) ACU✓✓ (2)
- 18.2 (Gene) mutation✓ (1)
- 18.3 - CTC on the DNA changed to CAC✓
 - Codons (on the mRNA) changed✓/GAG changed to GUG
 - Anticodons (on tRNA) changed✓/CUC replaced by CAC
 - which resulted in a different amino acid✓/ Val (4)
- 18.4 - The cells will not receive enough oxygen✓
 - resulting in reduced cellular respiration✓/ a person lacking energy/becoming tired/ anaemia (2)
(10)

Question 19

19.1 (a) Transcription✓ (1)

(b) Translation✓ (1)

19.2 (a) Nucleus✓ (1)

(b) mRNA✓ (1)

19.3 Chloroplasts✓
Mitochondria✓ (2)

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

(7)

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

(6)

19.5 (a) TCG✓ (1)

(b) Tyrosine✓ (2)
Valine✓

19.6 Gene mutation✓ (1)

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

(26)

TOPIC: MEIOSIS SOLUTIONS**Question 1**

	DESCRIPTION	TERM
1.1	The point of crossing over between two adjacent chromosomes	Chiasma
1.2	The splitting of the cytoplasm during cell division	Cytokinesis
1.3	The failure of chromosome pairs to separate during meiosis	Non-disjunction
1.4	The structures in the cell that forms the spindle fibres.	Centrioles
1.5	The phase of meiosis when homologous chromosomes are aligned at the equator of the cell.	Metaphase I
1.6	The division of the nucleus	Karyokinesis
1.7	Exchange of genetic material between chromatids of homologous chromosomes	Crossing over
1.8	The point at which the two chromatids of a chromosome are joined together	Centromere
1.9	Site of meiosis in females	Ovaries
1.10	A genetic disorder caused by having an extra copy of chromosome number 21	Down syndrome
1.11	The Structure formed by the centrioles during cell division	Spindle fibres
1.12	The non-sex chromosomes in humans	Autosomes
1.13	The condition in a cell where there is only one set of Chromosomes	Haploid
1.14	The structure that is responsible for the formation of spindle fibres during cell division in animal cells and is made up of two centrioles	Centrosomes
1.15	The phase in the cell cycle during which the cell growth occurs	Interphase
1.16	Chromosomes that carry the same set of genes	Homologous
1.17	The structure that joins two chromatids of a chromosome	Centromere
1.18	The division of the cytoplasm of a cell during cell division	Cytokinesis
1.19	The process during meiosis where there is an exchange of genetic material between chromatids.	Crossing over
1.20	The structures in animal cells that give rise to spindle fibres during cell division.	centrosome
1.21	The phase in the cell cycle during which DNA replication takes place	interphase
1.22	The point where adjacent chromatids overlap during meiosis May June	Chiasma /chiasmata
1.23	The representation showing the arrangement of a diploid set of chromosomes	karyotype
(23 x 1)		(23)

Question 2**MATCHING COLUMNS**

- 2.1. None✓✓
 2.2. B only✓✓
 2.3. Both✓✓
 2.4. B only✓✓
 2.5. Both✓✓
 2.6. B only✓✓

(6x2)**(12)****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✓
 whereas in metaphase II, the chromosomes arrange at the equator singly✓
(Mark first ONE only)

(2)

(8)**Question 4**

- 4.1. Anaphase II✓ (1)
- 4.2 (a) Centrosome✓ (1)
 (b) Centromere✓ (1)
 (c) Spindle fibre✓/ Spindle threads (1)
- 4.3 The chromatids separate✓/ centromere splits (1)
- 4.4 Crossing over✓ (1)
- 545 Reduces genetic variation✓ (1)
- 4.6 (a) Four✓/4 (1)
 (b) 23✓ (1)

(9)

Question 5

5.1. Metaphase II✓ (1)

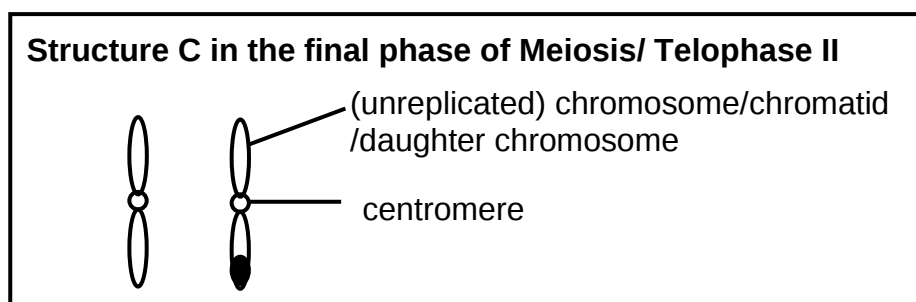
5.2. Individual chromosomes line up at the equator✓✓ of the cell
(Mark first one only) (2)

5.3. a) Cell membrane✓ (1)

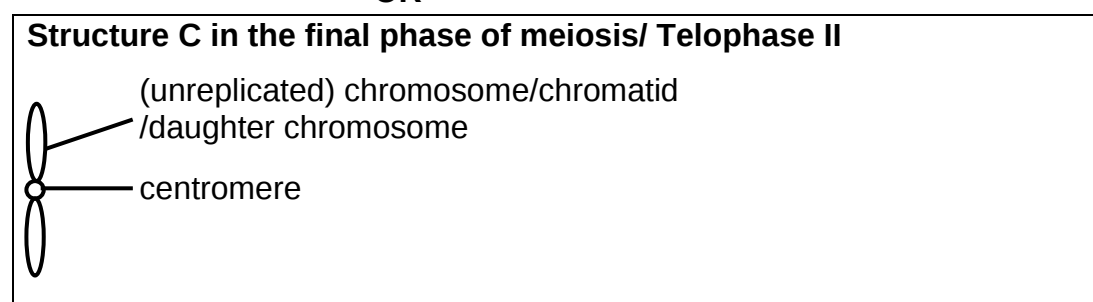
b) Spindle fibres✓ (1)

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

5.5



OR

**Guideline for assessing the drawing**

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

(4)

(11)

Question 6

- 6.1. (a) Metaphase I✓ (1)
 (b) Telophase I✓ (1)
- 6.2. (a) B✓ (1)
 (b) C✓ (1)
 (c) D✓ (1)
- 6.3. Testis✓ (1)
- (6)**

Question 7

- 7.1 - in prophase I✓ of meiosis
 - crossing over✓ occurs
 - between homologous chromosomes✓
 - resulting in the exchange of genetic material✓
 - leading to chromosomes with a mixture of maternal and paternal genetic material✓
- 7.2 - In metaphase✓ of meiosis
 - random arrangement of chromosomes occur✓
 - leading to chromosomes moving into gametes in different combinations✓ Any 5
- (5)**
- (5)**

Question 8

- 8/1. Autosomes✓ (1)
- 8.2. a) – One chromosome comes from the sperm✓/father
 - and other comes from the ovum✓/mother (2)
 b) – Shape✓
 - Size✓/length
 - Position of genes✓/alleles
 - Genes coding for same characteristic✓
 - Location of centromere✓
(Mark the first THREE only) (3)
- 8.3. - Gonosomes are not identical✓/chromosomes at position 23 are not identical
 - Individual 1 has XY gonosomes✓/is a male
 - Individual 2 has XX gonosomes✓/ is a female (3)
- (9)**

