Simple Genetics

Section 3 – Studying Heredity

Inheritance of Traits

- **Autosomal**

  Non-sex chromosomes

  The gene will appear in both sexes equally
  ex: hair or eye color

Inheritance of Traits

- **Sex-linked**

  The allele of the gene will only appear on the **X or Y gene**

  Mostly recessive

  ex: Albinism or Red-green colorblindness or Male Pattern Baldness

Inheritance of Traits

- **Autosomal Dominant**

  Every individual with the condition will **have a parent with** the condition

  Example: **Huntington's Disease**

Inheritance of Traits

- **Recessive**

  Every individual with the condition can either have **<u>one, two or neither parent</u>** with the condition

  Example: **Cystic Fibrosis**

Traits cont.

- **Heterozygous or Homozygous Dominant:**
  The individual will show the **dominant** allele
  Example: **Detached Earlobes**
- **Homozygous:**
  They will show the **recessive** allele
  Example: **Attached Earlobes**

Review Questions:

1. Using 1-3 sentences summarize the words; autosomal, sex-linked, heterozygous dominant and recessive, so someone can understand the differences (do not just copy definitions).
2. Devise a possible plan to figure out which traits you received from your mother and which you received from your father based on autosomal and sex-linked traits.

Recap of Day 2

1. **Heterozygous and Homozygous Dominant**
   a. **Examples: Gg and GG**

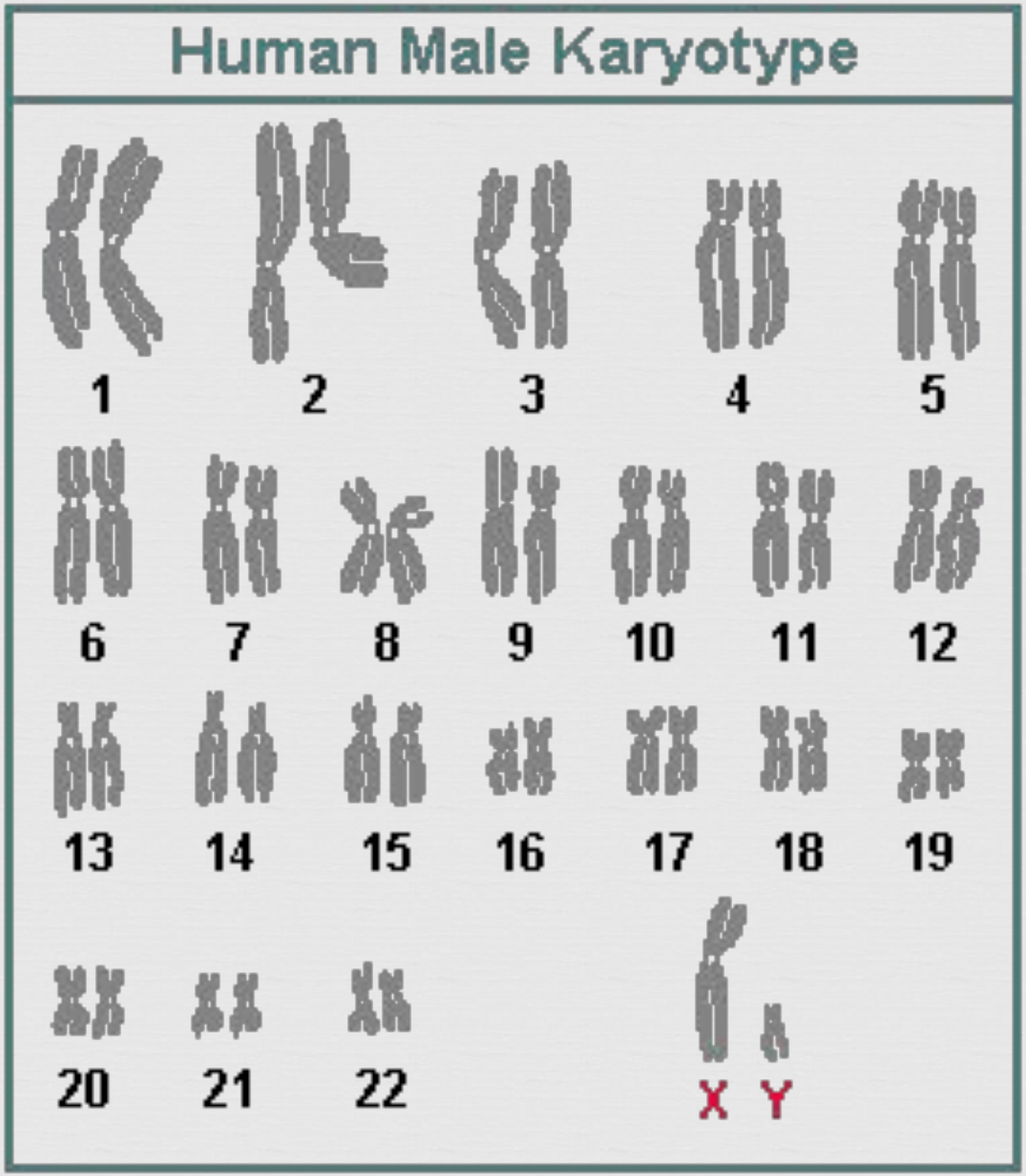
2. **Punnett Square Purpose**

3. **Probabilities**

Karotype

Useful to determine if there are **extra or missing chromosomes** due to **abnormalities** in meiosis and fertilization

