

SENIOR SECONDARY INTERVENTION PROGRAMME 2013



education

Department: Education

GAUTENG PROVINCE

GRADE 12

LIFE SCIENCES

LEARNER HOMEWORK SOLUTIONS

The SSIP is supported by



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LEARNER HOMEWORK SOLUTIONS

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SOLUTIONS TO HOMEWORK: SESSION 1
TOPIC 1: NUCLEIC ACIDS – DNA AND RNA

QUESTION 1

1. (a) b – thymine✓
d – guanine✓
e – hydrogen bond✓ (3)
- (b) c✓, a✓, b✓ (3)
- (c) To join two chains / helices✓ (1)
- (d) mutation✓ (1)
- (e) ultra-violet rays✓, x-rays✓ (2)
- (f) DNA✓ – double helix✓ (2)
- [12]**

QUESTION 2

2. (a) RNA✓ (1)
- (b) single chain✓
uracil present✓ (2)
- (c) Bases do not pair✓ (1)
- (d) ribose✓ (1)
- (e) mRNA, tRNA, ✓ rRNA✓ (3)
- [8]**

SOLUTIONS TO HOMEWORK: SESSION 1**TOPIC 2: PROTEIN SYNTHESIS AND DNA FINGERPRINTING****QUESTION 1**

The father is 2. ✓ There are 5 matches ✓ in the VNTR. ✓

[3]**QUESTION 2 Protein synthesis - the process:****Step 1: Transcription**

- The enzyme RNA polymerase causes the DNA to unwind and separate in the nucleus. ✓
- One DNA strand provides the code which is copied onto an mRNA strand in the nucleus. ✓
- Each mRNA strand consists of three bases called a codon, per DNA code triplet. ✓

This process of copying the triplet code onto the mRNA is called transcription. ✓

- When the **mRNA is coded**, it leaves the nucleus through the nucleopore ✓ and carries the message as a codon to the ribosomes ✓ in the cytoplasm. The codon will provide the ribosome with the code to synthesise a specific piece of a protein. ✓

Step 2:

- **tRNA has an anticodon** – it has the opposite bases to the codon. ✓
- It picks a specific amino acid and carries it to the ribosome ✓ where mRNA codon determines the **anticodon fit**. ✓
- The tRNA carries the amino acid to the ribosomes according to the template formed by the codon of the mRNA. ✓
- The mRNA will therefore determine which anticodons will fit ✓

Step 3:

- The tRNA releases the amino acid ✓ into the correct place on the polypeptide chain (many peptides) and leaves to collect the next amino acid. ✓
- The processing of the information carried by the mRNA ✓ into an amino acid sequence during protein synthesis is known as translation. ✓

[16]**QUESTION 3**

- Process to produce specific proteins required for cells, antibodies, blood, enzymes and hormones (1)
- Proteins are a reserve energy source in the body (1)
- Nucleoproteins present in the chromosomes are important for cell division and heredity (1)
- Conjugated proteins like haemoglobin (transports oxygen to all the cells in the body) and lipoproteins (necessary to form cell membranes and organelles) are essential for the body to function properly. (1)

(any 3) [3]

SOLUTIONS TO HOMEWORK: SESSION 2**TOPIC 1: MEIOSIS****QUESTION 1**

- 1.1. 4 ✓ (1)
1.2. $2n$ ✓ – 2 sets of chromosomes/ homologous pairs of chromosomes are present ✓ (2)
1.3. 2 ✓ (1)
1.4. n / haploid ✓ (1)
1.5. yes ✓ (1)
[6]

QUESTION 2

- 2.1. The number of Down's Syndrome babies increases ✓ as the age of the mother increases ✓
The incidence of Down's Syndrome babies increases rapidly after the age of 35 of the mother ✓ (3)
- 2.2. Normal baby = 46 chromosomes ✓,
Down's syndrome baby = 47 chromosomes ✓ (2)
- 2.3. The learner agrees or disagrees with termination of the pregnancy. ✓
They must provide a reason for their answer that is valid and not just because they think so, i.e. religious beliefs, cultural beliefs, economic or psychological reasons etc. ✓ (2)
[7]

SOLUTIONS TO HOMEWORK: SESSION 2
TOPIC 2: GENETICS TERMS

QUESTION 1

✓P₁ phenotype Brown x Grey ✓
 genotype Bb x bb ✓ (3)

✓Meiosis

G₁

B, b x b ✓

gametes	b
B	Bb
b	bb

1 mark for correct gametes
1 mark for correct genotypes

✓Fertilization

F₁ genotype
 phenotype

Bb ; bb ✓
 1 brown; 1 grey ✓

Allocation of marks

Showing the P₁ (parents) G₁(gametes) and F₁ (offspring) generation ✓
 Showing meiosis ✓ Showing fertilisation ✓
 Each correct step of problem – 5 marks [8]

QUESTION 2

P₁ ✓ phenotype Red x white ✓
 genotype RR x rr ✓

Meiosis

G

R x r ✓

gametes	R	R
r	Rr	Rr
r	Rr	Rr

1 mark for correct gametes
1 mark for correct genotypes

Fertilization

F₁ ✓ genotype
 phenotype

Rr ✓
 red ✓

max (6)

SOLUTIONS TO HOMEWORK: SESSION 2 SELF STUDY**TOPIC 1: CONSOLIDATION EXERCISES - MEIOSIS AND DNA****QUESTION 1**

- 1.1 Crossing over (1)
- 1.2 B – Centromere (1)
C – Nuclear membrane (1)
D – Centrosome/centriole (1)
E – Homologous chromosomes (1)
- 1.3 Part F/Spindle threads contract✓ to move chromosomes✓ towards opposite Poles. Allow for the attachment✓ of chromosomes✓ (any 1 x 2) (2)
(Mark first ONE only)
- 1.4 Metaphase1 ✓✓ (2)
- 1.5 Chromosomes arranged along the equator✓ in homologous pairs✓ (2)
(Mark first one only)
- 1.6 4 (1)
- 1.7 Ovary *(Mark first ONE only)* (1)