Question 9

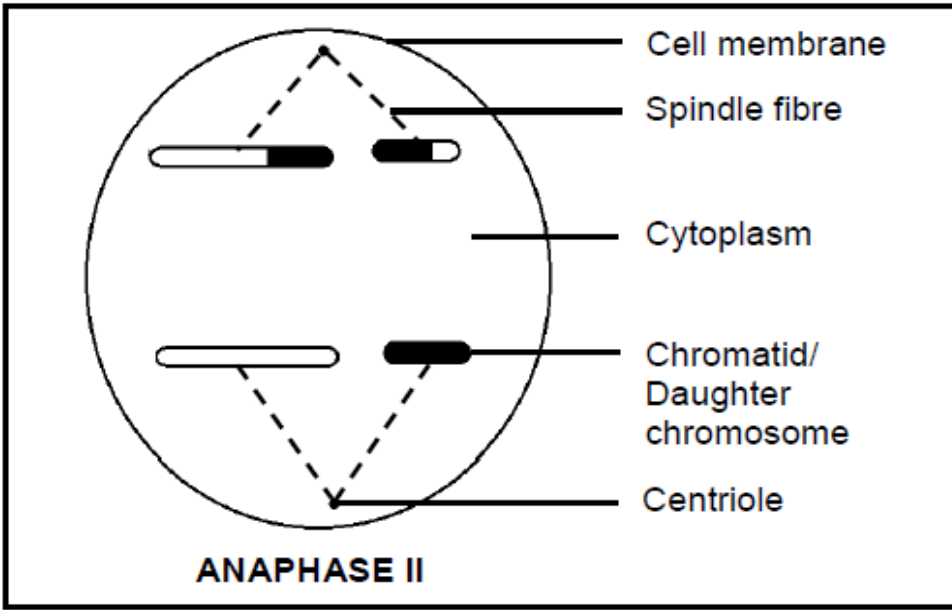
- 9..1. (a) Down syndrome✓ (1)
(b) Anaphase I/II✓ (1)
(c) Chromosomal aberration✓ (1)
(3)

Question 10

- 10.1. - Due to non-disjunction✓ / non-separation of a chromosome pair
- during Anaphase I✓
- Two chromosomes moved to the one pole✓ and
- none moved to the other pole✓ (3)
- 10.2. - Gamete **A** will have 24 chromosomes✓ / extra chromosome
- and when it fertilises a normal ovum✓ / gamete with 23 chromosomes
- the zygote will have 3 chromosomes at position 21✓ / 47 chromosomes (3)
- 10.3. (a) Prophase I
(b) - Adjacent chromatids of homologous chromosomes cross✓ (1)
- At a point called the chiasma✓ (3)
- There is an exchange of DNA segments✓ / genetic material
(10)

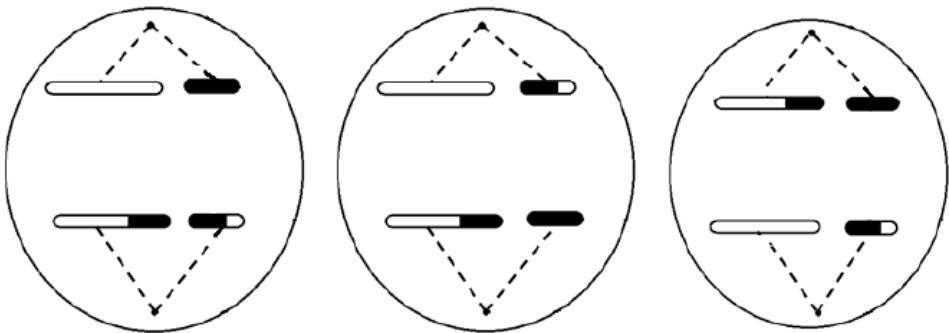
Question 11

11.1



OR

ANY ONE OF THE FOLLOWING ARRANGEMENTS INCLUDING CORRECT LABELS



MARK ALLOCATION FOR DIAGRAM

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

(5)

(5)

(5)

Question 12

- 12.1. Centromere✓ (1)
- 12.2. Metaphase I✓ (1)
- 12.3. - A pair of chromosomes with the same structure✓/location of centromere/ length and
- the same sequence of genes✓
- One is of maternal origin and the other of paternal origin✓ Any (2)
- 12.4. - Some chromatids have a mixture of genetic material✓ from its homologue
- as crossing over✓ took place
- during Prophase I✓ (3)
- 12.5. 48✓✓ arbitrary units. (2)
- (9)**

Question 13

- 13.1. Centrosome✓ (1)
- 13.2. Anaphase I✓ (1)
- 13.3. - The spindle fibres contract✓
- The centromeres split✓
- Each chromatid is pulled to the opposite poles✓ Any 2 (2)
- 13.4. Crossing over✓ (1)
- 13.5. It leads to (genetic) variation✓
(Mark first ONE only) (1)
- 13.6. 46✓/23 pairs (1)
- 13.7. Structure B consists of two DNA molecules✓/ contains a double thread/ is made up of two chromatids
-because of DNA replication✓
- Structure C consists of one DNA molecule✓/ contains a single thread/ chromatid
- because it is unreplicated✓/ as a result of splitting of the chromosome during anaphase 2 Any (3)
- (10)**

Question 14

- 14.1. a) Centrosome✓ (1)
b) Chromosome✓ (1)
c) Cell membrane✓ (1)
- 14.2. a) 2✓ - Metaphase II✓ (2)
b) 4✓ - Prophase I✓ (2)
c) 1✓ - Anaphase I✓ (2)

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

Question 15

- 15.1. a) Meiosis✓ / Meiosis I (1)
 b) Prophase I✓ (1)
 15.2. Ovary✓ (1)
 15.3. C✓ - centromere✓ (2)
 15.4. 3✓ / Three (1)
(6)

Question 16

- 16.1 (a) Centrosome ✓ / Centriole (1)
 (b) Spindle ✓ (1)
 16.2 Prophase 1✓ (1)
 16.3 -Pairing of homologous chromosomes is visible✓ / bivalent are visible
 -Development of spindle fibres ✓
 - Crossing over is taking place✓
 -Centriole / Centrosome moved to opposite poles ✓
 -Disintegration of the nuclear membrane ✓ (3)
(Mark first Three only)
 16.4 -Parts of the homologous chromosomes overlap ✓ and-DNA /genetic material is exchanged ✓
 -at points called chiasmata ✓ / chiasma (3)
 16.5 (a) Metaphase 1 ✓
 (b) -In Metaphase 1✓ / Meiosis 1 chromosomes are arranged in pairs at the equator ✓ (2)
 16.6 -Four (daughter) cells will be formed ✓ of which
 - two will each have five chromosomes ✓ and
 -the other will each have three chromosomes ✓ (3)
(15)

TOPICS: REPRODUCTION SOLUTIONS

Question 1

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

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

	(53x 1)	(53)
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Question 2

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

Question 3

3.1 External ✓ fertilisation (1)

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

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

OR

-Many/ up to 6000 ova are released ✓
 -since fertilisation is external ✓

(Mark the first ONE only) (2)

3.4 Many/ up to 6000 ova are released ✓
 -since fertilisation is external ✓/ increasing the chance that some will be fertilised

OR

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

(Mark the first ONE only)**(2)****(7)****Question 4**

4.1 Internal ✓ fertilisation

(1)4.2 -Sperm are deposited inside the female body ✓
thereby increasing the chances of fertilisation ✓

- Gametes/zygotes are inside the body✓

therefore protected from the predators✓/ environmental dangers

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

4.3 - The eggs hatch inside the female's body ✓

- and the young are born live ✓

(2)**(7)****Question 5**

5.1 - The (amniotic) egg is retained inside the mother's body✓*

- to protect the embryo from predators✓

- The allantois✓protects the embryo

- by removing waste products✓

- The embryo is protected from shocks✓/sudden changes in
temperature/dehydration by the:

• Chorion✓

• Amnion✓

• Amniotic fluid✓ inside the amniotic membrane

• Shell✓/outer covering

• Air pocket✓

Compulsory 1* + Any 4

Nourishment (N)

- The embryo receives nutrients✓

- from the egg yolk✓ in the yolk sac

and from the albumen✓

(7)**Question 6**

6.1 Internal fertilisation ✓

(1)

6.2 Internal fertilisation ✓

increases the chances of fertilisation ✓

Ovovivipary ✓/ eggs retained inside the female's body

where they are protected ✓

(Mark first TWO only)