Examples:
Down Syndrome
Polydactyl - extra limbs


Human Male Karyotype
1
2
3
4
5
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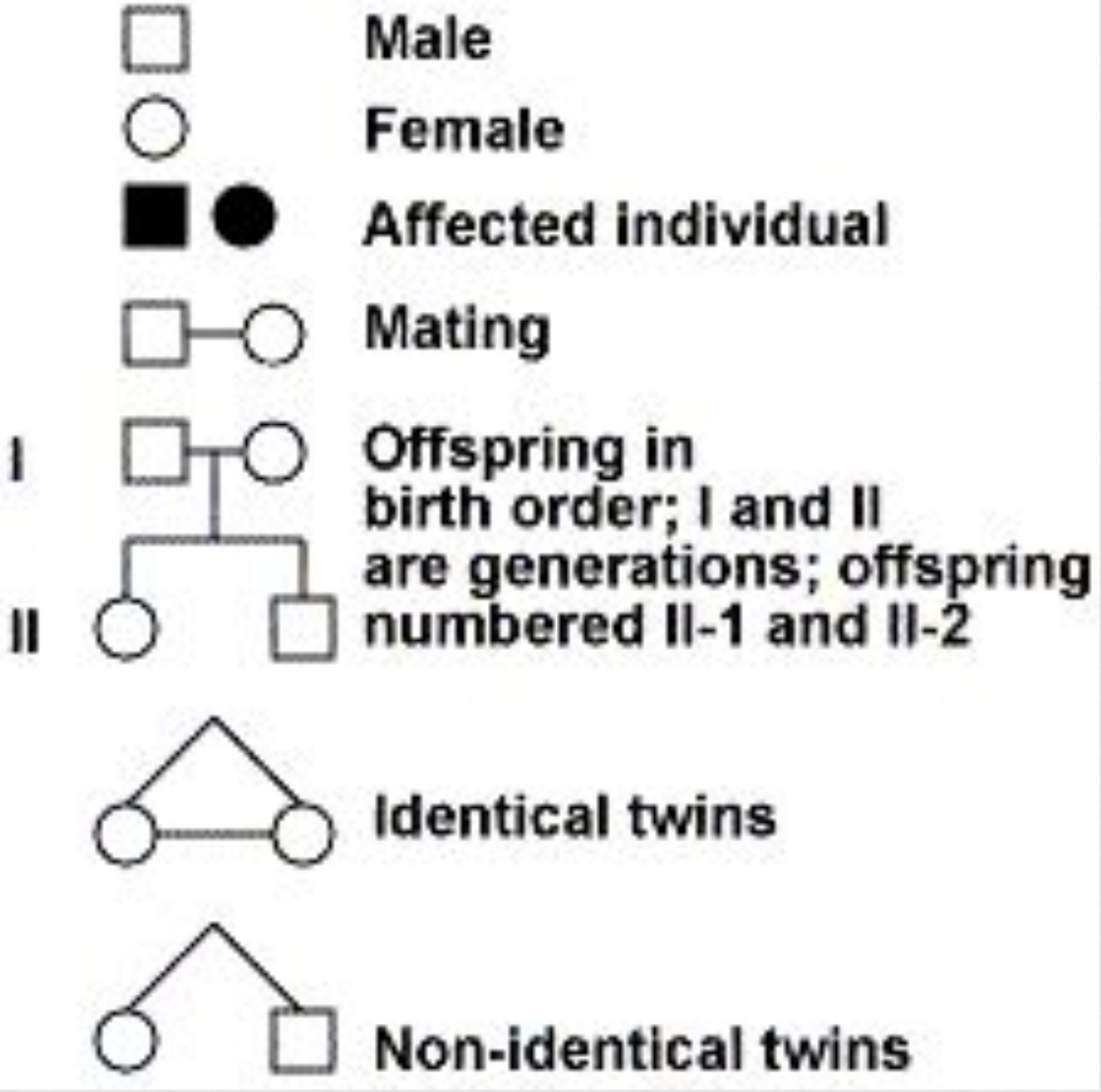
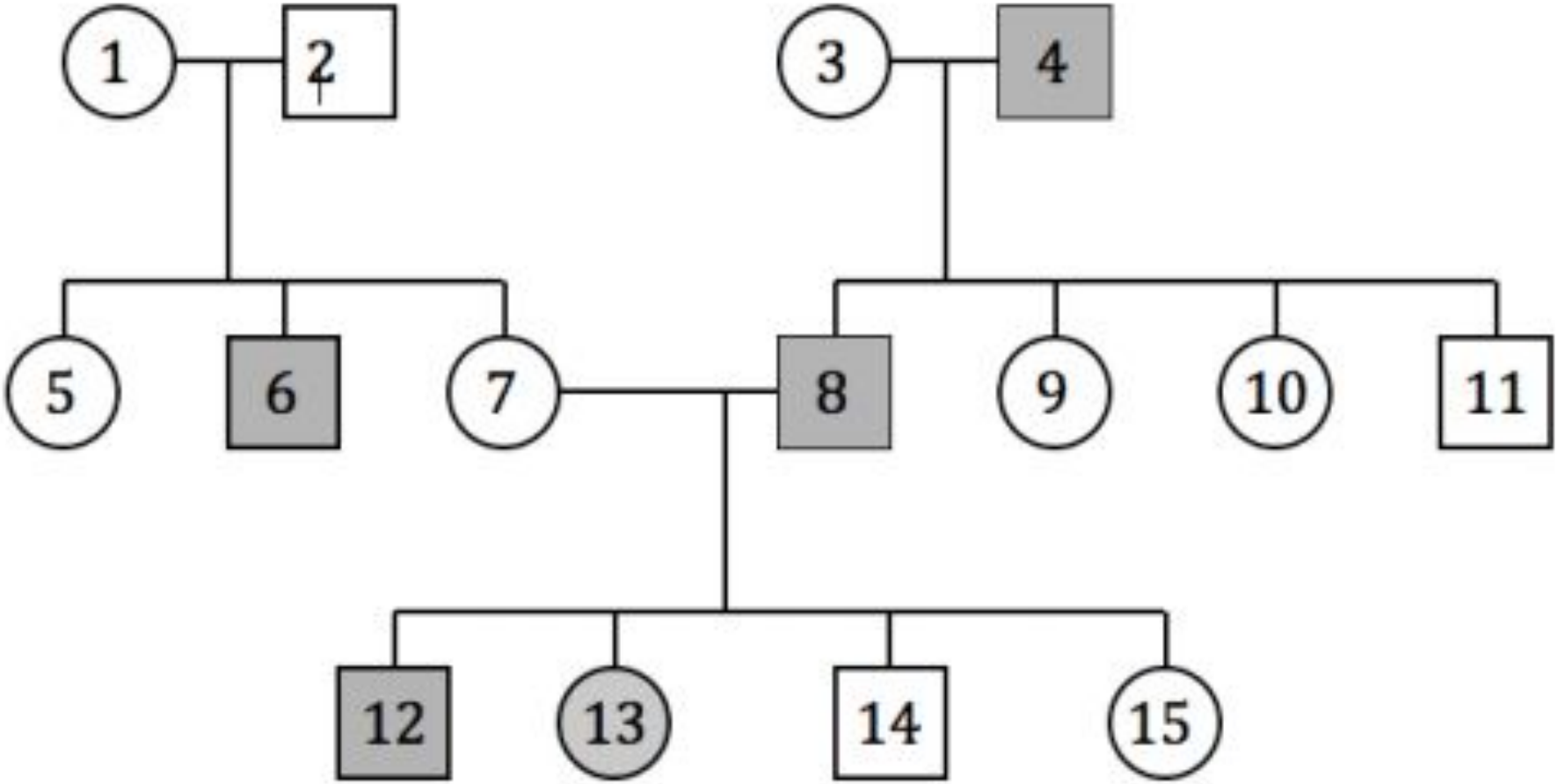
21
22
X
Y


