Genetics 4

- Send answer to iClicker 4A now
- Genetics Survey Answers
- Chromosomes
  - human
  - sex-chromosomes
- Sex-linked inheritance
  - hemophilia
- Answer to iClicker 4B

- Due in Lab this week
  - Pre-Lab 2
  - VGL 1 lab report
  - Bring textbook to lab

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Survey #1: Genetics Answer

a) Fur color is a character with two traits and it is controlled by one gene with two alleles:

allele	**contribution to phenotype**
B	black fur - dominant (simple dominance)
b	white fur - recessive

Parents: Bb X Bb **Offspring**: BB or Bb (black) and bb (white)

Note that incomplete dominance and co-dominance do not work because there are only two colors; to suspect co- or incomplete- dominance, there would have to have been more than two colors observed. Also, since the parents must be heterozygous, the parents would have to be gray (if incomplete dominance) or black & white (if co-dominance).

b) Here is one answer that says all that is required in a few words:

"If both the parents are black, and they produce one black offspring, an one white offspring, then both parents must carry the gene to produce the white fur color. Since both parents are black, the white gene must be recessive."

What is good about this answer? It shows a logical thought process. Each supposition is backed up by an understanding of genetics. It shows that they matched the predictions of their model to the data. It uses the terms correctly. It does not say more than is needed.

Other notes:

1. Many students were tripped up by the "one black and one white kitten" part. They assumed that meant that they had to make a model where the ratio of black:white in the offspring was 1:1. This led them to make one parent homozygous and the other heterozygous (this will give a 1:1 offspring ratio). If I had said 20 black and 20 white kittens, this would have been a logical way to proceed. Since I only had one of each, it is possible that these came from a model that would produce a 3:1 black:white ratio in a large number of offspring. Two kittens is too small a sample size to distinguish between 3:1 and 1:1 - all you can be sure of is that your model must be able to produce some black and some white kittens from two black parents. Also, making one parent homozygous bb means that parent is white, which is inconsistent with the problem as stated.
2. Some students gave Punnett squares that looked correct, but never defined their alleles as above. Some also defined the alleles, but never gave the parent genotypes. On an exam, these incomplete answers would receive only partial credit; you should be sure to give all the information the question asks for.
3. Some answers gave extra unnecessary information (ex. the crosses that could have produced the parents). This is fine, but risky. Any errors in this extra information could lead to reduced credit.
4. Some students did not give the genotypes of the parents and offspring. Since the question asked you to "give all genotypes", these answers would not receive full credit on an exam.
5. Some students were not careful when defining their symbols. They said "Black is dominant and white is recessive" without saying which letter went with which allele; others said "B- dominant; b - recessive" without saying which color corresponded to which allele. On an exam, answers like these would receive little or no credit.
6. Some students put phrases like "Male dominant" when talking about a male with genotype Bb. I'm not sure what this means, but it is not correct to call an individual or a

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genotype "dominant" or "recessive" - these terms refer to the relationships between alleles only.

7. Even though the parents are Bb, it is not necessarily true that their parents were BB and bb. In fact, there are many possibilities: Bb x BB, Bb X Bb, Bb x bb, etc.