Any

(2 x 2)**(4)**6.3 To increase the chances of fertilisation✓/ the survival of the eggs/ number of
offspring

- As eggs may be lost to predators✓/environmental factors etc.
- Since there is external fertilisation✓

Any 1

(1)

(7)**Question 7**

- 7.1 External✓ fertilisation (1)
- 7.2 - Their embryos develop inside eggs ✓that are (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
- since many will be lost✓ (3)
- 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 Cervix ✓ (1)
- 9.2 - The site of fertilisation ✓
- The site of zygote division✓
- The transfer of the ovum/embryo to the uterus ✓
- (Mark first ONE only)** (1)
- 9.3 -Diploid cells in the ovary undergo mitosis✓
- to form numerous follicles✓
- Under the influence of FSH ✓
- one cell undergoes meiosis✓
- to form a (haploid) ovum ✓ Any (4)
- 9.4 -It is a hollow organ ✓
- It has a muscular wall✓
- It has a blood-rich lining✓/endometrium Any (1)
- (Mark first ONE only)**
- 9.5 - No follicle will develop ✓
- No oestrogen produced ✓

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

Compulsory mark✓*1 + Any 2

(3)

(10)

Question 10

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

Question 11

- 11.1 (a) Vas deferens✓/sperm duct (1)
 (b) Scrotum✓ (1)
 (c) Penis✓ (1)
- 11.2 D✓ Epididymis✓ (2)
 G✓ Urethra (2)
 E✓ Testis✓ (2)
- 11.3 A✓
 B✓
 E✓ Any 2x1 (2)
- (Mark first TWO only)**
- (11)**

QUESTION 12

- 12.1 Vas deferens ✓ (1)

- 12.2 - Sperm storage✓
 - Sperm maturation ✓ Any 1 x1 (1)
(Mark first ONE only)
- 12.3 - The semen will not contain sperm ✓ because
 - they are not transported✓
 - but will contain all other secretions of the accessory glands✓
 - / examples thereof
 - the vasectomy occurred before✓ the accessory glands (3)
- 12.4 - The temperature of the testes inside the body will be too high✓
 - No/abnormal sperm will be produced✓
 - The man will be infertile✓/not able to reproduce (3)
- 12.5 - Under the influence of testosterone✓
 - diploid cells✓/germinal epithelial cells
 - in the seminiferous tubules✓/testes
 - undergo meiosis✓
 - to form haploid sperm cells ✓ (4)
(12)

QUESTION 13

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

Question 14

- 14.1 Acrosome✓ 1
 14.2 - Fuses with the nucleus of the ovum✓ 1
 - Carries genetic material✓
 14.3 - Produce energy✓/ site for cellular respiration 2
 - which is needed for movement✓ of the sperm
- 14.4 - The oval/torpedo-shaped head✓
 - will facilitate faster movement✓
 - The presence of an acrosome✓/part A
 - enables the sperm to penetrate the ovum

- A longer tail✓
 - ensures faster movement✓
- (Mark first TWO only)**

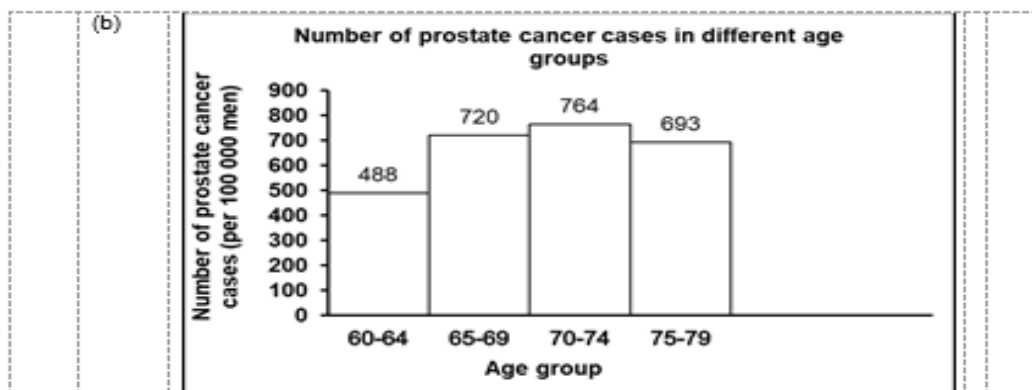
Any (2 x 2)

4

8

Question 15

- 15.1 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	1
All 4 required age groups only	2

(8)
(11)

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)
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(11)

- 16.1 - Must have regular menstrual cycles✓

- They must not become pregnant✓
- Diet ✓

Any (2x1)

(2)

(Mark first TWO only)

- 16.2 - 250 females per group were used✓/1000 females participated
- Measurement was done for 5 cycles✓

(Mark first TWO only)

(2)

- 16.3 Older groups of women have a higher (average) FSH level than the younger groups✓✓
- OR**
- Younger groups of women have a lower (average) FSH level than the older groups✓✓

Any (1x2)

(Mark first ONE only)

(2)

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

(3)

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

(3)

(12)**Question 16**

- 17.1 Male fertility✓ (1)

- 1.2 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(2x1))

(Mark first TWO only)

(2)

- 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 TWO

(2)**(11)****Question 18**18.1 Acrosome✓ **(1)**18.2 mitochondrion✓ **(1)**18.3 (a) 3✓ **(1)**(b) 1✓ **(1)**(c) 1✓ **(1)**18.4 B✓ - Nucleus✓ **(2)**18.5 Mitosis✓ **(1)**

- 18.6 - 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 19**19.1 **(1)**(a) Zygote ✓ **(1)**(b) Morula ✓ **(1)**(c) Blastocyst/blastula ✓ **(1)**19.2 **(1)**(a) Fertilisation ✓ **(1)**(b) Endometrium✓ **(1)**19.3 Mitosis ✓ **(1)**19.4 23 ✓ **(1)**19.5 Chorion ✓ **(1)****(8)****Question 20**20.1 (a) Pituitary✓ gland/hypophysis ✓ **(1)**(b) Graafian follicle ✓ **(1)**(c) Ovulation ✓ **(1)**

(d) Corpus luteum✓

20.2 Remains low✓/decreases (1)

20.3 - stimulates ovulation✓

- stimulates the development of the corpus luteum✓

(Mark first ONE only) (1)**(6)****Question 21**

21.1 -A✓

-B✓

-E✓

(2)

Mark first TWO only

21.2 -The scar tissue✓

-may partially block the Fallopian tube✓

- preventing the embryo from reaching the uterus✓/resulting in implantation in the Fallopian tube

(3)

21.3 - 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)

21.4 - Insufficient space✓

- Poor/no placental development✓

- Decreased blood supply✓

- Insufficient nutrients✓/oxygen

(Mark first TWO only)

Any

(2)

(9)**Question 22**

22.1 - Stimulates the development of ovarian follicles✓

(1)

- Initiates puberty ✓

22.2 - LH✓/Luteinising Hormone

(1)

22.3 - LH stimulates ovulation✓

(2)

- therefore, ovulation will not take place✓

- There will be no ovum to fertilise✓

- 22.4 - 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✓ (5)
 - and no implantation can take place✓ (9)

Question 23

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

QUESTION 24

- 24.1 Progesterone maintains/thickens the endometrium✓ and therefore,
 maintains the pregnancy✓ (2)
- 24.2 (a) Progesterone treatment ✓ (1)
 (b) Development of gestational diabetes✓ (1)
- 24.3 • Glucose levels were taken daily✓
 • When the glucose level of a pregnant woman remains high
 continuously it indicates the development of gestational diabetes. ✓ (2)
- 24.4 (Same) dosage/250 mg of progesterone✓
 (Same) period of time for injection injections given between weeks 16 and
 20 ✓
 (Same) frequency of injections/weekly injections✓. Any 2 (2)
(Mark first TWO only)
- 24.5 Group B did not receive progesterone✓
 If gestational diabetes develops in group A it would be due to the
 progesterone treatment✓ (2)
(10)
- 25.2 (a) Graafian follicle ✓
 Corpus Luteum ✓
(Mark first TWO only) (2)
- (b) (Intense) pain ✓
 (Internal) bleeding ✓
(Mark first TWO only) (2)

