DNA FINGERPRINTING Vocabulary

Complete the worksheet BEFORE we do we do notes in class

A-B-C-D-E-F-G-H-I-J-K-L-M-N-O-P-Q-R-S-T-U-V-W-X-Y-Z

1. A particular form of a gene. For example, brown hair or blond hair.

Answer:_____

2. A structure in the nucleus of the cell which contains genetic material

Answer:_____

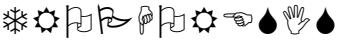
3. Pattern of DNA fragments obtained by examining a person's unique sequence of DNA base pairs

Answer:_____

4. A molecule labeled with a radioactive isotope, dye, or enzyme used to locate a particular sequence of DNA.

Answer:_____

5. A method of separating molecules, such as DNA according to their size and electrical charge using an electrical current passed through a gel containing the samples

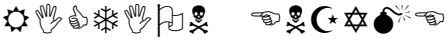


Answer:_____

6. Segment of DNA in a chromosome that contains information used to produce a protein or an RNA molecule.

Answer:_____

7. A molecule that cuts a DNA molecule at a specific base sequence



Answer:_____

DNA Profiling

Learning Objectives:

- ❑ Explain how DNA evidence is collected and analysis
- ❑ Explain how DNA evidence is compared for a match
- ❑ Explain how DNA evidence can be used to determine relations

---

Structure of DNA

_____ _____ - two coiled DNA strands

_____ - segments of DNA that code for proteins (height)

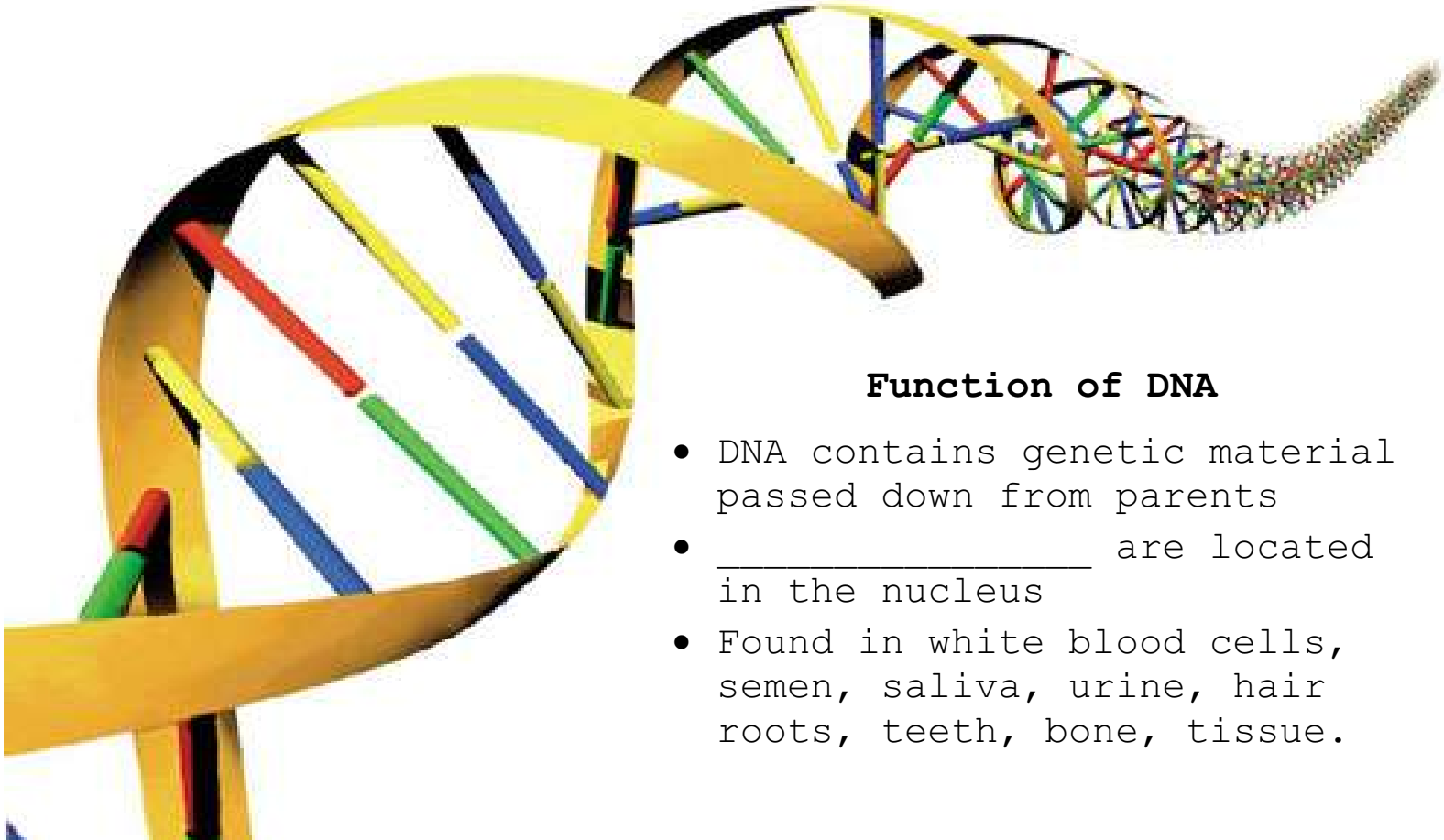
_____ - a form of a gene that tells how it presents itself (tall or short)

