

SINGLE TRAIT PROBLEMS

REGULAR PROGRAM

Exercise I: General Questions

1. The following letters represent pairs of genes. Indicate which of the following pairs of genes are dominant, recessive, heterozygous, and homozygous. You may use abbreviations but in each case include all possibilities. As an example, the first one is completed for you.

- | | | |
|--------|--|--------------|
| | <i>Expression / Hetero or homozygous genes</i> | |
| | ↓ ↓ | |
| (a) DD | Dominant/Homozygous | (g) ss _____ |
| (b) Dd | _____ | (h) Yy _____ |
| (c) dd | _____ | (i) ww _____ |
| (d) Mm | _____ | (j) rr _____ |
| (e) pp | _____ | (k) BB _____ |
| (g) Rr | _____ | (l) Cc _____ |

2. Use any three letters to illustrate three different examples of heterozygous conditions in a pair of chromosomes.

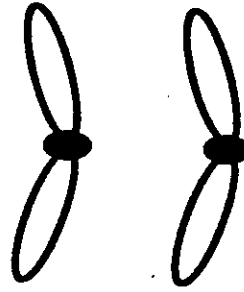
3. Illustrate examples of homozygous conditions using any five letters.

4. Use letters to show the following gene conditions in a pair of chromosomes (be sure and give all possibilities).

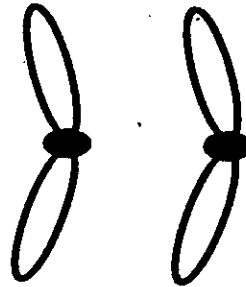
- | | |
|--|---|
| (a) ^{expressed} recessive _____ | (c) ^{expressed} dominant _____ |
| (b) homozygous _____ | (d) heterozygous _____ |

to represent gene alleles -

5. Insert any four pair of letters within the pair of chromosomes to the right. Show the heterozygous condition.



6. Do the same as for Number 5, except illustrate a recessive homozygous condition.



7. Give the difference between genotype and phenotype. _____

Single Trait Problems

Example:

A. In humans assume that brown eyes (B) are dominant over blue eyes (b). What is the probable F₁ generation when the father is pure brown-eyed and the mother is blue-eyed? The problem may be solved by using the Punnett square method.

♂ Brown-eyed father
P₁ genotype BB
possible gamete B

♀ Blue-eyed mother
P₁ genotype bb
possible gamete b

♀ \ ♂	B	B
b	Bb	Bb
b	Bb	Bb

F₁: all heterozygous - brown eyed

3. One tall heterozygous and one dwarf homozygous parent.

- (a) _____
 (b) _____
 (c) _____

4. Two dwarf parents.

- (a) _____
 (b) _____
 (c) _____

In Questions 5-8, assume color black (BB or Bb) is dominant over brown (bb) in guinea pigs. Write the possible F_1 for each of the following crosses.

- (a) Number of black individuals?
 (b) Number of brown individuals?
 (c) Number of heterozygous individuals?
 (d) Phenotypic ratio if possible?

5. Both heterozygous black parents.

- (a) _____
 (b) _____
 (c) _____
 (d) _____

6. Both homozygous black parents.

- (a) _____
 (b) _____
 (c) _____
 (d) _____

7. One homozygous black parent and one homozygous brown parent.

(a) _____

(b) _____

(c) _____

(d) _____

8. One heterozygous black and one homozygous brown parent.

(a) _____

(b) _____

(c) _____

(d) _____

EXERCISE III: SINGLE-TRAIT PROBLEMS

In problems 1 and 2, assume that in some insects long-winged (LL or Ll) is dominant over short-winged (ll).

1. If 50% heterozygous long-winged, 25% pure (homozygous) long-winged and 25% short-winged were found in one generation of offspring, give the possible genotypes of both parents.

2. Suppose 50% of the generation were short-winged, what would be the genotypes of both parents?

In problems 3-5, use (SS or Ss) for smooth-coated seeds and (ss) for wrinkled-coated seeds.

3. If a phenotypic ratio of 1:1 resulted when these two plants were crossed, give the possible genotypes of both parents.

4. What percent of the offspring would be wrinkled-coated seeds if both parents were heterozygous?

5. Give the phenotypes of both parents if a 3:1 ratio resulted in the offspring.

6. Use (TT or Tt) for tall and (tt) for dwarf. If a homozygous tall garden pea plant is crossed with one homozygous dwarf plant, give the phenotypes of the:

(a) F_1 offspring.

(b) F_2 generation

(c) Progeny of the F_1 when crossed back with its tall parent.

(d) Progeny of the F_1 when crossed back with its dwarf parent.

In problems 7-8, use the following pea plant traits whenever applicable: (YY or Yy) yellow seeds, (yy) green seeds.

7. A pea plant with yellow seeds is crossed with one with green seeds. The resulting offspring have about equal numbers of yellow and green seeds plants. Give the genotypes of both parents.

8. In another cross, a yellow-seeded plant was crossed with another yellow-seeded plant and produce offspring of which about 25% were green-seeded plants. State the genotype of both parents.