Male
Female
Affected individual
Mating
I
II
Offspring in
birth order; I and II
are generations; offspring
numbered II-1 and II-2
Identical twins
Non-identical twins



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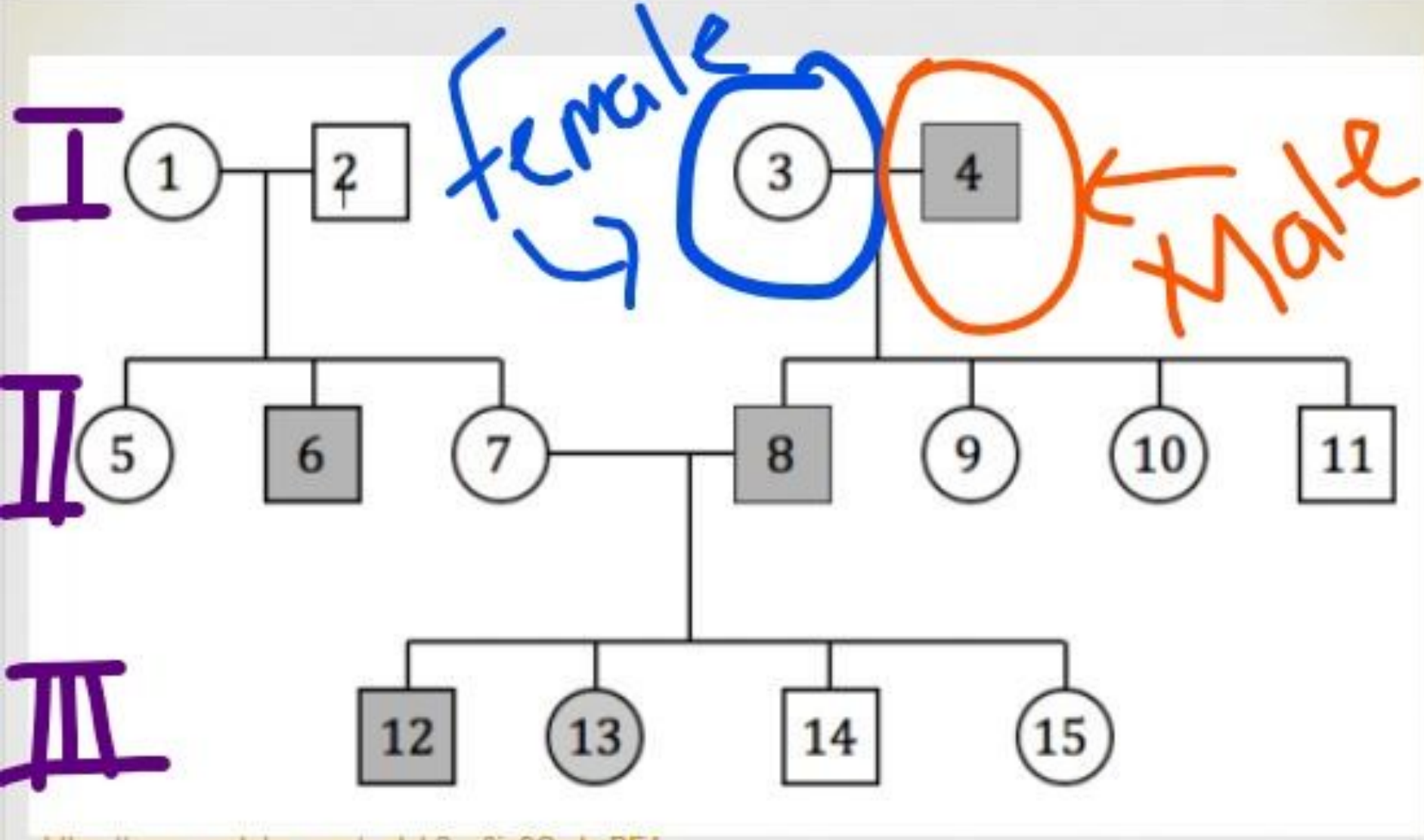

