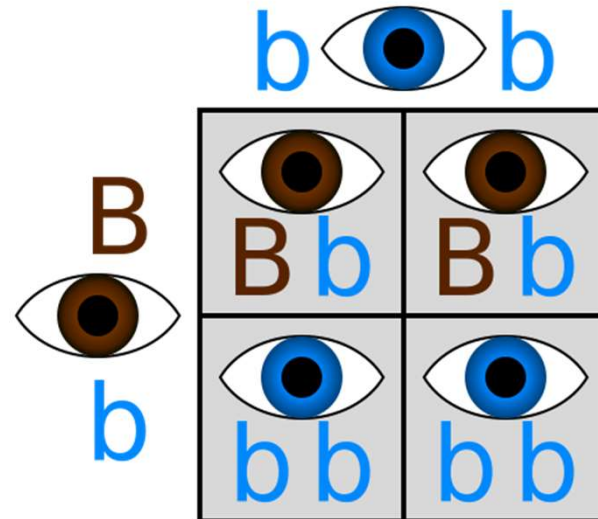
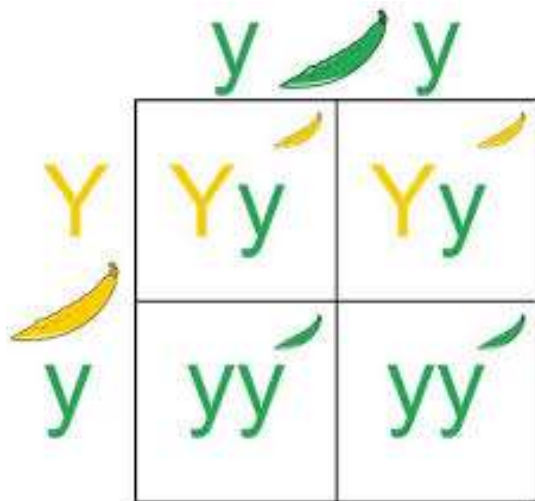


Genetics and Diversity

Punnett Squares



OUTCOME QUESTION(S):

S1-1-12:

How are the features of the parents inherited to create unique offspring?

