

Assignment 1

Questions 1-10 are multiple choice worth 1 mark each. You have one opportunity to revise incorrect answers before marks become final. Revised answers are worth 1/2 of a mark.

Question 1

In a monohybrid cross, the second generation is referred to as the _____ generation.

Select one:

- a. Second Filial**
- b. Parental
- c. Backcross
- d. First Filial
- e. Testcross

Question 2

Which of the following terms refers to a cross that is typically used to determine the genotype of individuals exhibiting the dominant phenotype?

Select one:

- a. Monohybrid cross
- b. Reciprocal cross
- c. Dominant cross
- d. Dihybrid cross
- e. Testcross**

Question 3

_____ are individuals that are heterozygous at 2 loci.

Select one:

- a. homozygotes
- b. dihybrids**
- c. heterohybrids
- d. dizygotes
- e. monohybrids

Question 4

A rare recessive trait in a pedigree is indicated by which pattern of inheritance?

Select one:

- a. diagonal
- b. vertical, horizontal and diagonal
- c. vertical
- d. both vertical and horizontal
- e. horizontal**

Question 5

In a monohybrid cross $AA \times aa$, what proportion of homozygotes is expected among the F₂ offspring?

Select one:

- a. 3/4

- b. none
- c. 1/2**
- d. all
- e. 1/4

Question 6

Consider the following cross with 2 genes that assort independently: $AAbb \times aaBB$. What proportion of the F2 offspring is expected to be homozygotic for at least one gene?

Select one:

- a. 1/2
- b. all**
- c. 3/4
- d. 1/4
- e. none

Question 7

Consider the following cross with 2 genes that assort independently: $AaBb \times aabb$. What proportion of individuals are expected to be homozygotic for either gene?

Select one:

- a. 1/2
- b. 1/4
- c. none
- d. all
- e. 3/4**

Question 8

Among the crosses below, which will produce a 1:1 phenotypic ratio?

Select one:

- a. $AAbb \times aaBB$
- b. $AaBb \times aabb$
- c. $AaBB \times aaBB$**
- d. $AaBb \times AaBb$
- e. $AABB \times aabb$

Question 9

Among the crosses below, which will give a 1:1:1:1 phenotypic ratio?

Select one:

- a. $AaBb \times AaBb$
- b. $AABB \times aabb$
- c. $AaBb \times aabb$**
- d. $AaBB \times aaBB$
- e. $AAbb \times aaBB$

Question 10

Assume that in guinea pigs brown fur (B) is dominant over black fur (b). If you mate a black guinea pig with a homozygous brown guinea pig, what proportion of the progeny will be homozygous?

Select one:

- a. 1/4
- b. all
- c. 1/2
- d. none**
- e. 3/4

Question 11

A phenotype derived from a new combination of genes compared to parents' phenotypes is called

- a. an independent assortment.
- b. a multihybrid cross.
- c. a recombinant type.
- d. heterozygote.
- e. homozygote.

Question 12

Which of the following was not among the 7 antagonistic pairs of traits studied by Mendel?

- a. White and purple flowers
- b. Wrinkled and smooth peas
- c. Round and pinched pods
- d. Long and short stems
- e. straight and branched stems**

Question 13. You are a summer student in a *Drosophila* genetics laboratory. In these insects, normal wing size is dominant over short wings and these traits are controlled by a single gene with antagonistic pairs of alleles *W* and *w*. You accidentally release all the normal and short wing stocks. You manage to capture a few individuals with normal wings and several with short wings. Your generous supervisor lets you redeem yourself by asking you to re-establish true-breeding stocks of normal and short-winged insects to begin the experiment again.

- (a) How can you identify true-breeding individuals with short wings?
- (b) How can you identify true-breeding individuals with normal wings?
- (c) Explain the possible outcomes of crosses to achieve (b).

Answer

(a) All short winged insects will be true-breeding with the *ww* genotype

(b) The true-breeding short-winged individuals can be used in individual test-crosses to determine the genotypes of individuals exhibiting the dominant phenotype. i.e. *W*-individuals that are either *WW* or *Ww*.

(c) The outcomes of the crosses in (b) would be either:

An individual testcross between a normal-winged fly and a short-winged individual could yield progeny with only the dominant phenotype (all offspring are heterozygous *Ww*). These normal winged parents would be homozygous dominant and true-breeding. Keep these as your true-breeding stock with normal wings!

This cross can be summarized by: *WW* x *ww* gives 100% *Ww* (normal wings)

An individual testcross between a normal-winged fly and a short-winged individual that yields both and recessive phenotypes would be interpreted to indicate that the normal winged parent was heterozygous (*Ww*). The expected ratio among progeny would be 1:1 (*Ww:ww* normal to short winged). These heterozygotes are not true breeding. Keep them separate from your true-breeding stocks! Of course the short winged progeny are pure-breeding homozygous recessive like those in (a).

This cross can be summarized by:

Ww x *ww* yielding 50% *Ww* (normal wings) and 50% *ww* (true-breeding short-winged)