- 40 Bell Work Week 8 5/12
- 41 Genetic Notes 5/12
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- 1. I am available after school on Wed. and Thurs. this week.
- 2. Quiz Friday over genetic material
- 3. Last day to turn in any late work for partial credit is 5/16
- 4. Show the possible genotypes for this cross

Dd x DD

Crossing involving 2 traits – Dihybrid crosses

- Example: In rabbits black coat (B) is dominant over brown (b) and straight hair (H) is dominant to curly (h). Cross 2 hybrid rabbits and give the phenotypic ratio for the first generation of offspring.

Possible gametes:

X

Gametes

Phenotypes - 9:3:3:1

9 _____ _____

3 _____ _____

3 _____ _____

1 _____ _____

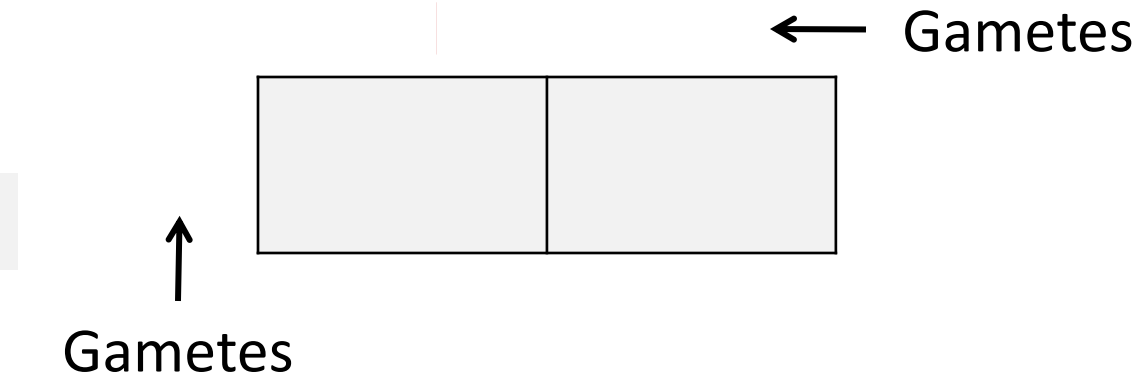
- Example: In rabbits black coat (B) is dominant over brown (b) and straight hair (H) is dominant to curly (h). Cross a rabbit that is homozygous dominant for both traits with a rabbit that is homozygous dominant for black coat and heterozygous for straight hair. Then give the phenotypic ratio for the first generation of offspring.

X

Possible gametes:

Phenotypes:

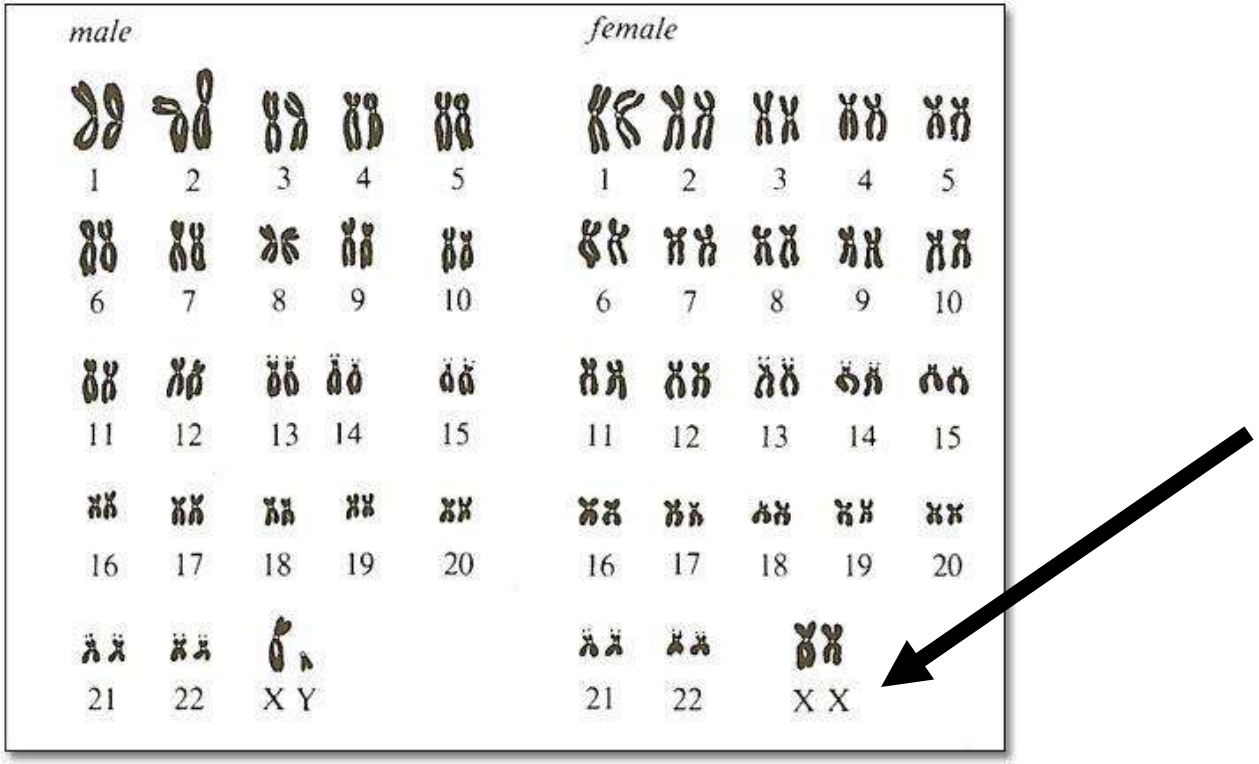
100% _____ _____



(Hint: Only design Punnett squares to suit the number of possible gametes.)

Sex Determination

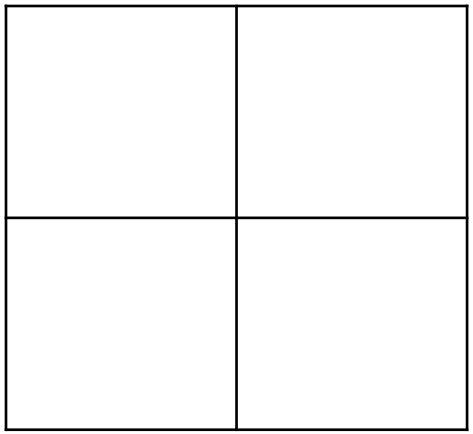
- People – **46** chromosomes or **23** pairs
- 22 pairs are **homologous** (look alike) – called **autosomes** – determine body traits
  1 pair is the **sex** chromosomes – determines sex (male or female)
- Females – sex chromosomes are **homologous** (look alike) – label **XX**
  Males – sex chromosomes are different – label **XY**



- What is the probability of a couple having a boy? Or a girl?

Chance of having female baby?

male baby?



Who determines the sex of the child?

Genetics with a Smile

Name _____

Part A: Smiley Face Traits

(1) Obtain two coins from your teacher. Mark one coin with a "F" and the other with a "M" to represent each of the parents. The parents are heterozygous for all the Smiley Face traits.

(2) Flip the coins for parent for each trait. If the coin lands with heads up, it represents a dominant allele. A coin that lands tails up indicates a recessive allele. Record the result for each person by circling the correct letter. Use the results and the Smiley Face Traits page to determine the genotype and phenotype for each trait.

Trait	Female	Male	Genotype	Phenotype
Face Shape	C c	C c		
Eye Shape	E e	E e		
Hair Style	S s	S s		
Smile	T t	T t		
Ear Style	V v	V v		
Nose Style	D d	D d		
Face Color	Y y	Y y		
Eye Color	B b	B b		
Hair Length	L l	L l		
Freckles	F f	F f		
Nose Color	R Y	R Y		
Ear Color	P T	P T		

Part B: Is it a boy or girl?

To determine the sex of your smiley face, flip the coin for the male parent. Heads would represent X, while tails would be Y.