Vocabulary & Concepts

Allele

Dominant

Recessive

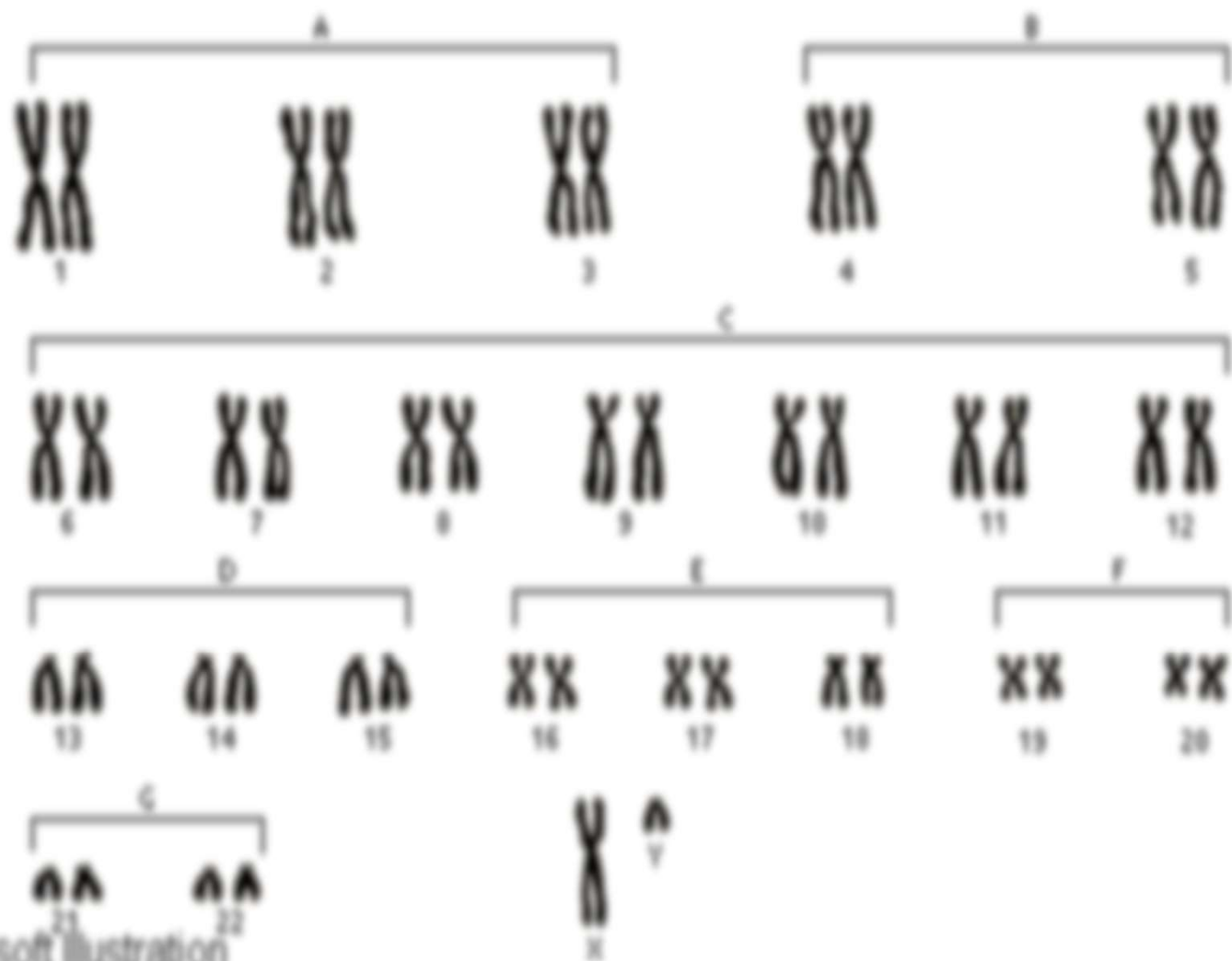
Genotype

Phenotype

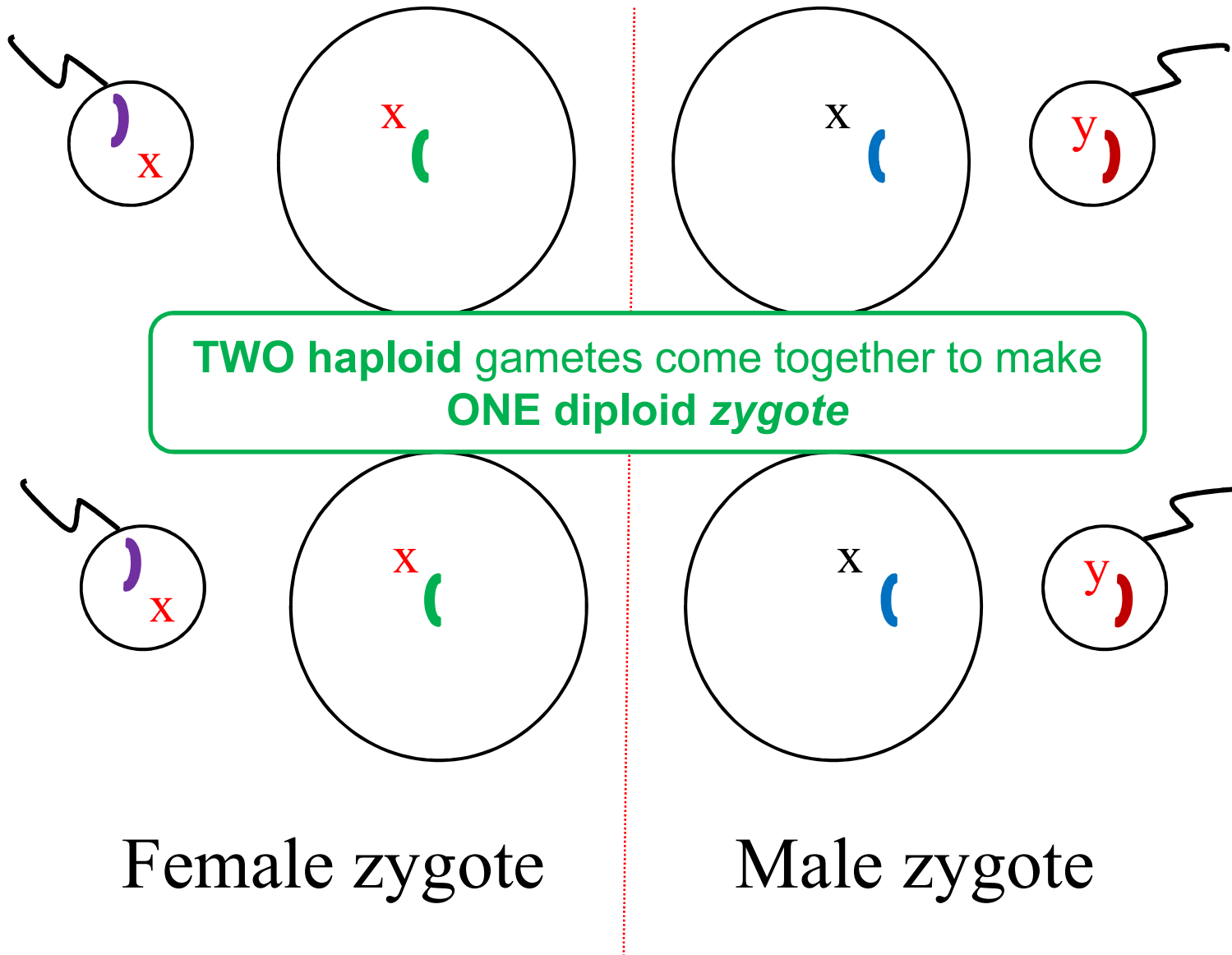