Composed of Nucleotides

- Deoxyribose _____
- _____ group
- Nitrogenous _____

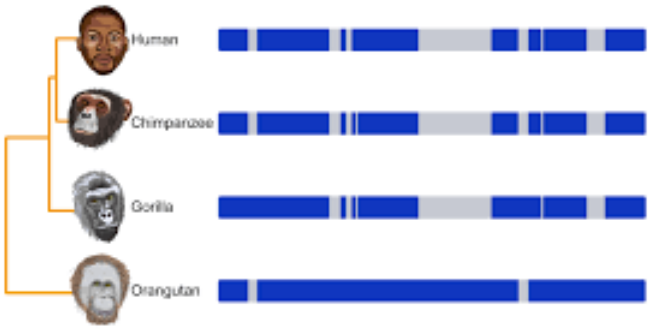
Base Pairing

- _____ pairs with _____
- _____ pairs with _____



Function of DNA

- DNA contains genetic material passed down from parents
- _____ are located in the nucleus
- Found in white blood cells, semen, saliva, urine, hair roots, teeth, bone, tissue.



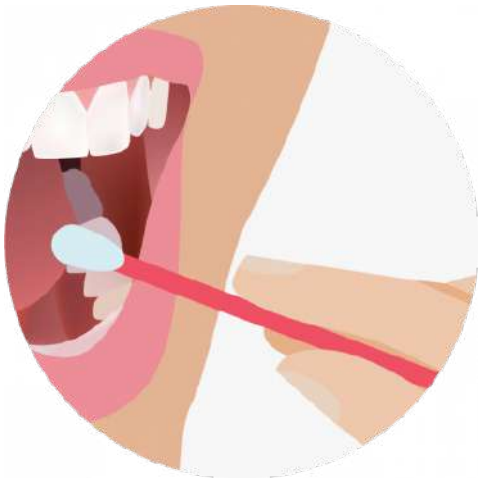
Comparing DNA Sequences

_____ the human is identical for everyone

DNA profiling looks at 13 specific sequences that are highly variable and different for every person.

Why Do We Use DNA Profile

. To _____ potential _____
. To _____ an _____ person
. To identify human _____
. To establish _____
. To match _____ _____

