Heredity and Traits : Notes/W.S.-100

In any body cell, the chromosomes come in pairs. One-half of the chromosomes come from the male parent, and the other half come from the female parent. In human body cells there are 23 pairs of chromosomes. In fruit fly body cells, there are 4 pairs of chromosomes.

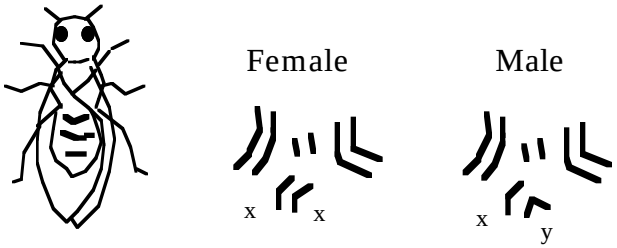
Sex Determination

It was noticed by microscopists that there are chromosomal differences between male and female animals. It turned out that one pair of chromosomes differs between the sexes. These chromosomes are known as **sex chromosomes**. All of the other chromosomes are known as **autosomes**. The autosomes are the same whether the animal is male or female.

In general, the sex chromosomes are identical in the female (XX) but different in the male (XY). During meiosis, all egg cells formed have one (X) chromosome. Sperm cells have an (X) or a (Y) chromosome.

Fruit Flies

Fruit flies produce a new generation every two weeks. They are ideal for geneticists to study. The body cells of fruit flies have 4 pairs of chromosomes. This is shown below.



Sex-linked Traits

Scientists (like T. H. Morgan) did breeding experiments with fruit flies, much like Mendel did with peas. These experiments proved that the genes are in the chromosomes. They also proved that Mendel's ideas

were basically correct. An example of one of Morgan's important experiments follows.

Most fruit flies have red eyes. But one-time, a white eyed male fruit fly was found. The white eyed fruit fly had a **mutation** in the gene for eye color. A mutation is a change in the gene structure. The white eye color turned out to be a recessive trait.

The scientists found that the gene for eye color in the fruit fly must be on the (X) chromosome. The (X) chromosome is not only for sex determination. Genes on the (X) chromosome lead to what are called **sex-linked traits**. Some sex linked traits can be found in humans. Two examples (both recessive) are; **red-green colorblindness**, which is the inability to distinguish between the colors red and green, and **hemophilia** which causes persons to bleed easily.

In general, males show these traits far more than women. If the gene for either of these traits is in the (X) chromosome of the male, that trait will appear. But the trait will not show up in women because they have two (X) chromosomes. The gene would have to be on both chromosomes to be expressed. So women with the gene are said to be carriers who pass it on to male offspring.

Problems:

1) Mosquito body cells have 6 chromosomes. How many chromosomes does a mosquito sex cell have?

2)a) How many pairs of chromosomes are found in human body cells?

b) How many pairs of autosomes are found in human body cells?

3)a) Name the two sex chromosomes.

b) Which sex chromosomes do males have?

c) Which sex chromosomes do females have?

4) Draw the Punnett Square showing sex chromosome combinations after a sperm unites with an egg. What is probability that the offspring is male or female?

5) Why are fruit flies ideal for geneticists to study?

6) What two important things did Morgan's fruit fly experiment prove?

7) What is a mutation?

8)a) What is a sex-linked trait?

b) Give an example of a sex-linked trait in the fruit fly.

9)a) Give an two examples of sex-linked traits in humans.

b) Explain why males show these (recessive) traits far more than females.

Answers: 1) 3, 2)a) 23, b) 22, 3)a) (X) and (Y), b) XY, c) XX, 4)

	X	X
X	XX	XX
Y	XY	XY

Probability of female is 50%. Probability of male is 50%.
5) Fruit flies produce a new generation every two weeks., 6) Genes are in the chromosomes, and Mendel's laws are basically correct., 7) A mutation is a change in the structure of a gene., 8)a) It is a trait due to a gene on the X chromosome., b) eye color, 9)a) color blindness, hemophilia, b) These are recessive traits. Males carry only one X chromosome. Females carry two X chromosomes. It is more likely that females carry a dominant gene on one of the two X chromosomes.