Homozygous

Heterozygous

Punnett Square

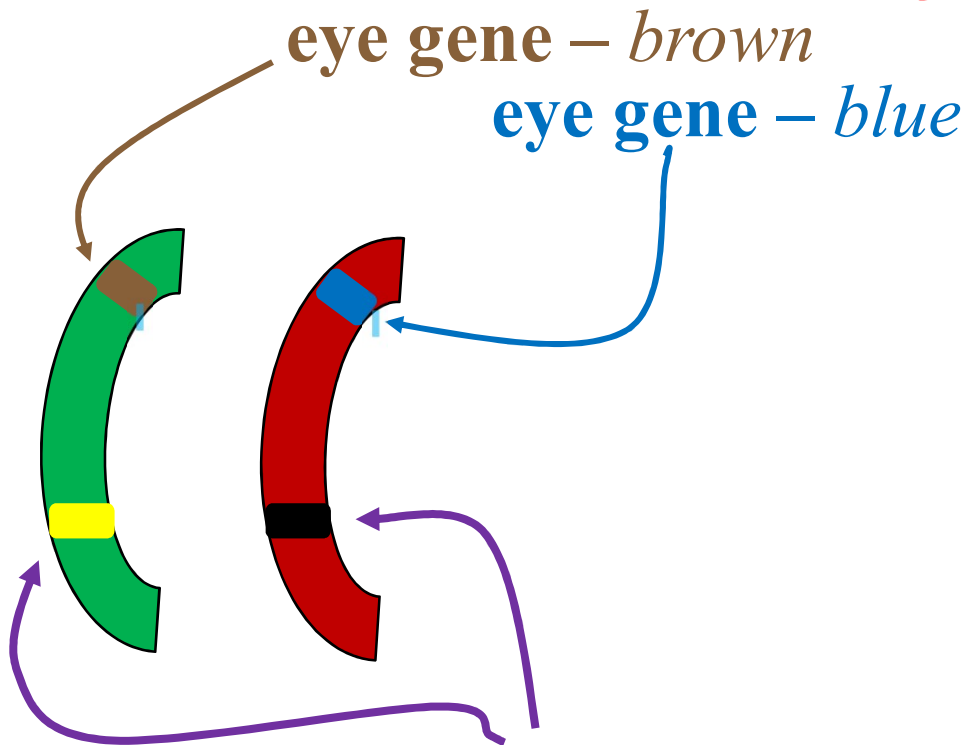


Microsoft Illustration

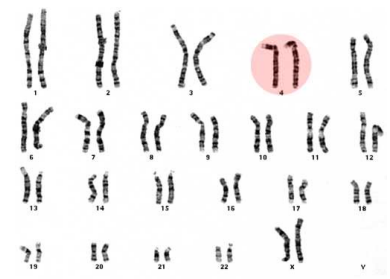


Allele – *alternate forms* of a **gene**. Alleles occupy the same location on homologous chromosomes.