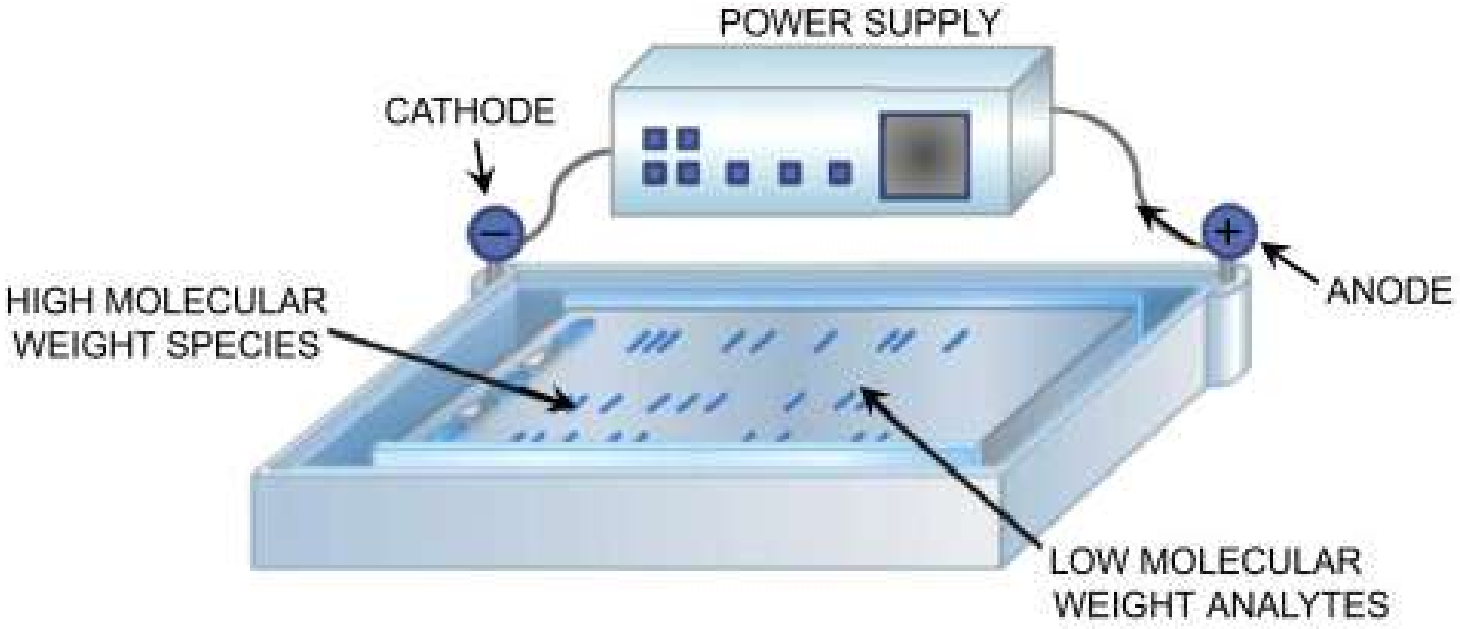


Handling Genetic Material

1. Use disposable _____ and collection instruments
2. Avoid physical contact, talking, sneezing, and coughing in the evidence area
3. Air-dry evidence and put it in _____ _____ or envelopes
4. Dry or freeze the evidence
5. Keep evidence cool and dry for transport and storage.

Handling Genetic Material

1. _____ are _____ from biological evidence such as blood, saliva, urine, semen, and hair
2. The cells are disrupted to _____ the _____ from proteins and other cell components
3. The DNA can be _____ from the cell nucleus
4. _____ may be used to make _____ of a DNA segment if there was not much left behind



Electrophoresis

An electric current _____ _____ _____ _____, small move farther, large move slower.
Smaller molecules will move the farthest
After developing, the fragments can be visualized for characterization

DNA Probes

Complementary segment of synthetic DNA used to visualize the unique sequences in a person's DNA
In most criminal cases, _____ _____ are used

Short Tandem Repeats (STR)

STR is another method of DNA typing. STRs contain two to five _____ _____ in a DNA molecule.
This method requires less time and a _____ _____ _____, and the DNA is less susceptible to degradation.

FBI's CODIS DNA Database Combined DNA Index System

FBI developed CODIS DNA database in 1998
Used for _____ _____ _____ and unsolved cases with repeat offenders in all 50 states
Requires 13 and 15 markers and/or 13 core STR markers

