

Mixed Genetics Practice Problems

Part of the difficulty of this unit is knowing what type of problems you are being asked to solve and being able to solve it correctly. The following problems are a mix of basic genetic, incomplete dominance, codominance, blood type, sex linked, and dihybrid crosses. Complete each of the problems below.

	N	n
N	NN	Nn
n	Nn	nn

1. *In humans the allele for albinism is recessive to the allele for normal skin pigmentation.* If two heterozygous parents have children, what is the chance that a child will have normal skin pigment? What is the chance that a child will have albinism?

Normal pigment? 75%

Albinism? 25%

2. *In pea plants, the green allele (G) is dominant over the yellow color allele (g) for seed color and tall (T) is the dominant allele in plant height over short (t).* Parent pea plants, both heterozygous for both traits, are cross-pollinated. Determine the frequency for the four different phenotypes of the offspring.

	GT	Gt	gT	gt
GT	GGTT	GGTt	GgTT	GgTt
Gt	GGTt	GGtt	GgTt	Ggtt
gT	GgTT	GgTt	ggTT	ggTt
gt	GgTt	Ggtt	ggTt	ggtt

Parent Genotypes: **GgTt x GgTt**

Green seeds, tall plant: 9

Green seeds, short plant: 3

Yellow seeds, tall plant: 3

Yellow seeds, short plant: 1

3. *Pure-breeding red radishes crossed with pure-breeding white radishes make pink radishes.* What are the genotypic and phenotypic ratios when you cross pink radish with a white radish?

This is an example of incomplete inheritance.

Genotypic Ratio? 0:2:2 or 0:1:1

Phenotypic Ratio? 0:2:2 or 0:1:1

	R	W
W	RW	WW
W	RW	WW

	A	B
B	AB	BB
O	Ao	Bo

4. **Knowing what you know about blood types...** A man with AB blood marries a woman with type B blood. Please note, the woman's mother had type O blood.

What percentage of their children will have Type A blood? 25%

What percentage of their children will have Type B blood? 50%

What percentage of their children will have Type AB blood? 25%

What percentage of their children will have Type O blood? 0%

5. **In certain fish, red and blue fish when mated create offspring with a patchwork of blue AND red scales.** What would be the genotypic and phenotypic probabilities for a cross between a blue fish and a fish with patchwork red/blue scales?

This is an example of codominance inheritance.

What percentage of the fish will be red? 0%

What percentage of the fish will be blue? 50%

What percentage of the fish will be red and blue? 50%

	R	B
B	RB	BB
B	RB	BB

	W	W
W	WW	WW
w	Ww	Ww

6. **In seals, long whiskers (W) are dominant over short whiskers (w).** What is the genotypic and phenotypic ratio for the offspring from two long-whiskered seals, one that is homozygous and one that is heterozygous?

Genotypic Ratio? 2:2:0 or 1:1:0

Phenotypic Ratio? 4:0 or 1:0

7. **When pure breeding red cows are bred with pure breeding white cows, the offspring are roan (a pinkish coat color).** Give the genotype and phenotype probabilities for the cross between a roan cow and a roan bull.

What percentage of the offspring will be red? 25%

What percentage of the offspring will be white? 25%

What percentage of the offspring will be roan? 50%

	R	W
R	RR	RW
W	RR	WW

	A	o
B	AB	Bo
o	Ao	oo

8. **Knowing what you know about blood types...** A mother had type A blood. Her husband has type B blood. They have a child with Type O blood. Is this possible? Show the Punnett square to support your answer.

Possible? Yes

What other blood types could future children have? AB, A, B

9. **The genes for hemophilia, a condition that causes blood not to clot properly, are located on the X chromosome. It is a recessive disorder.** A man normal for blood clotting and a woman who is a carrier of the condition but still clots normally have children. Show the cross and answer the questions.

Percentage of children who are female with normal clotting: 50%

Percentage of children who are female with hemophilia: 0%

Percentage of children who are male with normal clotting: 25%

Percentage of children who are male with hemophilia: 25%

	X ^H	X ^h
X ^H	X ^H X ^H	X ^H X ^h
Y	X ^H Y	X ^h Y

10. **In summer squash, white fruit color (W) is dominant over yellow fruit (w) and disk-shaped fruit (D) is dominant over sphere-shaped fruit (d).** If a squash plant is true-breeding for white, disk-shaped fruit is crossed with a plant true-breeding for yellow, sphere-shaped fruit, determine the frequency of the four different phenotypes?

	WD	WD	WD	WD
wd	WwDd	WwDd	WwDd	WwDd
wd	WwDd	WwDd	WwDd	WwDd
wd	WwDd	WwDd	WwDd	WwDd
wd	WwDd	WwDd	WwDd	WwDd

Genotypes of parents: **WWDD x wwdd**

White, disk-shaped: 16

White, sphere: 0

Yellow, disk-shaped: 0

Yellow, sphere: 0

	X ^r	X ^r
X ^R	X ^R X ^r	X ^R X ^r
Y	X ^r Y	X ^r Y

11. **In fruit flies, the gene for white eyes is sex-linked recessive on the X chromosome. Red eyes are dominant.** Cross a white-eyed female with a normal red-eyed male.

a. What percent of offspring will be males with red eyes? White eyes?
0%, 50%

b. What percentage of the offspring will be females will have red eyes? White eyes?
0%, 50%

12. Saguaro cacti have two L-shaped arms, one on each side. Having both arms the same length (A) is dominant over having two different length arms (a). A cactus that is homozygous for same length arms is crossed with a cactus with different length arms. What is the probability of having a cactus with these two phenotypes?

Same length arms? _____ **100%** _____

Different length arms? _____ **0%** _____

	A	A
a	Aa	Aa
a	Aa	Aa

	R	R
R	RR	RR
Y	RY	RY

13. **Lubber grasshoppers are black with either red stripes, yellow stripes, or red AND yellow stripes.** A red-striped grasshopper is crossed with red & yellow striped grasshopper. List the genotypic and phenotypic ratios for this cross.

This is an example of codominance inheritance.

Genotypic ratio: _____ **2:2:0 or 1:1:0** _____

Phenotypic ratio: _____ **2:2:0 or 1:1:0** _____

14. **When a raccoon with wide tail stripes reproduces with a raccoon with narrow tail stripes, their offspring all have medium tail stripes.** A medium tail striped raccoon mates with another raccoon with medium tail stripes. Determine the frequency of the phenotypes.

This is an example of incomplete dominance inheritance.

Wide Tail Stripes: _____ **25%** _____

Narrow Tail Stripes: _____ **25%** _____

Medium Tail Stripes: _____ **50%** _____

	W	N
W	WW	WN
N	WN	NN

	X^N	X^N
X^n	$X^N X^n$	$X^N X^n$
Y	$X^N Y$	$X^n Y$

15. **Colorblindness is a recessive trait carried on the X chromosome.** A colorblind male has children with a normal sighted female with no history of colorblindness in her family. Show the Punnett square and answer the following questions.

Will any of the female offspring be carriers for colorblindness? _____ **No** _____

Will any of the male offspring be colorblind? _____ **No** _____

Can males ever be carriers for colorblindness? _____ **No** _____

If a male is colorblind, which parent is to "blame?" _____ **Mother** _____