BIOLOGY 310

Simulated Blood Typing

Name _____

Period ____

LEARNING TARGET

Apply principles of dominance and codominance to predict blood types.

BACKGROUND

Early attempts to transfer blood from one person to another produced varied results. Sometimes it seemed to help the recipient and other times it produced very serious consequences. Eventually, it was discovered that each individual has a unique combination of substances in his or her blood. This led to the discovery and development of procedures to type and individuals' blood. It is now known that safe transfusions of blood depend upon properly matching the blood types of the donors and the recipients.

There are three different genes in the gene pool for blood type: A, B, and o. AA or Ao codes for protein A, BB or Bo codes for protein B, and oo codes for neither protein. Within this multiple gene pool the gene interactions illustrate both simple dominance as well as codominance. ***Fill in the chart below to show the gene combinations, resulting blood type, proteins on the red blood cells, and antibodies in the blood for the four different human blood types.***

Phenotype	Genotype	Protein on RBC (Antigen)	Antibodies in Blood Plasma
Type A	I^AI^A or I^Ai	A	B
Type B	I^BI^B or I^Bi	B	A
Type AB	I^AI^B	AB	none
Type O	ii	none	A + B

ABO blood typing is based upon the clumping phenomena of blood cells of mixed types. Blood sera antibodies can be isolated from other components of the blood and then used as blood typing sera. Based on your understanding of blood cells, the antigens they contain, and the antibodies present; predict if agglutination (clumping) will occur in each of the following blood types.

Blood Type	Anti-A Sera	Anti-B Sera
A	Clumping	—
B	—	Clumping
AB	Clumping	Clumping
O	—	—

MATERIALS

3 blood typing slide wells
6 toothpicks
Anti-A sera
Anti-B sera
Marking pen
Unknown blood samples (W, X, Y)
1 piece of white 8½ x 11 paper

PROCEDURE

1. Label four blood typing slide wells using a marking pen: W, X, and Y.
2. Place 2 drops of Person W blood in the wells labeled "A" and "B" of the slide marking "W." Similarly, place 2 drops of X, Y, and Z in each well of the corresponding cell plates.
3. Add 2 drops of Anti-A sera to each A well.
4. Add 2 drops of Anti-B sera to each B well.
5. Stir each mixture in all 6 wells being careful not to scratch the plastic. Use a different toothpick for each well to avoid contaminating the samples!
6. After mixing, allow the slides to sit for one minute.
7. Observe each well against a white sheet of paper and record the results in the data table provided.

**Wash the well plate as soon as you finish collecting your data
(DO NOT ALLOW THE SOLUTION TO DRY)

DATA

	Anti-A Sera	Anti-B Sera	~~Blood Type~~ Rh	Blood Type
Person W	Clumping	—	Clumping	A^+
Person X	—	—	—	O^-
Person Y	Clumping	—	Clumping	A^+

QUESTIONS

1. What is the name for the proteins on red blood cells?

   antigens

2. What is the name of the proteins in the blood plasma?

   antibodies

3. The lab describes the process of "clumping." Describe what "clumping" looked like in this lab.

   cloudy / white

4. What would happen if a person of one blood type received a transfusion of a different, in compatible blood type? Be specific and include vocabulary terms from your notes.

   The recipient's own antibodies would "attack"/attach to the antigens on the donors blood causing agglutination to occur; resulting in the blood clotting the blood vessels.

5. What would be the result of adding Anti-B sera to blood that is Type B?

   Agglutination → anti-B sera would attach to the antigens on the blood cells.

6. What antigens are present on the surface of the red blood cells in Person X?

   none

7. What antibodies are present in Person Y's plasma?

   anti-B

8. Person W needs a transfusion. What blood types might Person W safely receive?

   A^+, A^-, O^+, O^-

9. Could a man with Type AB blood be the father of a child with Type O blood? Explain.

   NO, O blood is recessive to A and B. Therefore, since he can only give an A or B allele, the i allele would never be expressed.

10. Could a child with Type B blood have a mother and father with Type A blood? Explain.

    NO; Type A + B are codominant and would both be expressed if present. The parents only have type A, so no B alleles.

11. Why is blood Type AB referred to as the "universal recipient?"

    Type AB blood has no antibodies, so it would not "recognize" ~~and~~ any foriegn blood.

12. Which blood type do you think is called the "universal donor?" Why?

    O^- O blood has no antigens on its surface so recipients would not have to worry about antibodies "attacking" the cells.

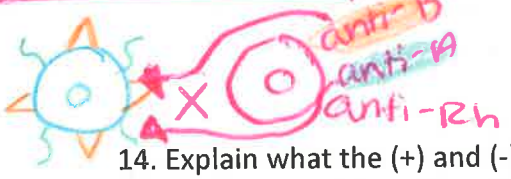
13. Draw a diagram/picture that explains why an individual with type O- blood can only accept blood from other type O- individuals (Hint: you will need to draw multiple pictures to receive full credit for this question).

Type O-

A + O-

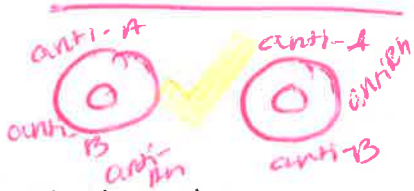
B + O-

AB + O-



(+) + O-

O- + O-



14. Explain what the (+) and (-) stands for in our blood types, can anyone have a blood type that does not contain a (+) or (-) sign? If so, explain your answer.

The (+) and (-) represents if the Rh antigen is found on the surface of the blood cell.

NO, you are either (+) or (-)
have Rh
don't have Rh.

15. Can a couple that are both Rh+ have a child with Rh- blood? Draw a Punnett square with a key and ratios to support your answer.

(+) RR or Rr (-) rr

if parents are both Rr x Rr

	R	r
R	RR	Rr
r	Rr	rr

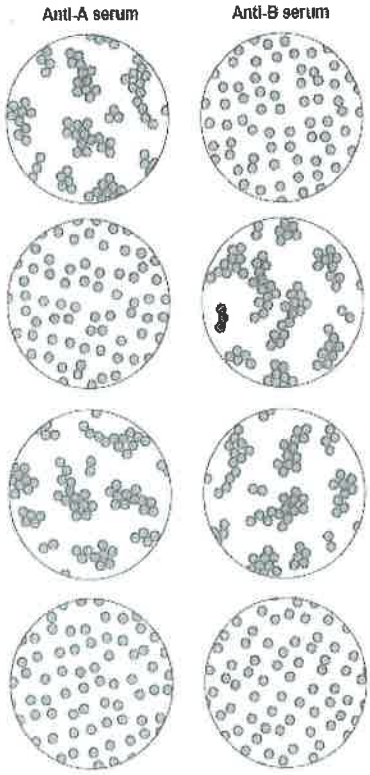
(+) = RR or rr = 3/4
(-) = rr = 1/4

yes, the couple has a 25% chance of having a Rh - child.

16. Fill in the table below, placing an "X" in each box to indicate if a transfusion between both the donor and recipient would be successful.

		DONOR							
RECIPIENT	TYPE	A+	A-	B+	B-	O+	O-	AB+	AB-
	A+	X	X			X	X		
	A-		X				X		
	B+			X	X	X	X		
	B-				X		X		
	O+					X	X		
	O-						X		
	AB+	X	X	X	X	X	X	X	X
	AB-		X		X		X		X

17. Label the correct blood type for each of the following:



A

B

AB

O