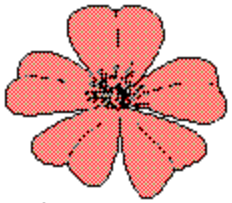
Incomplete dominance and Codominance

- When one allele is **NOT** completely **dominant** over another (they **blend**) – **incomplete dominance**

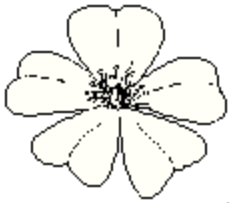
  Example: In carnations the color red (R) is incompletely dominant over white (W). The hybrid color is pink. Give the genotypic and phenotypic ratio from a cross between 2 pink flowers.

X

homozygous dominant



heterozygous



homozygous recessive

Genotypic = : :

Phenotypic = : :

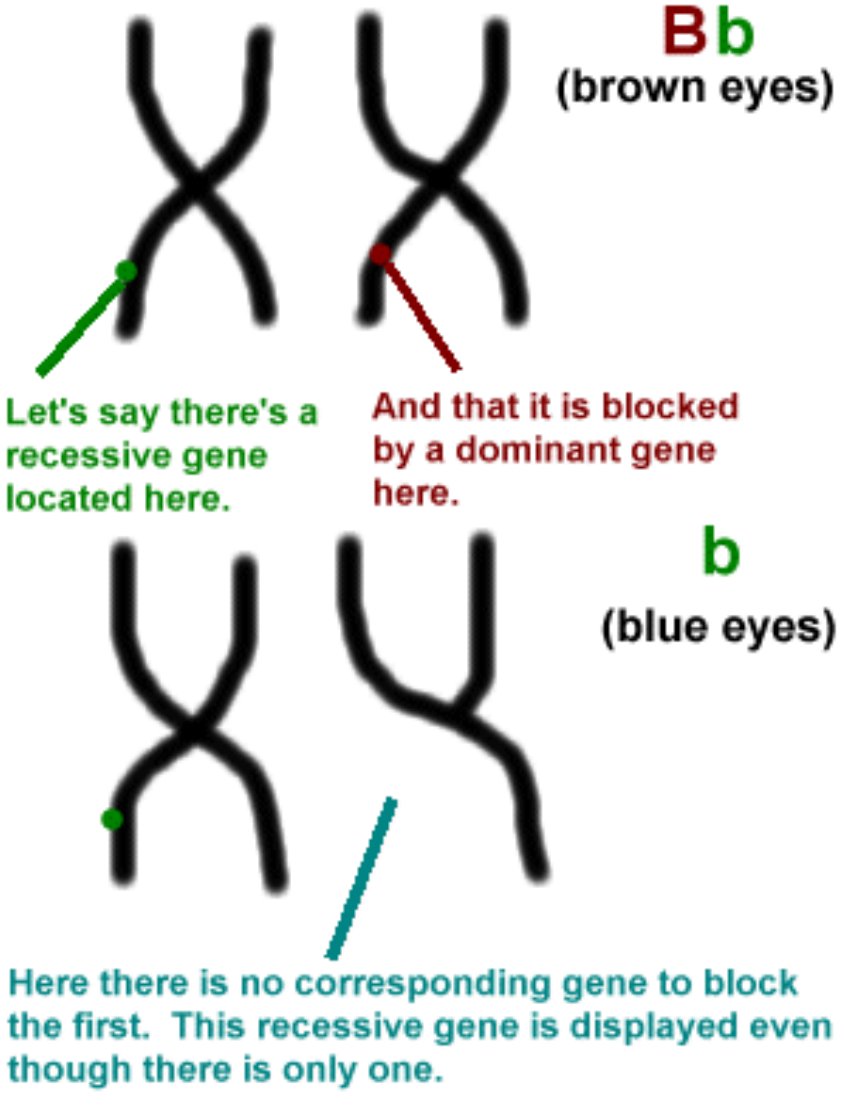
- When **both** alleles are **expressed** – **Codominance**

  Example: In certain chickens black feathers are codominant with white feathers.

  Heterozygous chickens have black and white speckled feathers.

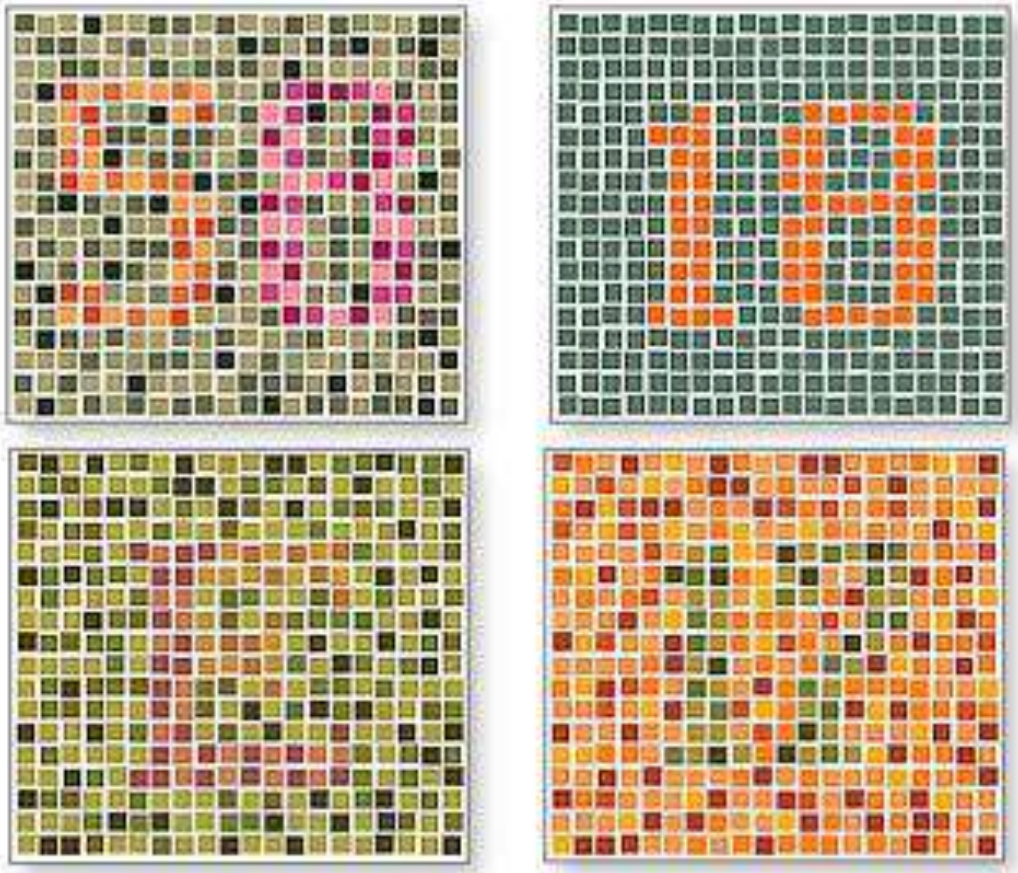
Sex – linked Traits

- **Genes** for these **traits** are located **only** on the **X** chromosome (NOT on the Y chromosome)
- X linked alleles **always** show up in **males** whether **dominant** or **recessive** because males have only **one** X chromosome



- Examples of **recessive** sex-linked disorders:

  1. **colorblindness** – inability to distinguish between certain colors

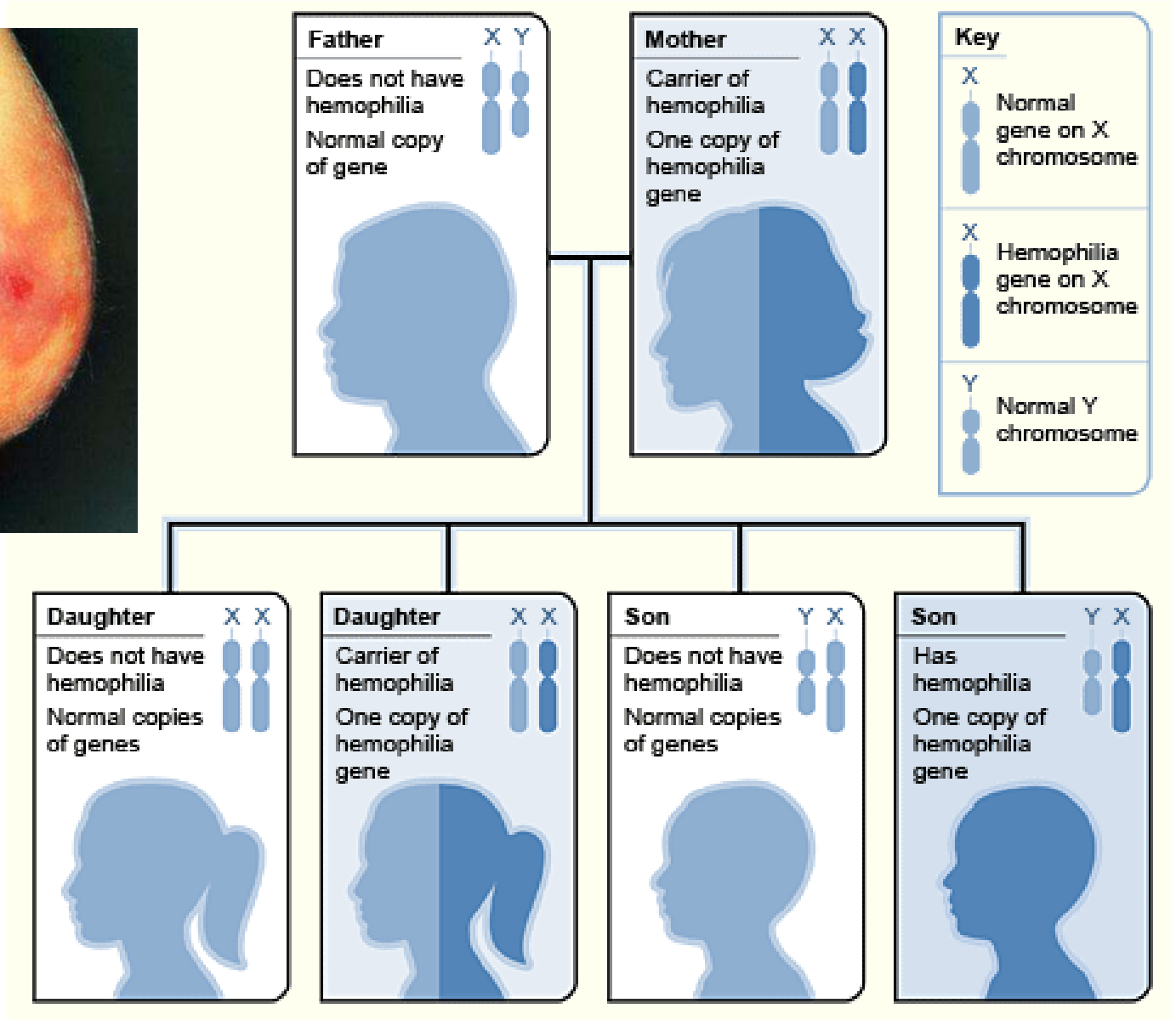


Various tests for color blindness

You should see **58** (upper left), **18** (upper right), **E** (lower left) and **17** (lower right).

Color blindness is the inability to distinguish the differences between certain colors. The most common type is red-green color blindness, where red and green are seen as the same color.

2. hemophilia – blood won't clot



- Example: A female that has normal vision but is a carrier for colorblindness marries a male with normal vision. Give the expected phenotypes of their children.

  N = normal vision

  n = colorblindness

X

Phenotype:

http://www.youtube.com/watch?v=OZIQTMHmWmg

Watch the video and answer questions. Questions on next page.

Stopped here on 5/12

"Bill Nye: Genes" Video Worksheet

1. Where do your genes come from?

2. What is inside every cell in your body?

3. What does DNA stand for?

4. What did Bill climb to get out of the Nye Lab?

5. How long is the DNA string model of science?

6. How many times longer is DNA than it is wide?

7. How does Bill define a Gene?

8. Why is the white blood cell dark on the computer screen?

9. What does the nucleus of the cell contain?

10. What can you do with DNA after you take it out of an organism?

a.

b.

11. What 2 organisms were combined to create the message to Bill in the petri dish?

12. What do genes do?

13. Mom tells Richie: Genes are the set of _____ _____ that get passed down from _____to child. In the process, of course, the genetic material is _____ in new ways, which is why people bear resemblance to their _____ and _____without looking like any one relative in particular.

14. What analogy does Bill use to describe the human set of chromosomes?

15. What is each chapter analogous to?

16. How many genes to humans have?

17. What do cells in the body not need to do? _____

18. Most species have fewer than _____chromosomes but thousands and thousands of genes

19. Bill calls the babies "bundles of _____"

20. The reproductive cell that a mother donates to her child is called the ____

21. The reproductive cell that a father donates to his child is called the _____

22. The number of cells needed to make a baby is: _____

23. DNA is the _____ print for the future

24. Earlobes can be _____or _____

25. A _____is a piece of the _____ molecule

26. The four chemicals of DNA are

a.

b.

c.

d.

27. The number of chromosomes that a mule foal has is _____

28. The number of chromosomes that a horse has is _____

29. The number of chromosomes that a donkey has is _____

30. In the demonstration, the _____ gene for rolling your tongue is represented by the letter “R”

31. In the demonstration, the _____ gene for rolling your tongue is represented by the letter “r”

32. If a person has the pattern RR, then the person _____ roll their tongue

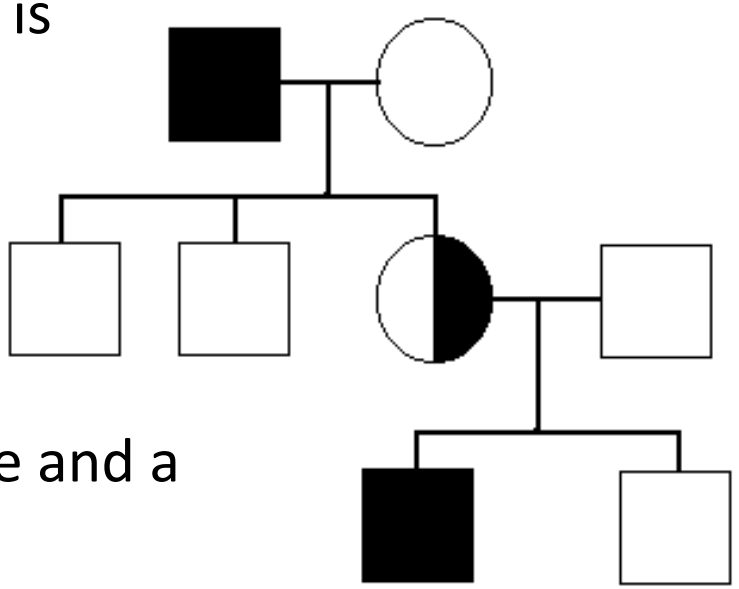
33. If a person has the pattern Rr, then the person _____ roll their tongue

34. If a person has the pattern rr, then the person _____ roll their tongue

35. What is special about the turtle in this movie?

Pedigrees

- **Graphic** representation of how a **trait** is passed from parents to **offspring**
- Tips for making a pedigree
  1. **Circles** are for females
  2. **Squares** are for males
  3. **Horizontal lines** connecting a male and a female represent a **marriage**
  4. **Vertical line** and **brackets** connect parent to offspring
  5. A **shaded** circle or square indicates a person **has** the trait
  6. A circle or square **NOT shaded** represents an individual who does NOT have the trait
  7. **Partial** shade indicates a **carrier** – someone who is **heterozygous** for the trait



- Example: Make a pedigree chart for the following couple. Dana is color blind; her husband Jeff is not.

  They have two boys and two girls.

  HINT: Colorblindness is a recessive sex-linked trait.