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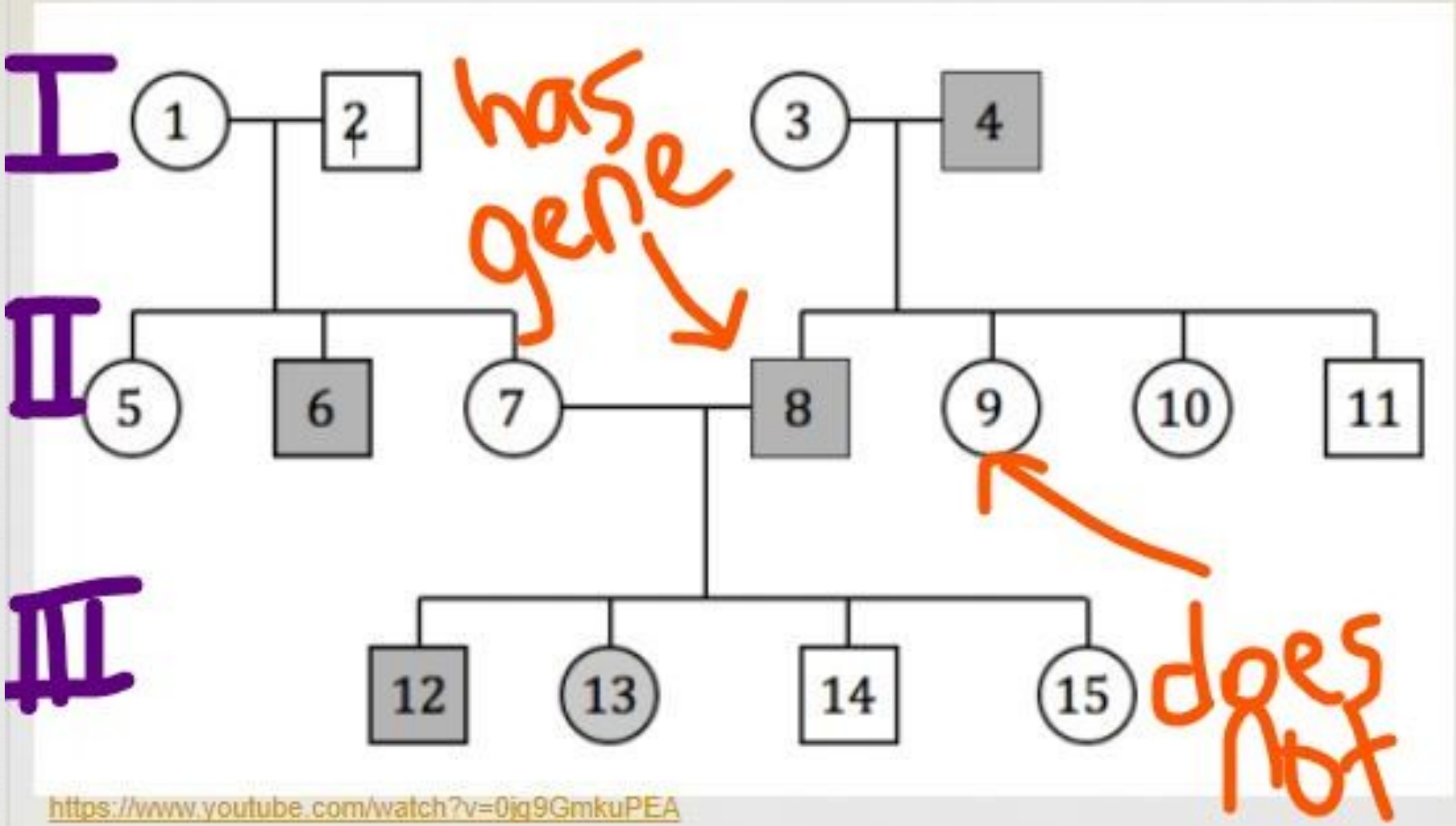


https://www.youtube.com/watch?v=0jq9GmkuPEA

Comparing Pedigrees

Dominant

- If two affected parents have an unaffected child
- Occurs more often in a pedigree = **more shaded** individuals

Recessive

- If two **unaffected** people have an **affected child**, it is a recessive pedigree

Comparing Pedigrees

Autosomal Dominant

- All unaffected are **homozygous recessive** (ex. dd)
- The affected parents of an unaffected child must be heterozygotes Dd

Autosomal Recessive

- All affected are **homozygous recessive**
- If two unaffected mate and have an affected child, both parents must be **Rr heterozygotes**

