

#3 - ANSWERS p1

Name _____ Date _____ Period _____

Worksheet: Punnett Square Review

BIOLOGY: CHAPTER 6 & 7

Directions: Answer the following questions using your notes and textbook

1. In pea plants, tall (T) plants are dominant over short (t) plants. Complete the following crosses and give the genotypic and phenotypic ratios of offspring.

a. TT x tt

	T	T
+	Tt	Tt
+	Tt	Tt

G: 100% Tt

P: 100% Tall

b. Tt x tt

	T	t
+	Tt	tt
+	Tt	tt

G: Tt, tt

P: 50% Tall, 50% Short

c. Tt x Tt

	T	t
T	TT	Tt
t	Tt	tt

G: TT, Tt, tt

P: 75% Tall, 25% Short

2. In pea plants, purple flowers (P) are dominant over white (p) flowers. Complete the following crosses and give the genotypic and phenotypic ratios of offspring.

a. A heterozygous purple plant is crossed with a homozygous purple plant.

	P	P
P	PP	Pp
P	PP	Pp

G: PP, Pp

P: 100% Purple

b. A cross between two pea plants produces offspring in which approximately 50% of the flowers are white and 50% are purple. What are the genotypes of the parents? Show punnett square to support your answer.

	P	p
p	Pp	pp
p	Pp	pp

PARENTS
G: Pp, pp

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c. A cross between two purple pea plants yields approximately 25% of the offspring exhibiting white flowers. What are the genotypes of the parents? Show punnett square to support your answer.

	P	P	
P			
P		pp	

parent
G: Pp

3. A widow's peak in humans is determined by a dominant/recessive inheritance. A person who is purebred for widow's peak is crossed with a person who is purebred for no widow's peak. All of the offspring have a widow's peak. Which trait is dominant and which is recessive? Show punnett square to support your answer.

	W	W	
w	Ww	Ww	
w	Ww	Ww	

Widow's Peak Dominant
No Widow's Peak Recessive

4. In guinea pigs, black fur is dominant. If a black guinea pig is crossed with a white guinea pig and the litter contains a white offspring, the genotype of the black-haired parent is probably? Show punnett square to support your answer.

	B	b	
b		bb	
b		bb	

parent
G: Bb

5. In minks, brown is dominant over silver-blue color.

a. What offspring would you predict if you crossed a homozygous brown mink with a silver-blue mink? Show punnett square to support your answer.

	B	B	
b	Bb	Bb	
b	Bb	Bb	

heterozygous brown
Bb

b. What would the genotypic and phenotypic ratios of two F2 generation mink from the above problem be if they were crossed? Show punnett square to support your answer.

	B	b	
B	BB	Bb	
b	Bb	bb	

G: BB, Bb, bb

P: 75% Brown
25% Silver-blue

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6. In snapdragons, red is not completely dominant over white flowers. RR - Red WW - white RW - pink

a. What color flowers would you expect when you cross a red flower with a white flower? What would be the genotypic and phenotypic ratios of the offspring be?

	R	R
W	RW	RW
W	RW	RW

G: RW 100%

P: 100% pink

(OFFSPRING)

b. Cross two of the F₁ generation from above. What would be the genotypic and phenotypic ratios of the offspring be?

	R	W
R	RR	RW
W	RW	WW

G: 25% RR
50% RW
25% WW

P: 25% Red
50% Pink
25% White

7. In dragons, the ability to breath fire is a recessive trait. Homozygous dominant dragons cannot produce fire or smoke at all. Heterozygous dragons can produce smoke, but no fire.

a. Cross a fire breathing dragon with a homozygous dominant dragon. What would be the genotypic and phenotypic ratios of the offspring be?

	f	f
F	Ff	Ff
F	Ff	Ff

G: 100% Ff

P: Smoke - no fire

b. Cross two smoke-producing only dragons. Are any of the offspring able to produce fire? Show punnett square to support your answer.

	F	f
f	Ff	Ff
f	Ff	ff

25% fire breathing

8. In cattle, red and white hair are codominant. The heterozygous condition is roan colored (contains both red hair and white hair) RR Red WW White RW Roan

a. Cross a red cow and a white cow. What would be the genotypic and phenotypic ratios of the offspring be?

	R	R
W	RW	RW
W	RW	RW

G: 100% RW

P: 100% Roan

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b. Would it be possible to have any red cattle when two roan cattle are crossed? Show punnett square to support your answer.

	R	W	
R	RR	RW	25% RED CATTLE
W	RW	WW	

9. In Guinea pigs, the genotype (BB) is black, and the genotype (bb) is white color, and (Bb) is grey color, ~~The gene (B) and (b) are sex-linked.~~

a. What type of offspring are to be expected in a cross between a black female and a white male?

	b	b	
B	Bb	Bb	G: 100% Bb
B	Bb	Bb	

P: 100% GREY

b. A heterozygous female is crossed with a white male. What are the expected genotypic and phenotypic ratios of the offspring?

	b	b	
B	Bb	Bb	G: 50% Bb 50% bb
b	bb	bb	

P: 50% GREY
50% WHITE

~~c. Would it ever be possible to produce a male with grey hair? Explain~~

10. In humans, colorblindness is due to the recessive allele (c), and normal vision is due to the dominant allele (C). Color blindness is a sex-linked trait.

a. What is the expected offspring between a normal man and a colorblind woman? Give both genotypic and phenotypic ratios of offspring

	X	Y	
X ^c	X ^c X	X ^c Y	G: 50% X ^c X 50% X ^c Y
X ^c	X ^c X	X ^c Y	

P: 50% CARRIER FEMALE
50% COLORBLIND MALE

b. A normal male is crossed with a female who is not colorblind? Would it ever be possible to produce offspring that are colorblind? Show punnett square to support your answer.

