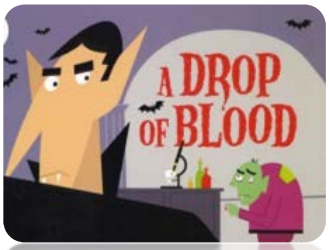
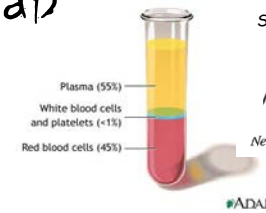


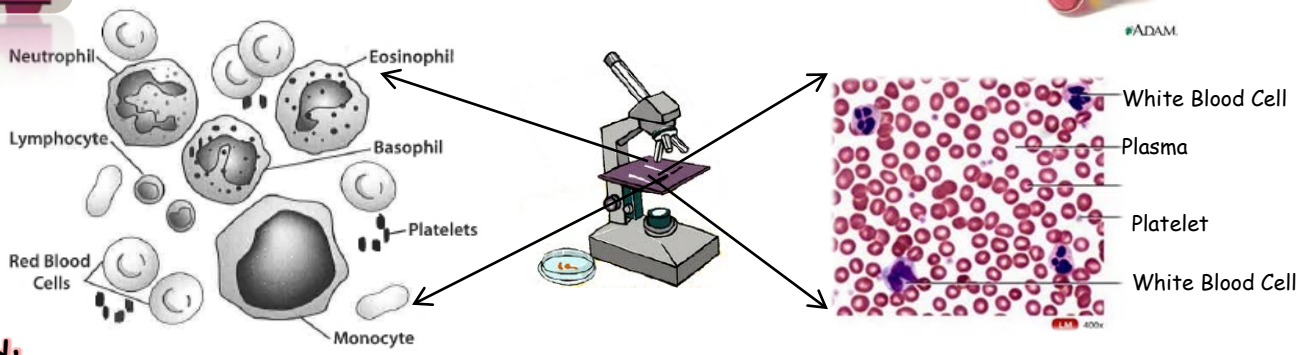
Name _____

A closer look at BLOOD Lab

Part 1 … a drop of blood



Synthetic Blood by …
NEO SCI
New ideas for teaching science



Background:

All blood will contain Red Blood Cells (RBC), White Blood Cells (WBC), and Platelets. The number of each type of cells present in a sample of blood will determine the health of the patient. Red Blood Cells (Erythrocytes) absorb and carry oxygen throughout the body, White Blood Cells (Leukocytes) fight disease, and Platelets (Thrombocytes) clot the blood to stop bleeding.

Erythrocytosis is a condition where the blood contains too many Red Blood Cells. Erythrocytosis can cause easy bruisability, purpura (purplish areas of the skin where hemorrhage has occurred), blood in the stool, blood clots, painful erythema (redness of the skin) and warmth in parts of the limbs, blackening of the fingers or toes (necrosis), fever, heat tolerance, weight loss, and itching.

Anemia is a condition where the blood contains too few red blood cells. If red blood cells are also deficient in hemoglobin, then your body isn't getting enough oxygen. The main symptom of anemia is constant fatigue (always tired).

Normal and Abnormal Red Blood Cell Count

	MEN	WOMEN	CHILDREN
Normal	4.7 - 6.1 million cells per uL	4.2 - 5.4 million cells per uL	4.6 - 4.8 million per uL
Anemia (Low Red Blood Cell Count)	<4.5 million cells per uL	<4 million cells per uL	<4.4 million cells per uL
Polycythemia (High Red Blood Cell Count)	>6.8 million cells per uL	>6 million cells per uL	>5.4 million cells per uL

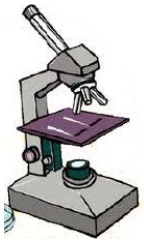
Note: Red Blood Cells are counted in millions of cells per microliter (uL) of blood.