[13]**QUESTION 2**

DNA	RNA
1. Double helix/double stranded	1. Single strand
2. Sugar is deoxyribose	2. Sugar is ribose
3. Thymine is a base	3. Uracil is a base
4. Equal number of A = T and G = C	4. Bases in any number and ratio
5. Occurs in the nucleus only	5. Occurs in the nucleus and cytoplasm

any 3 x 2 = 6+1 for table *(Mark first THREE differences only)***[7]****QUESTION 3**

- 3.1 A –Nucleus✓
B –Ribosome✓ (2)
- 3.2 C –mRNA✓
E –tRNA✓
F - Amino acids✓ (3)
- 3.3 (a) Transcription (1)
(b) Translation (1)
- 3.4 C✓A✓G✓ (3)

[10]

QUESTION 4

4.1 No (1)

4.2 There was more than 1 person involved in the murder✓✓/possibly 2✓✓ (2)

4.3 Suspect 1 (1)

4.4 The DNA fingerprint of the skin found under the victim's fingernail matches the DNA fingerprint of suspect 1 (1)

4.5 No (1)

4.6 - The hair/skin tissue could have been planted✓at the crime scene✓

OR

- The DNA from the skin tissue could have been under the victim's finger nails✓
- before the murder✓

OR

- The suspect may have an identical twin✓who has the same DNA fingerprint✓

OR

- The samples taken may be mixed✓with others✓in the laboratory (2)

4.7 Tracing criminals✓ would be made easier✓

OR

It infringes on the rights of people✓ who might not want their fingerprint done✓

OR

It would cost the country too much money✓which could be used for basic needs like food/housing✓ (2)

[10]

SOLUTIONS TO HOMEWORK: SESSION 2 SELF STUDY**TOPIC 2: CONSOLIDATION EXERISES - MEIOSIS AND DNA FINGERPRINTING-****QUESTION 1**

- 1.1 Anaphase II✓ (1)
- 1.2 (Sister) chromatids✓/(daughter) chromosomes are moved✓/pulled towards the poles (2)
- 1.3 A Spindle✓fibre
B Cell membrane✓ (2)
- 1.4 (a) (1)
(b) (1)
- 1.5 Ovary✓/germinal epithelium/follicle (1)
- 1.6 No✓ (1)
- 1.7 Humans would have 23✓chromosomes/46 chromatids in this phase. This diagram shows only 4 chromosomes✓/8 chromatids /incorrect number of chromosomes (2)
- 1.8 - Reduction/halving of chromosome number✓/ allows for creation of gametophyte/ keep chromosome number constant from generation to generation/prevents doubling of chromosome number at fertilisation
- Contributes to genetic variation✓
- Leads to the formation of gametes✓ (Any) **(Mark first TWO only)** (2)
- [13]**

QUESTION 2

- 2.1 Normal female: Chromosome pair 23 = XX✓/46 chromosomes
Female with Turner's syndrome: Only one X✓ chromosome/ 45chromosomes (2)
- 2.2 She will not be able to have children✓ since her sex organs will not develop✓
OR
No menstrual cycle✓ because there are underdeveloped gonads✓/ and, therefore, no hormones
OR
No sex hormones✓ and therefore secondary sexual characteristics will not appear✓(2)
(Mark first ONE only) [4]

QUESTION 3

- 3.1 Hypothesis formulation Formulate hypothesis✓ on what the most common type of fingerprint might be
- Sample selection Identify dependent and independent variables✓
Determine the sample size✓ of learners to be used
- Method of data collection Learn how to identify the different fingerprint types correctly✓
Organise an ink-pad and paper to take an imprint✓ of the fingerprint
Arrange a time and place✓ to take fingerprints
- Data representation Design a table✓ to record the number that have each fingerprint type
- (Any) **(Mark first FOUR only)** (4)

NOTE: Answers must be contextualised to the specific investigation on fingerprint types.

- 3.2 (a) Number of learners✓ with different fingerprint types✓ (2)
- b) No✓ (1)
- (c) Results indicate✓ that most learners✓ have the plain whorl type✓ of fingerprinting (Any 2)
- OR**
- Results indicate✓ that learners with a plain arch type✓ do not make up the largest number✓ (Any 2)
- OR**
- Results ✓are not in line with the conclusion✓ (2)

3.3. (a)

Advantages

Can be used to identify

criminals✓

lost children✓

deceased bodies✓

Immigration control✓ can be more strict (Any)

(Mark first TWO only)

(2)

(b)

Disadvantages

Falsely incriminated✓/ (people can be framed)

Infringing on the rights of people✓/invasion of
privacy

It is costly✓

Incorrect capture of data✓/human error

Not all persons✓ can be fingerprinted e.g.
amputees**(Mark first TWO only)**

(2)

[13]**QUESTION 4**

4.1 Translation (1)

4.2 Ribosome (1)

4.3 (a) Isoleucine (1)

(b) CAG✓/cytosine, adenine, guanine✓ (1)

(c) Codon✓ (1)

(d) Have arginine✓ instead of alanine✓/have different✓ amino acids✓ (any 2) (2)

4.4 GTA✓✓ (2)

[9]This diagram shows only 4 chromosomes✓/8 chromatids /incorrect number of
chromosomes (2)