CHEMISTRY ONLINE
TUITION

Phone: +442081445350

www.chemistryonlinetuition.com

Email:asherrana@chemistryonlinetuition.com

BIOLOGY

FOUNDATIONS IN BIOLOGY

Level & Board	OCR (A-LEVEL)
TOPIC:	BIOLOGICAL MOLECULES - PROTEINS
PAPER TYPE:	SOLUTION - 3
TOTAL QUESTIONS	06
TOTAL MARKS	/30

Biological Molecules – Proteins - 3

1.

(a) 264 / 263.932 / 263.93 / 263.9 nm^3

(b)

Hydrophobic regions / R groups on inside of molecule / protein

AND

Hydrophilic regions / R groups on outside of molecule / protein

2.

(a) disulfide

(b) α-helix

(c) quaternary

3.

(a) The Y allele codes for the production of this enzyme is a length of DNA that has nucleotides with different bases. The nucleotides come in triplets that code for a specific amino acid. mRNA is transcribed by RNA polymerase and tRNA translates the triplet codons into a specific amino acid. The Y allele will code for a chain of amino acids that will make up the protein. The mutated Y allele codes for an enzyme with a different primary structure, due to insertion or deletion mutation that can lead to a frameshift change in the whole DNA code, this changes every triplet codon and changes which amino acids added to the chain. Therefore, leading to a change in the primary structure of the enzyme.

OR

The Y allele codes for an enzyme breaking down chlorophyll, resulting in yellow peas, while the y allele, through mutation, produces an inactive enzyme, leading to green peas. In heterozygotes (Yy), the yellow color is dominant, whereas homozygous recessive (yy) peas are green, following Mendel's laws of heredity.

The yellow color in peas is due to the presence of the dominant Y allele, which codes for an enzyme that breaks down chlorophyll, resulting in the yellow coloration of peas. The enzyme production is controlled by the genetic instructions within the Y allele, where the DNA sequence is transcribed into RNA, and subsequently translated into a functional enzyme. On the other hand, the recessive y allele is a mutated form of the Y allele, where changes in the DNA sequence lead to the production of an inactive enzyme with a different primary structure. This structural change means it cannot perform its function of breaking down chlorophyll, thus allowing peas to remain green.

In heterozygotes (Yy), the presence of one functional Y allele is sufficient to produce the enzyme necessary for yellow peas. However, only in plants that are homozygous recessive (yy) do we observe the green phenotype, as both alleles code for an inactive enzyme incapable of chlorophyll breakdown, and therefore, the green color from the chlorophyll remains. Mendel's first law, also known as the law of segregation, explains that each parent contributes one allele to the offspring, which is why heterozygotes show the dominant phenotype. Mendel's second law, the law of independent assortment, states that alleles for different traits are passed on independently of one another, as demonstrated by the independent inheritance of seed shape and color traits in pea plants.

(b) Active enzyme / protein / product will still be synthesized even if you only have one Y allele

4.

(a)

Three from

Paper chromatography

Set blots / AW of the two urine samples

Separate / AW with aqueous /

hydrophilic solvent

Use a stain / ninhydrin to visualise the spots

Compare patterns of separated components / colours

5.

(a) Name

Amino acid

Joined by:

Peptide bond / link between amine group and carboxyl group of different amino acid

Condensation / water is produced

6.

(a)

Pigment A contains 2 components / molecules

Pigments B and D contain 1 component / molecule

Pigment C contains 3 components / molecules 1

Idea that pigments A and C share 2 components / molecules

Idea that pigments A and D

OR

Pigments B and C

OR

Pigments C and D share 1 component / molecule

All pigments are soluble in liquid phase

(b) 0.35 ± 0.01

DR. ASHAR RANA

CHEMISTRY ONLINE TUITION

Phone: +442081445350
www.chemistryonlinetuition.com
Email: asherrana@chemistryonlinetuition.com

- Founder & CEO of Chemistry Online Tuition Ltd.
- Tutoring students in UK and worldwide since 2008
- Chemistry, Physics, and Math's Tutor

CONTACT INFORMATION FOR **CHEMISTRY ONLINE TUITION**

- UK Contact: 02081445350
- International Phone/WhatsApp: 00442081445350
- Website: www.chemistryonlinetuition.com
- Email: asherrana@chemistryonlinetuition.com
- Address: 210-Old Brompton Road, London SW5 OBS, UK