	X	Y	
X	XX	Xy	YES
X ^c	XX ^c	X ^c y	

COLORBLIND MALE

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c. What would you expect when a colorblind man marries a colorblind woman? Give both genotypic and phenotypic ratios of offspring.

$$\begin{array}{c}
 X^c \quad Y \\
 \begin{array}{|c|c|}
 \hline
 X^c & X^c X^c \quad X^c Y \\
 \hline
 X^c & X^c X^c \quad X^c Y \\
 \hline
 \end{array}
 \end{array}$$

Q: $X^c X^c, X^c Y$

P: COLORBLIND FEMALE
COLORBLIND MALE

d. Is it ever possible to have a male that is a carrier for colorblindness? Explain

NO.
ONLY X CHROMOSOME IS AFFECTED.
NO OTHER X CHROMOSOME AVAILABLE
FOR PROTECTION.

e. Would there ever be an instance when a female could not be a carrier? Explain

YES.
NORMAL FEMALE XX
OR
COLORBLIND FEMALE $X^c X^c$

11. The chart below shows the inheritance of human blood types. There are four different phenotypes possible: A, B, AB, and O. The alleles A and B are codominant, and the O allele is recessive to both A and B.

Blood Groups				
Phenotype (Blood Type)	Genotype	Antigen on Red Blood Cell	Safe Transfusions	
			To	From
A	$I^A I^A$ or $I^A i$	A	A, AB	A, O
B	$I^B I^B$ or $I^B i$	B	B, AB	B, O
AB	$I^A I^B$	A and B	AB	A, B, AB, O
O	ii	none	A, B, AB, O	O

a. A person with $I^A I^B$ is crossed with a person who is $I^A I^A$. What are the genotypic and phenotypic ratios of the offspring?

$$\begin{array}{c}
 A \quad B \\
 \begin{array}{|c|c|}
 \hline
 A & AA \quad AB \\
 \hline
 A & AA \quad AB \\
 \hline
 \end{array}
 \end{array}$$

Q: AA, AB
↓
P: A, AB

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b. A person with type AB blood is crossed with a person with type O blood. What are the genotypic and phenotypic ratios of the offspring?

	A	B	
O	AO	BO	
O	AO	BO	

G: AO, BO
P: ↓ ↓
A B

c. A person with type A blood is crossed with a person with type B blood. They have offspring with type O blood. What are the genotypes of the parents? Show punnett square to support your answer.

	A	O	
B			
O		OO	

PARENT
G: AO + BO

d. A person with type AB blood is crossed with another individual. They have 20 children and all of them have either type A blood or type B blood. What is the probably the genotype of the second individual? Show punnett square to support your answer.

	A	B	
O	AO	BO	
O	AO	BO	

2nd G: OO

e. In blood drives there are certain blood types which are more sought after than others. What blood type can be used in more transfusions than the others? Which can be used least often?

MORE → O → UNIVERSAL DONOR

LEAST → AB → UNIVERSAL RECIPIENT

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Punnett square worksheet

Complete the following monohybrid crosses: draw a Punnett square, list the ratio and describe the offspring. Be sure to remember that the capital letter is dominant.

Example)

A green pea plant (GG) is being crossed with a green pea plant (Gg).

	G	G
G	GG	GG
g	Gg	Gg

GenoType= 2 GG: 2 Gg ; 0 gg

Phenotype= 4 Green pea plants: 0 other color

- 1) A green pea plant (Gg) is crossed with a yellow pea plant (gg).

	G	g
g	Gg	gg
g	Gg	gg

G: Gg, gg
P: 50% Green
50% Yellow

- 2) A tall plant (TT) is crossed with a tall plant (Tt).

	T	T
T	TT	TT
t	Tt	Tt

G: TT, Tt
P: 100% TALL

- 3) A tall plant (Tt) is crossed with a short plant (tt).

	T	t
t	Tt	tt
t	Tt	tt

G: Tt, tt
P: 50% TALL
50% Short

- 4) A red flower (Rr) is crossed with a white flower (rr).

	R	r
r	Rr	rr
r	Rr	rr

G: Rr, rr
P: 50% Red
50% White

- 5) A white flower (rr) is crossed with a white flower (rr).

	r	r
r	rr	rr
r	rr	rr

G: rr
P: 100% White

- 6) A black chicken (BB) is crossed with a black chicken (BB).

	B	B
B	BB	BB
B	BB	BB

G: BB
P: 100% Black

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Punnett square problems continued

Complete the following problems. List the parent genotypes, draw and fill in a Punnett square, and then list the offspring genotypes and phenotypes.

1. A homozygous dominant brown mouse is crossed with a heterozygous brown mouse (tan is the recessive color).

	B	B
B	BB	BB
b	Bb	Bb

G: BB, Bb

P: 100% Brown

2. Two heterozygous white (brown fur is recessive) rabbits are crossed.

	W	w
W	WW	Ww
w	Ww	ww

G: WW, Ww, ww

P: 75% White
25% Brown

3. Two heterozygous red flowers (white flowers are recessive) are crossed.

	R	r
R	RR	Rr
r	Rr	rr

G: RR, Rr, rr

P: 75% Red
25% White

4. A homozygous tall plant is crossed with a heterozygous tall plant (short is the recessive size).

	T	T
T	TT	TT
t	Tt	Tt

G: TT, Tt

P: 100% Tall

5. A heterozygous white rabbit is crossed with a homozygous black rabbit.

	W	w
w	Ww	ww
w	Ww	ww

G: Ww, ww

P: 50% White
50% Black