Name: Key Period: Date:

Dihybrid Cross Questions

1. In humans, there is a gene that controls formation freckles. Having freckles is dominant over not having freckles. The ability to taste certain substances is also genetically controlled. For example, there is a substance called phenylthiocarbamide (PTC for short), which some people can taste (the dominant trait), while others cannot (the recessive trait). The biological supply companies actually sell a special kind of tissue paper impregnated with PTC so students studying genetics can try tasting it to see if they are tasters or non-tasters. To people who are tasters, the paper tastes very bitter, but to non-tasters, it just tastes like paper. Let's let ~~R represent tongue-rolling, f represent a non-roller,~~ **T** represent ability to taste PTC, and **t** represent non-tasting.

? freckles FF No freckles tt

F = freckles
f = no freckles
T = tastes PTC
t = can't taste PTC

Suppose a woman who is both a **homozygous freckled** and a **non-PTC-taster** marries a man who is **heterozygous** for both traits.

a. ID mom's and dad's genotypes:

Mom's genotype:	FFtt
Dad's genotype:	Ff Tt

b. Complete the Punnett square: If they have a child, what is their probability of having a **homozygous freckled non-taster**? 4/16 or 1/4

FFtt

	Ft	Ft	Ft	Ft
FT	FFTt	FFTt	FFTt	FFTt
Ft	FFtt	FFtt	FFtt	FFtt
fT	Ff Tt	FfTt	FfTt	FfTt
ft	Ff tt	Fftt	Fftt	Fftt

eggs: FOIL FFtt

sperm: FfTt

*can also do 2 punnett squares (1 for each trait, & multiply the probabilities)

c. Complete the Punnett square: If this child (the homozygous freckled kid who is also a non-taster) marries someone who is heterozygous for both traits, what are the possible gamete combinations of the kids??

FFtt x FfTt

	Ft	Ft	Ft	Ft

same as b? =

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

ex) FF tt

F | FF | FF
t | Ft | Ft

T | Tt | Tt
t | tt | tt

2. About 70% of Americans perceive a bitter taste from the chemical phenylthiocarbamide (PTC). The ability to taste this chemical results from a dominant allele (T) and not being able to taste PTC is the result of having two recessive alleles (t). Albinism is also a single gene trait with normal pigment being dominant (A) and the lack of pigment being recessive (a). A normally pigmented woman who cannot taste PTC has a father who is an albino taster. She marries a homozygous, normally pigmented man who is a taster but who has a mother that does not taste PTC.

   a. ID mom's and dad's genotypes.

Mom's genotype:	Aatt (from her father)
Dad's genotype:	AATt (from his mother)

   b. Use the Punnett square to show the possible genotypes of their children:

	At	At	at	at
AT	AATt	AATt	AaTt	AaTt
At	AAtt	AAtt	Aatt	Aatt
AT	AATt	AATt	AaTt	AaTt
At	AAtt	AAtt	Aatt	Aatt

   c. What is the probability of having albino children? 0% (aa)
   d. What is the probability of having PTC non-taster children? 8/16 = 50% (tt)

3. In summer squash, white fruit color (W) is dominant over yellow fruit color (w) and disk-shaped fruit (D) is dominant over sphere-shaped fruit (d).

   a. **Complete the following table and Punnett square** for a squash plant true-breeding (homozygous) for white, disk-shaped fruit being crossed with a plant true-breeding for yellow, sphere-shaped fruit.

Mom's genotype:	WWDD
Dad's genotype:	wwdd

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

   b. What is the probability of getting a plant that will produce white, sphere-shaped fruit from this cross? 0%

all offspring will be white, disk-shaped fruit

4. Wolves are sometimes observed to have black coats and blue eyes. Assume that normal coat color (N) is dominant to black (n) and brown eyes (B) are dominant to blue (b). Suppose the alpha male and alpha female of a pack (these are the dominant individuals who do most of the breeding) are black with blue eyes and normal colored with brown eyes, respectively. The female is also heterozygous for both traits.

N = normal
n = black
B = brown eyes
b = blue eyes

a.

Mom's genotype:	NnBb
Dad's genotype:	nnbb

b. What is the probability of getting offspring with each of the following genotypes?

i. NnBb = 4/16 = 25%

ii. Nnbb = 25%

iii. nnBb = 25%

iv. NNBb = 0%

	NB	Nb	nB	nb
nb	NnBb	Nnbb	nnBb	nnbb
nb	NnBb	Nnbb	nnBb	nnbb
nb	NnBb	Nnbb	nnBb	nnbb
nb	NnBb	Nnbb	nnBb	nnbb

c. What is the probability of getting a normal colored blue-eyed wolf pup from this cross? 25%.

N–bb

5. Carrion beetles lay their eggs in dead animals and then bury them in the ground until they hatch. Assume that the preference for fresh meat (F) is dominant to the preference for rotted meat and that the tendency to bury the meat shallow (S) is dominant to the tendency to bury the meat deep. Suppose a female carrion beetle **homozygous dominant** for both traits mates with a male **homozygous recessive** for both traits.

F = fresh meat
f = rotted meat
S = shallow
s = deep

a.

Mom's genotype:	FFSS
Dad's genotype:	ffss

	FS	FS	FS	FS
fs	FfSs	"	"	"
fs	FfSs	"	"	"
fs	"	"	"	"
fs	"	"	"	"

b. **What will be the genotype of the F_1 generation?** all FfSs

c. **What will be the phenotype of the F_1 generation?** fresh meat, shallow

6. In the breeding season, male Anole lizards court females by bobbing their heads up and down while displaying a colorful throat patch. Assume for this question that both males and females bob their heads and have throat patches. Now, suppose that anoles prefer to mate with lizards who bob their heads fast (F) and have red throat patches (R) and that these two alleles are dominant to their counterparts, slow bobbing and yellow throats. A male lizard **heterozygous** for **head bobbing** and **homozygous dominant** for the throat patch mates with a female that is also **heterozygous** for **head bobbing** but is **homozygous recessive** for throat patches.

F- fast R- red
f- slow r- yellow

a.

Mom's genotype:	Ffrr
Dad's genotype:	FfRR

	Fr	Fr	fr	fr
FR	FFRr	FFRr	FfRr	FfRr
FR	FFRr	FFRr	FfRr	FfRr
fR	FfRr	FfRr	ffRr	ffRr
fR	FfRr	FfRr	ffRr	ffRr

b. **What is the probability of an F_1 offspring having the preferred fast bobbing & red throat phenotype?** 14/16 or 7/8 F- R-

c. **What is the probability that the offspring will have both slow head bobbing *and* yellow throats** (and therefore get less nookie)? 0/1. ffrr

d. **What is the probability that the offspring will lack lack one of the dominant traits** (and therefore get less nookie)? 2/16 or 1/8 ff or rr