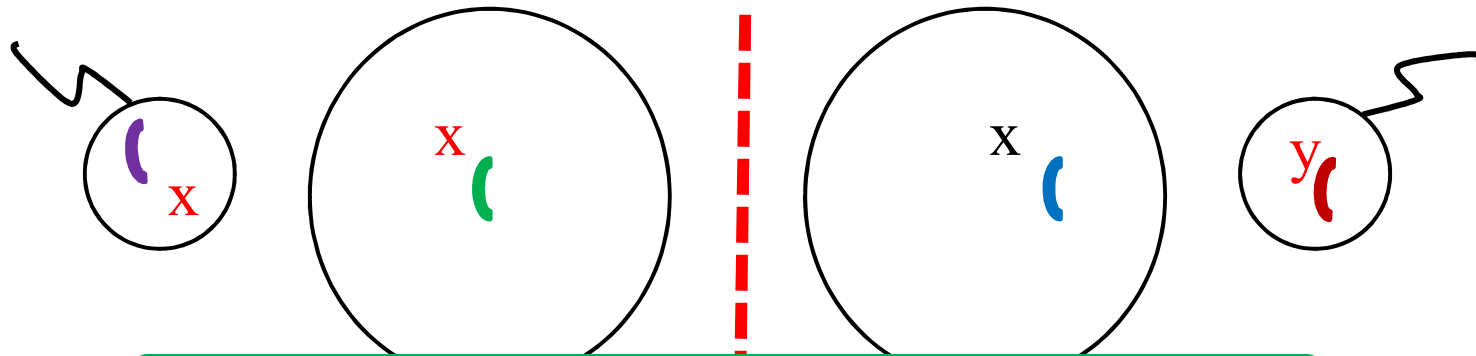
pairs



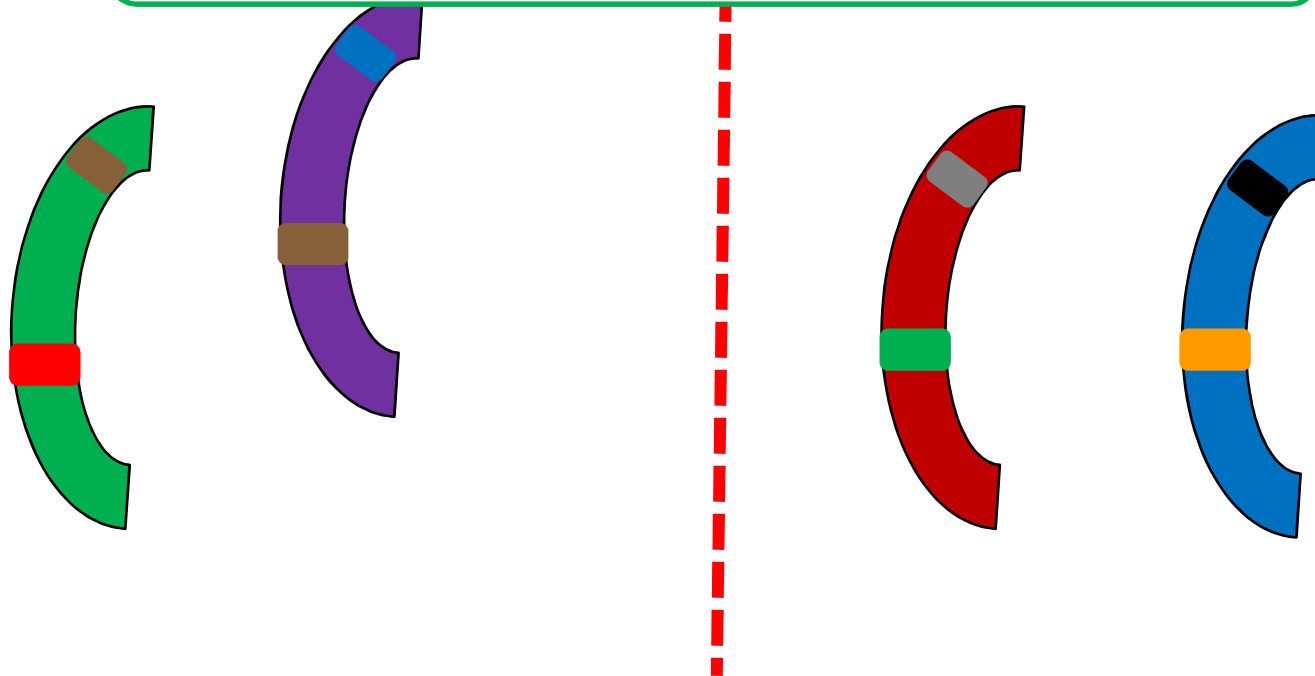
Remember:
one from
“mom,” one
from “dad”



Two different alleles for a gene trait



Homologous chromosomes have **alleles**
(different versions) of all the same genes

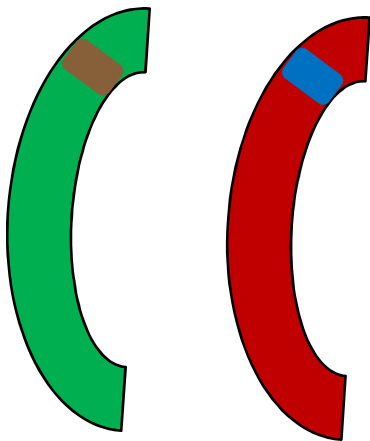


There are 2 types of genes:

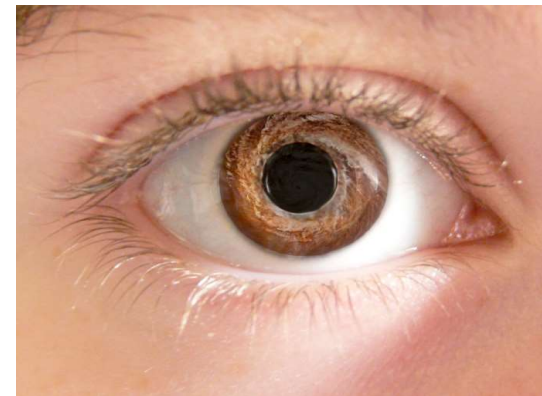
Recessive alleles and **Dominant** alleles

Recessive allele: gene *version* that is masked or not expressed.

Dominant allele: gene *version* that **determines** how the person will *look*.



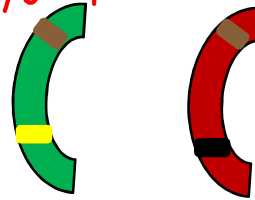
Recessive alleles
only show in
offspring when
there are **no**
dominant versions
present



The way a person **looks** (*the traits they show*) is called their **phenotype** – can be observed (*seen*).