Pedigree charts

Pedigree showing albinism

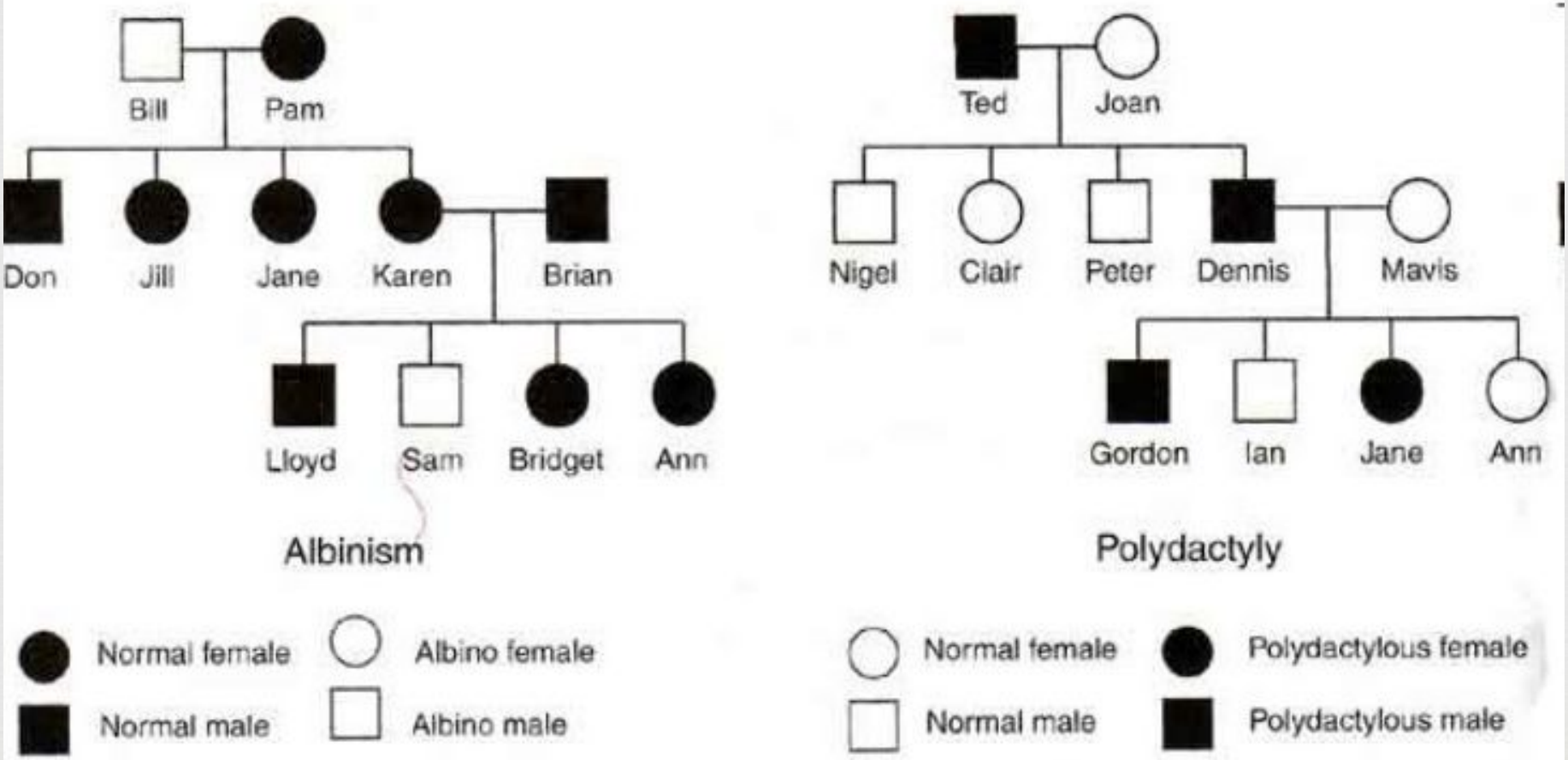


Fig. 3.8: Pedigrees showing inheritance of albinism and polydactyly.