Multiple Alleles

- **3 or more alleles** of the **same** gene that code for a **single** trait
- In humans, **blood type** is determined by 3 alleles – **A**, **B**, and **O**

BUT each human can only **inherit 2** alleles

1. Dominant – A and B (codominance)

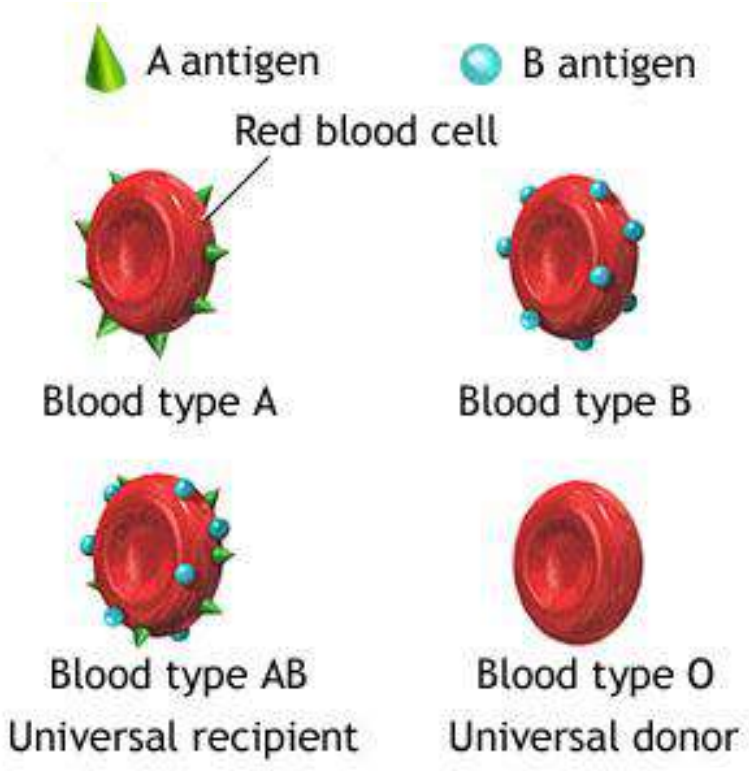
   Recessive – O

2. Blood type – A = AA or AO

   B = BB or BO

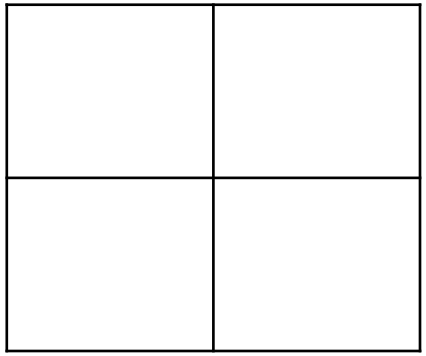
   AB = AB

   O = OO



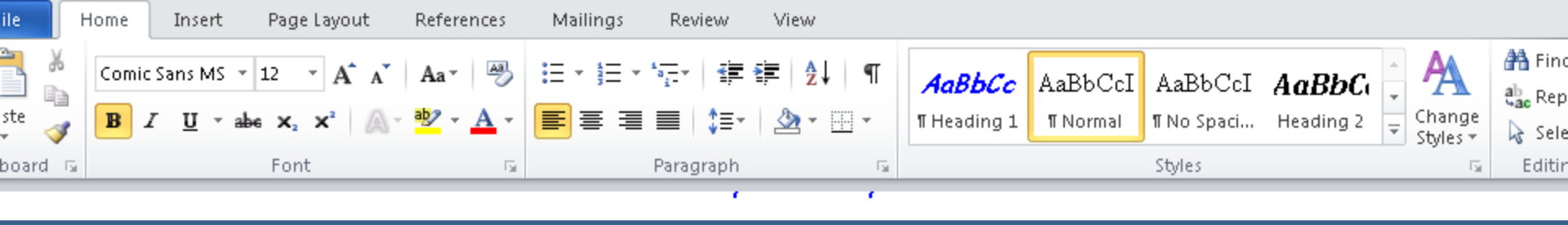
Example: What would be the possible blood types of children born to a female with type AB blood and a male with type O blood?

X



Children would be type or only

"Bill Nye: Genes" Video Worksheet -- ANSWERS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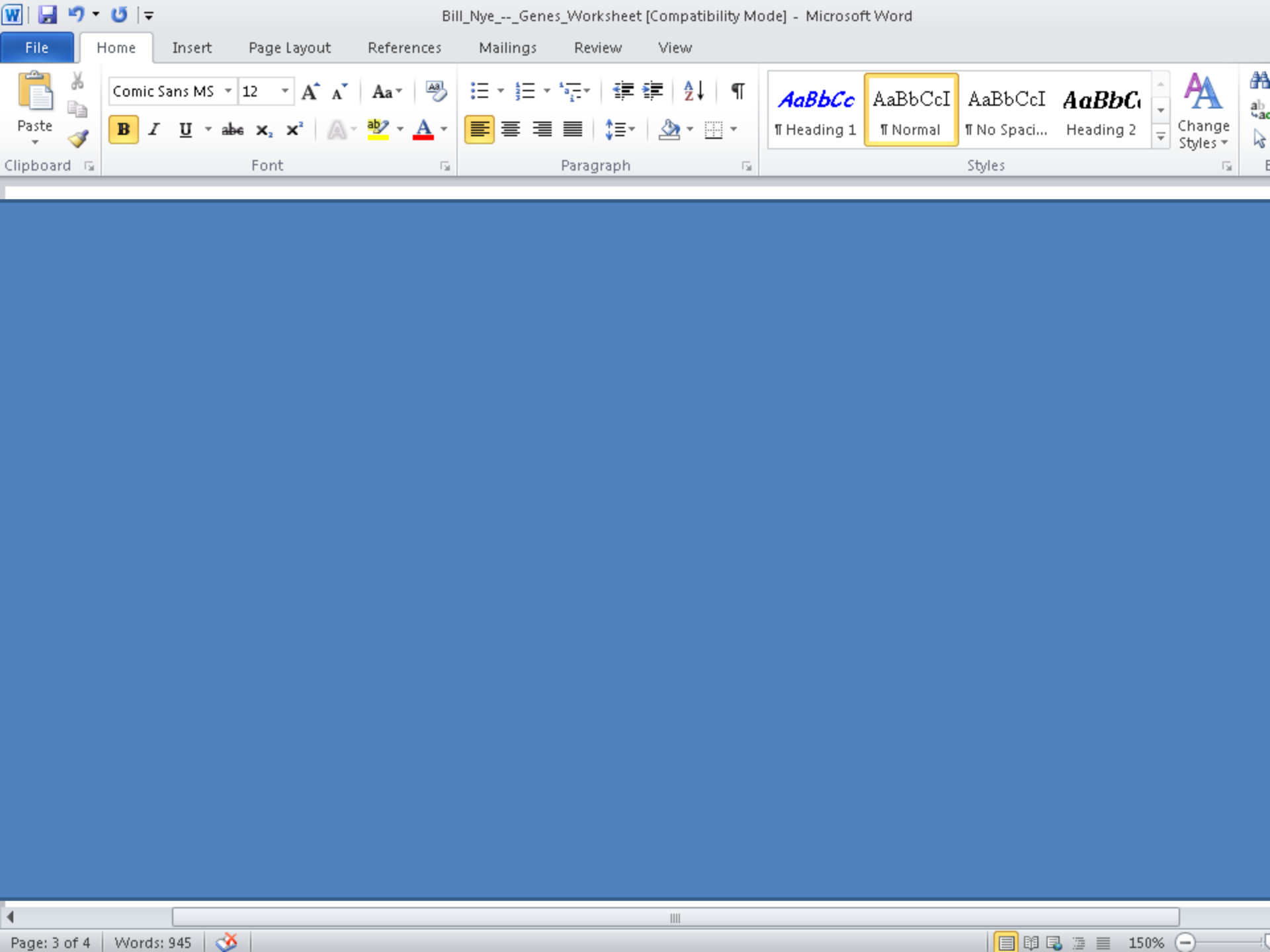
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Name _____ Date _____

