

10.2 Inheritance

Question Paper

Course	DP IB Biology
Section	10. Genetics & Evolution (HL Only)
Topic	10.2 Inheritance
Difficulty	Medium

Time allowed: 20
Score: /10
Percentage: /100

Question 1

If two genes are said to be linked, what is meant by the term 'linked'?

- A. Two genes are both at the same loci on a chromosome
- B. Two genes both occupy the same chromosome
- C. They are both alleles of the same gene
- D. The phenotypes of the genes are both influenced by the gender of their owner

[1 mark]

Question 2

Fruit flies (*Drosophila melanogaster*) have been used in genetic cross experiments since the early 1900s. Which of the following features of fruit flies is the **least** good reason for choosing them for conducting genetic cross experiments?

- A. They have a short gestation period
- B. They reproduce in large numbers
- C. They eat a wide variety of food
- D. They have easily observable mutations

[1 mark]

Question 3

Fruit flies (*Drosophila melanogaster*) exhibit characteristics governed by the following pairs of alleles.

M = brown body, **m** = black body

R = red eyes, **r** = white eyes

These pairs of alleles can be assumed to be unlinked.

If two double-heterozygous flies are crossed and produce 160 offspring, what is the likely number of offspring with red eyes and a black body?

- A. 90
- B. 120
- C. 30
- D. 10

[1 mark]

Question 4

Which discovery was first made by Bateson and Punnett in the early 20th century?

- A. Sex linkage in *Drosophila melanogaster*
- B. New, as-yet-unseen alleles in sweet pea plant crosses
- C. Chromosomes assorting independently
- D. Non-typical ratios of offspring phenotype, at odds with Mendel's predicted ratios

[1 mark]

Question 5

Events in meiosis play an important role in determining the inheritance of alleles. Which row of the table states the correct words to name the processes being described?

	The orientation of chromosomes pairing up in prophase I	Chromosome are pulled towards the poles of the cell in anaphase I
A	Synapsis	Assortment
B	Segregation	Assortment
C	Assortment	Segregation
D	Segregation	Cytokinesis

[1 mark]

Question 6

Two linked genes are denoted by the dominant alleles **G** and **H**. Their recessive counterparts are **g** and **h** respectively.

Which way of writing the allele combinations on their chromosomes best displays the linkage between the two genes?

- A.

G	H
—————	
- B.

h	g
—————	
G	g
—————	
- C.

H	h
—————	
G	G
—————	
- D.

H	H
—————	
G	H
—————	
g	h
—————	

[1 mark]

Question 7

The inheritance pattern of two separate genes was investigated in a double-heterozygous cross in watercress plants. A chi-squared test of phenotypic ratios of the two separate genes results in a χ^2 value of 3.5.

At a 5% probability level, the critical value of chi-squared is 7.8 for an experiment of this nature.

Which row of the table best describes a conclusion that can be drawn from this data?

	Probability that the Results Are Due to Chance (High / Low)	Are the two genes linked? (Yes/No)
A	High	Yes
B	High	No
C	Low	Yes
D	Low	No

[1 mark]

Question 8

Which row(s) below give(s) correct statements about continuous variation?

- I. Most individuals are close to the mean value of a trait, with fewer individuals at the extremes
- II. There are distinct categories of the trait with no intermediate values
- III. A continuously variable trait tends to be regulated by multiple genes
- IV. Individuals are distributed approximately evenly and the environment cannot influence the trait

- A. I only
- B. I, III and IV
- C. II and IV
- D. I and III

[1 mark]

Question 9

Over time, many dihybrid cross experiments of autosomally-linked genes in sweet pea plants (*Lathyrus odoratus*) have been carried out by reputed scientists.

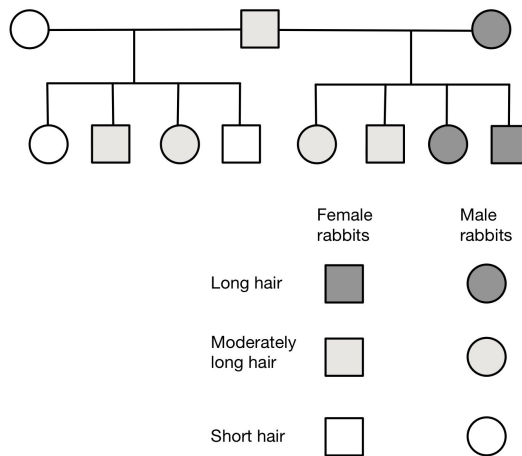
Which of the following best explains the presence of some non-parental phenotypes in the offspring of such crosses?

- A. Crossing over has occurred, leading to the production of recombinant plants
- B. The scientists made errors such as not cleaning the small paint brush that they used to transfer pollen grains between plants
- C. Independent assortment was disproved by Thomas Hunt Morgan so unusual phenotypes are to be expected
- D. Only plants of one gender exhibit the parental phenotypes due to linkage

[1 mark]

Question 10

Long hair in a species of rabbit is caused by the presence of the allele H^L . These rabbits have either very long hair or moderately long hair. The 'wild-type' short-haired rabbit possesses the allele H^S . The diagram below shows the results of two crosses involving one female and two male rabbits.



Which row of the table below shows the phenotypes of the rabbits with the genotypes H^LH^L and H^LH^S ?

	H^LH^L	H^LH^S
A	Long hair	Moderately long hair
B	Moderately long hair	Short hair
C	Moderately long hair	Long hair
D	Long hair	Short hair

[1 mark]