25.2

(a) FSH ✓ (1)

(b) Oestrogen ✓

OR

LH ✓

OR

FSH

(1)

25.3. The Graafian follicle keeps on producing oestrogen ✓/ fails to rupture (1)

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

25.4 -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 26**

26.1 Chorion✓ (1)

26.2 - 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)

26.3 - 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)

26.4 - Acts as a micro-filter✓/protect against pathogens

- Removal of harmful metabolic waste✓

- Produces antibodies✓

- Maintains the endometrium✓

Any (2)

(Mark first TWO only)

- 26.5 Umbilical vein✓ (1)
- 26.6 -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 27

- 27.1 - Stimulates ovulation✓
 - Stimulates the development of the corpus luteum✓
(Mark the first TWO only) (2)
- 27.2 (a) - FSH✓/a high concentration of hormone A
 - will stimulate follicles to develop✓
 - Therefore, ova will be produced✓ increasing the chances to fall pregnant (3)
- (b) - A peak in hormone B✓/LH
 - will indicate that ovulation is about to happen✓
 - therefore, an ovum will be available for fertilisation✓ Any 2 (2)
- 27.3 - The levels will remain low✓ because
 - the high progesterone levels✓ during pregnancy
 - will inhibit the secretion of FSH ✓/hormone A (3)
(10)

QUESTION 28

- 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 29**

29.1	(a) Oestrogen✓	(1)
	(b) Progesterone✓	(1)
29.2	- It increases✓	
	- the thickness✓ of the endometrium/the blood vessels in the endometrium/the amount of glandular tissue in the endometrium	(2)

29.3	(a) Release of an ovum✓ from the ovary✓/Graafian follicle	(2)
	(b) Day 14 ✓	(1)
	(c) LH/ Luteinising Hormone ✓	(1)

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

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

29.6 - High levels of progesterone ✓
 - stimulate the Pituitary gland/ Hypophysis✓ to secrete a less FSH ✓
 To prevent the growth of a new follicle ✓/ ovulation during the pregnancy
 OR
 - Low levels of progesterone ✓
 - stimulate the Pituitary gland/ Hypophysis✓ to secrete a more FSH ✓
 -which stimulate the development of new follicles ✓ (4)
(17)

Question 30

- 30.1 Accept day 14✓ or day 15 (1)
- 30.2 Days 0 - 7✓ (1)
- 30.3 - Causes the follicle to burst open✓/stimulates ovulation
 - Stimulates the formation of corpus luteum✓
(Mark first ONE only) (1)
- 30.4 - LH levels remain low up to day 12/13✓
 - Then it increases sharply up to day 14✓
 - After which it decreases and remains low✓ (3)
- 30.5 As the oestrogen level increases✓
 The thickness of the endometrium also increases✓ (2)
- 30.6 Maintain the increase in the thickness of the endometrium✓ for greater
 chance of implantation✓ (2)
- 30.7 No✓ (1)
- 30.8 The progesterone levels✓ has dropped✓/ not maintain/corpus luteum has
 started to degenerate (2)
(13)

TOPIC: GENETIC SOLUTIONS**Question 1**

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

1.25	The position of a gene on a chromosome	Locus
1.26	The type of dominance which results in an intermediate phenotype in the heterozygous condition.	Incomplete Dominance
		26 x1 = (26)

Question 2

- 2.1 Both A and B ✓✓
- 2.2 None ✓✓
- 2.3 A only ✓✓
- 2.4 B only ✓✓
- 2.5 A only ✓✓
- 2.6 None ✓✓
- 2.7 A only ✓✓
- 2.8 B only ✓✓

(8x2) **(16)**

Question 3

- 3.1 Incomplete dominance ✓ (1)
- 3.2 - The pink flower colour is an intermediate phenotype ✓ / a blend of red and white indicating that neither of the alleles is dominant ✓ (2)

3.3

P₁ Phenotype
Genotype

Meiosis

G/gametes

Fertilisation

F₁ Genotype

Phenotype

P₁ and F₁✓
Meiosis and fertilisation✓

Pink x Pink✓
RW x RW✓

R, W x R, W✓

RR; RW; RW; WW✓

1 Red: 2 Pink: 1 White✓*

OR

P₁ Phenotype
Genotype

Meiosis

Fertilisation

F₁ Phenotype

P₁ and F₁✓
Meiosis and fertilisation✓

Pink x Pink✓
RW x RW✓

Gametes	R	W
R	RR	RW
W	RW	WW

1 mark for correct gametes
1 mark for correct genotypes

F₁ Phenotype 1 Red: 2 Pink: 1 White✓*

1* compulsory + Any 5

(6)

(9)

Question 4

4.1

P₁ Phenotype
Genotype

Meiosis

G/gametes

Fertilisation

F₁ Genotype

Phenotype

P₁ and F₁✓
Meiosis and fertilisation✓

Male x Female✓
XY x XX✓

X, Y x X, X✓

XX; XX; XY; XY✓

female : male✓

OR

P₁ Phenotype
Genotype

Meiosis

Fertilisation

F₁ Phenotype

P₁ and F₁✓
Meiosis and fertilisation✓

Male x Female✓
XY x XX✓

Gametes	X	Y
X	XX	XY
X	XX	XY

1 mark for correct gametes
1 mark for correct genotypes

female: male✓

Any

(6)

- 4.2
- Normal females have two X chromosomes ✓
 - Normal males have one X and one Y ✓
 - The female always provides X in the egg ✓
 - If an egg cell is fertilized by an X bearing sperm ✓ a female/girl ✓ is formed
 - If an egg is fertilized by a Y bearing sperm
 - a male/boy ✓ is formed

Any

OR

(5)

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

2 XX : 2 XY

Female ✓ Male ✓

(Any

(11)

Question 5

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

Question 6

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

Question 7

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

Question 8

- 8.1 Pedigree ✓ diagram (1)
- 8.2 (a) 6 ✓ (1)
- (b) 1 ✓ (1)
- 8.3 X^GX^g ✓✓ (2)

- 8.4 Unaffected✓✓ / without Goltz syndrome (2)
- 8.5 - Pilusa is affected ✓ $X^G Y$
 - Anju is unaffected✓ $X^g X^g$
 - Males inherit the Y chromosome from Pilusa✓
 - and inherit X^g from Anju✓ (4)
- (11)**

Question 9

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

Question 10

- 10.1 (a) 4✓/Four (1)
 (b) 1✓/One (1)
- 10.2 $1\frac{1}{2}$ ✓✓ (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) $I^B I^B$ ✓ of $I^B i$ ✓ (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 ✓man as the parent
but it cannot confirm that a particular man is the father✓
Since a large portion of the population have the same blood type✓ Any (2)
(8)

Question 14

- 14.1 3✓/ Three (1)
- 14.2 - Complete dominance✓
- The allele for blood group B/ I^B is dominant✓✓ and
- the allele for blood group O/ i is recessive✓✓ (3)

14.3

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

Meiosis

G/gametes I^A I^B x I^B i ✓

Fertilisation

F₁ Genotype: $I^A I^B$ $I^A i$ $I^B I^B$ $I^B i$ ✓*

Phenotype: Blood group:
 AB; A; B✓*

P₁ and F₁✓

Meiosis and fertilisation✓

Compulsory 2*+ Any 4

OR

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

*Meiosis**Fertilisation*

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

1 mark for correct gametes
 1 mark for correct genotypes*

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

P₁ and F₁✓

Meiosis and fertilisation✓

(6)

