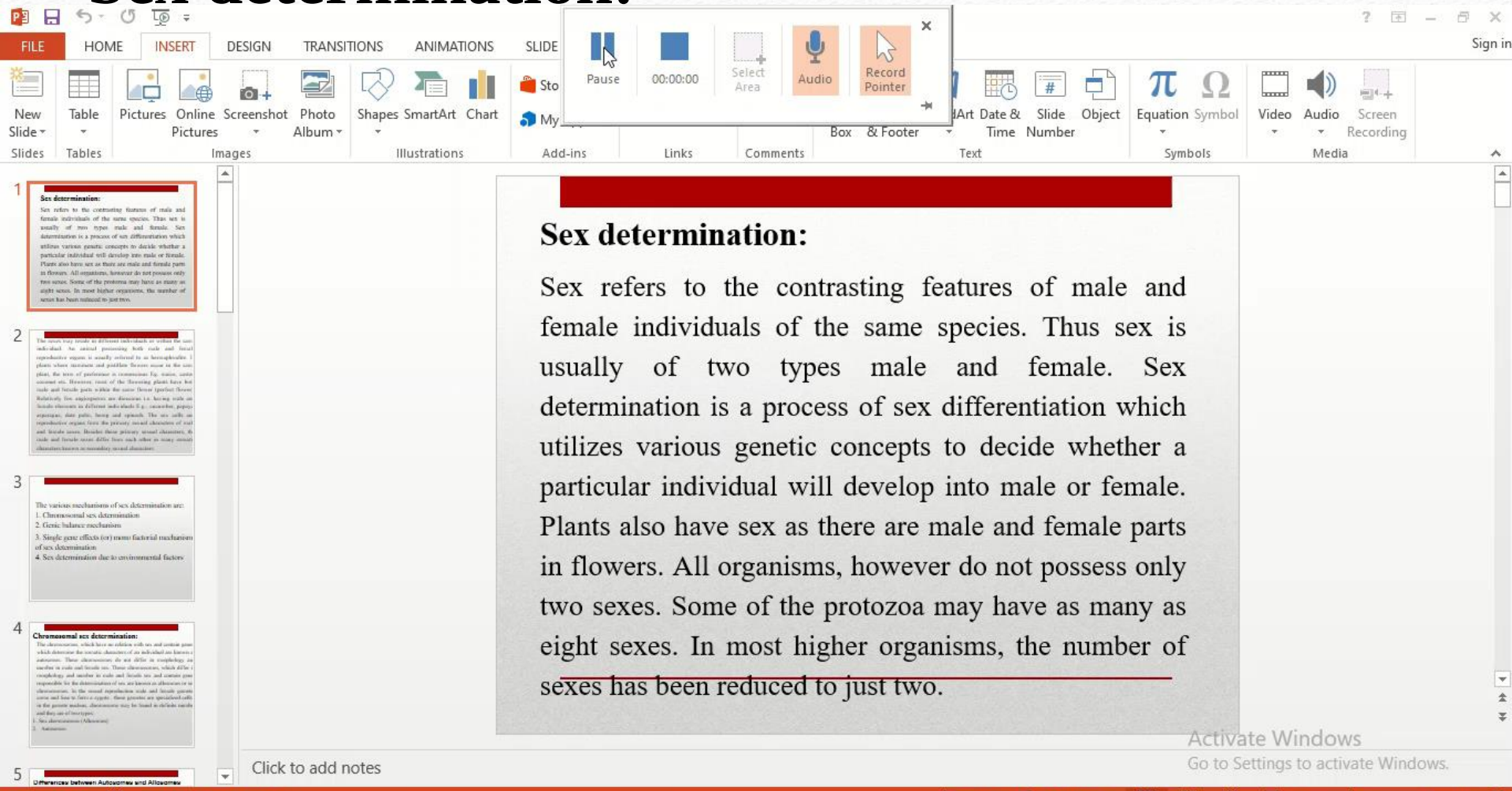
Sex determination:



sexes has been reduced to just two.

The sexes may reside in different individuals or within the same individual. An animal possessing both male and female reproductive organs is usually referred to as hermaphrodite. In plants where staminate and pistillate flowers occur in the same plant, the term of preference is monoecious Eg. maize, castor, coconut etc. However, most of the flowering plants have both male and female parts within the same flower (perfect flower). Relatively few angiosperms are dioecious i.e. having male and female elements in different individuals E.g.: cucumber, papaya, asparagus, date palm, hemp and spinach. The sex cells and reproductive organs form the primary sexual characters of male and female sexes. Besides these primary sexual characters, the male and female sexes differ from each other in many somatic characters known as secondary sexual characters.

The various mechanisms of sex determination are:

1. Chromosomal sex determination
2. Genic balance mechanism
3. Single gene effects (or) mono factorial mechanism of sex determination
4. Sex determination due to environmental factors

Chromosomal sex determination:

The chromosomes, which have no relation with sex and contain genes, which determine the somatic characters of an individual are known as autosomes. These chromosomes do not differ in morphology and number in male and female sex. Those chromosomes, which differ in morphology and number in male and female sex and contain genes responsible for the determination of sex are known as allosomes or sex chromosomes. In the sexual reproduction male and female gametes come and fuse to form a zygote . these gametes are specialized cells . in the gamete nucleus, chromosome may be found in definite number and they are of two types:

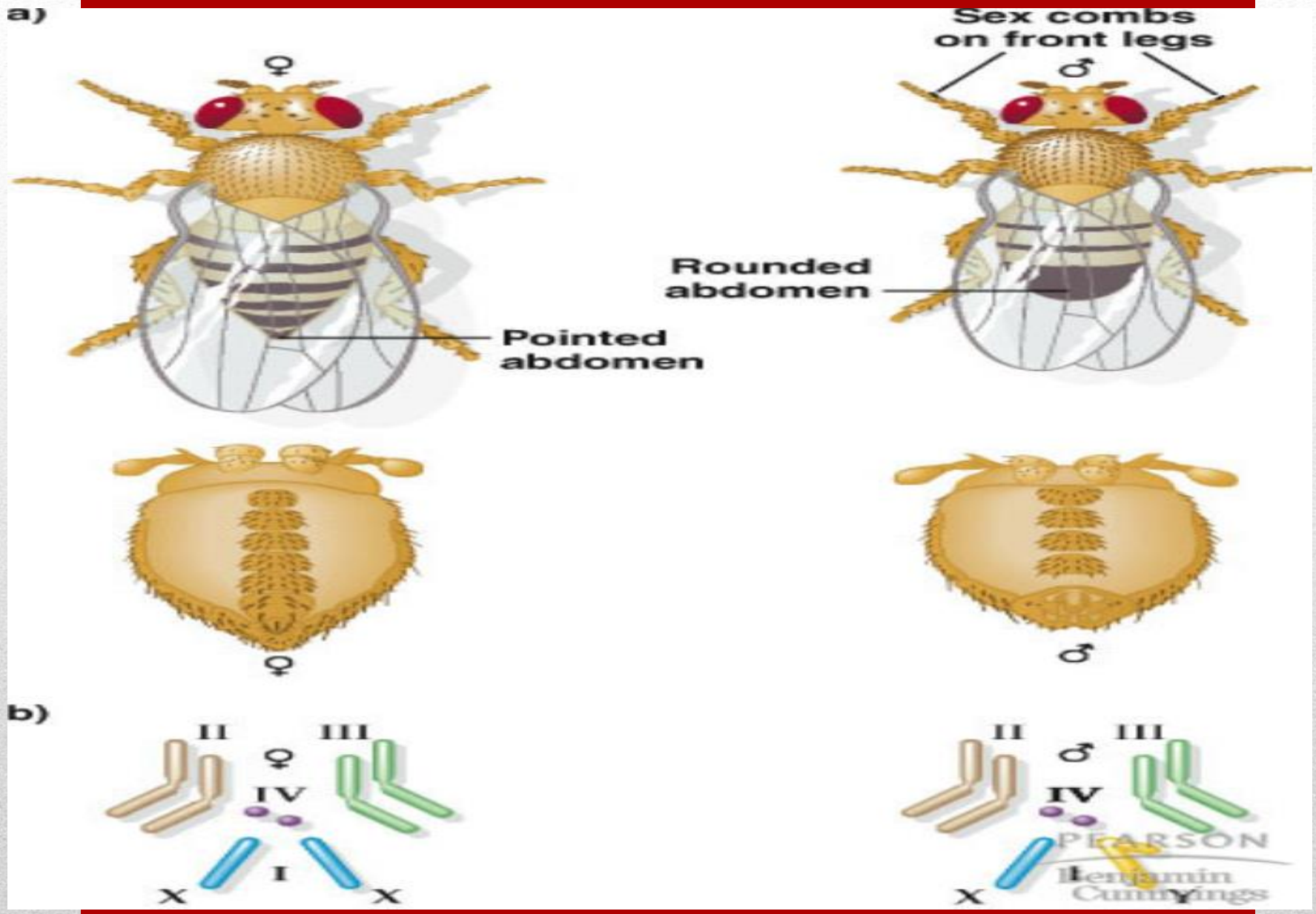
1. Sex chromosomes (Allosomes)
2. Autosomes

Differences between Autosomes and Allosomes

Autosomes	Allosomes
1. Refer to other than sex chromosomes.	1. These are sex chromosomes.
2. Morphology is similar in male and female sex.	2. Morphology is different in male and female sex.
3.The number is same in both the sexes.	3. The number is sometimes different in male and female sex.
4. Generally control traits other than sex.	4. Usually determine sex of an individual.
5. Number of autosomes differs from species to species.	5. Each diploid organism usually has two allosomes.
6. Do not exhibit sex linkage	. 6. Exhibit sex linkage.

The chromosome mechanism of sex determination varies in different organism, Three systems are described below:

1. **XX Female – XY Male**: In man, other mammals, certain insects including Drosophila, certain angiospermic plants including Melandrium, the females possess two X chromosomes (XX) and are thus homogametic and homomorphic, while the males possess one X and one Y chromosome (XY) and are hence heterogametic and heteromorphic. When an egg is fertilized by ‘Y’ bearing sperm, a male is produced.


a)
♀
Pointed abdomen
Sex combs on front legs
♂
Rounded abdomen
♀
♂
b)
II
III
♀
IV
I
X
X
II
III
♂
IV
I
X
Y
PEARSON
Benjamin Cummings

1. **XX Female – XO Male :** In certain insects belonging to orders *some* bugs, grass hoppers and cockroaches, female has two ‘X’ chromosomes (XX) and are, thus homogametic, while male has only single ‘X’ chromosome (XO). This mechanism was found by C.E. McClung in 1902. The presence of an unpaired X chromosome determines the masculine sex. The male being heterogametic sex produces two types of sperms, half with X chromosome and half without X chromosome in equal proportions. The sex of the offspring depends upon the sperm that fertilizes the egg, each of which carries a single X chromosome. Thus fertilization between male and female gametes always produced zygotes with one ‘X’ Chromosome from the female, but only 50% of the z ygotes have an additional X Chromosome from the male. In this way, ‘XO’ and ‘XX’ types would be formed in equal proportions, the former being males and the latter being females.