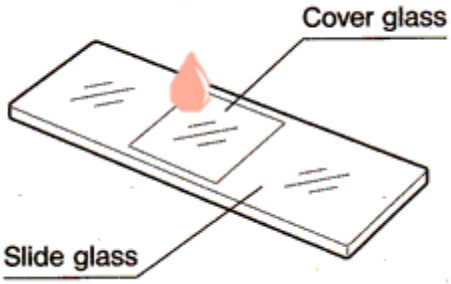
Examining a Drop of Blood:

Physicians and medical lab technicians examine blood cells under the microscope every day. They are checking the blood for abnormalities. We will be examining a drop of synthetic blood to identify the various components of blood and to determine if there are a healthy number of red blood cells. It is now time to examine a drop of blood (synthetic) under a microscope.

You will need:

Microscope
Glass Slide
Cover slip
1 drop of Synthetic BLOOD





Synthetic Blood

Do This:

Step 1: Place a single drop of simulated blood on a very clean microscope slide.

Step 2: Place a cover slip on the drop of simulated blood and place the slide under the compound microscope.

Step 3: Examine the simulated blood under low, medium, and then high power.
Red Blood Cells will appear red or pink, White Blood Cells are stained blue, and Platelets will be seen as fragments.

Step 4: Count the Red Blood Cells and do the math as shown below:

- Count the number of red blood cells that you can see in your field of view when using high power (400X).
- Record your value below, grab a calculator, and do the math.

Cells in field of view _____ X 1,000 (dilution factor) ÷ 0.01uL (microliters)

Example: Suppose you count 45 simulated red blood cells in the field of view, then,

$$\frac{45 \times 1000}{0.01\ \mu l} = 4{,}500{,}000 \text{ red blood cells per } \mu l \text{ of blood}$$

- Record the Red Blood Cell Count per uL of Blood here

Number of red blood cells per uL of blood

If our sample is from an adult male, their red cell count indicates

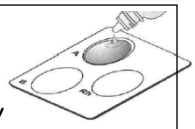
☐ Normal Count ☐ Anemia ☐ Polycythemia

Part 2 Blood Typing … matching donors to recipients

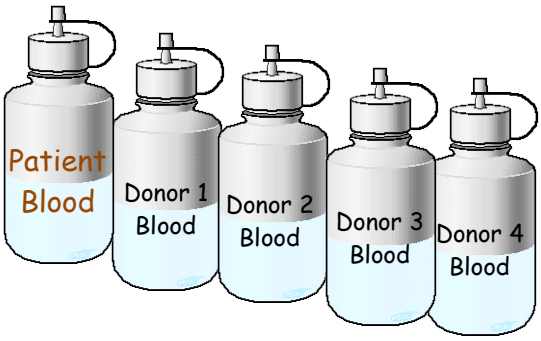
An injured man arrives at your Emergency Room by ambulance. He has been in an accident and has lost enough blood to require a transfusion. It's been a busy week and the blood bank is low so you will need a blood donor. But…not everyone's blood is the same. If you give your patient the wrong TYPE of blood he might die.

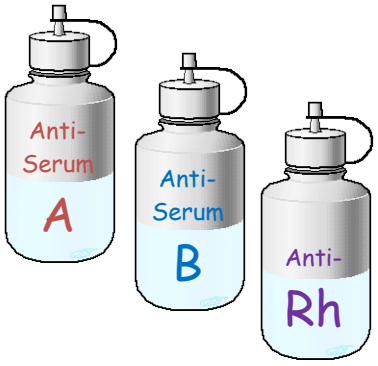
You will need to determine the BLOOD TYPE of your patient and find a donor with the same or compatible blood type.

You will need:

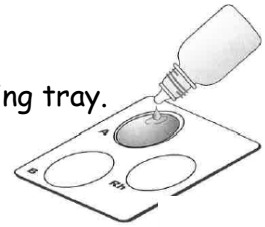


Blood Typing Tray
3 stirring sticks
2 drops of Patient's blood
2 drops of each Donor's blood
1 drop of Anti-serum A
1 drop of Anti-serum B
1 drop of Anti-Rh





First, let's determine the BLOOD TYPE of our patient:

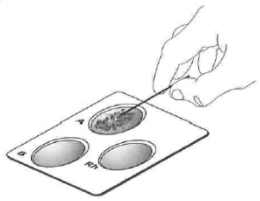


Step 1: Place 2 drops of the Patient's Blood in each well of your blood typing tray.