Blood and Serology

Complete the worksheet BEFORE we do we do notes in class

W P S S L S Q B Z P T M O R S

S H L E C G E H O U C E E M T

A U I A I Z E T E J T D Y W E

G S P T S D Y U P C B E B A L

G J H L E M O B C L T Y Z U E

L E A B K B A B O A G P M S T

U K T D O T L O I O F L X H A

T D K X P K D O L T Z H Q F L

I F Y P R C G O O A N I Z A P

N U Y P E S R E R D X A Y N T

A Q T L E E A J G X C H J C E

T H L H S U A N T I G E N S T

I S R G N I P Y T D O O L B A

O L S J M R L E C V E Q E L N

N M Y U E G N R E W J N V L S

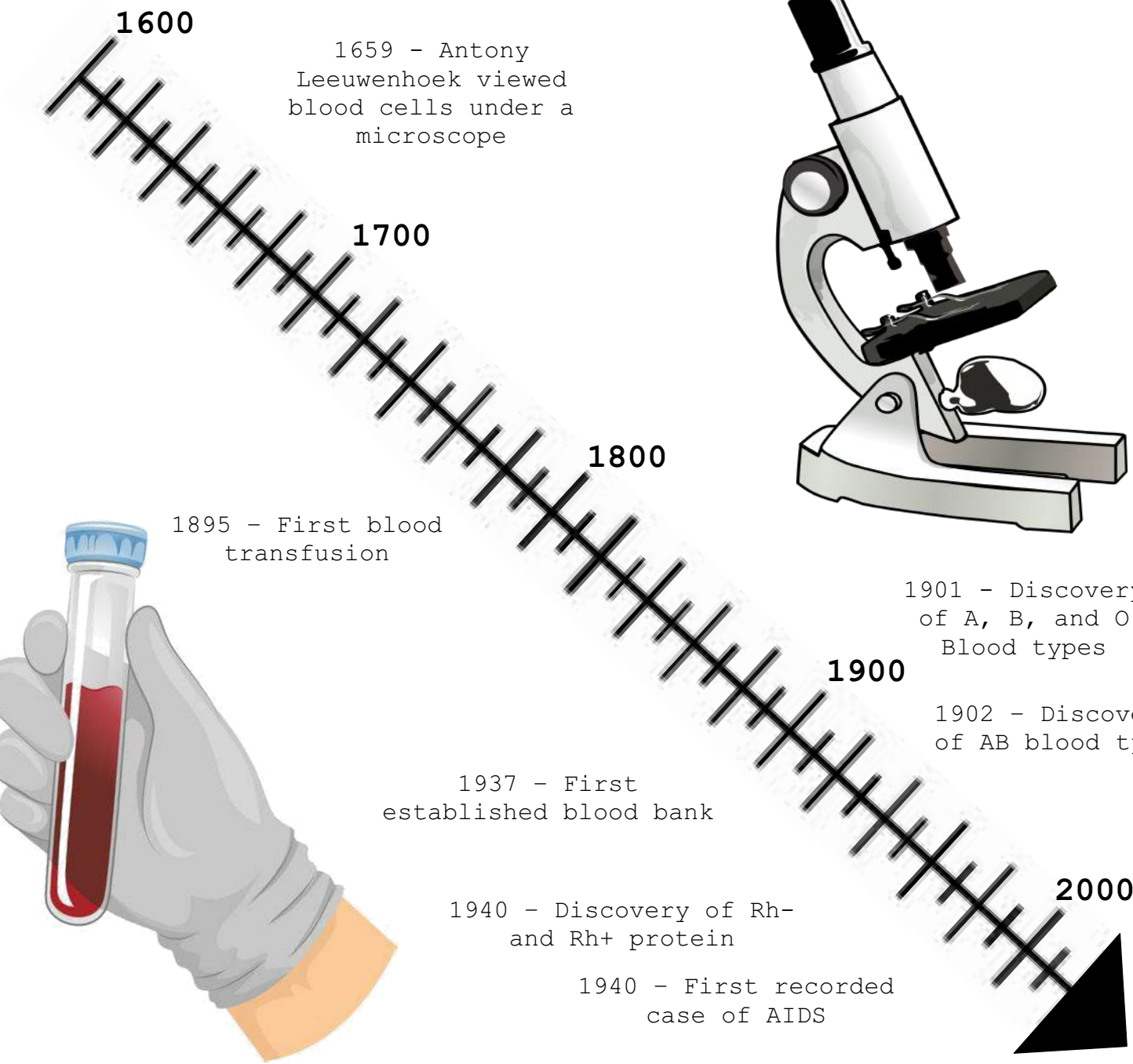
1. _____ Cells that travel through the blood to a point of injury to clot the blood
2. _____ The clumping of molecules or cells caused by an antigen-antibody reaction
3. _____ Proteins secreted by white blood cells that attach to antigens
4. _____ Yellow fluid through which blood cells travel to the body.
5. _____ Donut shaped cells that carry oxygen throughout the body
6. _____ Any foreign substance or cell in the body that reacts with antibodies
7. _____ Classification of blood into A, B, AB, or O phenotypes
8. _____ Type of cells that fight disease and prevent infection
9. _____ The study of blood