Compulsory 2*+ Any 4

(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

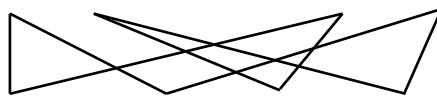
(6)

Question 16

- 16.1 Dihybrid✓ cross (1)
- 16.2 (a) Smooth✓ stem (1)
- (b) Elongated✓ fruit (1)
- 16.3 (a) nnrr✓✓/nnrr/ rrnn (2)
- (b) Smooth stem round fruit✓✓ (2)
- (7)

Question 17

- 17.1 - The disorder is controlled by alleles✓/genes that (2)
- are located on the autosomes✓
- 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✓ (2)
- tt✓ (10)

P₁	Phenotype	Woman without haemophilia	x	Man with haemophilia✓
	Genotype	$X^H X^h$	x	$X^h Y$ ✓
<i>Meiosis</i>	G/gametes	X^H, X^h	x	X^h, Y ✓
<i>Fertilisation</i>				
F₁	Genotype	$X^H X^h, X^H Y, X^h X^h, X^h Y$ ✓		
	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		

P₁ and F₁✓
Meiosis and fertilisation✓

***1 compulsory mark + any 6**

OR

P₁	Phenotype	Woman without haemophilia	x	Man with haemophilia✓									
	Genotype	X ^H X ^h	x	X ^h Y✓									
<i>Meiosis</i>													
<i>Fertilisation</i>													
<table><tr><td>Gametes</td><td>X^H</td><td>X^h</td></tr><tr><td>X^h</td><td>X^HX^h</td><td>X^hX^h</td></tr><tr><td>Y</td><td>X^HY</td><td>X^hY</td></tr></table>					Gametes	X ^H	X ^h	X ^h	X ^H X ^h	X ^h X ^h	Y	X ^H Y	X ^h Y
Gametes	X ^H	X ^h											
X ^h	X ^H X ^h	X ^h X ^h											
Y	X ^H Y	X ^h Y											
1 mark for correct gametes 1 mark for correct genotypes													
F₁	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											

P₁ and F₁✓
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 (1)
- (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**
- $\frac{34}{100}✓ \times 1\,800\,000✓ = 612\,000✓$ people (3)

- 22.3 - The allele for blood group A/ I^A is inherited from one parent✓ and
 - the allele for blood group B/ I^B is inherited from the other parent✓ therefore
 - the child has blood group AB✓/genotype $I^A I^B$

(3)

(7)

Question 23

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

(4)

23.2 **P₁** Phenotype Male with brown teeth x Female with white teeth✓

Genotype $X^B Y$ x $X^b X^b$ ✓

Meiosis

G/gametes X^B , Y x X^b , X^b ✓

Fertilisation

F₁ Genotype $X^B X^b$, $X^B X^b$, $X^b Y$, $X^b Y$ ✓

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

P₁ Phenotype Male with brown teeth x Female with white teeth✓

Genotype $X^B Y$ x $X^b X^b$ ✓

Meiosis

Fertilisation

Gametes	X^B	Y
X^b	$X^B X^b$	$X^b Y$
X^b	$X^B X^b$	$X^b Y$

1 mark for correct gametes
 1 mark for correct genotypes

F₁ 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)

Question 24

24	24.1	Pedigree✓diagram	(1)
	24.2	3✓/Three	(1)
	24.3	3✓/Three	(1)
	24.4	$\left. \begin{array}{l} I^A i \\ I^B i \\ ii \end{array} \right\} \checkmark \checkmark$	(2)
	24.5	ii✓	(1)
	24.6	Ann✓✓	(2)
			(8)

Question 25

25	P₁	Phenotype	With polydactyly	x	Without polydactyly✓		
		Genotype	Rr	x	rr✓		
	<i>Meiosis</i>						
		G/gametes	R , r	x	r, r✓		
	<i>Fertilisation</i>						
	F₁	Genotype	Rr, Rr, rr, rr✓				
		Phenotype	2 polydactyly ; 2 without polydactyly✓				
			50✓*0% chance of polydactyl child				
	P ₁ and F ₁ ✓						
	Meiosis and fertilisation✓						

***1 compulsory mark + Any 5
OR**

P₁	Phenotype	With polydactyly	x	Without polydactyly✓									
	Genotype	Rr	x	rr✓									
<i>Meiosis</i>													
<i>Fertilisation</i>													
<table><tr><td>Gametes</td><td>R</td><td>r</td></tr><tr><td>r</td><td>Rr</td><td>rr</td></tr><tr><td>r</td><td>Rr</td><td>rr</td></tr></table>					Gametes	R	r	r	Rr	rr	r	Rr	rr
Gametes	R	r											
r	Rr	rr											
r	Rr	rr											
1 mark for correct gametes 1 mark for correct genotypes													
F₁	Phenotype	2 polydactyly ; 2 without polydactyly✓											

(6)

Question 26

Question 27

45

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 controls body temperature	Hypothalamus ✓
1.12	The disease characterised by the degeneration of brain tissue, leading to memory loss	Alzheimer's disease ✓
		(16)

Question 2

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

(5x2) (10)**Question 3**

- 3.1 B ✓- Cerebrum ✓ (2)
 D ✓- Cerebellum ✓ (2)
 A ✓ - Pituitary gland ✓/ Hypophysis (2)
 C ✓- Corpus callosum ✓ (2)
 E ✓- Spinal cord ✓ (2)
(5x2) (10)

Question 4

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

Question 5

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

Question 6

- 6.1 Motor✓ /efferent neuron (1)
- 6.2 C → B → A ✓✓ (Must be in the correct sequence) (2)
- 6.3 - Impulse will be transmitted faster in neuron 1✓✓ / slower in neuron 2
 - because of the presence of myelin sheath in neuron 1✓ / absence of myelin sheath in neuron 2 (3)
- 6.4 - Impulses from the receptor✓/ sensory neuron
 - will be transmitted to the central nervous system ✓ but
 - the impulse will not reach the effector ✓ (3)
(9)

Question 7

- 7.1 Reflex arc ✓ (1)
- 7.2 (a) B- Motor neuron/Multipolar neuron/efferent neuron (1)
 (b) C - Interneuron ✓ (1)

- (c) E – Sensory neuron/unipolar neuron/afferent neuron ✓ (1)
- 7.3 (a) F ✓ (1)
- (b) A ✓ (1)
- 7.4 (c) D ✓ - Synapse ✓ (2)
- (b) G ✓ - Myelin sheath ✓ (2)
- (10)**

Question 8

- 8.1 A ✓ (1)
- 8.2 The Impulse does not travel to the brain ✓ / goes directly from receptor to effector via the spinal cord (2)
- 8.3 - Allows the person to respond rapidly ✓
 - and without thinking ✓ / involuntary
 - to a stimulus ✓
 - to prevent damage to the body ✓*
1* compulsory + any other 2 (3)
- 8.4 Nerve ✓ / spinal cord (1)
- 8.5 - Its acts as the insulator
 - and therefore, speed up the nerve impulse / prevents a short circuit (2)
- 8.6 - The person would be able to feel the stimulus ✓
 - but would be unable to react ✓
 - because the impulse would not be transmitted to the effector ✓
(Any two) (2)
- 8.7 - The receptor receives the stimulus ✓
 - And convert it to an impulse ✓
 - which is transported by the sensory neuron ✓ via the spinal cord
 - to the brain ✓* / cerebrum
 - the brain/cerebrum interprets the impulse ✓*
 - the brain/ cerebrum sends an impulse to the motor neuron ✓
 - which conducts impulse to the effector ✓
 - to bring about response ✓
2* compulsory + any other 4 (6)
- (16)**

