Pre-Lab Questions:
Use page 394 in your textbook to answer the questions below.

1. List the four blood types possible in humans.
   a. __________  
   b. __________  
   c. __________  
   d. __________  

2. Why is it important to know your blood type before having a transfusion?
   __________________________________________________________
   __________________________________________________________

3. How many different phenotypes are possible for human blood types? __________

4. How many different genotypes are possible for human blood types? __________

5. How can there be four different phenotypes even though there are six different genotypes? _____________________
   __________________________________________________________________________________________

Review Questions:
1. Two purple flowers are crossed. The offspring are as follows: 25% red, 50% purple, 25% blue. What pattern of inheritance does flower color in these flowers represent? ________________________________

2. Tall is dominant to short. Two tall parents are crossed. Their offspring is short. Predict the genotype of both parents.
   _________________ x _________________

3. Two flowers are crossed. The offspring are as follows: 25% purple, 50% purple with white dots, 25% white. What pattern of inheritance does flower color in these flowers represent? ________________________________

4. True or False
   a. _____ Mendel concluded some forms of a gene are recessive, while others are dominant.
   b. _____ Mendel discovered crossing-over occurs during meiosis.
   c. _____ Mendel studied incomplete dominance and co-dominance.
   d. _____ Mendel learned that alleles for different genes segregate independently.

5. For one trait crosses, if both parents are heterozygous the phenotypic ratio will always be: __________________

6. For two trait crosses, if both parents are hybrid for both traits the phenotypic ratio will always be: __________________
Blood and Food Coloring Activity:

Procedure:

1. Two sets of cups are provided. One set for the donors, and one set for the recipients. Please make sure you are using the correct set throughout the activity.

2. Measure 200mL of water using the beaker. Pour the 200mL of water into the donor cup. Do this for each donor cup.

3. Add 2 drops of yellow food coloring to Donor A.

4. Add 2 drops of blue food coloring to Donor B.

5. Add 2 drops of yellow food coloring and 2 drops of blue food coloring to Donor AB.

6. Do not add any food coloring to Donor O.

7. Using the transfer pipette, transfer two pipettes full of “blood” in each recipient cup. Make sure that you are using the matching cup. For example, use donor A cup to fill recipient A cup.

8. Now it is time for the transfusion. Transfer two pipette of blood from donor A cup into each recipient cup. If there is a color change, the transfusion was not successful. Record the results and discard the recipient blood.

9. Refill the recipient from the donor stock, and then transfuse each recipient with type B blood. Follow directions as in step 8.

10. Repeat steps 8 and 9 until all blood types have been used as the donor for the transfusion.

Fill out the table below after each transfusion. Put a “+” if the transfusion was successful and an “-” if it was not.

<table>
<thead>
<tr>
<th>Recipient</th>
<th>Donor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>A</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
</tr>
<tr>
<td>AB</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

1. What blood type is able to donate to all of the other blood types? __________

2. What blood type is only able to receive the blood type they have? __________
3. What blood type do you have? If unknown, write unknown on the line. __________

4. President Obama’s blood type is A. What type of blood could be used for his transfusion? ____________________

5. Michael Jackson had type B blood. What blood types could he have donated his blood for a transfusion? __________

6. What blood type would be considered the universal donor? __________

7. Tim Tebow has blood type AB. What type of blood could be used for his transfusion? ______________________

8. Explain why blood type is considered co-dominant. _____________________________________________________

Human blood types are determined by genes that follow a co-dominant pattern of inheritance.

There are two dominant alleles (I^A and I^B) and one recessive allele (i).

<table>
<thead>
<tr>
<th>Phenotype (Blood Type)</th>
<th>Genotype</th>
<th>Antigen (marker) on RBC</th>
<th>Safe Transfusions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>To</td>
</tr>
<tr>
<td>A</td>
<td>I^A I^A or I^A i</td>
<td>A</td>
<td>A, AB</td>
</tr>
<tr>
<td>B</td>
<td>I^B I^B or I^B i</td>
<td>B</td>
<td>B, AB</td>
</tr>
<tr>
<td>AB</td>
<td>I^A I^B</td>
<td>A and B</td>
<td>A</td>
</tr>
<tr>
<td>O</td>
<td>ii</td>
<td>none</td>
<td>A, B, AB, O</td>
</tr>
</tbody>
</table>

1. Write the genotype for each person based on the description:
   
   A. homozygous for type-B blood ________ E. type-AB blood ________
   
   B. heterozygous for type-A blood ________ F. can donate blood to anyone ________
   
   C. type-O blood ________ G. can only get blood from type O donor ________
   
   D. a person with type-A blood who had a type-O parent ________

2. Pretend Brad Pitt is homozygous for type-B blood and Angelina Jolie has type-O blood. What are the possible blood types for their children?

3. Draw a Punnett square showing all the possible blood types for the offspring of a type-O mother and a type-AB father.

4. Mrs. Clink has type-A blood, and Mr. Clink has type-O blood. They have three children named Marky, Matty, and Kimmy. Marky has type-O blood. Kimmy has type-AB blood.

   A. Mr. Clink must have the genotype ____________________.

   B. Mrs. Clink must have the genotype ____________________ because _______________ has type-____.

   C. Kimmy cannot be the child of these parents because neither parent has the allele _____________.
5. Two parents think their baby was switched at the hospital. It is 1968, so DNA fingerprinting does not yet exist. The mother has type-O blood, and the father has type-AB blood. The baby has type-B blood.

Mother’s genotype: ________  Father’s genotype: ________  Baby’s genotype: ________ or ______

Could the baby be theirs? ______________

6. Two parents think their baby was switched at the hospital. The mother has type-A blood, and the father has type-B blood. The baby has type-AB blood.

Mother’s genotype(s): ________  Father’s genotype(s): ________  Baby’s genotype(s): ________

Punnett square:  Could the baby be theirs? ___________

7. Based on the information in this below table, which man (or men) could not be the father of the baby?
Use a Punnett square to justify your answer.

<table>
<thead>
<tr>
<th>Person</th>
<th>Blood Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mom</td>
<td>A</td>
</tr>
<tr>
<td>Baby</td>
<td>B</td>
</tr>
<tr>
<td>Sammy</td>
<td>O</td>
</tr>
<tr>
<td>George</td>
<td>AB</td>
</tr>
<tr>
<td>Waiter</td>
<td>A</td>
</tr>
<tr>
<td>Cable Guy</td>
<td>B</td>
</tr>
</tbody>
</table>

8. Based on the information in this below table, which person(s) could not be a parent of the baby?
Use a Punnett square to justify your answer.

<table>
<thead>
<tr>
<th>Person</th>
<th>Blood Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mom</td>
<td>O</td>
</tr>
<tr>
<td>Baby</td>
<td>AB</td>
</tr>
<tr>
<td>Librarian</td>
<td>O</td>
</tr>
<tr>
<td>Doctor</td>
<td>AB</td>
</tr>
<tr>
<td>Lawyer</td>
<td>A</td>
</tr>
<tr>
<td>Store Clerk</td>
<td>B</td>
</tr>
</tbody>
</table>

9. Explain why blood type data cannot prove who a parent is and can only prove who a parent is not.

10. An elderly millionaire and her husband were killed in a car accident. The woman had type O blood and her husband had type A blood. A young man claimed to be their son and therefore the legal heir to their fortune. He had type A blood. Could this man be the son of the millionaire? Explain using a Punnett square and words.