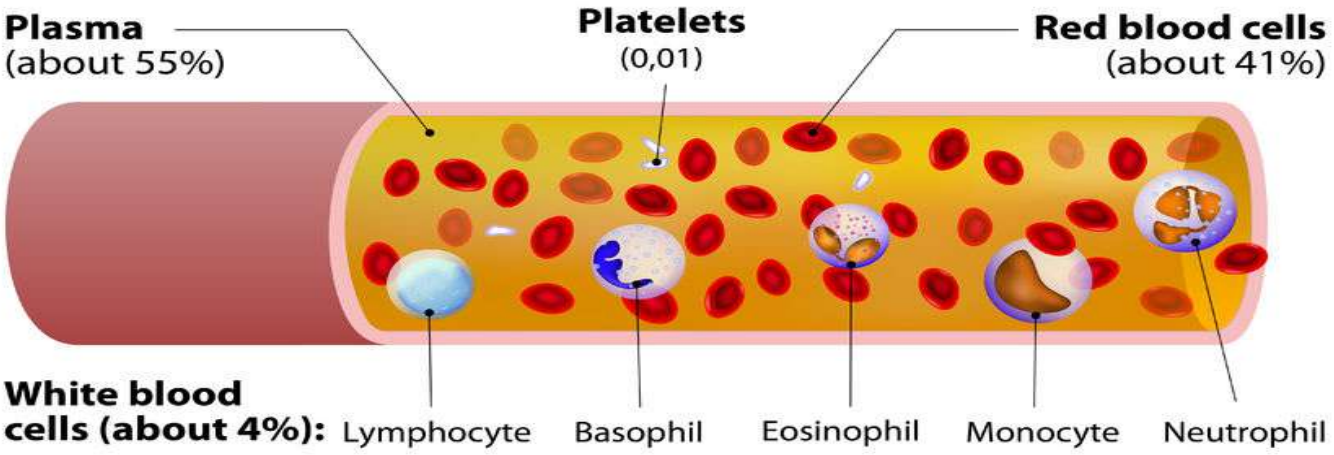
Blood and Serology

Learning Objectives:

- ❑ I can explain the composition and function of blood
- ❑ I can determine blood type from a sample of blood.

Draw arrows and give the year of each of the following events in the development of the science of fingerprinting.



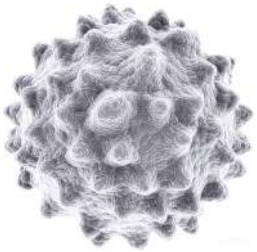


What Makes up the Blood

Red Blood Cells – aka _____

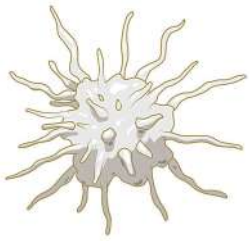
- Produced in bone marrow, no nucleus
- Hemoglobin carries _____ and _____ _____ through the body

White Blood Cells – aka _____



- Part of immune system which helps _____ _____
- Contain a nucleus allowing it to replicate on its own