Question 9

- 9.1 - A rapid involuntary/automatic response ✓
 - to a stimulus ✓ (2)
- 9.2 (a) It ensures that the impulse is transmitted in one direction ✓
(Mark first ONE only) (1)
- (b) It is important for balance ✓ / movement (1)
- 9.3 - The impulse is transmitted from the receptors in the patellar tendon ✓ through the
 - sensory neuron ✓ and the
 - synapse ✓ to the
 - motor neuron ✓ and to the
 - quadriceps ✓ muscle (5)
- (Correct sequence is required)** (9)
- [50]**

Question 10

- 10.1 - From the dendrites ✓
- to the axon ✓ (2)
- 10.2 0 to 1 ✓✓ um / 0 to 0,9 um (2)
- 10.3 As the axon diameter increase the speed of the impulse increases ✓✓
OR (2)
As the axon diameter decrease the speed of the impulse decrease ✓✓
- 10.4 - The speed of the impulse will decrease ✓ (3)
- resulting in it taking longer for impulse to reach the effectors ✓
- and the person will react more slowly ✓ (9)

Question 11

- 11.1 - Degeneration✓/wasting away of nerve tissue
- Plaque/proteins formed around the nerve tissue✓ Any (1)
(Mark first ONE only)
- 11.2 (a) Worsening ability to remember new information✓ (1)
(Mark first ONE only)
- (b) Family history✓ (1)
- (c) - Learning ability✓
- Orientation✓ (2)
(Mark first TWO only)
- 11.3 They:
- Were all females✓/considered gender
- Were between the ages of 65 and 75✓/considered age group/age
- Did not show symptoms of Alzheimer's disease✓ (2)
Any
(Mark first TWO only)
- 11.4 They:
- Used 37 participants✓
- Conducted the investigation three times a week✓
- Conducted the investigation for three months✓ Any (2)
(Mark first TWO only)
- 11.5 - Investigation did not establish the relationship between exercise and development of Alzheimer's disease✓
- since no changes in the nervous tissue were measured✓/
period was short
OR
- There was no control group✓

- to show that it is the exercise that improve blood flow✓/higher order-thinking abilities

OR

- People who did not show symptoms of Alzheimer's disease were used✓
- therefore, results do not show prevention of development of Alzheimer's disease✓

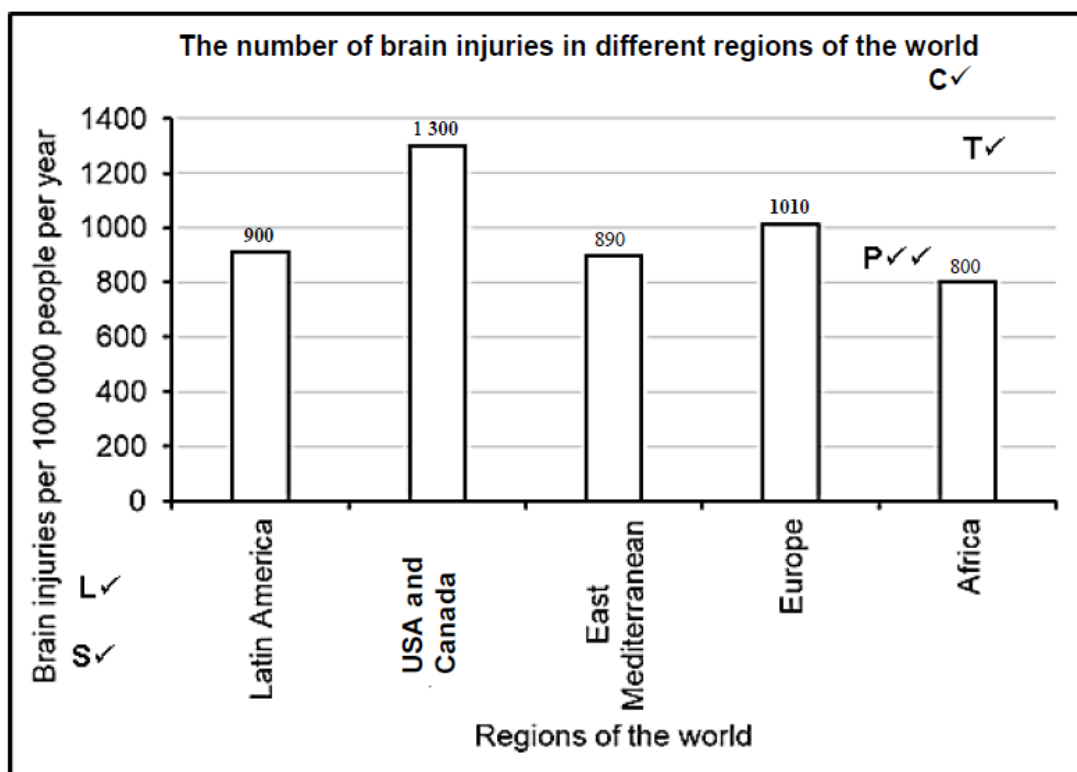
Any (1 x 2) (2)

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

(3)
(14)

Question 12

- 12.1 Africa✓ (1)
- 12.2 - not all brain injuries are recorded✓
- due to poor health facilities✓ (2)



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	1
All 5 co-ordinates plotted correctly	2

(6)

(9)

Question 13

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

(Mark first TWO only)

Any (2)

(8)

THE EYE**Question 1**

	DESCRIPTION	TERM
1.1	A type of vision in which both eyes are used together to focus on an object	Binocular vision ✓
1.2	The watery fluid that supports the cornea and the front chamber of the eye	Aqueous humor ✓
1.3	The pigmented layer of the eye that absorbs excess light	Choroid ✓
1.4	The series of changes that take place in the shape of the lens and the eyeball in response to the distance of an object from the eye	Accommodation ✓
1.5	A defect condition of the eye where a person can see nearby objects clearly while distant objects are blurred.	Myopia ✓
1.6	The visual defect characterised by a cloudy lens	Cataract ✓
1.7	The area of the retina that contains the highest concentration of cones	Yellow spot ✓ / fovea centralis
1.8	The layer in the eye that is richly supplied with blood vessels	Choroid ✓
		(8)

Question 2

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

(5x2) (10)**Question 3**

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

(10)**Question 4**

- 4.1 (a) Accommodation ✓ (1)
 (b) Pupillary mechanism ✓ / pupillary reflex (1)
- 4.2 (a) B ✓ and D ✓ (2)
(Mark the first TWO only)
 (b) A ✓ and B ✓ (2)
(Mark the first TWO only)
- 4.3 (a) C ✓ and D ✓ (2)
(Mark the first TWO only)
 (b) A ✓ and C ✓ (2)
(Mark the first TWO only)

Question 5

5.1 Long-sightedness✓ (1)

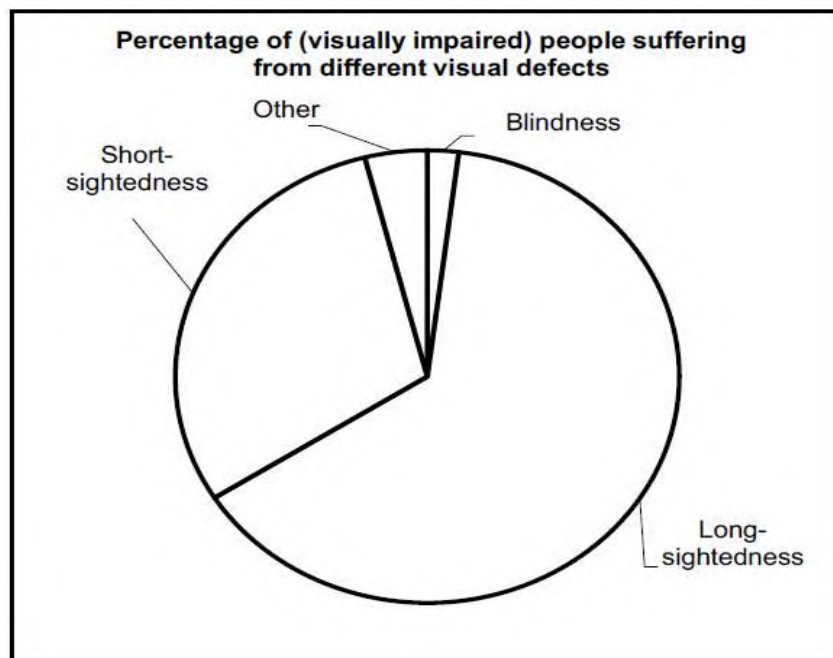
5.2 (a) The lens becomes cloudy/opaque/milky✓ and there it does not allow the light to pass through✓ (2)