Pedigree charts

Pedigree showing albinism

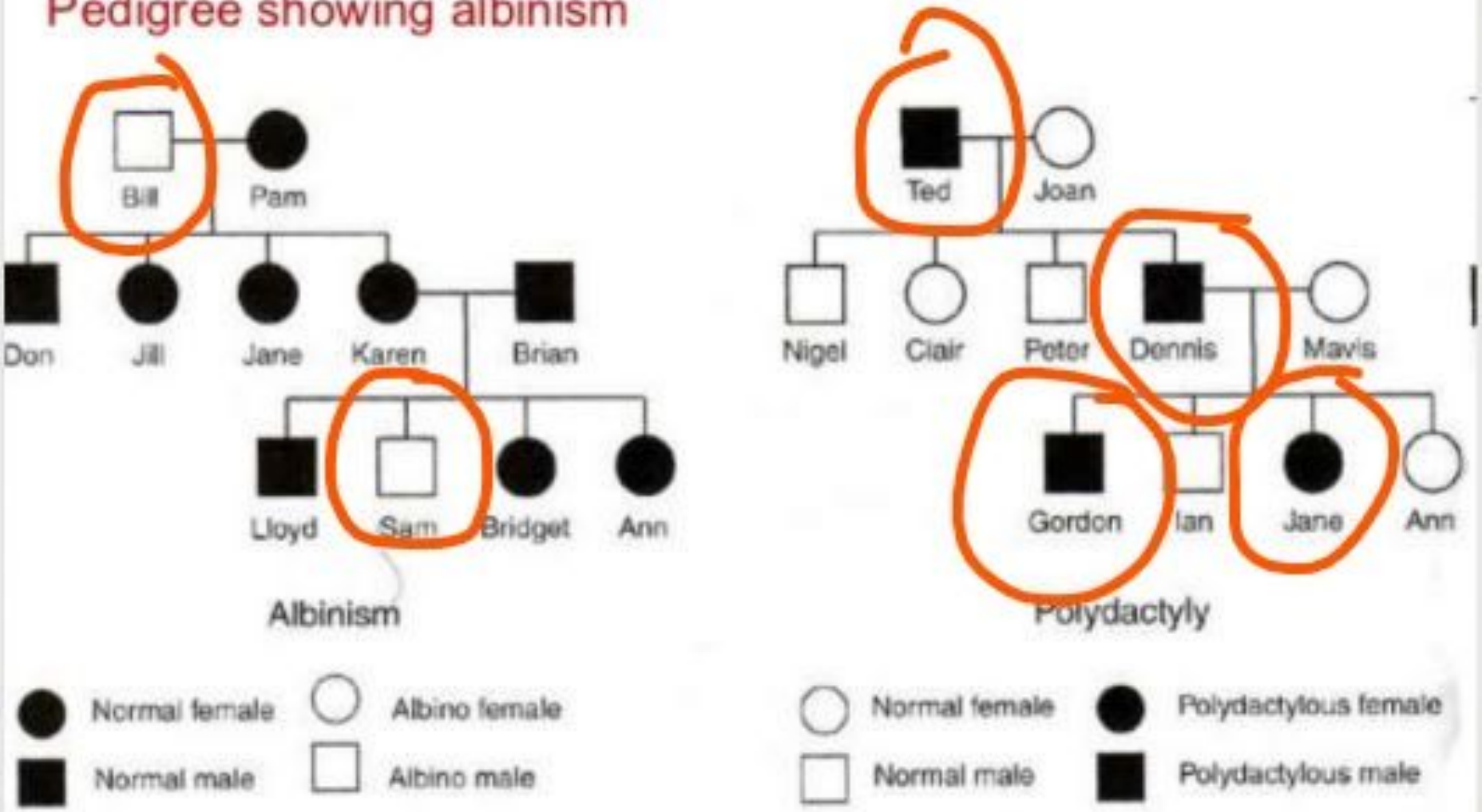


Fig. 3.8: Pedigrees showing inheritance of albinism and polydactyly.

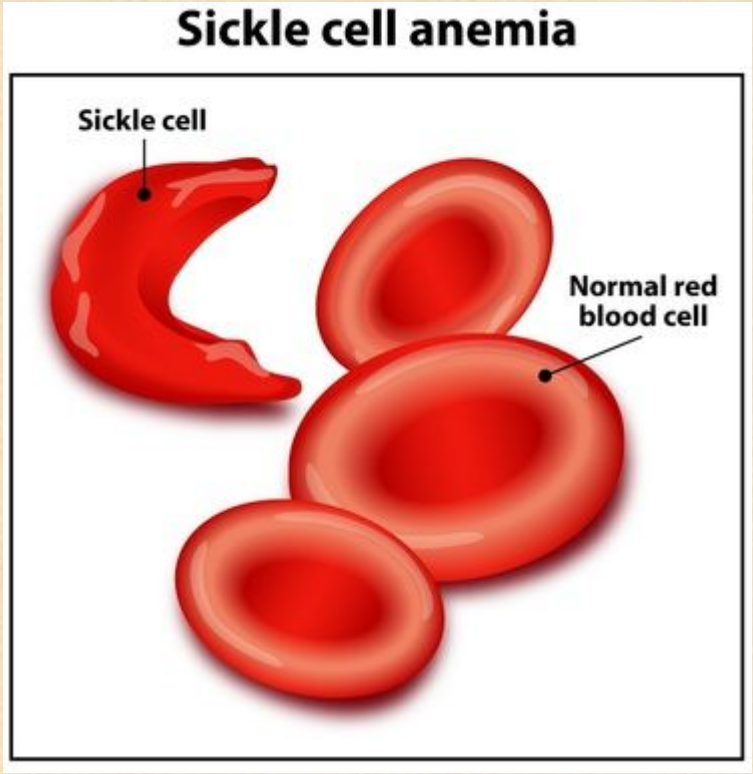
Genetic Disorders

- Think time!

What is a genetic disorder?
Can they be prevented?