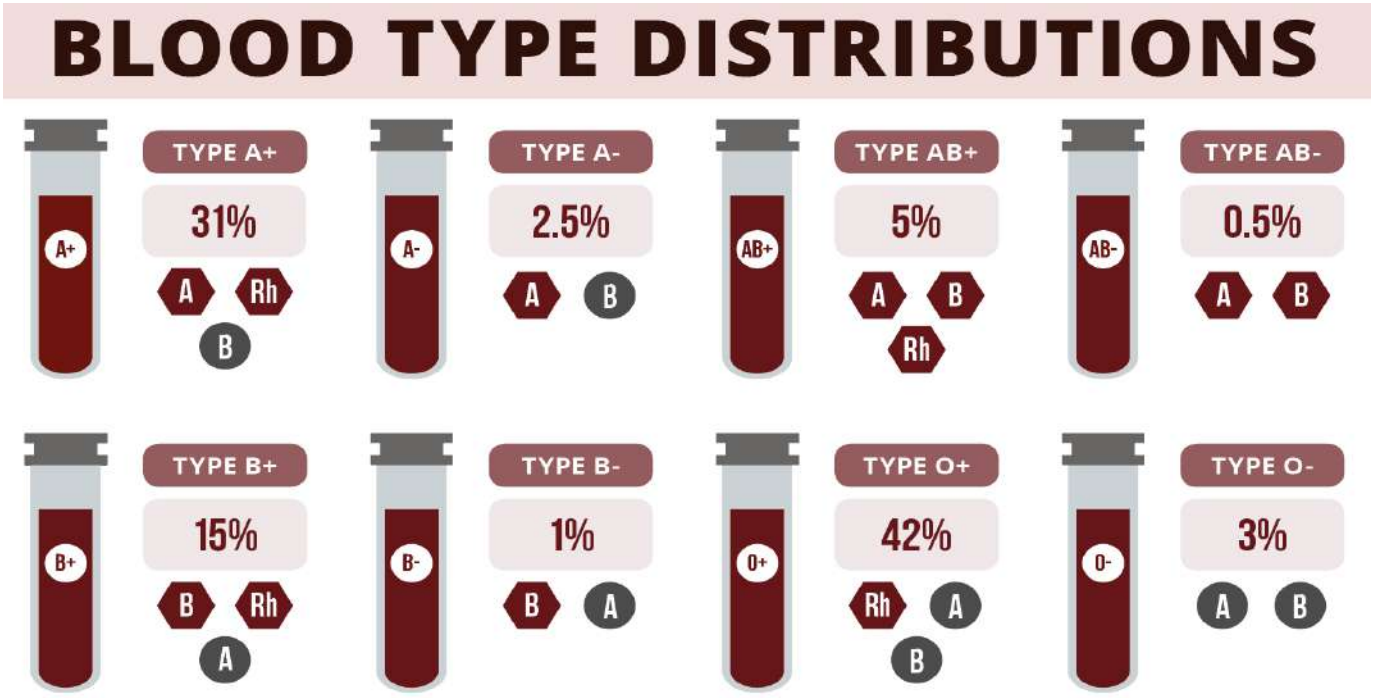
Platelets – aka _____



- Clotting factors caused by plasma
- Help to _____ a _____ preventing blood loss

Plasma

- Yellowish _____ portion of your blood
- Contains electrolytes, nutrients, vitamins, hormones, proteins (antigens, fibrogens, antibodies)



How are Blood Types Determined

Your blood type is determined by the genes you inherited from your mother and father

Blood type of offspring can be predicted using a Punnett square

Predict the blood type of the offspring in the following scenarios

1. A mother with AO and a father with AB

2. A mother with Type O and a father with type B

The ABO Blood System

Blood Type (genotype)	Type A (AA, AO)	Type B (BB, BO)	Type AB (AB)	Type O (OO)
Red Blood				

How are Blood Types Determined

Blood type is determined by antigen on the blood cells

Plasma makes antibodies for any antigens not in your blood cells

Tell whether each of the following transfusions are safe?

An AO donor to an AA recipient

An AB donor to a BO recipient

Blood Typing

To determine a person's blood type, we add three different serums to blood samples and see if clumps form.

Clumps = Positive (+)

No Clumps = Negative (-)

Blood Type	Reactions w/ Anti-A Serum	Reactions w/ Anti-B Serum
A	+	-
B	-	+
AB	+	+
O	-	-

Rh Serum = Clumping = +

Blood Spatter Vocabulary

Complete the worksheet BEFORE we do we do notes in class

You will be given a puzzle to cut out and place together below.

