

DNA & PROTEIN SYNTHESIS

2019

- 1.1.1 C✓✓
- 1.1.2 C ✓✓
- 1.1.3 C ✓✓
- 1.1.4 B✓✓
- 1.1.5 A ✓✓
- 1.1.6 A ✓✓
- 1.1.7 C✓✓
- 1.1.8 C✓✓
- 1.1.9 B✓✓

1.2.1 Uracil

1.2.5 ribosome

1.2.7 ribose

- 1.3.1 Both A and B✓✓
- 1.3.2 None✓✓
- 1.3.3 B only✓✓

- 2.1.1 (a) tRNA✓/transfer RNA (1)
 - (b) Anticodon✓ (1)
 - 2.1.2 (a) UGG✓✓ (in correct order) (2)
 - (b) TGG✓✓ (in correct order) (2)
- (6)**

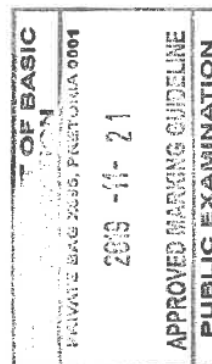
- The double helix DNA unwinds✓ and
- unzips✓/weak hydrogen bonds break
- to form two separate strands✓
- One strand is used as a template✓
- to form mRNA✓
- using free RNA nucleotides from the nucleoplasm✓
- The mRNA is complementary to the DNA✓
- The coded message for protein synthesis is thus copied onto mRNA✓

Any 6 **(6)**

Sex determination (S)

- Females have XX chromosomes✓
- thus produce an ovum which will always carry the X chromosome✓
- Males have XY chromosomes✓
- thus a sperm will either carry X✓
- or Y✓ chromosome
- If a sperm carrying the X chromosome fertilises the ovum carrying the X chromosome✓
- then a female child results✓
- If a sperm carrying the Y chromosome fertilises the ovum carrying the X chromosome✓
- then a male child results✓
- Therefore it is the father's gamete carrying X or Y chromosome that determines the sex of the child✓
- There is a 50% chance that the child can be a boy or a girl✓

Any 7 (7)



Blood grouping (B)

- 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 5 (5)

DNA profiling (P)

- A child received DNA from both parents✓
- The DNA profiles of the mother, child and the possible father are determined✓
- A comparison of the DNA bands of the mother and the child is made✓
- The remaining DNA bands are compared to the possible father's DNA bands✓
- If all the remaining DNA bands in the child's profile match the possible father's DNA bands✓
- then the possible father is the biological father✓
- If all the remaining DNA bands in the child's profile does not match the possible father's DNA bands✓
- then the possible father is not the biological father✓

Any 5 (5)

2018

1.2.1 Hydrogen bonds

1.2.2 Genome

1.3.3 A only

Structure (S)

- RNA is single stranded✓
- and is made up of nucleotides✓ which comprise:
- ribose✓ sugar
- phosphate✓ group
- nitrogenous bases✓ which are
- adenine, uracil, guanine and cytosine✓/ (A, U, G and C)
- The phosphate group is attached to the ribose sugar✓
- and the nitrogenous base is attached to the ribose sugar✓
- Bases on RNA are arranged in triplets✓
- as codons on mRNA✓
- and anticodons on tRNA✓
- tRNA has a clover-leaf✓/hairpin structure
- tRNA has a place of attachment for an amino acid✓

Any (9)

Involvement in protein synthesis (P)

- mRNA✓ forms
- during transcription✓/by copying the coded message from DNA
- and moves out of the nucleus✓
- and attaches to the ribosome✓
- During translation✓
- the anticodon matches the codon✓
- tRNA✓
- brings the required amino acid✓ to the ribosome
- Amino acids become attached by peptide bonds✓
- to form the required protein✓

Any (8)

2017

1.1.1 B

1.2.1 Uracil

1.2.5 Deoxyribose

- | | | |
|-------|-------------------------|-----|
| 1.5.1 | Translation✓ | (1) |
| 1.5.2 | (a) Ribosome✓ | (1) |
| | (b) mRNA✓/messenger RNA | (1) |
| | (c) Peptide✓ | (1) |
| 1.5.3 | (a) C✓ | (1) |
| | (b) B✓ | (1) |
| | (c) D✓ | (1) |

77

2.1.1	2✓	(1)
2.1.2	CUC✓	(1)
2.1.3	(a) TGG✓	(1)
	(b) Aspartate✓	(1)
2.1.4	(a) - C was replaced by U✓ on the 4 th codon✓/AGC OR - AGC✓/the 4 th codon changed to AGU✓	(2)
	(b) - It codes for the same amino acid✓/serine - Therefore there will be no effect✓/same protein formed	(2)
2.1.5	- The process is transcription ✓* Compulsory mark - The double helix DNA molecule unwinds✓ - When the hydrogen bonds break✓ - the DNA molecule unzips✓/2 DNA strands separate - One strand is used as the template ✓to form mRNA - using free RNA nucleotides✓from the nucleoplasm - The mRNA is complementary to DNA✓/A-U, C-G - This process is controlled by enzymes✓	1* + Any 5 (6)