25.The four chemicals of DNA are

4. guanine

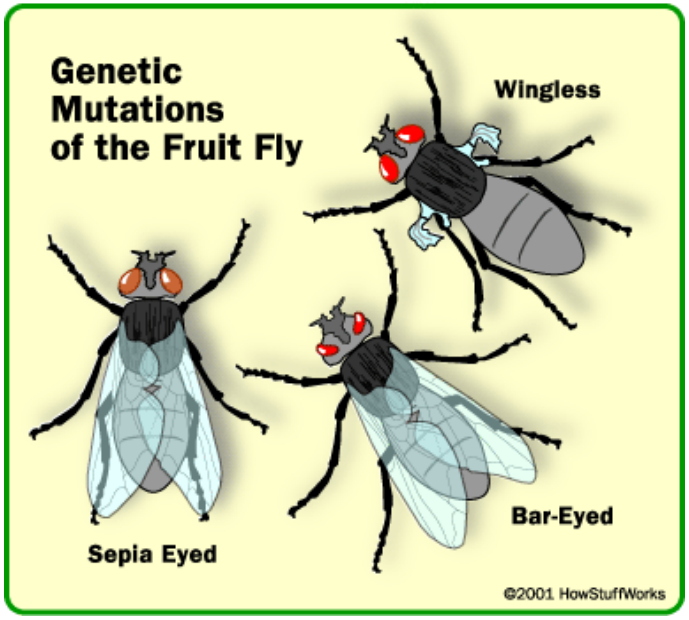
Mutations

- Mutation – sudden **genetic change** (change in **base** pair sequence of **DNA**)
- Can be :

  Harmful mutations – organism **less able** to survive: genetic disorders, cancer, death

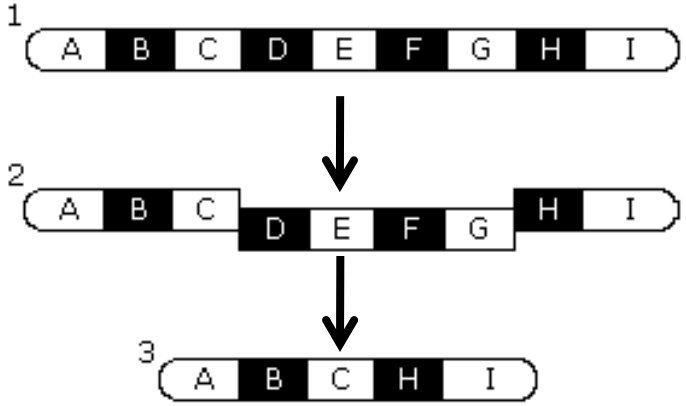
  Beneficial mutations – allows organism to **better survive**: provides **genetic variation**

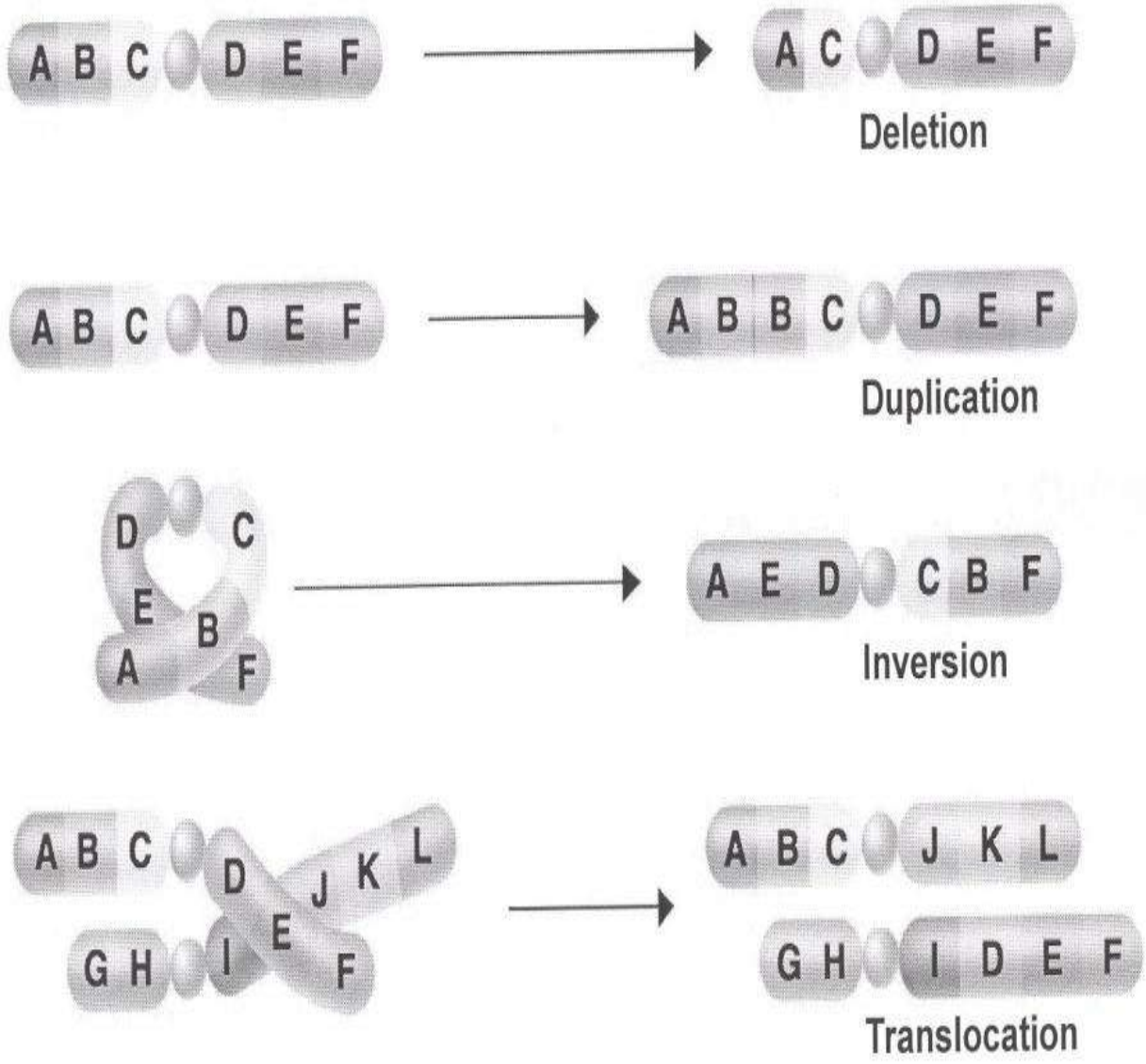
  Neutral mutations – **neither** harmful nor helpful to organism
- Mutations can occur in 2 ways: **chromosomal** mutation or **gene/point** mutation



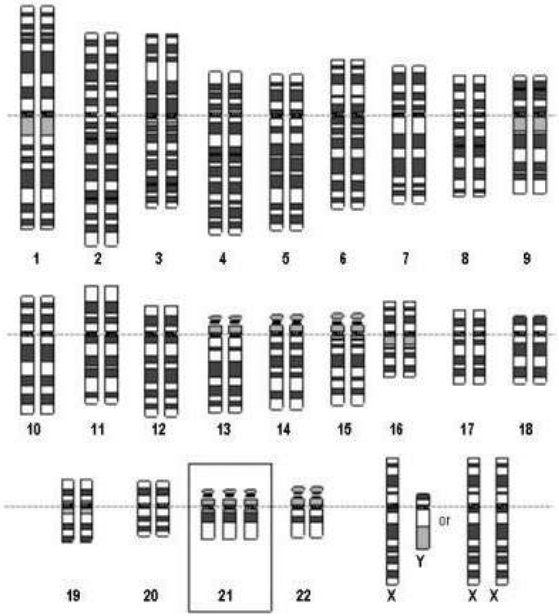
Chromosomal mutation:

- **less common** than a gene mutation
- more **drastic** – affects entire **chromosome**, so affects **many genes** rather than just one
- caused by failure of the **homologous** chromosomes to **separate** normally during **meiosis**
- **chromosome pairs** no longer look the same – too few or too many genes, different shape

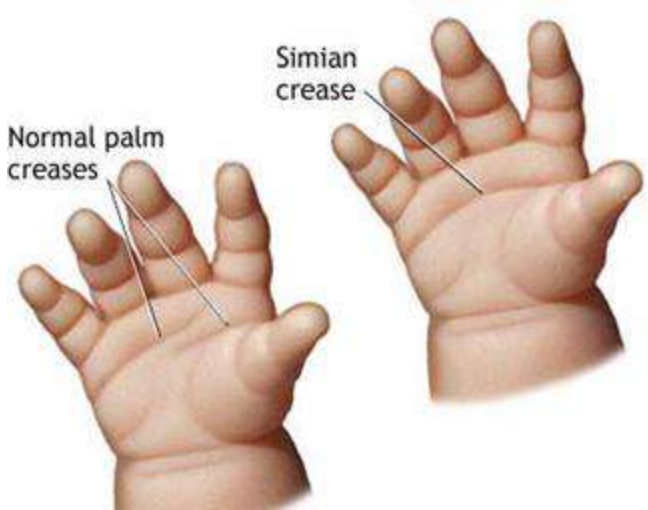



A B C D E F
A C D E F
Deletion
A B C D E F
A B B C D E F
Duplication
D C E B A F
A E D C B F
Inversion
A B C D J K L
G H I E F
A B C J K L
G H I D E F
Translocation

