Lesson 1. Assessment 1.1 (Preassessment)

Name: ____________________________________________  Per: _____  Date: __________

This is a PREASSESSMENT. We will use it to find out what you know about the topic we are going to study next. It’s OK if you don’t know the answer to a question. Do your best to make an educated guess. Credit is based on effort.

Multiple choice: Circle the ONE best answer among the options (1 point each):

1. Sexual reproduction leads to more variation in traits because:
   a. Alleles are randomly inherited from each parent
   b. The offspring contain double as many genes as the parents
   c. Genes are inherited from only the mom or the dad
   d. Genes are dominant to traits and alleles

2. A dominant trait is:
   a. The most common trait in a population of organisms
   b. The normal trait compared to the recessive trait
   c. Always observed in the presence of a dominant gene
   d. Present in all offspring

3. An example of a scientific model is:
   a. A math equation for bacterial growth
   b. A shoebox with candy representing organelles of an animal cell
   c. A diagram showing how blood moves through the heart
   d. All of the above

Fill the answer in on the line (1 point each, unless shown otherwise):

1. What is a hypothesis? ________________________________________________________

2. How do scientists know if a hypothesis is right or wrong? ________________________
   ________________________________________________________________________

3. WHY do scientists use models? ______________________________________________
   ________________________________________________________________________

4. What could be a problem with using a model? _________________________________
   ________________________________________________________________________

5. What is a scientific argument? ______________________________________________
   ________________________________________________________________________
6. What does “random” mean? ____________________________________________
_____________________________________________________________________

7. What is an “allele”? ________________________________________________
_____________________________________________________________________

8. What does “dominant trait” mean? ____________________________________
_____________________________________________________________________

9. Why do sisters with the same parents not look identical (2 points)? ______
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

10. Suki says: “A puppy inherits its genes from its mom and dad (not from its
grandparents), so it will look more like its parents than like its grandparents.” Is she
right? ________ Explain your reasoning (3 points): _________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

11. Can traits skip generations? ______ Can genes skip generations? ________
Explain your answer (3 points): _______________________________________
_____________________________________________________________________
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Our NEXT objective will be:
I can explain how genes cause the pattern of inheritance of traits.

Please circle a number from 1 to 5 to show your progress towards meeting this objective:

I cannot explain it - 1 2 3 4 5 - I can explain it very well

Explain WHY you gave yourself this rating: ________________________________
_____________________________________________________________________
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_____________________________________________________________________
**Breeding:** First generation cross

Draw your prediction of the offspring’s tails:

Describe your prediction in words:
Pattern of inheritance of the tail-color traits in the first generation:

Hypothesis 1: ____________________________

______________________________

______________________________

Hypothesis 2: ____________________________

______________________________

______________________________

Hypothesis 3: ____________________________

______________________________

______________________________
Pattern of inheritance of tail-color traits

Does this evidence (data) affect which hypotheses may be right? Explain:

__________________________________________________________________________
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Lesson 1. Assessment 1.3 (Exit ticket)

Exit ticket:

Rate your progress on today’s learning target:

CAN you develop three HYPOTHESES for how genes are passed from parents to offspring, based on the pattern of inheritance of traits?

No idea - 1 2 3 4 5 - Yes I can!

What do you still not understand about today’s lesson?

_________________________________________________________________________
_________________________________________________________________________
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_________________________________________________________________________
Critter model for **Hypothesis ____**

Use blue and orange colored pencils to draw the disks representing genes:

Use your model to explain how genes cause the pattern of inheritance of traits. (Use the graphic organizer to help you organize your thoughts):

________________________________________

________________________________________

________________________________________
Skye has a ______ tail, and Poppy has a _____ tail. Lucy and Ocean both have ______ tails.

Now describe the tail colors (pattern of traits) for Lucy and Ocean’s pups.

________________________________________________

________________________________________________

are the instructions for ______. In my model of hypothesis ____, Skye and Poppy each have ______ (how many?) genes for tail color.”

Now describe what genes Lucy and Ocean inherited from Skye and Poppy:

________________________________________________

________________________________________________

Why? Describe the RULES you used to decide what kinds of genes Lucy and Ocean get, so that both their tails would turn out blue.

________________________________________________

________________________________________________

________________________________________________

________________________________________________

Lucy and Ocean’s pups can have either ______ tails or _____ tails. To get _____ tails, they have to inherit ________________ from ____________, because

________________________________________________

________________________________________________

(Hint: Use the rules from step 2 to tell how you can make the different possible tail colors of the pups)
Lesson 2. Assessment 2.2

Name: ___________________________

Answer the following questions using complete sentences:

1. How did the model help you towards understanding our overall objective for this week? (I can EXPLAIN how GENES cause the pattern of inheritance of TRAITS).