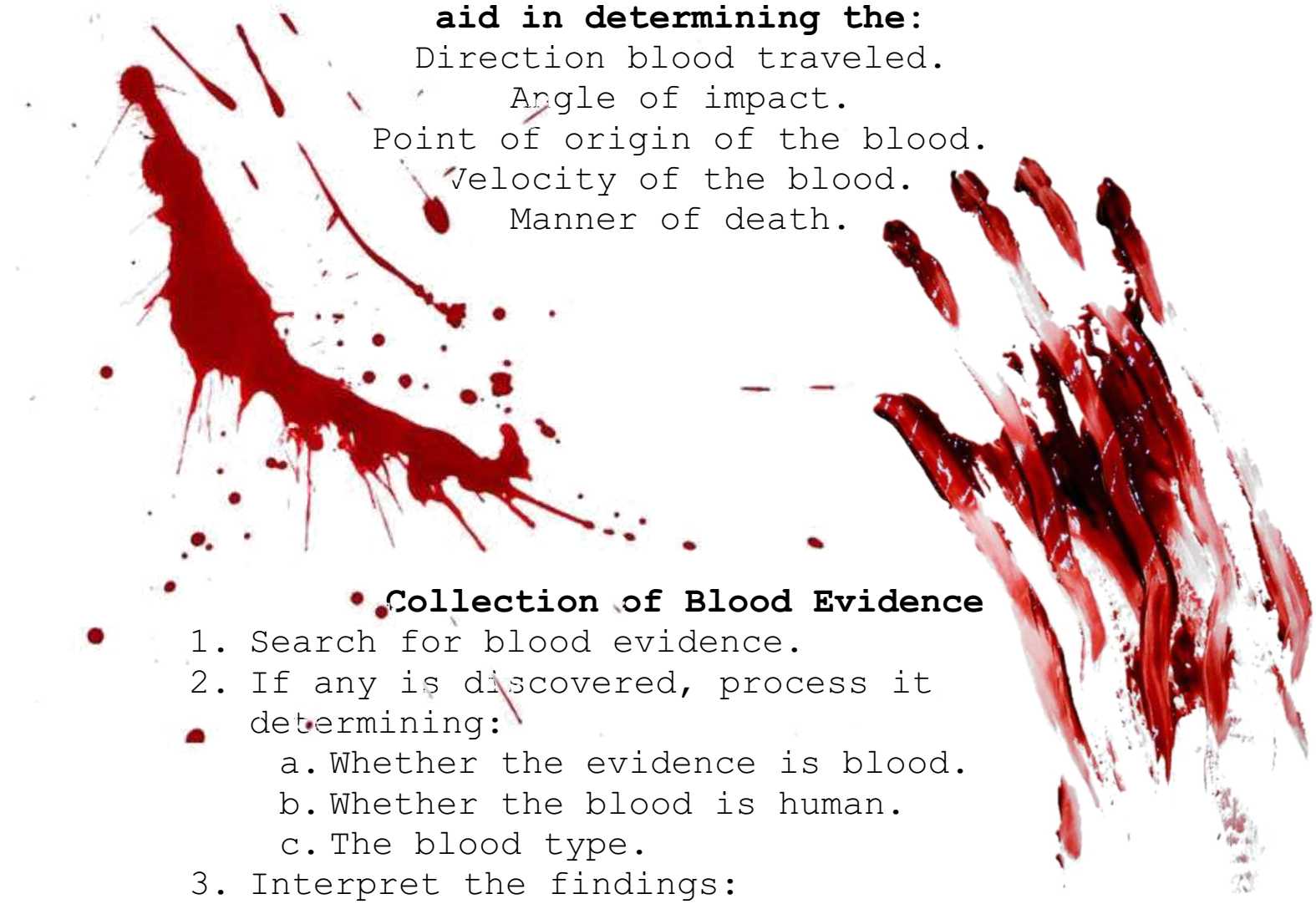
Blood Spatter

Learning Objectives:

- ❑ I can explain the composition and function of blood
- ❑ I can determine blood type from a sample of blood.
- ❑ I can examine stab wounds and blood spatter to reconstruct a crime.

Analysis of a spatter pattern can aid in determining the:

Direction blood traveled.
Angle of impact.
Point of origin of the blood.
Velocity of the blood.
Manner of death.



Collection of Blood Evidence

1. Search for blood evidence.
2. If any is discovered, process it determining:
   a. Whether the evidence is blood.
   b. Whether the blood is human.
   c. The blood type.
3. Interpret the findings:
   a. See if the blood type matches a suspect.
   b. If it does not, exclude that suspect.
   c. If it does, decide if DNA profiling is needed.

Pa ssive Drops

Height

- Blood falls due to gravity
- _____ fall causes _____ velocity reaching maximum velocity at _____

- Faster velocity causes _____ _____

Match the blood drops to the drop height

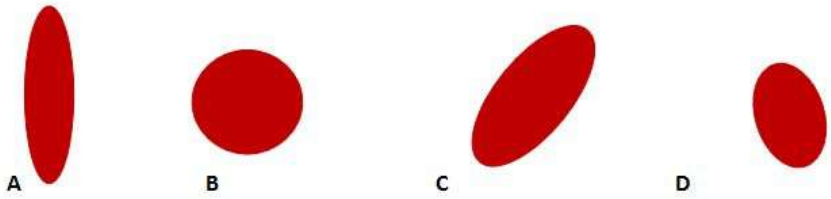
1. 8 in
2. 22 in
3. 25 in
4. 28 in
5. 33 in
6. 53 in
7. 78 in