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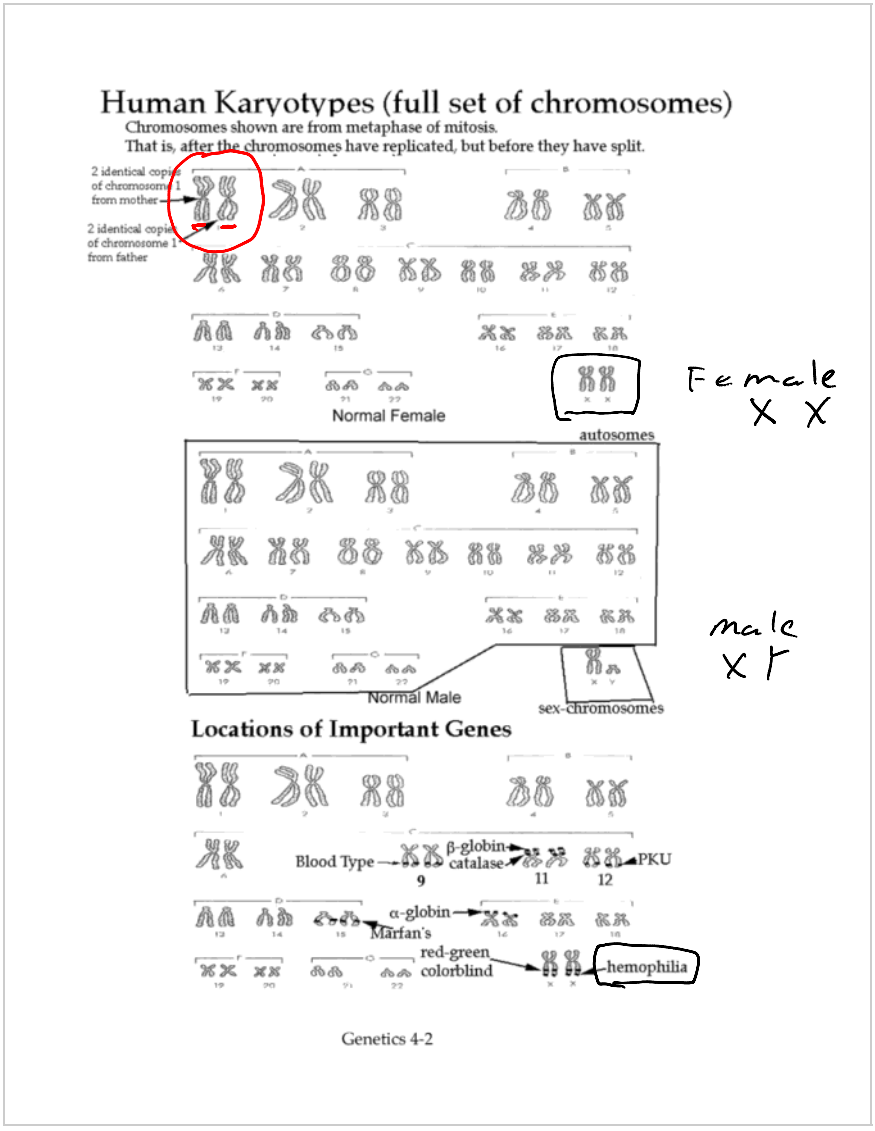
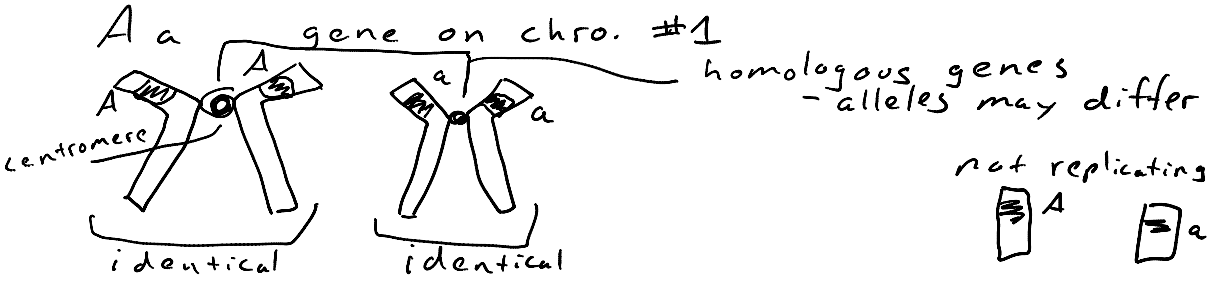


Chromosmes - carry genes
- numbered by type
(Same type has Samess genes)

* chromosomes only visible after they have been replicated



Human females: 23 types of chrom.
- one pair of each type

1,1 ; 2,2 ; 3;3 .... ; X X

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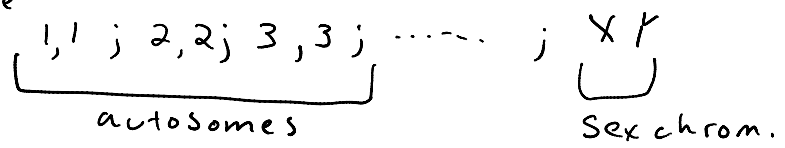
Human male



→ in many animals, sex is determined by the sex- chromosomes

animal	sex- chrom.	sex	
humans, fruit flies, etc.	X X	female	♀
	X Y	male	♂
Some birds	Z Z	male	♂
	Z W	female	♀

* Bio 111 Y & W chrom. carry no genes

genes Y & W just specify sex

Genes on X chrom. = sex- linkage

"X- linkage"

ex. hemophilia → blood clotting disease
1 gene on the X chrom. (with 2 alleles)

allele	contribution to phenotype
X^H	normal blood clotting (dom.)
X^h	blood does not clot (rec.)

genotypes	phenotypes	
$X^H X^H$	female	normal
$X^H X^h$	female	normal → (carrier)
$X^h X^h$	female	hemo. (does not just affect males)
$X^H Y$	male	normal
$X^h Y$	male	hemo.

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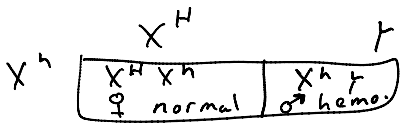
hemo. female × normal male

$X^hX^h \times X^HY$



offspring

½ ♀ normal

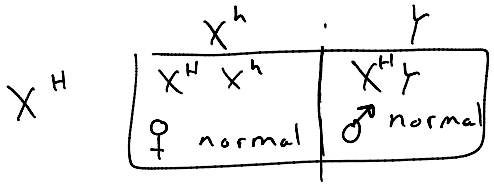
½ ♂ hemo.

∴ all ♀ normal

all ♂ hemo.

normal female × hemo male

$X^HX^H \times X^hY$



offspring

all normal

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