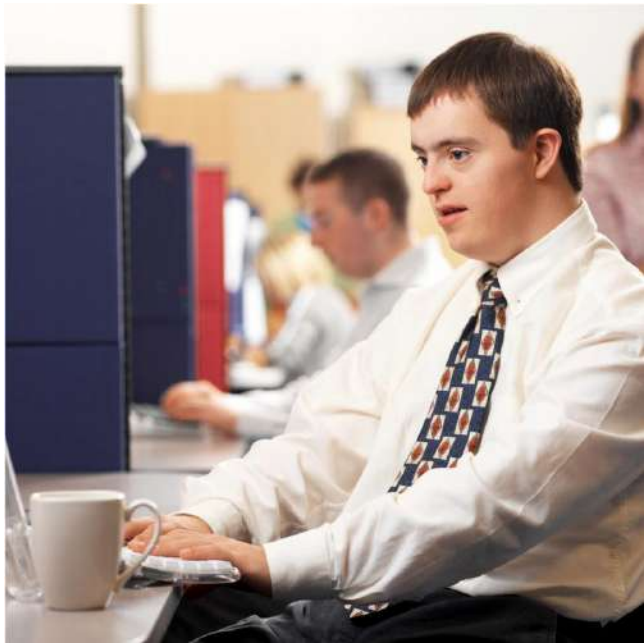
- Examples:
  Down's syndrome – (Trisomy 21) **47** chromosomes, extra chromosome at pair **#21**



flattened nose and face, upward slanting eyes,

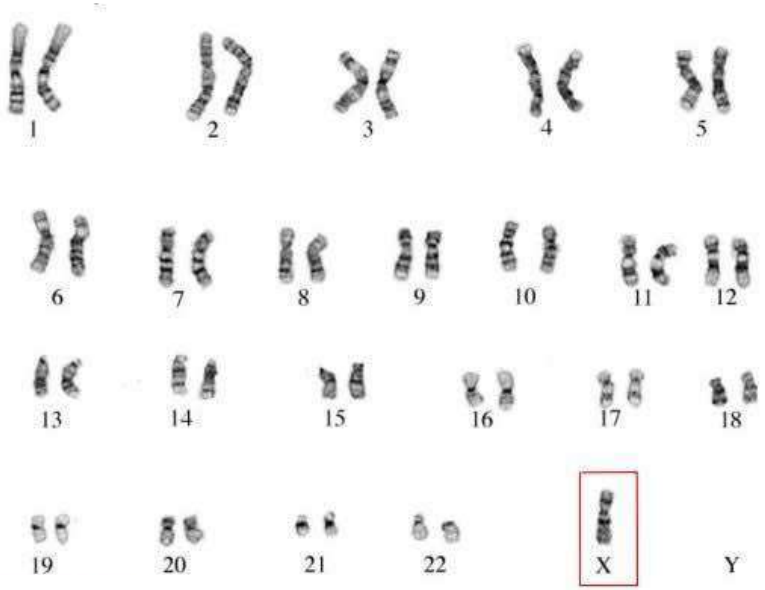


widely separated first and second toes and increased skin creases



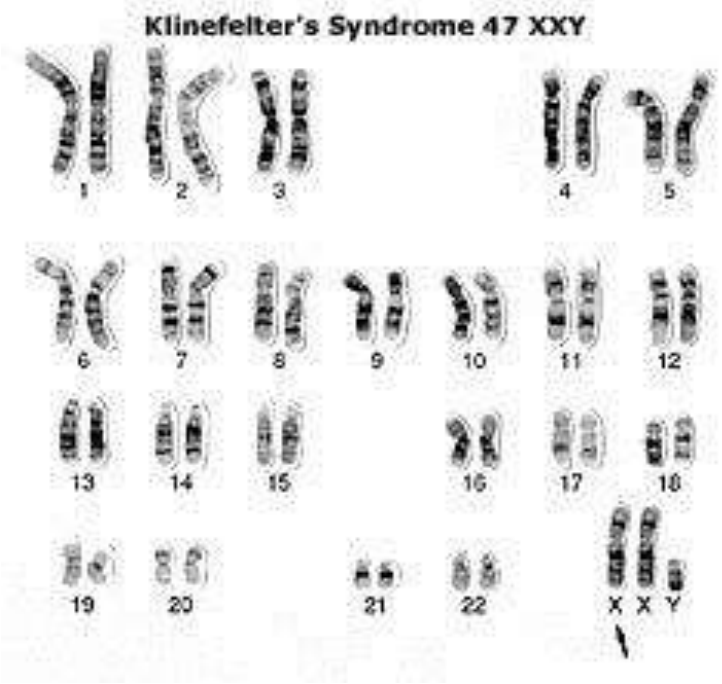
Turner's syndrome – only **45** chromosomes, missing a **sex** chromosome (X)

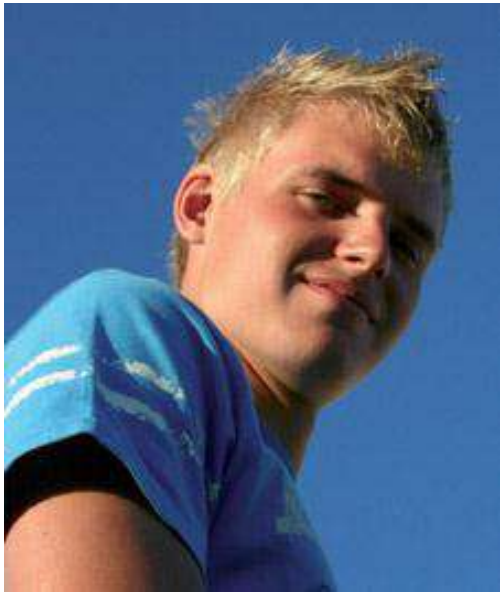
Girls affected – short, slow growth, heart problems



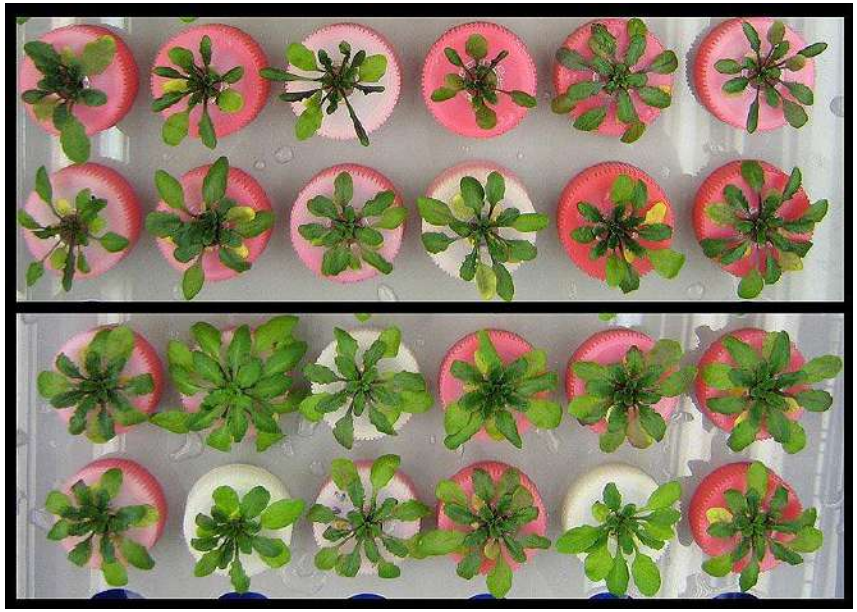
Klinefelter's syndrome – **47** chromosomes, **extra X** chromosomes (XXY)

