

PENANG SANGAM HIGH SCHOOL
YEAR 13 BIOLOGY – WORKSHEET 3

1. Read the following extract and answer the questions that follow.

Proteins are the products of DNA (genes). A protein is a functional unit of one or more polypeptide chains folded into a characteristic shape. Proteins document the hereditary background of an organism. If the evolutionary view of life is valid, we should be able to extend this concept of “molecular genealogy” to relationships between species.

- (i) List two functions of proteins in the human body.
-
-
- (ii) What determines the folding of polypeptide chains in the characteristic secondary structure of proteins ?
-
- (iii) Suggest an explanation for the evolutionary view of molecular genealogy to relationships between species.
-
-
- (iv) Explain the significance of mitosis occurring immediately after DNA replication.
-
-

2. Read the following extract and answer the questions that follow.

“Stick insects in Fiji belong to one of two groups; those that are green and basically cylindrical, and those that are brown and flattened and sometimes covered with fearsome-looking spines. The green species *Hermarchus apollonius* is relatively common while the brown one, *H. pythonius* is rare.”

Assuming that in a population of 10 000 stick insects in Hardy-Weinberg equilibrium, nine are identified as *H. pythonius* where the allele for the brown body colour is caused by a recessive gene, *g*.

- (i) Calculate the number of stick insects that would be homozygous dominant in such a population.
-
-

- (ii) Calculate the percentage of stick insects that would be heterozygous for green body colour.
-
-

In a hypothetical study, it was predicted that the value of 'p' and 'q' (allele frequencies) would change if Fiji's environment continues to be disturbed.

- (iii) Explain how the disturbance in the environment could result in these changes.
-
-
- (iv) How would the values of 'p' and 'q' change and how would the equilibrium be affected?
-
-

3. In tomatoes, plants homozygous for the hairy (HH) and purple (GG) stem phenotypes were crossed with hairless (hh) and green (gg) stem plants. The F1 offspring were test-crossed with a hairless and green tomato plant and the F2 offspring are as follows:

Hairy with purple stem	-	39
Hairy with green stem	-	11
Hairless with purple stem	-	9
Hairless with green stem	-	41

- (i) What information in the result indicates that the genes for stem texture and stem colour are linked?
-
- (ii) Calculate the percentage recombination between the two genes. Show your working.
-
-
- (iii) What is the distance (in map units) between the gene for stem texture and the gene for stem colour?
-
- (iv) If the genes for stem texture and stem colour were not linked, calculate the number of tomatoes that would be represented by each of the four phenotypes in the F2 generation. Show your working.
-
-