Step 2: Place 1 drop of anti-serum A in well A.

Step 3: Place 1 drop of anti-serum B in well B.

Step 4: Place 1 drop of anti-Rh in well Rh.



Step 5: Mix the blood and serum in each well using a separate stirring stick for each.
Stir Well A and Well Rh for 10 seconds. Stir Well B for up to 90 seconds.

Step 5: Examine each well to determine if the simulated blood has agglutinated (clumped).
Note: Blood that has not clumped will remain transparent (can see through it) while blood that has clumped becomes opaque (cannot see through it). After several minutes synthetic blood cells may settle to the bottom. This is not a positive test result.

Step 6: Thoroughly rinse the typing tray and stirring sticks (they will be reused).

Step 7: Record and interpret your results for the *patient* in table 1 (see next page).

How to determine blood type from your data:

Clumping indicates that the simulated blood sample contains antigens that reacted against the antibodies in the typing serum that you mixed it with.

Type A
If the blood in Well A is the only blood that agglutinates or clumps, then the blood sample you tested is Type A blood.

Type B
If the blood in Well B is the only blood that agglutinates or clumps, then the blood sample you tested is Type B blood.

Type AB
If the blood in both Well A and Well B agglutinates or clumps, then the blood sample you tested is type AB blood.

Type O
If the blood in both Well A and Well B does not agglutinate or clump, then the blood sample you tested is Type O blood.

Rh Factor
If the blood in well Rh clumps, this indicates the blood is Rh (+) positive. If the blood does not clump, the sample blood is Rh (-).

Agglutination Reactions in the ABO System

ABO Agglutination Reaction		
Anti-A Serum	Anti-B Serum	Blood Type
Agglutination	No Agglutination	A
No Agglutination	Agglutination	B
Agglutination	Agglutination	AB
No Agglutination	No Agglutination	O

Agglutination = clumping. The blood clumps together and becomes opaque(cannot see through it)

Data Table 1

Simulated Blood Sample	Agglutination in Well A (+/-)	Agglutination in Well B (+/-)	Agglutination in Well Rh (+/-)	Blood Type	Observations
Patient					
Donor 1					
Donor 2					
Donor 3					
Donor 4					

Next, we need to determine the BLOOD TYPE of each of our potential *donors*:

Step 1: Repeat steps 1-6 above for each or our potential blood donors.

Step 2: Record and interpret your results for the each potential donor in table 1 above.

Step 3: Go to the next page to answer the BIG QUESTION.

The BIG QUESTION:

Which donor or donors that we tested would have a compatible blood type to donate blood to our donor? (The charts below should help)

Write answerer here _____

Let's Get Technical:

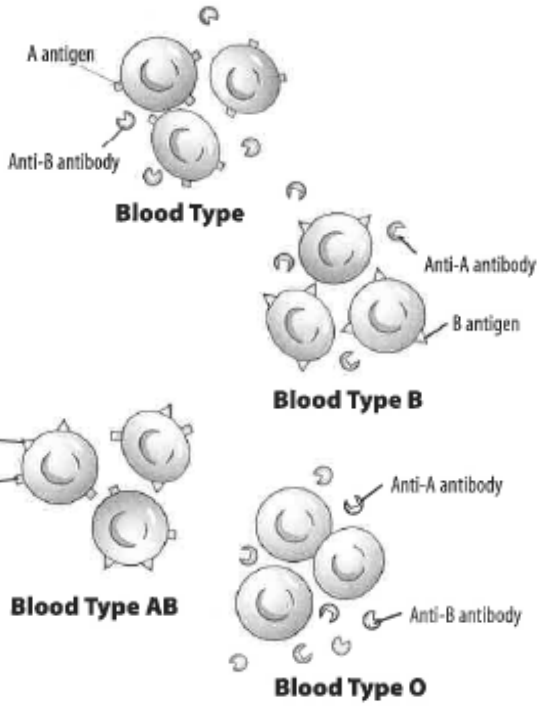
Blood Types

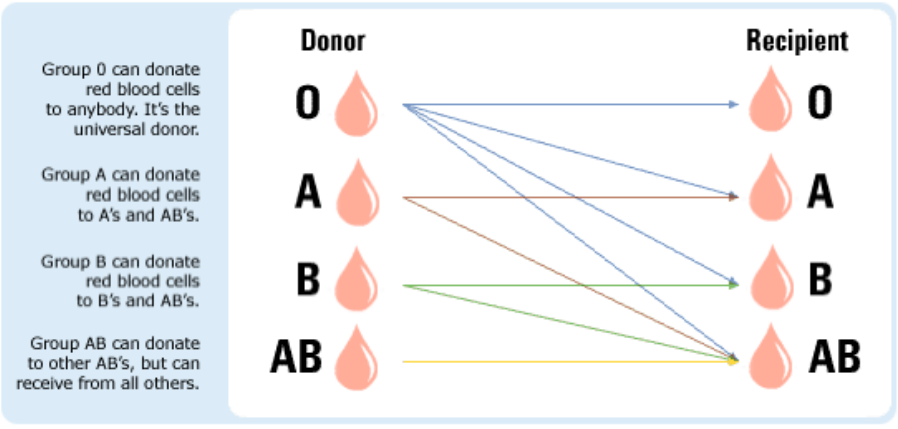
Although all blood is made of the same basic elements, not all blood is alike. In fact, there are eight different common blood types, which are determined by the presence or absence of certain antigens – substances that can trigger an immune response if they are foreign to the body. Since some antigens can trigger a patient's immune system to attack the transfused blood, safe blood transfusions depend on careful blood typing and cross-matching.

The ABO Blood Group System

There are four major blood groups determined by the presence or absence of two antigens – A and B – on the surface of red blood cells:

- **Group A** – has only the A antigen on red cells (and B antibody in the plasma)
- **Group B** – has only the B antigen on red cells (and A antibody in the plasma)
- **Group AB** – has both A and B antigens on red cells (but neither A nor B antibody in plasma)
- **Group O** – has neither A nor B antigens on red cells (but both A and B antibody are plasma)

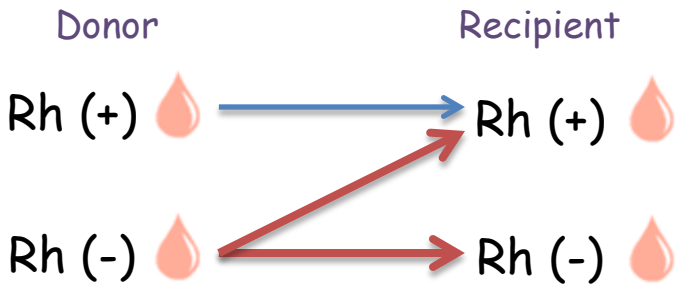




ABO Blood Types Summary

Blood Type	Antigen on RBC's	Antibodies in Plasma	Can Receive Blood from...	Can Donate Blood to...
A	A	A	O, A	A, AB
B	B	B	O, B	B, AB
AB	AB	None	O, AB, A, B	AB
O	O	A and B	O	O, A, B, AB

What is Rh factor: In addition to A and B antigens, there is a third antigen called the Rh factor. Blood is Rh positive (+) if the antigen is present or Rh negative (-) if the antigen is not present. In general, Rh (-) blood is given only to Rh (-) patients while Rh (+) blood or Rh (-) blood may be given to Rh (+) patients.



Putting it all together (a.k.a. "the questions") - use all of the information and data in this lab to answer these questions:

1. Can a patient with type O (-) blood safely receives a transfusion from a type A (-) donor? Explain.

2. Which, if any, of our donors is considered a Universal Blood Donor?

3. Which, if any, of our donors is considered a Universal Blood Recipient?

4. Which antigens are present on the red blood cells in Type A blood?

5. How is simulated blood typing similar to actual human blood typing?

   How is it different?