

1. Why must a recessive trait always be pure and never a hybrid when it appear in an organism? Explain. *If dominant is present then it is always expressed.*

2. Brown eyes are dominant over blue eyes. A brown-eyed man (Andrew) whose father (Mike) was brown-eyed and whose mother (Jill) was blue-eyed married a blue-eyed woman (Sarah) whose father (Rob) and mother (Kate) were brown-eyed. The couple has a blue-eyed son (Brian). For which of the individuals mentioned can you be sure of the genotypes? What are their genotypes? What genotypes are possible for the others? *We know all except Mike could be (BB or Bb)*
Jill = bb / Andrew (Bb) / Sarah (bb) / Rob (Bb) / Kate (Bb) / Brian (bb)

3. Cross a purebred tall (TT) plant with a purebred dwarf (tt). Show both the F₁ and F₂ generations. Show the genotypic ratio and phenotypic ratio for both crosses. *All Tall and Tt*

⊗	T	t
T	TT	Tt
t	Tt	tt

⊗	T	T	F ₁
+	Tt	Tt	
+	Tt	Tt	

4. If all the offspring in a cross are Gg, what are the genotypes of the parents? *Gg and gg*
 5. If 50% of the offspring are round and 50% are wrinkled, what are the genotypes of the parents? *Heterozygous ⊗ Homozygous Recessive*

*Grain = 1 TT / 2 Tt / 1 tt
 Phen = 3 Tall / 1 short*

6. Red carnations were crossed with white carnations. 25 seeds were produced which all developed red flowers. Was dominance shown? What could you do to prove this? *Yes, cross offspring. see if ratio of offspring fits for standard pure bred crossing of parents (9,3,3,1)*

7. A pure-breeding red flecker was mated with a pure-breeding white flecker. They produced 200 white flecker offspring. What are the genotypes of the F₁ and how many of each genotype were produced? What are the phenotypes of the F₁ and how many of each phenotype were produced? *Ww 100%*

8. You decide to start your own flecker farm. You take two of the F₁ generation from the previous question and you successfully get them to mate. They produce 600 offspring. What genotypes are produced and how many of each type should you get? What are the phenotypes and how many of each should you get? *450 white / 150 red* *WW = 150, Ww = 300, ww = 150*

9. Mendel did not limit his experiments on peas to ones in which single characteristics were involved. For example, he crossed plants characterized by wrinkled green seeds.

This is called a dihybrid cross.
 Parental generation: RRGG round yellow X rrgg wrinkled green.
 F₁ generation: RrGg round yellow

You want to determine what the F₂ generation would be like. To do this, you must determine the possible gametes the F₁ produce. The big hint: there are four possible types of gametes that could be produced. Show a Punnett square for this cross. (over)

gametes
 RG / Rg / rG / rg

x	RG	Rg	rG	rg
RG	RRGG	RRGg	RrGG	RrGg
Rg	RRGg	RRgg	RrGg	Rrgg
rG	RrGG	RrGg	rrGG	rrGg
rg	RrGg	Rrgg	rrGg	rrgg

9 round yellow
 3 round green
 3 wrinkled yellow
 1 wrinkled green

Phenotypic ratio:

10. Complete the following dihybrid cross between a tall blue rose and a dwarf red rose
 Tall is dominant to dwarf. Red is dominant to blue

Parent: TTrr x ttRR

Gametes: all Tr all tR

F₁: TtRr (All)

Crossing hybrids: TtRr x TtRr

Gametes: TR/Tr/tR/tr → same

x	TR	Tr	tR	tr
TR	TTRR	TTRr	TtRR	TtRr
Tr	TTRr	TTrr	TtRr	Ttrr
tR	TtRR	TtRr	ttRR	ttRr
tr	TtRr	Ttrr	ttRr	ttrr

Phenotypic ratio: 9 tall red: 3 tall blue: 3 dwarf red: 1 dwarf blue

Bonus: 1. In a trihybrid cross (such as RrTtBb x RrTtBb) how many possible offspring is there and how many genotypes are possible?

Pheno → 27:9:9:9:3:3:3:1.

Geno → 9 different types.

Bonus: 2. What is a flecker? Bird