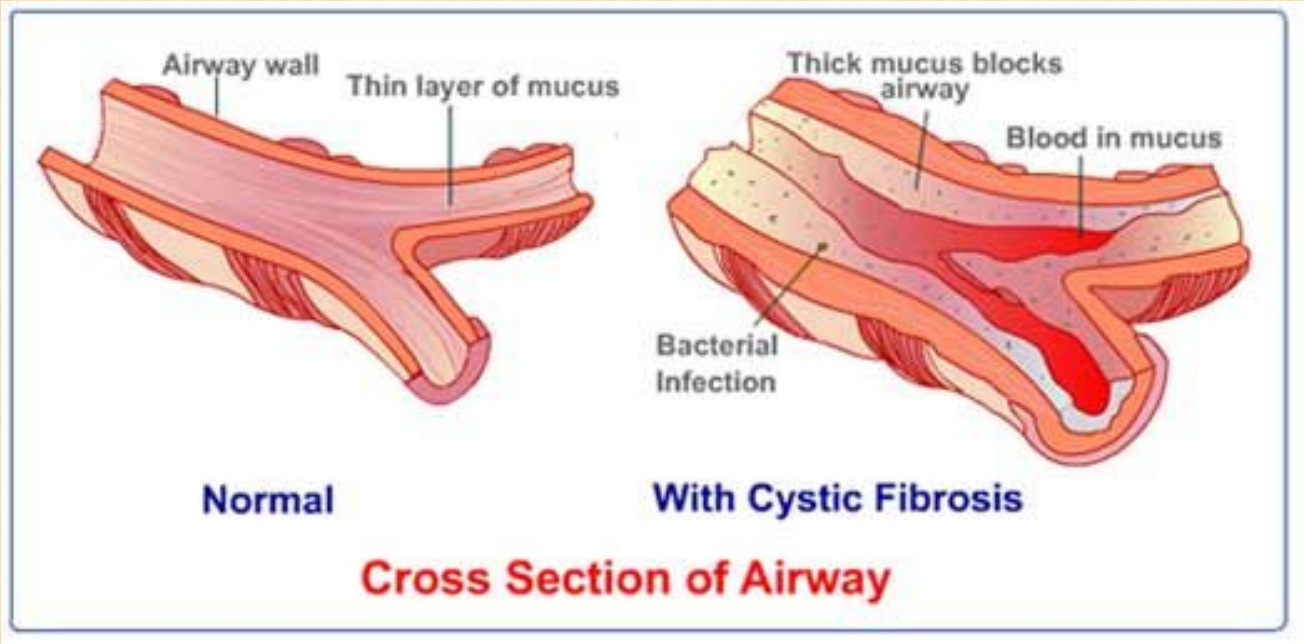
Genetic Disorders

- **Sickle Cell Anemia**
  - Recessive genetic disorder that produces a **defective protein** hemoglobin
  - Allows for less oxygen to be carried through the blood
  - Protects against the disease - Malaria



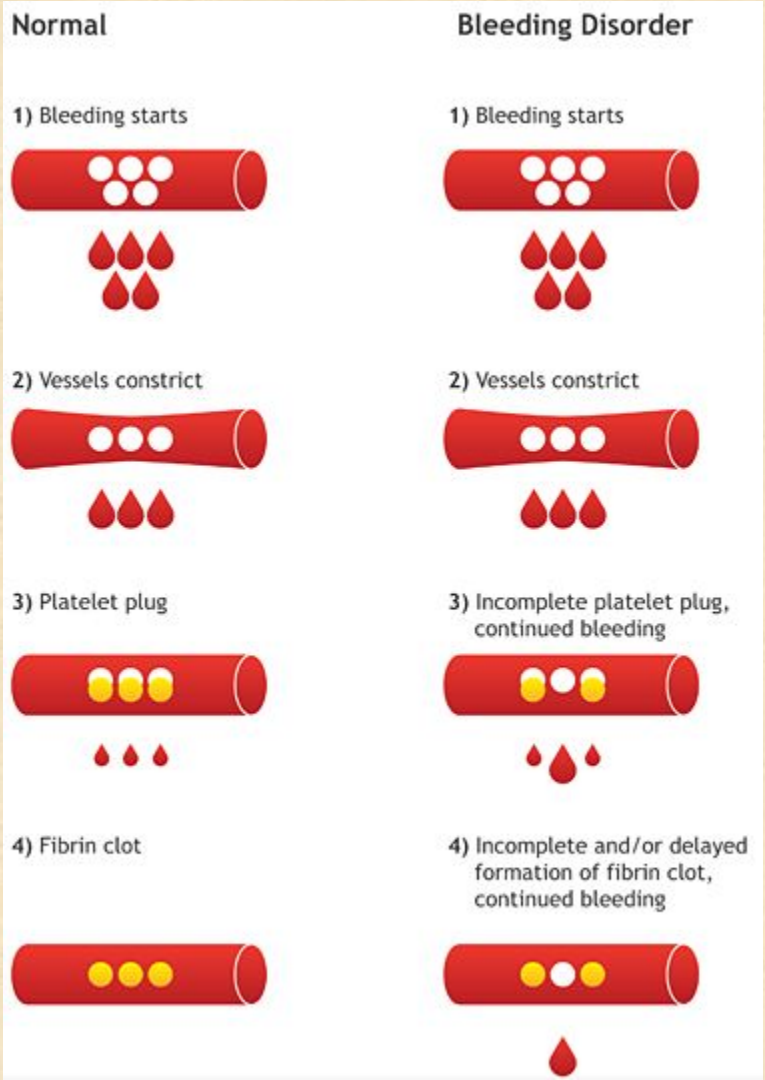
Genetic Disorders

- **Cystic Fibrosis**
  - Recessive disease which causes a defective gene that makes a protein that allows Cl to move in and out of the body
  - Fatal – as airways are **blocked by mucus** build-up



