

## Heredity Worksheet 1

Use the following table to complete questions 1, 2 and 3

	Trait					
	Stem length	Seed shape	Seed colour	Seed coat colour	Pod shape	Pod colour
Dominant	tall	round	yellow	coloured	inflated	green
Recessive	short	wrinkled	green	white	constricted	yellow

1. Give all the possible alleles which could represent the following:

- a) round seeds?  $RH$  or  $Rr$       d) wrinkled seeds?  $rr$   
 b) short plant?  $tt$       e) green seeds?  $yy$   
 c) white seed coat?  $cc$       f) yellow seeds?  $Yy$  or  $yy$

2. Draw the Punnett squares that would result from each of the following crosses and give the genotype and phenotype ratios for each.

a) trait: seed shape

female, heterozygous X male, heterozygous

	$R$	$r$	
$R$	$RR$	$Rr$	$1 : 2 : 1$ $RR : Rr : rr$
$r$	$Rr$	$rr$	

b) trait: seed colour

female, homozygous dominant

X male, homozygous recessive

	$Y$	$Y$	
$y$	$Yy$	$Yy$	$1 : 0$ $Yy$
$y$	$Yy$	$Yy$	

$1 : 0$   
yellow

3. In guinea pigs, a black coat is dominant over a brown coat. What would be the chance for 2 guinea pigs that are heterozygous for this trait to have a brown offspring?

	$B$	$b$	
$B$	$BB$	$Bb$	$\rightarrow 25\% \text{ or } \frac{1}{4}$
$b$	$Bb$	$bb$	

4. White (W) is dominant over black (w) in sheep. Sir Curlylocks is your prize ram by all ram-judging standards. An individual wishes to purchase the ram from you for 2 million dollars!! The only condition for the sale is that he will never produce any black offspring. How could you prove to this individual that your ram is indeed 'pure'?

Mate prize ram  
w/ a black ram

	W	W
w	Ww	Ww
w	Ww	Ww

When mated over & over all will be white ∴ prize one is pure WW.

5. You have discovered another plant species! This time, the flowers are either red or white. When you cross a red plant with a white plant, all the flowers of the offspring are red. What do you know about the alleles of this plant?

Red = homogeneous dominant  
White = " recessive

6. In guinea pigs, black fur is dominant (B) to white fur (b). What are the phenotype and genotype ratios for the offspring of 2 heterozygous parents?

	B	b
B	BB	Bb
b	Bb	bb

1 : 2 : 1  
BB Bb bb

3 : 1  
black white

7. Albinism is a recessive trait in humans.

a) What chance is there that an albino father and a homozygous normal mother could produce an albino child?

	a	a
A	Aa	Aa
A	Aa	Aa

0% chance.

b) What chance is there that an albino mother and a heterozygous normal father could produce an albino child?

	A	a
a	Aa	aa
a	Aa	aa

50% chance

8. In humans brown eyes (B) are dominant over blue eyes (b). A brown eyed man marries a blue eyed woman. They have eight children, all are brown eyed. What are the possible genotypes of each person in the family?

Mom = bb

Dad = BB or Bb

Kids = Bb

	B	B dad
b	Bb	Bb kids
b	Bb	Bb

mom

	B	b dad
b	Bb	bb
b	Bb	bb

mom



9. The parents of a blue eyed man were both brown eyed. He marries a brown eyed woman whose father was brown eyed and whose mother was blue eyed. They have one child who is blue eyed. What are the genotypes of the individuals mentioned?

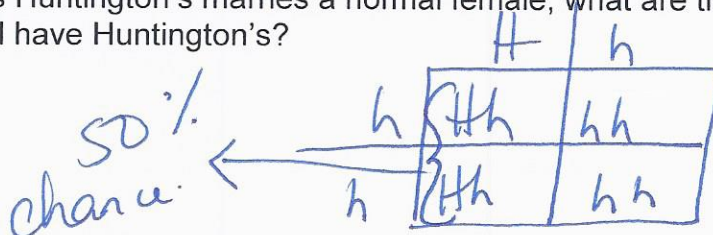


10. Complete the Punnett square that would show the  $F_1$  generation when 2 heterozygous black, rough-coated guinea pigs are crossed. (Genes for black and rough are dominant.)  $BbRr$   $BbRr$

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

- a) How many of the offspring will be black and rough? 9  
 b) How many of the offspring will be black and smooth? 3  
 c) How many of the offspring will be white and rough? 3  
 d) How many of the offspring will be white and smooth? 1

11. Huntington's is a fatal autosomal dominant disease. If a heterozygous man who has Huntington's marries a normal female, what are the chances that their child will have Huntington's?



