Unit 7 (DNA & Blood Evidence) Test Review

Use your class assignments, labs, and notes to answer the following.

Part 1: DNA

1. How can we use DNA to identify suspects if the majority of our DNA doesn’t differ from person to person?

2. Why do they use length polymorphisms for DNA testing?

3. Why is it important to use multiple loci to determine DNA fingerprinting?

4. When do scientists use gel electrophoresis?

5. How do we make DNA move through the gel?

6. What happens to short and long strands as they move through the gel?

7. What do you see in the gel instead of individual DNA strands?

8. Where is DNA found at a crime scene? (Give 5 sources)

9. When was DNA first used in the courtroom?

10. Can identical twins be differentiated by DNA analysis? Why or why not?

11. Is DNA evidence enough to convict a person?

12. What are the four factors that determine the success of DNA evidence?
   a. 
   b. 
   c. 
   d. 
13. Identify the parents of the child below.  

Parents: ____________________

<table>
<thead>
<tr>
<th>Child</th>
<th>A &amp; B are</th>
<th>married</th>
<th>C &amp; D are</th>
<th>married</th>
<th>E &amp; F are</th>
<th>married</th>
<th>G &amp; H are</th>
<th>married</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Parent A</td>
<td></td>
<td>Parent C</td>
<td></td>
<td>Parent D</td>
<td></td>
<td>Parent G</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parent B</td>
<td></td>
<td>Parent D</td>
<td></td>
<td>Parent E</td>
<td></td>
<td>Parent H</td>
<td></td>
</tr>
</tbody>
</table>

14. Which suspect(s) could be tied to the crime scene? ____________

15. What do the “lines” in this chart represent? BE SPECIFIC.

_________________________
_________________________

16. Is a single DNA profile enough to convict someone? ____________

Explain. __________________
_________________________

17. DNA evidence is (class | individual).
Part 2: Blood

1. Blood type is (class | individual) evidence.

2. Human blood type genes show (complete dominance | codominance | both). Explain: __________

3. The genotype for a person who has type AB blood is: ________________

4. The phenotype for a person who has the genes I_AI_O is: ________________

5. The person in question 3 would be (homozygous | heterozygous).

6. Blood type is determined by the (antigens on blood cells | antibodies in bloodstream).

7. If a person has type A blood, they have (type A antigens | type B antigens | both | neither), but will have (type A antibodies | type B antibodies | both antibodies | no antibodies).

8. If you have anti-A antibodies, you (can | cannot) receive blood that has A antigens.

9. A person who is Rh+ (can | cannot) receive blood from someone who is Rh-.

10. A person who is Rh- (can | cannot) receive blood from someone who is Rh+.

11. Complete the chart below regarding which types of blood these people can DONATE TO.

<table>
<thead>
<tr>
<th>Blood type:</th>
<th>O-</th>
<th>O+</th>
<th>A-</th>
<th>A+</th>
<th>B-</th>
<th>B+</th>
<th>AB-</th>
<th>AB+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can donate to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. Complete the chart below regarding which types of blood these people can RECEIVE FROM.

<table>
<thead>
<tr>
<th>Blood type:</th>
<th>O-</th>
<th>O+</th>
<th>A-</th>
<th>A+</th>
<th>B-</th>
<th>B+</th>
<th>AB-</th>
<th>AB+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can receive from:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13. Which blood type is MOST common? ________

14. Identify the blood type of each person below.

Blood type of Ms. J: ________

Blood type of Mr. K: ________

Blood type of Mr. L: ________

Blood type of Mrs. M: ________
15. What is the main job of a forensic serologist? ____________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

16. How can analysts determine the freshness of a blood sample? __________________________
_______________________________________________________________________________

17. Name and BRIEFLY describe two presumptive tests used to determine if a sample is actually blood.
   a. ____________________________________________________________
      ____________________________________________________________
   b. ____________________________________________________________
      ____________________________________________________________

18. Why is blood the most common, well-known, and perhaps the most important piece of evidence in forensics? _____________________________________________________________
_______________________________________________________________________________

19. Finding someone’s blood genotype is usually more relevant to (criminal | civil) cases. Describe an example of an instance when determining blood genotype would be used to resolve a court case:
_______________________________________________________________________________
_______________________________________________________________________________

20. A person has type B- blood. *Remember to consider their Rh type in the following questions.*
   a. Which antigens would be found on their blood cells? _____________________________
   b. Which blood types their blood be donated to? _________________________________
   c. Which antibodies would be found in this person’s bloodstream? _____________________________
   d. Which blood types could this person receive? _________________________________

21. Label the important features of the blood drop at right.

Which feature of the blood drop would indicate direction of travel? __________________________

22. Identify the direction of travel for the blood drop below. _________________________________
23. The picture at right shows (passive | projected | transfer) bloodstains.

