Name: KEY Date: _____

Genetics Practice 2: Dihybrid Crosses

1. Tall plants (T) are dominant to dwarf plants (t). Purple flowers (P) are dominant to white flowers (p). Cross a homozygous dominant parent with a homozygous recessive parent.

	TP	TP	TP	TP
tp	TtPp			
tp				
tp				
tp				

Probability of producing tall/purple plants?
100%

Possible genotypes?
TtPp

Probability of dwarf/white plants?
0%

Possible genotypes?
—

Probability of tall/white plants?
0%

Possible genotypes?
—

Probability of dwarf/purple flowers?
0%

Possible genotypes?
—

2. Black guinea pigs (B) are dominant to white guinea pigs (b). Rough fur (R) is dominant to smooth fur (r). Cross a heterozygous parent with a heterozygous parent.

	BR	bR	Br	br
BR	BBRR	BbRR	BBRr	BbRr
bR	BbRR	bbRR	BbRr	bbRr
Br	BBRr	BbRr	BBrr	Bbrr
br	BbRr	bbRr	Bbrr	bbrr

Probability of black/rough guinea pigs?
9/16 (56.25%)

Possible genotypes?
BBRR, BbRR, BbRr, BBRr

Probability of black/smooth guinea pigs
3/16 (18.75%)

Possible genotypes?
BBrr, Bbrr,

Probability of white/rough guinea pigs?
3/16 (18.75%)

Possible genotypes?
bbRR, bbRr

Probability of white/smooth guinea pigs?
1/16 (6.25%)

Possible genotypes?
bbrr

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Genetics Practice 2: Dihybrid Crosses

3. A tall pea plant with terminal flowers (flowers on the ends of the stems) is crossed with a short plant that has axial flowers. All 72 offspring are tall with axial flowers. This is a dihybrid cross with the height and flower position traits showing independent assortment.

   a. Name the dominant and recessive alleles.

   Tall, axial flowers = dominant; short, terminal flowers = recessive

   b. Give the genotypes of the parents and offspring in this cross.

   TTaa, ttAA = parents; TtAa = offspring

   c. Predict the F_2 offspring when the tall-axial F_1 plants are allowed to self-pollinate.

   9/16 = Tall, axial 3/16 short, axial
   3/16 = tall, terminal 1/16 = short, terminal

4. Suppose a white, straight haired guinea pig mates with a brown, curly-haired animal. All five babies in their first litter have brown fur, but three are curly and two have straight hair. The second litter consists of six more brown offspring, where two are curly and four are straight haired.

   a. Assuming curly is dominant to straight, what are the genotypes of the parents and the offspring?

   PARENTS: BB Hh (BROWN, CURLY) × bb hh (WHITE, STRAIGHT)
   OFFSPRING: Bb Hh (BROWN, CURLY) or Bbhh (BROWN, STRAIGHT)

   b. What is the probability of getting two female guinea pigs with straight hair in a row?

   6.25% (50% × 50%) (50% × 50%)
   straight hair female

5. About 55% of Americans get a bitter taste from the substance called phenylthiocarbamide (PTC). It is tasteless to the rest. The "taster" allele is dominant to non-taster. Also, normal skin pigmentation is dominant to albino. A normally pigmented woman who is taste-blind for PTC has an albino-taster father. She reproduces with albino man who is a taster, though the man's mother is a non-taster. Show the expected offspring of this couple.

   $P_p tt$ × $pp\ Tt$ P_pTt, $ppTt$, P_ptt, $pptt$
   WOMAN MAN OFFSPRING

6. In pigeons, the checkered pattern is caused by a dominant allele. A plain (non-checkered) pattern is recessive. Red color is also caused by a dominant allele and brown color by a recessive allele.

   a. Show the expected offspring of a cross between a homozygous checkered red bird and a plain brown one. Carry out this cross through the F_2 generation.

   CCRR × ccrr | CcRr | CCRR CcRR ccRR CcRr Ccrr
   P | F_1 | F_2 CCRr CCrr ccRr ccrr

   b. Carry out to the F_2 generation a cross between a homozygous plain red bird and its homozygous checkered brown mate.

   ccRR × CCrr | CcRr | CCRR CcRR ccRR CcRr Ccrr
   P | F_1 | F_2 CCRr CCrr ccRr ccrr

   c. A plain brown female pigeon laid five eggs. The young turned out to be 2 plain red, 2 checkered red, and 1 checkered brown. Describe the father pigeon. Give the genotypes.

   ccrr MOTHER CcRr FATHER