12. What are the chances that the offspring will be colour blind if a male who is not colour blind has children with a carrier?

	$X$	$Y$
$X^c$	$C^cX$	$X^cY$
$X$	$X^cX$	$XY$

0% daughters  
 50% boys.

13. A pea plant is heterozygous for both seed shape and seed color. It is crossed with a dented homozygous yellow pea. S is the allele for the dominant, spherical shape characteristic; s is the allele for the recessive, dented shape characteristic. Y is the allele for the dominant, yellow color characteristic; y is the allele for the recessive, green color characteristic. What will be the percentage distribution of these two alleles in this plant's gametes?

	sY	sY	sY	sY	
SY	SsYY	SsYY	SsYY	SsYY	50% spherical yellow
Sy	SsYy	SsYy	SsYy	SsYy	50% dented & yellow
sY	ssYY	ssYY	ssYY	ssYY	
sy	ssYy	ssYy	ssYy	ssYy	

P  
G  
 1:1:1:1  
 SsYY SsYy ssYY ssYy

14. Albinism is a recessive disease and Huntington's is a dominant disease.

Female: Heterozygous for Huntington's and Albinism

Male: Recessive for Huntington's and heterozygous for Albinism.

Give all possible genotypes and phenotypes.

HhAa x hhAa

	hA	hA	ha	ha
HA	HhAA	HhAA	HhAa	HhAa
Ha	HhAa	HhAa	Hhaa	Hhaa
hA	hhAA	hhAA	hhAa	hhAa
ha	hhAa	hhAa	hhaa	hhaa

P  
 37.5% hunt + no ALB  
 37.5% no hunt + no ALB  
 12.5% hunt + ALB  
 12.5% no hunt + ALB

G  
 HHAA = 2/16  
 HhAa = 4/16  
 Hhaa = 2/16  
 hhAA = 2/16  
 hhAa = 4/16  
 hhaa = 2/16



15. If a man with hairy ears has a child with a woman who does not have hairy ears, what are the chances that their children might have hairy ears?

	x	y <sup>c</sup>
x	xx	xy <sup>c</sup>
x	xx	xy <sup>c</sup>

girls 0%  
boys 100% have them

16. Explain using a Punnett square if two adults who are not hemophiliac will also produce children who are not hemophiliac.

not hemo, but carrier →

	x	y
x <sup>c</sup>	x <sup>c</sup> x	x <sup>c</sup> y
x	xx	xy

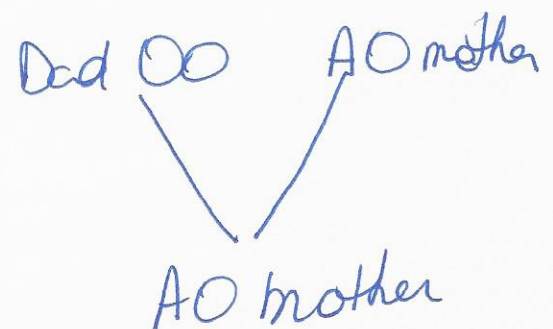
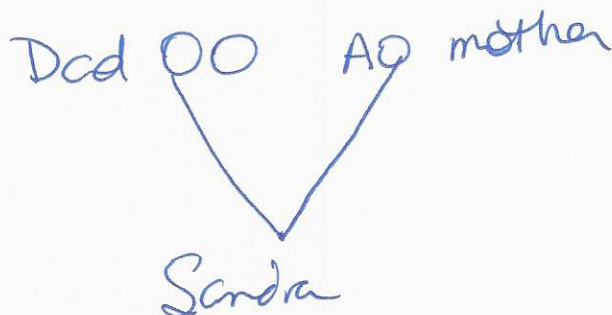
∴ Can have a son who has it.

17. Blood type is an inherited trait. There are two types of blood antigens you may inherit; A or B. If you are blood type AB you inherited both antigens and if you are blood type OO, you inherited no antigens. If you are blood type A there are two possible genotypes you can be AA or AO. Genotype AA means both parents gave you the A antigen while AO means one parent gave you the A antigen and the other gave you nothing. If you are AO, you are considered blood type A, but you may still pass on the O, which means you passed on no antigen.

Sandra is blood type O, while her brother is blood type A. She knows her mother is blood type A and her dad is blood type O.

Give the complete genotype of each person which would allow this situation to occur.

Sandra OO      Mother AO  
Dad OO      Brother AO



if mother was AA both kids would be A blood type.