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___________________________________________________________________
___________________________________________________________________
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___________________________________________________________________

2. What are the trade-offs of using models to investigate the real world?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Challenge question: Can you think of other examples where scientists use models, and how that might be useful?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
Lesson 3. Assessment 3.1

Names: ______________________, ______________________  Per: ____  Group: ___

Table 1: Coin Toss Lab Results

<table>
<thead>
<tr>
<th>Offspring</th>
<th>Ocean’s contribution (T or t?)</th>
<th>Lucy’s contribution (T or t?)</th>
<th>Offspring’s genes (TT, Tt, tT or tt?)</th>
<th>Offspring’s tail color (blue or orange?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>20</td>
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</tbody>
</table>
Lesson 3. Assessment 3.2

Data organization:
How will you organize the data to prepare a new data table which summarizes the results of your whole table group (4 students)?

a. Discuss this question with your partner. Your data table (Table 2) will need to include the number of times your group of four got each gene combo (TT, Tt, tT, or tt), and the number of times you got each tail color trait (blue or orange).

b. In your science notebook, write a heading (Coin Toss Lab and the date). Then draw this data table (Table 2), and use it to summarize the results of your whole group of four.***

Stop to think:
Answer the following questions in your science notebook:

a. What are you noticing about this data?
b. What was the hardest part of doing this investigation?
c. What do you think you need to do next to analyze the data?

***Template provided to students who struggle with math and data organization:
Students paste this data table directly into their notebooks

Table 2: Summary of Coin Toss lab Results

<table>
<thead>
<tr>
<th>Gene Combo (Alleles)</th>
<th>Number of times</th>
<th>Tail color</th>
<th>Tail color (Totals)</th>
<th>Whole CLASS Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT</td>
<td></td>
<td>blue</td>
<td>_____ blue</td>
<td>_____ blue</td>
</tr>
<tr>
<td>Tt</td>
<td></td>
<td>blue</td>
<td></td>
<td></td>
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<tr>
<td>tT</td>
<td></td>
<td>blue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tt</td>
<td></td>
<td>orange</td>
<td>_____ orange</td>
<td>_____ orange</td>
</tr>
</tbody>
</table>
Lesson 4. Assessment 4.1

Name: _________________________________
Per: __________

Coin Toss Lab Analysis and Conclusion

Question: Can the coin toss model explain the pattern of inheritance of traits in Ocean and Lucy’s offspring?

Analysis:
Our whole class data showed that the coin toss model of random inheritance resulted in _____ blue-tailed and _____ orange-tailed critter pups. Use this WHOLE CLASS data to answer the questions below. Show your work.

1. What is the **RATIO** of blue-tailed to orange-tailed critter pups?***

__________________________________________________________________________
__________________________________________________________________________

2. What are the **FRACTIONS** of blue-tailed and orange-tailed critter pups?***

__________________________________________________________________________
__________________________________________________________________________

3. Explain why we got such a large ratio. Why is the ratio of blue to orange tails not 1:1?

__________________________________________________________________________
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4. If you and your partner toss a coin 100 times, predict how many times the outcome will be tails-tails, heads-heads, heads-tails and tails-heads.

__________________________________________________________________________
__________________________________________________________________________

5. How sure are you that you will actually get the exact answers that you gave to question number 4? Why?

__________________________________________________________________________
__________________________________________________________________________
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6. Why was the ratio of the coin toss results not EXACTLY 3:1?

__________________________________________________________________________
__________________________________________________________________________
7. Ocean and Lucy had 19 pups. Five of the pups had orange tails and 14 of them had orange tails. Do the results of the coin toss model match the critter offspring data?

__________________________________________________________________________
__________________________________________________________________________
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8. About ¼ of Ocean and Lucy’s pups have orange tails and about ¾ have blue tails. What is the cause of this pattern of inheritance of tail color? (Use evidence and scientific concepts in your explanation.)***

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1. What is the RATIO of blue-tailed to orange-tailed critter pups?

   **How to get started:**

   Number of blue-tailed pups = _________
   Number of orange-tailed pups = _________
   (Blue-tailed pups)/(Orange-tailed pups) = _________

   Now figure out: How many blue-tailed pups are there, for every one orange-tailed pup?

