#### **OUTLINE 14**

- VI. Extensions to Mendel's Rules (continued)
- **D. Sex Linked Inheritance** 
  - **1. Sex chromosomes**
  - 2. Systems of sex determination
    - a. XY system
    - b. X0 systems
    - c. ZW systems
    - d. Haplo-diploid systems
    - e. Non-chromosomalsex determination
  - 3. X-linked inheritance
  - 4. Y-linked inheritance

**Application of Mendel's Rules assumes:** 

- 1. One allele completely dominates the other
- 2. All genes have 2 allelic forms
- 3. All traits are monogenic (affected by only one locus)
- 4. All chromosomes occur in homologous pairs
- 5. All genes assort independently
- 6. An allele is completely expressed when either dominant or heterozygous
- 7. Each trait is controlled by a different set of factors

Hypothetical mechanism for determination of eye color in Humans

Gene for melanin production B (produce) dominant to b (none)

2 Modifier loci affect amount of pigment deposited

CC' and DD' each non prime allele contributes one unit of deposition

<b>G'type at B</b>	Modifier loci	Phenotype
B_	CCDD	Dk brown (+4)
B_	CCDD'	Med. Brown (+3)
B_	CC'DD'	Lt Brown (+2)
B_	CC'D'D'	Hazel (+1)
BB	С'С'D'D'	Green
Bb	С'С'D'D'	Greenish blue
Bb	any g'type	Blue

Hypothetical mechanism for determination of eye color in Humans

A possible cross:

PbbCCDDXBbC'C'D'D"(Blue)(Gr-blue)



# XY sex determination

In some plants



# Drosophila melanogaster



# XO sex determination



#### ZW sex determination





#### Haplo-diploid sex determination



#### Parthenogenesis



#### Environmental control

## Alligators





#### Social control





Х

# Y

## **Color blindness**:

Alleles:  $X^+$  = normal vision,  $X^c$  = color blind (X<sup>+</sup> is dominant)

## female genotypes

normal color blind carrier  $\begin{array}{c} X^+ X^+ \\ X^c X^c \\ X^+ X^c \end{array}$ 

#### male genotypes X<sup>+</sup> Y X<sup>c</sup> Y