Boys affected – low testosterone levels, underdeveloped muscles, sparse facial hair





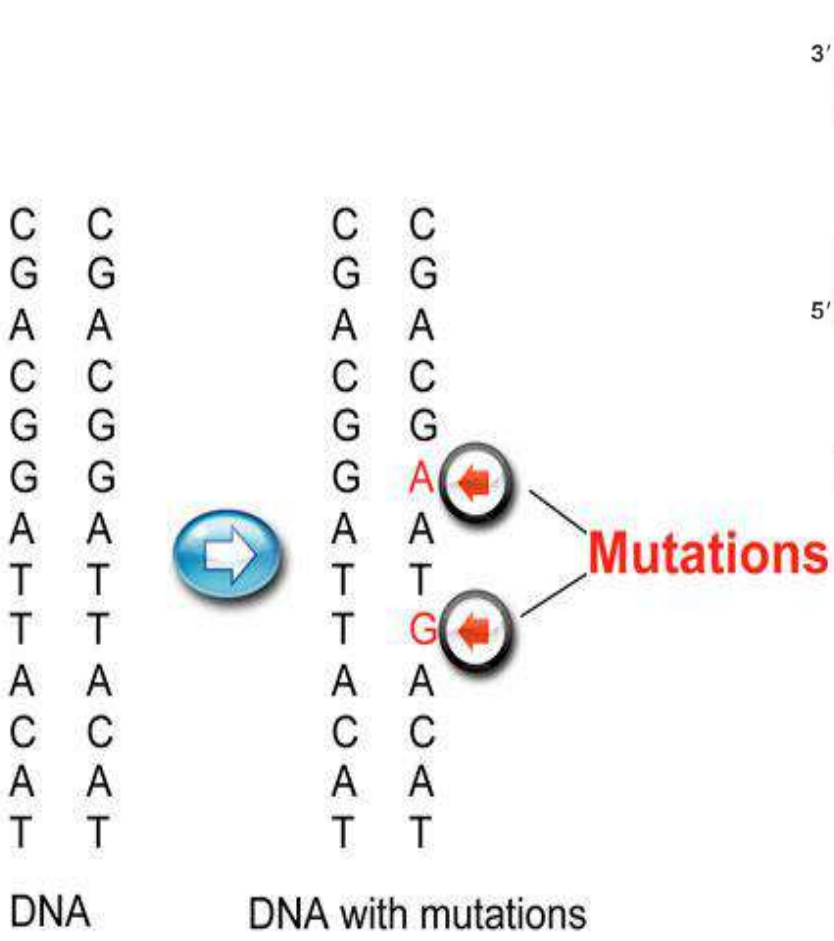
- Having an **extra set** of chromosomes is **fatal** in **animals**, but in **plants** it makes them **larger** and **hardier**.