   __________________________________________________________________________
   __________________________________________________________________________

2. What are the FRACTIONS of blue-tailed and orange-tailed critter pups?

   **How to get started:**

   Number of blue-tailed pups = _________
   Number of orange-tailed pups = _________
   Total number of pups = _________

   Now figure out: (Blue-tailed pups)/(Total pups) = ?
   (Orange-tailed pups)/(Total pups) = ?

   __________________________________________________________________________
   __________________________________________________________________________
8. About ¼ of Ocean and Lucy’s pups have orange tails and about ¾ have blue tails. What is the cause of this pattern of inheritance of tail color? (Use evidence and scientific concepts in your explanation.)

Claim:
The pattern of inheritance of tail color is caused by __________________________ inheritance of different versions of __________________________.

Evidence and reasoning:
There are _______ different versions of the tail color gene: __________________________.
Each critter has ________ alleles. Each pup inherits __________________ from __________________________.
The ______ allele for ______ tail color is ____________________, which means that it will overpower the ____________ allele for ________ tail color.
We tested a coin toss model of __________________ inheritance of either the _____ or _____ allele. We found (use data!): __________________________
_____________________
_____________________
_____________________
_____________________
The ratio of _______ (color) to _______ (color) tails obtained by tossing coins was _____:_____. This is about the same as __________________________
_____________________
_____________________
_____________________
_____________________
Therefore, the science concepts of __________________________ and __________________________ can explain the pattern of inheritance of tail color (about ¼ orange tails and about ¾ blue tails).
Lesson 4. Assessment 4.2

Exit ticket

Rate your progress towards today’s learning target:
“Analyze the results of the coin toss lab, and construct an evidence-based explanation for how genes cause the pattern of inheritance of traits.”

I have no idea - 1 2 3 4 5 - I know this! I can do it!

What was the hardest part?
________________________________________________________________________
________________________________________________________________________

Where can you get more help?
________________________________________________________________________
________________________________________________________________________
Punnett Square Practice

Name: _____________________

Predicted genotypes:

TT

Tt

TT

Tt

Predicted phenotypes:
Punnett Square Practice

Name: _____________________

Predicted genotypes:

Predicted phenotypes:

Tt  Tt

tt  tt
Lesson 5 Assessment 5.2

Quiz: Mendelian inheritance of genes and traits (32 points)
(Standards Assessed: NGSS MS-LS3-2, WASS EARL4 6-8 LS3D, EARL2 6-8 INQE)

Multiple choice: Circle the ONE BEST answer (1 point each):

1. Sexual reproduction leads to more variation in traits because:
   a. Parents have homozygous alleles.
   b. The offspring contain double as many genes as the parents
   c. Genes are inherited from only the mom or the dad
   d. Alleles are randomly inherited from each parent

2. A dominant trait is:
   a. The most common trait in a population of organisms
   b. The normal trait compared to the recessive trait
   c. Always observed in the presence of a dominant gene
   d. Present in all offspring of a genetic cross

3. An example of a scientific model is:
   a. A math equation for bacterial growth
   b. A shoebox with candy representing organelles of an animal cell
   c. A diagram showing how blood moves through the heart
   d. All of the above

4. An organism reproduces **asexually**. It has two alleles (B and b) of a gene.
   The offspring will:
   a. All have two alleles (B and b)
   b. All have one allele (either a B or a b)
   c. Have BB, Bb or bb alleles
   d. Have no B or b alleles

5. We used a coin toss to:
   a. model that dominant alleles are more likely than recessive alleles
   b. investigate whether the T allele was dominant or recessive
   c. model random inheritance of two different alleles by the offspring
   d. model that all the offspring had blue rather than orange tails
Fill the answers in on the lines (points in parentheses):

6. Name at least one limitation of the coin toss model (1 point): __________________________
   ____________________________________________________________________________
   ____________________________________________________________________________

7. What does “random” mean? (1 point) ____________________________________________
   ____________________________________________________________________________

8. What is an “allele”? (1 point) ________________________________________________
   ____________________________________________________________________________

9. What does “recessive trait” mean? (1 point) ______________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________

10. A man has one B allele, and one b allele for an eye color gene. Will all his sperm cells be
    identical for this gene? ______ Explain your answer (2 points): ____________________
    ____________________________________________________________________________
    ____________________________________________________________________________

11. Is it possible for one phenotype to have more than one genotype? _____ Explain your
    answer (3 points): ____________________________________________________________
    ____________________________________________________________________________
    ____________________________________________________________________________
    ____________________________________________________________________________

12. Why do sisters with the same parents not look identical (2 points)? ________________
    ____________________________________________________________________________
    ____________________________________________________________________________
    ____________________________________________________________________________
13. Suki says: “A puppy inherits its genes from its mom and dad (not from its grandparents), so it will always look more like its parents than like its grandparents.” Is she right? ______
Explain your reasoning (3 points):
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

14. Can genes skip generations? ______ Explain your answer (2 points):
________________________________________________________________________
________________________________________________________________________

15. In humans, curly hair is dominant (H) to straight hair (h). A man with a genotype of Hh and a woman with a genotype of hh are wondering what their children's hair may look like. Complete the sides and inside of the Punnett square below, and fill in the predicted genotypes and phenotypes of the children on the lines in the box (3 points).