2016

1.1.5 C 1.1.7 B

1.2.1 Ribosome

1.2.2 Peptide

1.2.3 DNA replication

1.2.6 Hypothesis

1.2.7 tRNA / transfer RNA

1.3.3 A only

1.4.1	(a) Adenine✓/A	(1)
	(b) Deoxyribose✓sugar	(1)
	(c) Hydrogen bond✓	(1)
1.4.2	10✓	(1)
1.4.3	- DNA has the nitrogen base thymine✓ whereas RNA has the nitrogen base uracil✓ (Mark first ONE only)	(2) (6)

2.5.1	Transcription✓		(1)
2.5.2	Nucleus✓/nucleoplasm		(1)
2.5.3	(a) GTC✓		(1)
	(b) UAC✓		(1)
2.5.4	Valine✓✓		(2)
2.5.5	<ul style="list-style-type: none"> - A mutation affects the nucleotide sequence✓/nitrogen base sequence/gene structure - Resulting in a changed mRNA✓/codon - A different amino acid✓ may be coded for - by tRNA✓/anticodon 	Any 3	(3)

2015

1.1.3 B 1.1.4 C

1.3.1 B only

- 3.1.1
- More mistakes are made✓/high rates of mutation
 - when RNA is copied✓/than when DNA is copied
- (2)

- 3.1.2
- A mutation could allow the virus to be transmitted through the air✓
 - This would allow the virus to be spread more easily✓
- (2)

3.2.1

DNA	RNA
1. Double stranded✓ molecule	1. Single stranded✓ molecule
2. Has a helix✓ shape	2. Is a straight molecule✓
3. One of the nitrogen bases is thymine✓	3. The nitrogen base uracil✓ in place of thymine
4. Contains deoxyribose✓ sugars	4. Contains ribose✓ sugars
5. A longer ✓ molecule	5. A shorter✓ molecule
6. Paired bases✓	6. Unpaired bases✓

(Mark first **THREE** only)

(Any 3 x 2)
table +1

(7)

3.2.2

Helps to:

- Solve crimes✓/criminal investigations
- Identify organisms from their tissues✓
- Identify family relationship✓
- Test for specific alleles that can cause a genetic disorder✓
- Establish matching tissues for organ transplants✓
- Used in research into variation in populations ✓

(Mark first **TWO** only)

Any 2

(2)

3.2.3

- 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)

(11)

PROTEIN SYNTHESIS

Transcription✓ (T)

- Double stranded DNA unwinds ✓
- and unzips when✓
- the hydrogen bonds break✓
- and this is controlled by enzymes✓
- One strand is used as a template✓
- to form mRNA✓
- using free RNA nucleotides from the nucleoplasm✓
- The mRNA is complementary to the DNA✓
- mRNA now has the coded message for protein synthesis✓

Translation✓ (S)

- mRNA moves from the nucleus✓/to the ribosome
- Each tRNA carries an amino acid✓
- tRNA carries the amino acid to the ribosome✓
- When the anticodon on the tRNA✓
- matches the codon on the mRNA✓
- Amino acids become attached✓ in the sequence determined by the mRNA
- by peptide bonds✓
- to form the required protein✓

Max 13

EFFECTS OF A MUTATION (M)

- A gene mutation affects arrangement/type of the nitrogen bases✓/nucleotides
- This changes the code on the DNA ✓
- which changes the code on the RNA✓
- A different amino acid✓ may be coded for
- which causes a change in the amino acid sequence✓ in the protein
- leading to the formation of a different/alternate/no protein

Max 4

(17)

3.2.1

DNA	RNA
1. Double stranded✓ molecule	1. Single stranded✓ molecule
2. Has a helix✓ shape	2. Is a straight molecule✓
3. One of the nitrogen bases is thymine✓	3. The nitrogen base uracil✓ in place of thymine
4. Contains deoxyribose✓ sugars	4. Contains ribose✓ sugars
5. A longer ✓molecule	5. A shorter✓ molecule
6. Paired bases✓	6. Unpaired bases✓

(Mark first THREE only)

(Any 3 x 2)
table +1

(7)

3.2.2

Helps to:

- Solve crimes✓/criminal investigations
- Identify organisms from their tissues✓
- Identify family relationship✓
- Test for specific alleles that can cause a genetic disorder✓
- Establish matching tissues for organ transplants✓
- Used in research into variation in populations ✓

(Mark first TWO only)

Any 2

(2)

3.2.3

- 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)

111