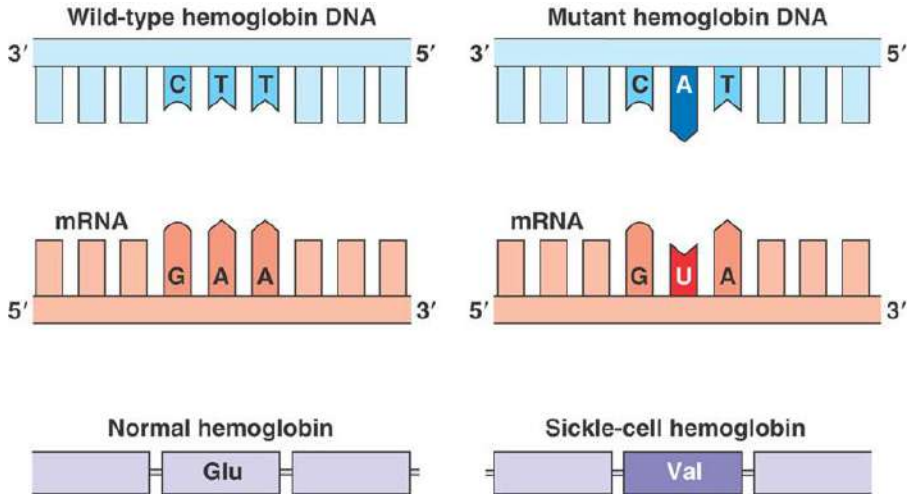


Hardier

Gene or Point Mutation

- **most common** and **least drastic**
- only **one gene** is altered

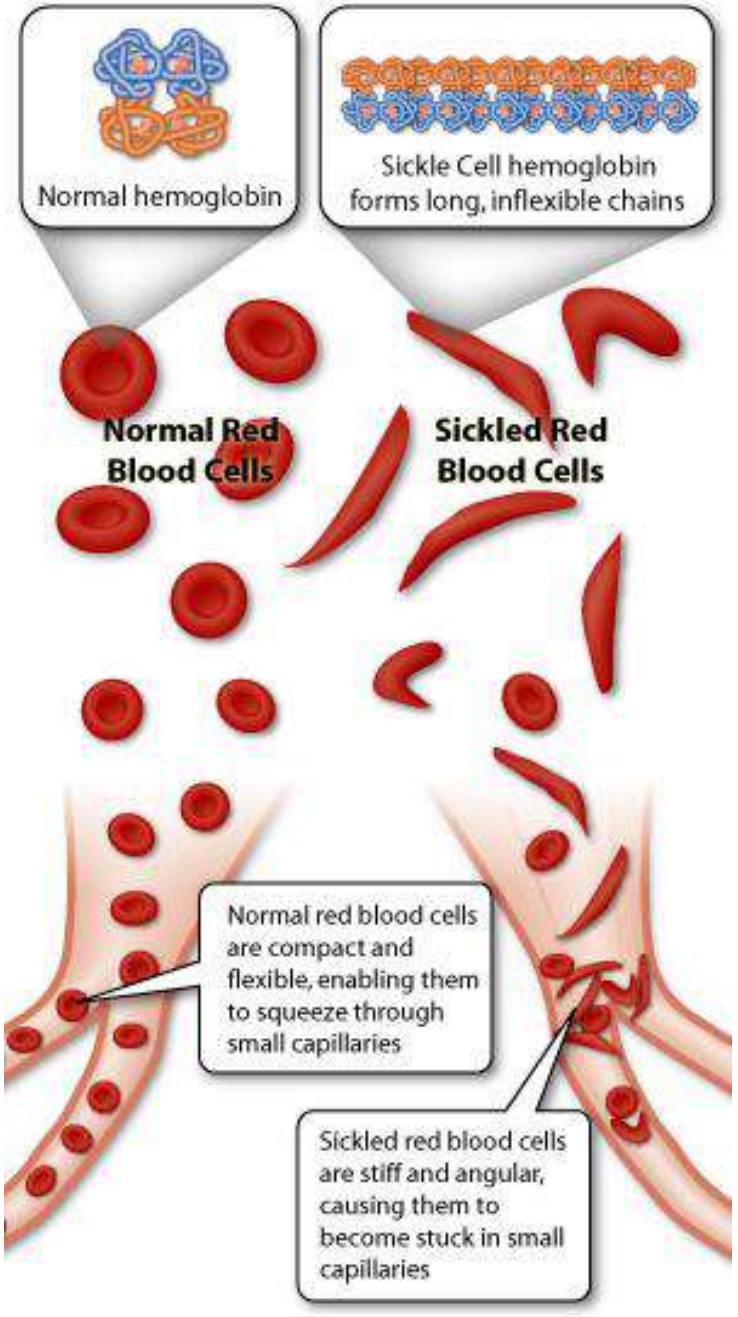




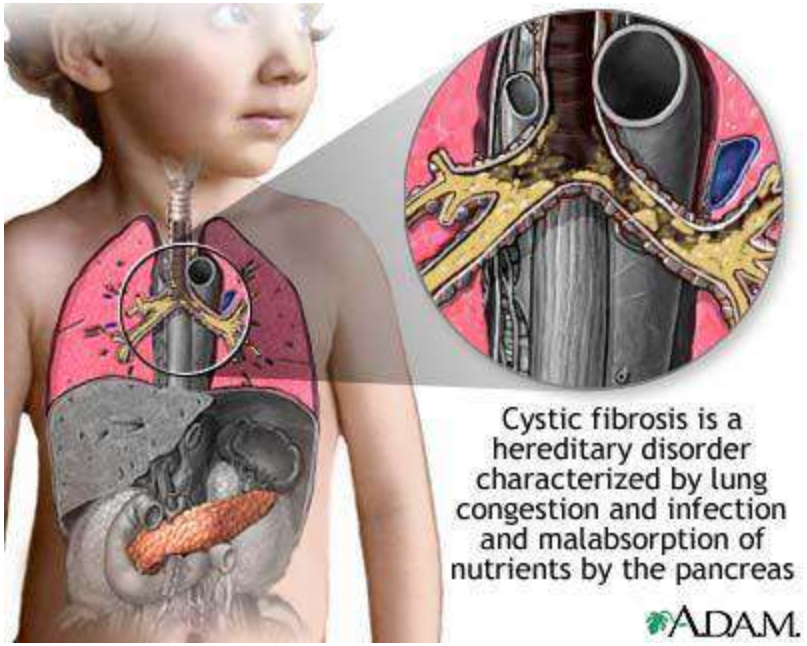
- Examples:

Recessive gene mutations:

Sickle cell anemia – **red blood cells** are sickle shaped instead of round and cannot carry enough **oxygen** to the body tissues – heterozygous condition protects people from **malaria**

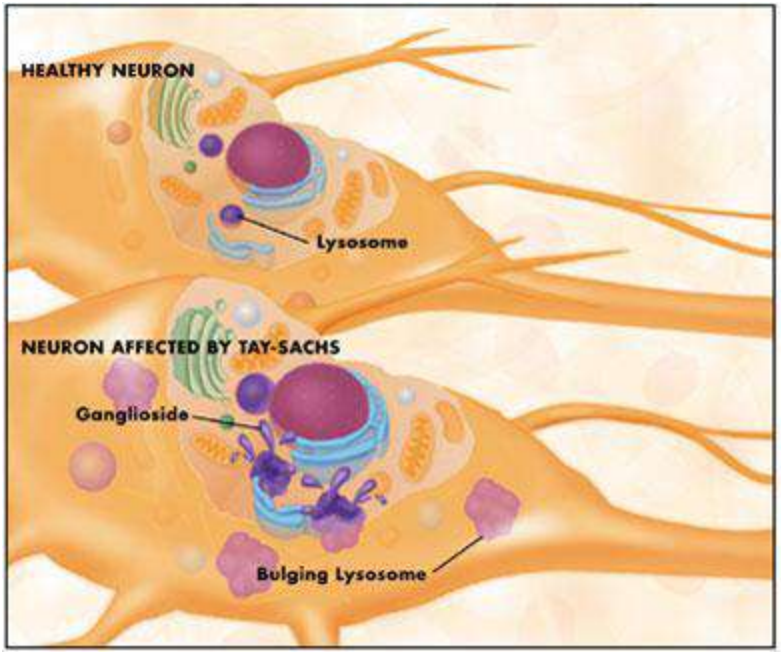


Cystic fibrosis – **mucous** builds up in the **lungs**



Tay-Sachs Disease – deterioration of the **nervous system** – early death

Mutated genes produce enzymes that are less effective than normal at breaking down fatty cell products known as gangliosides. As a result, gangliosides build up in the lysosomes and overload cells. Their buildup ultimately causes damage to nerve cells.

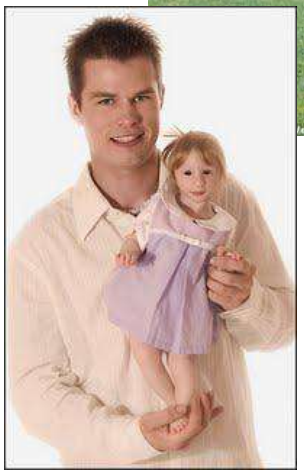


Phenylketonuria (PKU) – an **amino acid** common in **milk** cannot be broken down and as it builds up it causes **mental retardation** – newborns are tested for this

Dominant gene mutations:

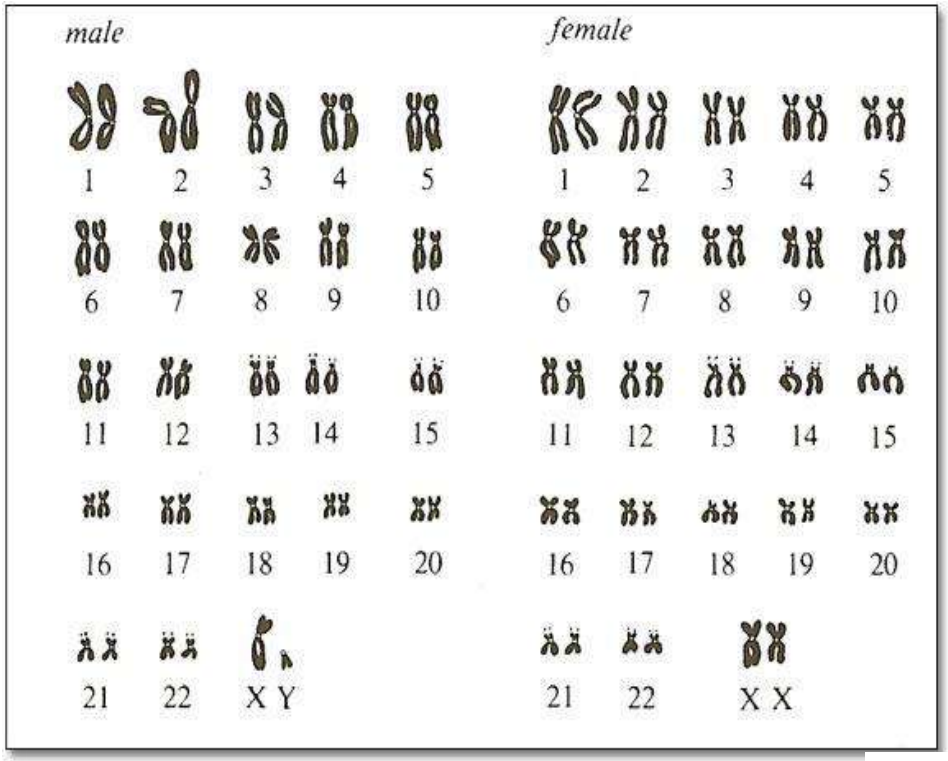
Huntington's disease – gradual **deterioration** of **brain tissue**, shows up in **middle age** and is **fatal**

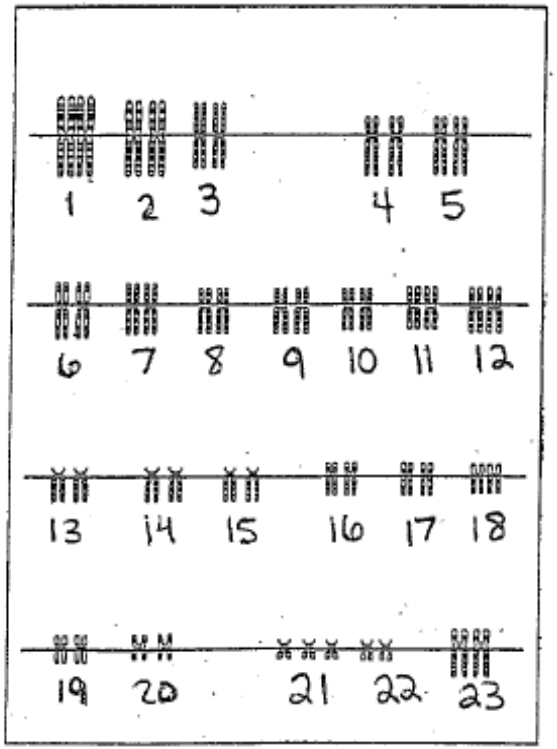
Dwarfism – variety of **skeletal** abnormalities



Detecting Genetic Disorders

- picture of an individual's chromosomes – **karyotype**
- amniotic fluid surrounding the embryo is removed for analysis – **amniocentesis**





Female with **Down's** syndrome