Name: _____ Date: _____ Block: _____

Dihybrid Cross Supplemental Questions

1) Aliens can either be dominant green (G) or blue (g).
   Aliens also exhibit codominance in the decorations on their heads: H^A will have curly antennae on their heads, while H^F will have flowers on their heads.
   a. Draw an $H^A H^A$ alien, an $H^F H^F$ alien, and an $H^F H^A$ alien.
   b. Use a Punnett square to determine the genotypic and phenotypic ratios of a cross between a heterozygous green female with curly antennae and a blue male that is heterozygous for his head decorations.

2) In rabbits, black fur colour (F^B) and white fur colour (F^W) are incompletely dominant.
   Additionally, ear length is an X-linked trait, where long ears (X^L) are dominant over short ears (X^l)
   a. Use a Punnett square to determine the genotypic and phenotypic ratios of a cross between a grey short-eared female and a black long-eared male.
   b. What percentage of the offspring will be:
      i. Black coloured?
      ii. Grey coloured?
      iii. Males with long ears?
      iv. Females with long ears?

3) In four-o-clock flowers, flower colour can be either red, white, or red with white spots. Seed shape is a Mendelian trait where smooth seeds are dominant over wrinkled.
   a. What type of trait is flower colour: codominant, incomplete dominant, Mendelian, or sex-linked? How do you know?
   b. A pink-flowered plant that is heterozygous for seed shape is crossed with a white-flowered plant that is heterozygous for seed shape. Use a Punnett square to determine the genotypic and phenotypic ratios of offspring resulting from this dihybrid cross.
   c. A "Minnie Mouse" plant is one that has flowers that are red with white spots, and smooth seeds. These plants are very valuable. What would you advise a farmer who is trying to produce the maximum number of Minnie Mouse plants?

Name: _____ Date: _____ Block: _____

Dihybrid Cross Supplemental Questions

4) Aliens can either be dominant green (G) or blue (g).
   Aliens also exhibit codominance in the decorations on their heads: H^A will have curly antennae on their heads, while H^F will have flowers on their heads.
   a. Draw an H^AH^A alien, an H^FH^F alien, and an H^FH^A alien.

H^AH^A should have antennae; H^FH^F should have flowers; H^FH^A should have both flowers and antennae.

   b. Use a Punnett square to determine the genotypic and phenotypic ratios of a cross between a heterozygous green female with curly antennae and a blue male that is heterozygous for his head decorations.

GgH^AH^A x ggH^AH^F

	GH^A	GH^A	gH^A	gH^A
gH^A	GgH^AH^A	GgH^AH^A	ggH^AH^A	ggH^AH^A
gH^A	GgH^AH^A	GgH^AH^A	ggH^AH^A	ggH^AH^A
gH^F	GgH^AH^F	GgH^AH^F	ggH^AH^F	ggH^AH^F
gH^F	GgH^AH^F	GgH^AH^F	ggH^AH^F	ggH^AH^F

^Note: colours are used to distinguish between 'blocks' with the same genotype.

Genotypic ratios: $1GgH^AH^A$:$1ggH^AH^A$:$1GgH^AH^F$: $1ggH^AH^F$

Phenotypic ratios: 1 green with antennae: 1 green with antennae and flowers: 1 blue with antennae: 1 blue with antennae and flowers

5) In rabbits, black fur colour (F^B) and white fur colour (F^W) are incompletely dominant.
   Additionally, ear length is an X-linked trait, where long ears (X^L) are dominant over short ears (X^l)
   a. Use a Punnett square to determine the genotypic and phenotypic ratios of a cross between a grey short-eared female and a black long-eared male.

Grey short-eared female: $F^BF^WX^lX^l$

Black long-eared male: $F^BF^BX^LY$

	F^BX^L	F^BX^L	F^BY	F^BY
F^BX^l	$F^BF^BX^LX^l$	$F^BF^BX^LX^l$	$F^BF^BX^lY$	$F^BF^BX^lY$
F^BX^l	$F^BF^BX^LX^l$	$F^BF^BX^LX^l$	$F^BF^BX^lY$	$F^BF^BX^lY$
F^WX^l	$F^WF^BX^LX^l$	$F^WF^BX^LX^l$	$F^WF^BX^lY$	$F^WF^BX^lY$
F^WX^l	$F^WF^BX^LX^l$	$F^WF^BX^LX^l$	$F^WF^BX^lY$	$F^WF^BX^lY$

Genotypic ratio: 1 $F^BF^BX^LX^l$: 1 $F^WF^BX^LX^l$: 1 $F^BF^BX^lY$: 1 $F^WF^BX^lY$

Phenotypic ratio: 1 black, long-eared female: 1 grey, long-eared female: 1 black, short-eared male: 1 grey, short-eared male

b. What percentage of the offspring will be:
   i. Black coloured? 50%
   ii. Grey coloured? 50%
   iii. Males with long ears? 0%
   iv. Females with long ears? 50%

6) In four-o-clock flowers, flower colour can be either red, white, or red with white spots. Seed shape is a Mendelian trait where smooth seeds are dominant over wrinkled.
   a. What type of trait is flower colour: codominant, incomplete dominant, Mendelian, or sex-linked? How do you know?

Codominant. One of the phenotypes (red with white spots) shows both of the other phenotypes. This is the heterozygote.

   b. A pink-flowered plant that is heterozygous for seed shape is crossed with a white-flowered plant that is heterozygous for seed shape. Use a Punnett square to determine the genotypic and phenotypic ratios of offspring resulting from this dihybrid cross.

Let flower colour alleles be C^R for red, C^W for white.

Let seed shape be represented by A (smooth) or a (wrinkled).

Cross: $C^R C^W Aa$ x $C^W C^W Aa$

	$C^R A$	$C^R a$	$C^W A$	$C^W a$
$C^W A$	$C^R C^W AA$ Red/white smooth	$C^R C^W Aa$ Red/white smooth	$C^W C^W AA$ White smooth	$C^W C^W Aa$ White smooth
Same as previous row				
$C^W a$	$C^W C^R Aa$ Red/white smooth	$C^W C^R aa$ Red/white wrinkled	$C^W C^W Aa$ White smooth	$C^W C^W aa$ White wrinkled
Same as previous row				

Genotypic ratio: 1 $C^R C^W AA$: 1 $C^R C^W Aa$: 1 $C^W C^W AA$: 1 $C^W C^W Aa$: 1 $C^W C^R Aa$: 1 $C^W C^R aa$: 1 $C^W C^W Aa$: $C^W C^W aa$

Phenotypic ratio: 3 red/white smooth: 1 red/white wrinkled: 3 white smooth: 1 white wrinkled

   c. A "Minnie Mouse" plant is one that has flowers that are red with white spots, and smooth seeds. These plants are very valuable. What would you advise a farmer who is trying to produce the maximum number of Minnie Mouse plants?

First, through trial and error, create two groups of true-breeding plants: 1) red flowers and smooth seeds; 2) white flowers with smooth seeds. Then, cross these two lines. All offspring will be Minnie Mouse plants. However, do not let Minnie Mouse plants cross with each other…