↳ physical description

Black hair, brown eyes...



The **genes** that code for a trait are called a person's **genotype** - not directly observable.

2 brown alleles for eyes, 1 black and 1 blonde allele for hair colour...

Your **genotype** can only be known by undergoing **genetic testing**

Put another way:

Genotype refers to the **alleles** of a person's DNA.
Phenotype is how alleles are expressed - what you look like as a result.

Alleles are represented with:

- Capital letters represent a **dominant** allele
- Lower case represents a **recessive** allele

Three possibilities:

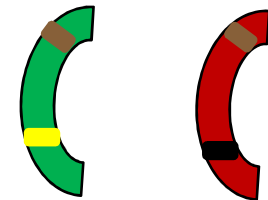
One from dad (sperm)

One from mom (egg)



dominant phenotype

recessive phenotype



bb – person has *two recessive alleles* for eyes.



Genotype – bb

So if a person has brown eyes, you can't tell which **genotype** they are unless they get tested, or have children...

BB – person has *two dominant alleles* for eyes.



Genotype – BB

Phenotype – Brown eyes

Bb – person has *one dominant* and *one recessive*.



Genotype – Bb

Phenotype – Brown eyes

Having the same allele on both homologous chromosomes is called homozygous *for that trait*.

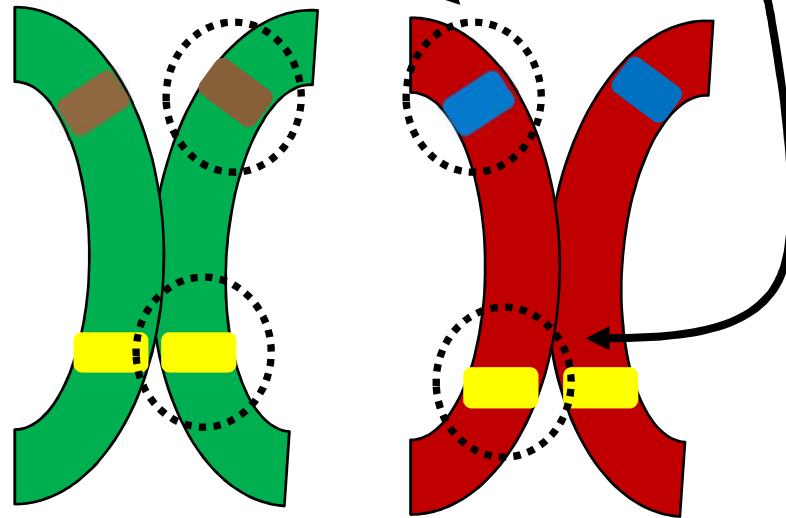
BB or bb

A person with two different alleles is called heterozygous – *for that trait*.

Bb

Homozygous for a trait is also called “*purebred*”

Heterozygous for a trait is also called “*hybrid*”



bb



Genotype – homozygous recessive

Phenotype – blue eyes

BB



Genotype – homozygous dominant

Phenotype – Brown eyes

Bb



Genotype – heterozygous

Phenotype – Brown eyes

Punnett squares:

Shows the possible combinations of alleles from *parents* when they are crossed (*fertilization*).

Used to predict the genotype and phenotype of any offspring.

You must know the genotypes of both parents to start a square

Fig. 1 Punnett square

	B	b
B	BB	Bb
b	Bb	bb

1. State the genotypes for each parent.

Chose a “letter” to represent the trait that makes sense – then include a legend:

E – dominant allele

e – recessive allele

homozygous big eyes)

homozygous small eyes)

2. Draw a Punnett square and *place the parents* at the top and the left side of the square.

3. Complete the square by *combining* the possible genes from *each parent in each square*.

Father = **Ee**

These **two** choices represent the **two** types of **gametes** the parents can make

1/2 offspring will have Big eyes – 50%

1/2 offspring will have small eyes – 50%

Mother's Genes

Father's Genes

Ee	ee
Ee	ee

A father (heterozygous for Brown eyes), wants to have children with a homozygous blue eyed mother. What are the chances of a blue eyed baby?