24. The picture at right shows (low | medium | high) velocity spatter.

25. What kind of blood spatter is shown in the picture at left?

______________________________________________________________________________

What direction was the blood moving? __________________________

How can you tell? _____________________________________________

26. What is the difference between a wipe pattern and a swipe pattern? _________________________

_______________________________________________________________________________

27. Describe the difference in the bloodstain patterns for blood dropped onto porous surfaces (like paper and cardboard) vs. blood dropped onto non-porous surfaces (like plastic or a white board).

_______________________________________________________________________________

28. The greater the impact angle, the (more | less) circular the blood drop will become. Blood drops at ____° will be perfectly circular.

29. At an impact angle of about ____°, the blood drop forms a long, distinctive tail.

30. Secondary splashes of blood found around parent drops are called ____________________________.

31. Blood drops from greater heights will be (larger | smaller) than blood drops from lower heights.

32. Name 8 things an investigator can learn from analysis of a blood spatter.

a. __________________________________________________________________________

b. __________________________________________________________________________

c. __________________________________________________________________________

d. __________________________________________________________________________

e. __________________________________________________________________________

f. __________________________________________________________________________

g. __________________________________________________________________________

h. __________________________________________________________________________

33. What is luminol and how is it used in forensic investigations? _________________________________

_______________________________________________________________________________

34. Name 2 other chemicals used to identify blood at crime scenes.

_______________________________________________________________________________

_______________________________________________________________________________
** KNOW ALL DEFINITIONS FROM THE LAST 2 SLIDES OF THE BLOODSTAIN SCIENCE NOTES **
Part 3: Problems

Complete the Punnett squares and determine the possible offspring genotypes and phenotypes for each.

1. A woman heterozygous for type B blood has children with a man who has type AB blood.

   Possible offspring genotypes:
   Possible offspring phenotypes:

2. What is the probability that a child from this couple has type B blood?
   ( 100% | 75% | 50% | 25% | 0% )

3. A woman with type O blood has children with a man heterozygous for type B blood.

   Possible offspring genotypes:
   Possible offspring phenotypes:

4. What is the probability that a child from this couple has type O blood?
   ( 100% | 75% | 50% | 25% | 0% )

5. A woman with type AB blood has children with a man with type AB blood.

   Possible offspring genotypes:
   Possible offspring phenotypes:

6. What is the probability that a child from this couple has type O blood?
   ( 100% | 75% | 50% | 25% | 0% )

7. A woman homozygous for type A blood has children with a man heterozygous for type B blood.

   Possible offspring genotypes:
   Possible offspring phenotypes:

8. What is the probability that a child from this couple has type O blood?
   ( 100% | 75% | 50% | 25% | 0% )
* Angle of impact & Height of impact formulas WILL BE GIVEN ON TEST *

Angle of impact = \( \sin^{-1}\left(\frac{\text{width}}{\text{length}}\right) \)

Height of impact = distance to convergence \( \times \) tan(angle of impact)

Complete the chart below to determine the height of the blood drop for each.

<table>
<thead>
<tr>
<th></th>
<th>Width of drop</th>
<th>Length of drop</th>
<th>Angle of impact</th>
<th>Distance to point of convergence (m)</th>
<th>Height of blood drop (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>2.9 cm</td>
<td>3.7 cm</td>
<td></td>
<td></td>
<td>0.44 m</td>
</tr>
<tr>
<td>10.</td>
<td>0.11 cm</td>
<td>0.45 cm</td>
<td></td>
<td></td>
<td>0.84 m</td>
</tr>
<tr>
<td>11.</td>
<td>0.03 cm</td>
<td>0.05 cm</td>
<td></td>
<td></td>
<td>1.88 m</td>
</tr>
<tr>
<td>12.</td>
<td>1.2 cm</td>
<td>1.4 cm</td>
<td></td>
<td></td>
<td>0.32 m</td>
</tr>
</tbody>
</table>

13. A person has type AB- blood.
   a. Which antigens are on their blood cells? _______________________
   b. Which antibodies in their bloodstream? _______________________
   c. What blood types can they receive? _______________________
   d. What blood types can they donate to? ______________________

14. A person has type B+ blood
   a. Which antigens are on their blood cells? _______________________
   b. Which antibodies in their bloodstream? _______________________
   c. What blood types can they receive? _______________________
   d. What blood types can they donate to? ______________________