Impact Angle

- Angle of Impact is calculated with the following equation
- Make sure your calculator is in degrees

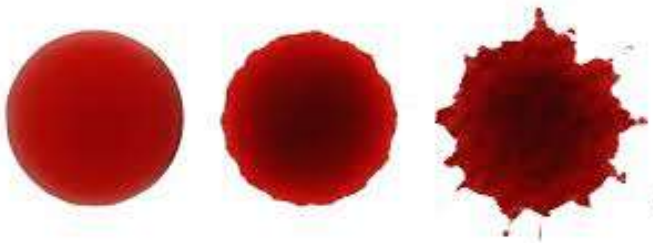
$$Angle\ of\ Impact = sin^{-1}\left(\frac{width}{height}\right)$$

Calculate the impact angle of the drops below

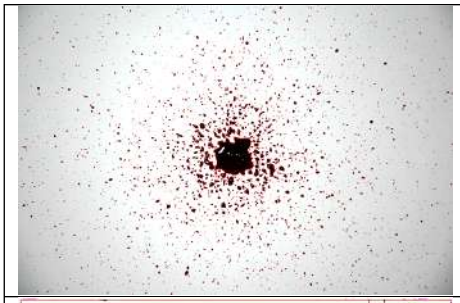


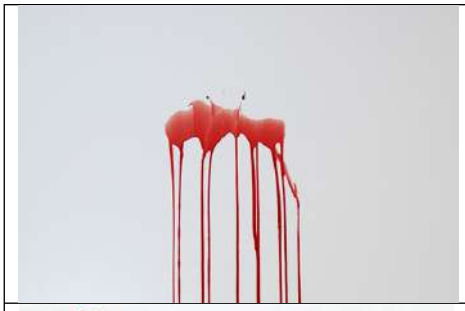
Surface

- Drops falling onto smooth, non-porous surfaces have smooth edges.
- Drops falling onto rough surfaces produce spiny irregular stains and possibly satellite splatter



Spatter Patterns

	**_____ Pattern** A bloodstain pattern which results from blood dripping into blood
	**_____ Pattern** A change in the shape and direction of a bloodstain due to the influence of gravity or movement of the object
	_____ A bloodstain pattern created when a source of blood remains stationary over a surface causing an accumulation of blood
	**_____ /Contact Pattern** A bloodstain pattern created when a wet, bloody surface comes in contact with a second surface. Often leaves a pattern or recognizable image of the original surface
	**_____ Pattern** The transfer of blood from a moving source onto an unstained surface. Direction of travel may be determined by the feathered edge
	**_____ Pattern** A bloodstain pattern created when an object moves through an existing stain, removing and/or altering its appearance

	**_____ Spurting** Bloodstain pattern(s) resulting from blood exiting the body under pressure from a breached artery
	**_____ _____ Pattern** A bloodstain created when blood is released or thrown from a blood-bearing object Used to determine number of blows, position of victim and attacker, direction weapon was traveling, height of attacker
	**_____ Blood** Blood that is blown out of the nose, mouth, or a wound as a result of air pressure and/or air flow which is the propelling force.
	**_____ _____ Impact Spatter** A bloodstain pattern that is caused by a low velocity impact/force to a blood source Up to 5 ft/s. Stains 4 mm or greater
	**_____ _____ Impact Spatter** A bloodstain pattern that is caused by a medium velocity impact/force to a blood source, typical beating 5-25 ft/s. Stains 1-4 mm in size
	**_____ _____ Impact Spatter** A bloodstain pattern that is caused by a high velocity impact/force to a blood source 100+ ft/s. Stains less than 1 mm in size

Passive Stains	A two dimensional view of intersecting lines drawn from two or more blood drops to show area of the source of blood spatter
Lines of Convergence	Attraction between blood particles that hold a blood drop together similar to how water beads on a waxed car
Impact Stains	Blood stains from blood being projected through the air as spatter, gushes, or arterial spurts
Point of Origin	Drops, Flows or pools of blood caused by blood falling with only gravity acting on it
Cohesive Forces	Three dimensional view using angle of impact to identify the location of the source of blood spatter
Transfer Stains	Secondary Drop formed when some blood breaks free from the main contact drop of blood
Satellite Droplets	Blood stains left behind when an object comes into contact with an existing sample of blood and leaves behind a wipe, swipe or print on another object