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

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

5.4 Astigmatism✓ (1)

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



Rubric for assessing the graph	
--------------------------------	--

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

(6)
(14)

Question 6

- 6.1 (a) Curvature✓ of the lens (1)
 (b) Distance✓ of the pencil (1)
- 6.2 Same light intensity✓
 Same person doing experiment✓
 Same person taking measuring✓
 Using the same optic instrument✓
 Time to focus on the pencil✓
 Same eye✓ **(Mark first TWO only)** (2)
- 6.3 To improve the validity✓ of the procedure
 To get results for the factors✓ that is being tested so the above factors do not interfere with the factors being tested✓ **(Mark first TWO only)** (2)
- 6.4 As the distance increases✓ curvature of the lenses decreases✓ (2)
- 6.5 Ciliary muscle ✓ (2)
 Suspensory ligament✓ (2)
(10)

Question 7

- 7.1 (a) B✓ - Iris✓ (2)
 (b) A✓ - Sclera✓ (2)
- 7.2 (a) 2✓ (1)
 (b) 3✓ (1)
- 7.3 (a) Circular✓ muscles (1)
 (b) Circular ✓muscles (1)
(8)

Question 8

- 8.1 Iris✓ (1)
- 8.2 - Helps to maintain the shape of the eye✓
 - Plays a role in refraction of light✓
 - Allows the transmission of light✓
 - Prevents desiccation✓ of structures in the eye
 - Holds the retina in position✓
 - Nourishment✓ of the eye
 - Prevents mechanical injury✓ in the eye **(Mark first TWO only) (Any two)** (2)
- 8.3 - Area B contains (a high concentration of) photoreceptors✓/ cones (2)
 - Area C contains no photoreceptors✓/ no rods & cones (2)
- 8.4 Astigmatism✓ (1)
- 8.5 - Because the lens will become cloudy✓/opaque
 - no/less light will enter the eye✓
 causing no sight ✓/weak sight (3)
- 8.6 - The ciliary muscle contracts✓
 - The ciliary body moves closer to the lens✓
 - The suspensory ligaments slacken✓
 - Tension on the lens decreases✓

- The lens becomes more convex✓/rounded
- Light rays are refracted more✓
- To focus the light on the retina✓

Any Six**(6)**
(15)**EAR****Question**

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 ✓
	1x6	(10)

Question 2**MATCHING COLUMNS**

- 2.1 A only ✓✓
 2.2 A only ✓✓
 2.3 B only ✓✓
 2.4 None✓✓

(4x2) (8)**Question 3**

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

Question 4

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

- 4.3 (a) F✓
(b) A✓

(1)

(1)

(8)**Question 5**

- 851 (a) Transmits sound waves to the tympanic membrane✓/Secretes ear wax (1)
(Mark first ONE only)
- (b) Equalises pressure on either side of the tympanic membrane✓ (1)
(Mark first ONE only)
- (c) Releases pressure from the inner ear✓ (1)
(Mark first ONE only)
- 5.2 (a) C✓ (1)
(b) D✓ (1)
- 5.3 - The receptors cannot convert the stimuli into impulses✓
- No impulses/fewer impulses are transmitted to the cerebrum✓
- and the person does not hear anything✓/hearing is impaired (3)
- 5.4 - The sound vibrations are transmitted from the large tympanic membrane✓
- to the smaller oval window✓
- through the ossicles✓
- which are arranged from largest to smallest✓
- This concentrates the vibrations✓, amplifying them Any (3)
- 5.5 - A change in speed/direction of movement✓
- stimulates the cristae✓
- The stimulus is converted to an impulse✓
- The impulse is transmitted to the cerebellum✓
- via the auditory nerve✓
- The cerebellum sends impulses to the muscles✓ to restore balance Any (4)
(15)

Question 6

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

Any (7)
(7)

Question 7

- 7.1 Cochlea✓ (1)
- 7.2 (a) Absorbs excess pressure waves✓/releases pressure from the inner ear/ prevents an echo
(Mark first ONE only) (1)
- (b) It converts stimuli/pressure waves into impulses✓
(Mark first ONE only) (1)
- 7.3 - Part A/tympanic membrane will not be able to vibrate✓/vibrate freely
- No/less vibrations will be carried to the middle ear✓/ossicles (2)
- 7.4 - Middle ear infections cause fluid build-up in the middle ear✓
- which can block the Eustachian tube✓
- The grommet will release the pressure✓that will build up in the middle ear/ drain the fluid from the middle ear
- The pressure on either side of the tympanic membrane is equalised✓
- preventing the tympanic membrane from rupturing✓ and
- allowing the ossicles to vibrate freely ✓ Any (4)
- 7.5 - The cristae are stimulated✓ and
- convert the stimuli into impulses✓
- The impulses are sent via the auditory nerve✓
- to the cerebellum✓
- which interprets the information✓ and
- sends impulses to the skeletal muscles ✓to restore balance Any (4)
- (13)**

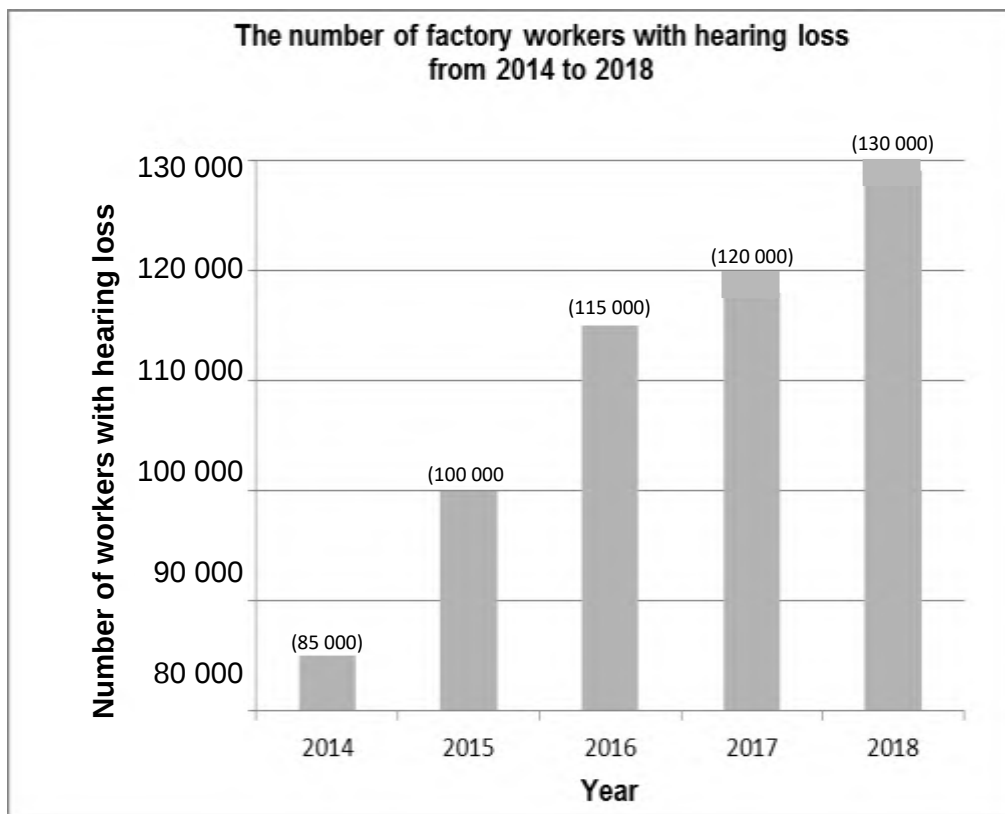
Question 8

- 8.1 Cochlea✓ (1)
- 8.2 $\frac{(130\,000 - 85\,000)}{85\,000} \times 100 = 52.94\%$ (3)
- 8.3 - More factories✓ were built increase in supply and demand
- More workers✓ were employed
- Extended exposure to loud sounds✓
- Lack of precautionary measures✓ Any (1)

