Name Key Course/Section

Date Professor/TA

Activity 14.1 A Genetics Vocabulary Review

Mendel did not know anything about chromosomes, genes, or DNA. Because modern genetics uses vocabulary that assumes students today understand these ideas, it's helpful to review some key terms.

Match each commonly used genetics term with its appropriate definition or example.

Terms	Definitions and Examples
e heterozygous	a. Blue-eyed blonde mates with brown-eyed brunette
b homozygous	b. *BB* or *bb*
g monohybrid cross	c. not on sex chromosomes
c autosomal	d. blue or brown eyes
h genotype	e. *Bb*
d phenotype	f. locus on a chromosome that codes for a given polypeptide
f gene	g. Blonde mates with brunette
i allele	h. *BB*, *Bb*, or *bb*
a dihybrid cross	i. Males have only one for each gene on the X chromosome

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Activity 15.1 Solving Problems When the Genetics Are Known

Refer to Activity 14.3 and to Chapters 14 and 15 in *Biology*, 8th edition, to complete this activity.

1. An organism that has the genotype *AaBbCc* is crossed with an organism that has the genotype *AABbCc*. Assume all genes are on separate sets of chromosomes (that is, they are not linked).

   a. What is the probability that any of the offspring will have the genotype *AABBCC*? (*Hint:* To get the answer, consider the six possible types of autosomal crosses. Determine the individual probabilities of getting *AA* offspring from the monohybrid cross. Then do the same to determine the probabilities of getting *BB* offspring and *CC* offspring. Multiply these probabilities together.)

   Six possible types: AA Aa BB Bb bb CC Cc cc

   $\frac{1}{2} \times \frac{1}{4} \times \frac{1}{4} = \frac{1}{34}$

   b. What is the probability that any of the offspring will have the genotype *AaBbcc*?

   $Aa = \frac{1}{2}$ $Bb = \frac{1}{2}$ $cc = \frac{1}{4}$

   $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{4} = \frac{1}{16}$

2. Consider the cross *AaBbCcddEe* × *AABBccDDEe*.

   a. What is the probability that any offspring will have the genotype *AaBBCcDdEE*?

   Aa Bb Cc Dd EE ee Ee Ee

   AA BB cc

   $Aa = \frac{1}{2}$ $EE = \frac{1}{4}$ $BB = \frac{1}{2}$ $Cc = \frac{1}{2}$ $Dd = \frac{1}{1}$

   $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{1} \cdot \frac{1}{4} = \frac{1}{32}$

   b. What is the probability that any offspring will have the genotype *AABBCCDDee*?

   $\frac{1}{2} \cdot \frac{1}{2} \cdot 0 \cdot 0 \cdot \frac{1}{4} = 0$

3. In fruit flies (*Drosophila melanogaster*), the most common eye color is red. A mutation (or allele) of the gene for eye color produces white eyes. The gene is located on the X chromosome.

a. What is the probability that a heterozygous red-eyed female fruit fly mated with a white-eyed male will produce any white-eyed offspring?

b. What is the probability that the mating in part a will produce any white-eyed females?

c. What is the probability that this mating will produce any white-eyed males?

4. A heterozygous brown-eyed human female who is a carrier of color blindness marries a blue-eyed male who is not color-blind. Color blindness is a sex-linked trait. Assume that eye color is an autosomal trait and that brown is dominant over blue. What is the probability that any of the offspring produced have the following traits?

a. Brown eyes

b. Blue eyes

c. Color blindness

d. Color-blind males

e. Brown-eyed, color-blind males

f. Blue-eyed, color-blind females

g. What is the probability that any of the males will be color-blind?

h. Why do males show sex-linked traits more often than females?

Cross 2: Female Ambler × Male Wild Type

Offspring Vial 2	Wild type	Ambler	Total
Male	0	32	32
Female	32	0	32
Total	32	32	64

a. What does cross 2 tell you about dominance versus recessiveness of the alleles?

Wild is dominant & Ambler is recessive.

b. What does cross 2 tell you about placement of the alleles on autosomes vs sex chromosomes? (In your answer show the chromosomal genotypes for the parents in this cross.)

Sex linked — no mate wildtype. no female Ambler

2. Problem Two

Mt = Monocle; Bt = Bifocal; Tr =Trifocal; Sp = Spinner; Sh = Shing

Wild Population	Mt, Sp	Mt, Sh	Bt, Sp	Bt, Sh	Tr, Sp	Tr, Sh	Total
Male	10	6	6	0	22	3	47
Female	19	1	9	1	20	4	54
Total	29	7	15	1	42	7	101

Cross 1: Bifocal, Spinner Female × Monocle, Shiny Male

Mt = Monocle; Bt = Bifocal; Tr =Trifocal; Sp = Spinner; Sh = Shing

Offspring Vial 1	Mt, Sp	Mt, Sh	Bt, Sp	Bt, Sh	Tr, Sp	Tr, Sh	Total
Male	0	0	0	0	31	34	65
Female	0	0	0	0	34	38	72
Total	0	0	0	0	65	72	137

a. What does cross 1 tell you about dominance versus recessiveness of the alleles?

Mt and Bt are codominant + the heterozyote is Tr

Can't tell about Sp + Sh since they are equal numbs

b. What does cross 1 tell you about placement of the alleles on autosomes vs. sex chromosomes? (In your answer show the chromosomal genotypes for the parents in this cross.)

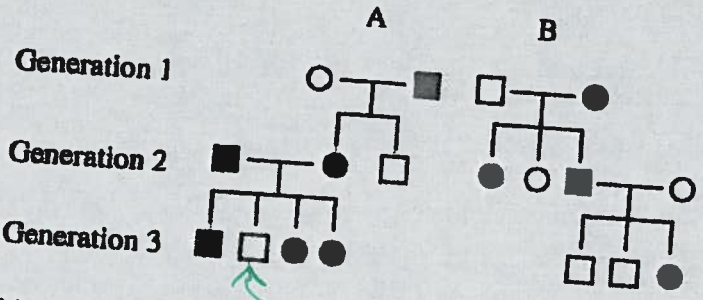
Since all males & females are hybrid, the Mt + Bt must be autosomal.

Sp + Sh unclear -

Analysis of Pedigrees

Analyze the pedigree and answer the questions that follow.

The diagram below shows a pedigree of three generations in a family. Black circles/squares indicate persons with a genetic disorder. A square indicates a male and a circle indicates a female. The two males in generation 1 are siblings.



3. Looking only at the generation 2 offspring (of the two generation 1 brothers), what can you say about the gene(s) controlling the genetic disorder? Is the disorder caused by a gene that is dominant or recessive, autosomal or sex-linked?

It's dominant autosomal.

4. What additional information do you gain from examining the generation 3 offspring?

That both parents could have it but offspring may not.