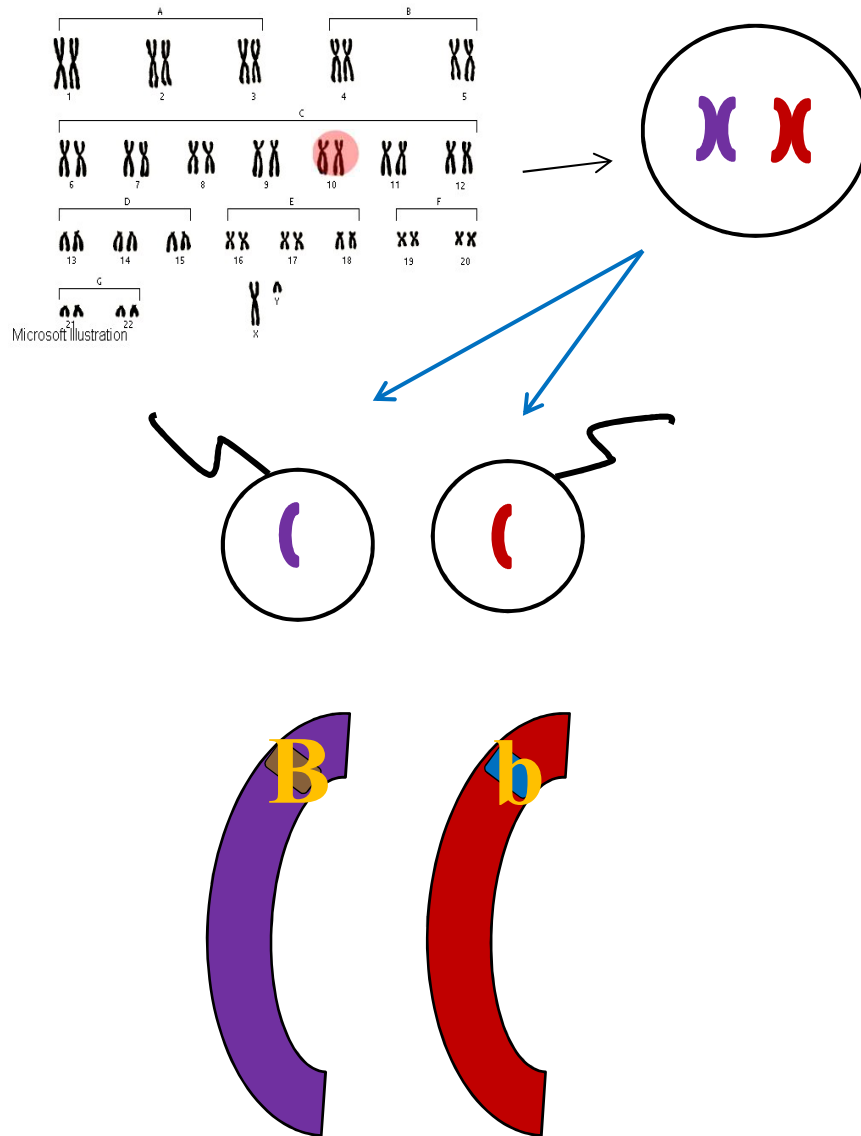
Father = **Bb**

Mother = **bb**

$\frac{1}{2}$ offspring will have blue eyes.

50% chance.

		Father's Genes	
M o t h e r 's G e n e s	Bb	Bb	bb
	Bb	Bb	bb



Remember: We're looking at the heredity of **ONE** gene on **ONE** homologous pair from parent to offspring.

Father's Genes

B **b**

M
o
t
h
e
r
'
s
G
e
n
e
s

	B	b

CAN YOU ANSWER THESE QUESTIONS?

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Homozygous

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Punnett Square