- 8.4 - The impulse will not be transmitted✓ to the cerebrum✓
 - and will not be interpreted✓

Any 2 (2)

8.5

**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	1
All 5 co-ordinates are plotted correctly	2

Histogram or line graph drawn:

- Lose marks for type of graph and for scale

Transposed axes:

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

(6)
(13)

TOPIC: ENDOCRINE AND HOMEOSTASIS SOLUTIONS**QUESTION 1**

DESCRIPTION		TERM
1.1	A gland whose secretion are transported through blood streams.	Endocrine gland ✓
1.2	A system that is responsible for chemical coordination in the body.	Endocrine system ✓
1.3	A hormone that stimulates ovulation in humans	LH ✓
1.4	The process of maintaining a constant internal environment in the human body	Homeostasis ✓
1.5	A gland whose secretions are transported through ducts.	Exocrine Gland ✓
1.6	A hormone that stimulates mammary gland to produce milk.	Prolactin ✓
1.7	A hormone that is responsible for osmoregulation in the body.	ADH ✓
1.8	Specialized cells in the pancreas that secretes insulin and glucagon	Islets of Langerhans ✓
1.9	A hormone responsible for secondary sexual characteristics in males	Testosterone ✓
1.10	A hormone that is responsible for maintaining salt balance in the blood.	Aldosterone ✓
1.11	A gland that secretes FSH and LH in females.	Pituitary ✓
1.12	Chemical messengers produced by endocrine glands.	Hormone ✓
1.13	A gland located in the neck that secretes thyroxin hormone.	Thyroid gland ✓
1.14	A hormone that controls the metabolic rate in the body.	Thyroxin ✓
1.15	A hormone that increases the blood glucose level in the body.	Glucagon ✓
1.16	A hormone that lowers the blood glucose level in the body.	Insulin ✓
1.17	Promotes the secretions of hormones produced by thyroid glands.	TSH ✓
1.18	A mechanism that detects imbalances and restores balance in the internal environment	Negative feedback ✓
1.19	A hormone responsible for growth and development in the body.	Growth Hormone ✓
		(19x1) (19)

QUESTION 2

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

QUESTION 3

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

Question 4

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

Question 5

- Testes✓

Question 6

- | | | |
|-----|-----------------------|-----|
| 6.1 | (a) Thermoregulation✓ | (1) |
| | (b) Hypothalamus✓ | (1) |

- 6.2 (a) Sweat gland✓ (1)
 (b) Capillary✓/blood vessel (1)
- 6.3 $\frac{(37,4 - 35,4)}{37,4} \times 100 = 5,35\%$ ✓ (3)
- 6.4 Skin temperature decreased✓/lowers from 37,4 °C to 35,4 °C because part **Q** dilated✓/vasodilated causing more blood to flow to the (surface of the) skin✓ and part **P** 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) Kidney✓ (1)
 (b) Endocrine✓ system (1)
- 7.2 - It releases hormones✓
 - directly into the blood✓/and it is ductless (2)
(Mark first TWO only)
- 7.3 - 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)
- 7.4 - 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 8

- 8.1 (a) Growth hormone ✓ (1)
 (b) Prolactin ✓ (1)

8.2 (a) Adrenalin✓

(1)

- (b) - More air/oxygen will be inhaled✓
 - Blood will be pumped faster✓
 - therefore, transporting more oxygen and glucose✓ to the skeletal muscles
 - which will increase the rate of cellular respiration✓/metabolism

(4)

8.3

- 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 9

9.1 5✓ µg/dl

(1)

$$9.2 \quad \left. \frac{(25 - 5)}{5} \right\} \checkmark \times 100 \checkmark$$

$$= 400\% \checkmark$$

OR

$$\left. \frac{(24 - 5)}{5} \right\} \checkmark \times 100 \checkmark$$

$$= 380\% \checkmark$$

Accept a range between:

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

(3)

- 9.3 - Thyrotoxicosis increases the metabolic rate✓/rate of cellular respiration
 - More glucose is used✓
 - less glucose is stored✓
 - fat is broken down✓ causing weight loss

Any

(3)

- 9.4 - 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 10

10.1 50✓°C (1)

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

10.3 $\frac{11-4}{4}$ } ✓ x 100✓ = 175✓% **OR** $\frac{7}{4}$ } ✓ x 100✓ = 175✓% (3)

10.4 - 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)

10.5 - Less blood flows to the skin✓ at low temperatures
- Less oxygen✓/nutrients reach the cells of the tissue and the cells may die
OR
- Less blood flows to the skin✓ at low temperatures
- More carbon dioxide✓/waste products accumulate in the cells of the tissue and the cells may die (2)

(12)

Question 11

- 11.1 - Body temperature increases✓
 - Pulse rate increases✓

OR

Both increase✓✓

(2)

30✓ minutes

(1)

11.2

Vasoconstriction

- 11.3 - Less blood reaches the surface of the skin✓
 - and less heat is lost✓

OR

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

Any 1 x 2

Increase in metabolism

- An increase in metabolism results in an increase in respiration✓
 - which generates more heat✓

(4)

11.4

- Amount of energy drink✓
 - Length of time when measurements were taken✓
 - Amount of caffeine in the energy drink✓
 - Type of energy drink✓
 - The level of activity of all participants✓
 - Gender✓/only men

(Mark first TWO only)

Any

(2)

(9)

Question 12

12.1 The level increases✓

T✓

12.2

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

(1)

(Mark first TWO only)

1 for table + Any 2 x 2

(5)

- 12.3
- 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 13

- 13.1 - The pituitary gland✓ is stimulated
 - to secrete less TSH✓
 - Low TSH levels causes the thyroid gland✓
 - to secrete less thyroxin✓ (5)
 - Thyroxin levels return to normal✓
- 13.2 - 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 14**

- 14.1 Adrenalin✓ (1)
- 14.2 - Increases the heart rate✓
 - Increases blood pressure✓
 - Stimulates the conversion of glycogen into glucose✓
 - Increases the blood supply to the heart✓/skeletal muscles
 - Decreases blood flow to the digestive system✓
 - Decreases blood flow to the skin✓
 - Increases muscle tone✓
 - Increases the rate/depth of breathing✓
 - Increases the rate of respiration✓/metabolism
 - Dilates/increases the diameter of the pupils✓
(Mark first THREE only) (3)
- 14.3 - Blood glucose levels rise✓ above normal
 - The pancreas✓/islets of Langerhans
 - secretes insulin✓ into the blood
 - which travels to the liver✓/muscle cells
 - and stimulates them to absorb glucose✓ from the blood
 - and to convert the excess glucose into glycogen✓
 - which decreases the blood glucose levels✓ to normal

Any 5**(5)****(9)**

Question 15

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

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

Any (7)

(7)

Question 16

Role of the endocrine system in providing energy (E)

- More adrenalin✓ is secreted
- by the adrenal glands✓
- increases blood glucose✓/increase heart rate/ increase breathing rate/dilate blood vessels to essential organs
- More glucagon✓ is secreted
- by the pancreas✓/islets of Langerhans
- increases blood glucose✓
- More TSH✓ is secreted
- by the pituitary gland✓
- to increase thyroxin production✓
- More thyroxin✓ is secreted
- by the thyroid gland✓
- to increase the body's metabolic rate✓/rate of respiration

Any (9)

(9)