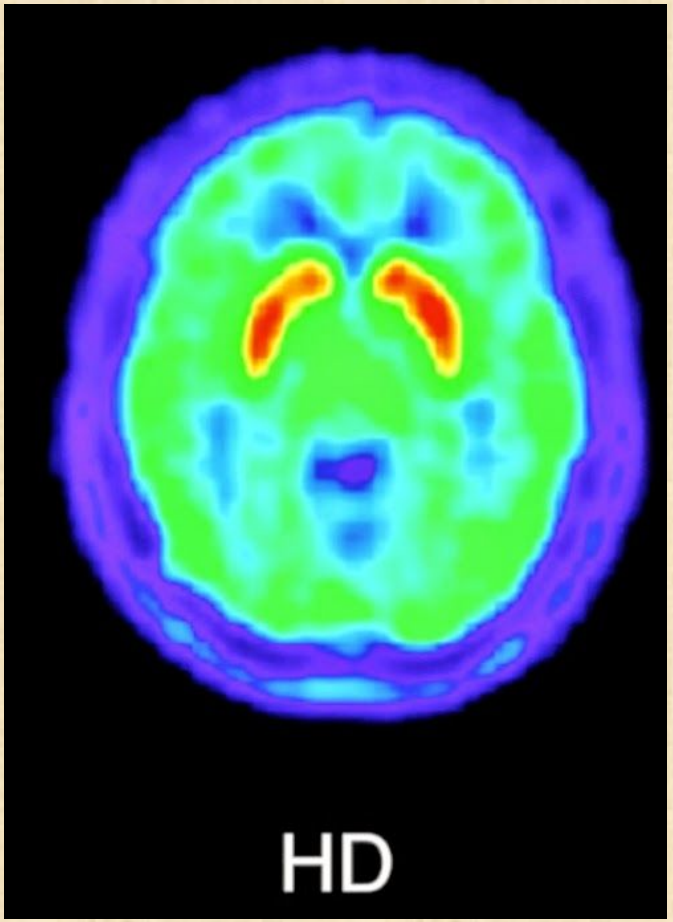
Genetic Disorders

- **Hemophilia**
  - Recessive and sex-linked disorder – blood is unable to clot
  - Mutation on an **X gene** = Hemophilia A
    - Son receives a mutated X from mother



Genetic Disorders

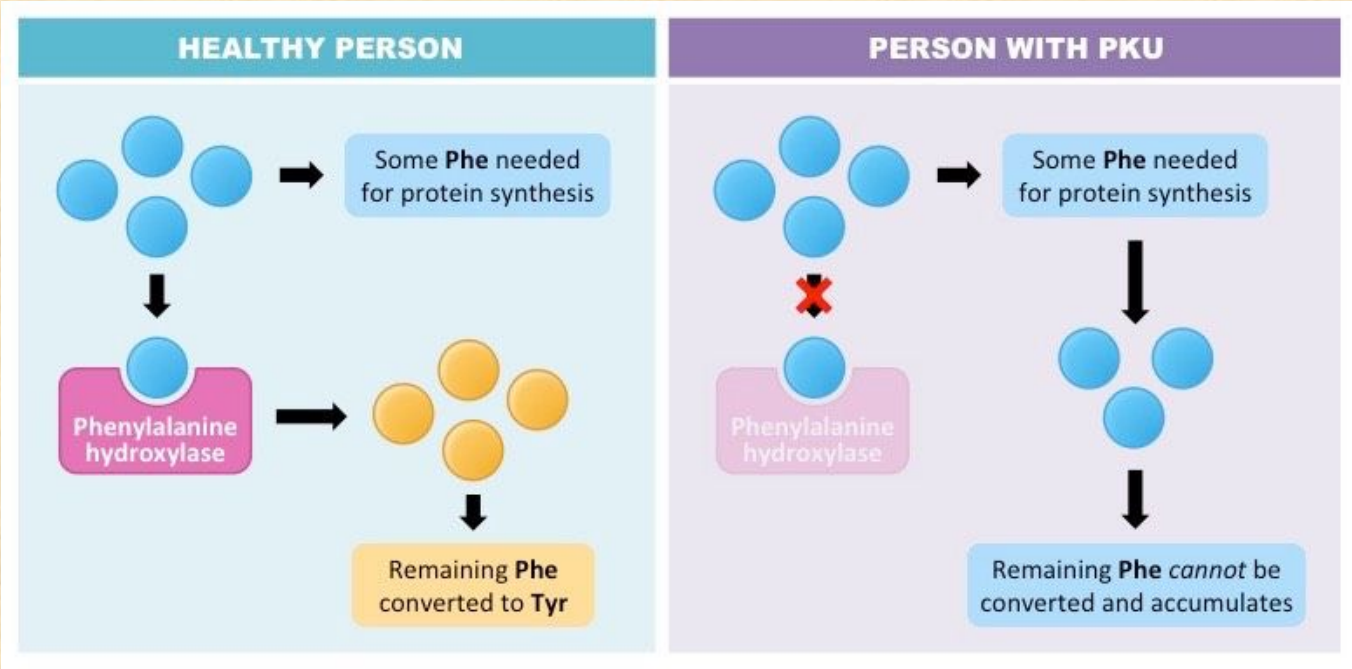
- **Huntington's Disease**
  - Dominant allele on an **autosome** gene
  - Causes memory and muscle control loss, **severe mental illness** and eventually death
  - Passed from one generation to next as diagnosis is in late 30s to 40s



See chart on page 181

Genetic Disorders

- **PKU**
  - Autosomal recessive
  - Causes an amino acid called **phenylalanine** to build up in the body.
  - Caused by a **defect in the gene** that helps create the enzyme needed to break down phenylalanine.



Genetic Disorders

- **Tay-Sachs**
  - Autosomal recessive
  - progressively destroys **<u>nerve cells</u>** (neurons) in the brain and spinal cord.
  - Children with this severe infantile form of Tay-Sachs disease usually live only into early childhood.