Predicted percentages (%) for children:

Genotypes:

Phenotypes:
16. Fish color is caused by a single gene with two different alleles (R and r). You buy a red male fish (called “Jim”) and a yellow female fish (called “Mary”) from the pet store. Jim and Mary produce 50 offspring that are all red. You name one of these red offspring “Bob”, and another one “Sally”. When Bob and Sally produce offspring of their own, there are 31 red fish and 9 yellow fish.

   a. List the genotypes of the parents (1 point):
   
   Jim: _______ Mary: _______ Bob: _______ Sally: _______

   b. Complete the Punnett square with Bob and Sally as the parents (3 points):

<table>
<thead>
<tr>
<th></th>
<th>Bob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sally</td>
<td>Predicted offspring:</td>
</tr>
<tr>
<td></td>
<td>Genotype:</td>
</tr>
<tr>
<td></td>
<td>____% _____ (Phenotype: _________)</td>
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<tr>
<td></td>
<td>____% _____ (Phenotype: _________)</td>
</tr>
<tr>
<td></td>
<td>____% _____ (Phenotype: _________)</td>
</tr>
</tbody>
</table>

   c. Write a paragraph using science concepts and evidence (numbers and ratios of the offspring) to explain how genes cause the pattern of inheritance of fish color in Bob and Sally’s offspring (4 points)

   ____________________________________________________________
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Reflection: Your answers will not affect the grade for your Quiz

1. Circle a number from 1 to 5 to show your progress towards meeting our objective: I can EXPLAIN how GENES cause the pattern of inheritance of TRAITS.
   I cannot explain it    1    2    3    4    5    I can explain it very well

Explain WHY you gave yourself this rating ____________________________________________
____________________________________________________________________________________

2. What was the hardest part of this unit to understand or do? ________________________________
____________________________________________________________________________________

<table>
<thead>
<tr>
<th>Rate your strengths and needs for what we did this week</th>
<th>I'm good at this</th>
<th>I need a little help</th>
<th>I need a LOT of help</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asking questions and making hypotheses</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Using and understanding models</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Doing investigations and collecting data</td>
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<td>O</td>
<td>O</td>
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<tr>
<td>Organizing and Analyzing data</td>
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<td>O</td>
</tr>
<tr>
<td>Making conclusions based on evidence</td>
<td>O</td>
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<td>O</td>
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<tr>
<td>Communicating results</td>
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</table>

3. What are your next steps to reach a 5 on our objective, and to become an expert on scientific practices?
____________________________________________________________________________________
____________________________________________________________________________________

4. Give examples of books, people or internet sites where you can get more help:
____________________________________________________________________________________
____________________________________________________________________________________

5. Now that we have learned how genes cause the pattern of traits, what do you wonder next? (What should our next question be in learning about genetics?)________________________________________
____________________________________________________________________________________

6. How is what we learned in this unit related to you?
____________________________________________________________________________________
____________________________________________________________________________________
Quiz: Mendelian inheritance of genes and traits (32 points)
(Standards Assessed: NGSS MS-LS3-2, WASS EARL4 6-8 LS3D, EARL2 6-8 INQE)

Multiple choice: Circle the ONE BEST answer (1 point each):

1. Sexual reproduction leads to more variation in traits because:
   a. Parents have homozygous alleles.
   b. The offspring contain double as many genes as the parents
   c. Genes are inherited from only the mom or the dad
   d. Alleles are randomly inherited from each parent

2. A dominant trait is:
   a. The most common trait in a population of organisms
   b. The normal trait compared to the recessive trait
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3. An example of a scientific model is:
   a. A math equation for bacterial growth
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4. An organism reproduces asexually. It has two alleles (B and b) of a gene.
   The offspring will:
   a. All have two alleles (B and b)
   b. All have one allele (either a B or a b)
   c. Have BB, Bb or bb alleles
   d. Have no B or b alleles

5. We used a coin toss to:
   a. model that dominant alleles are more likely than recessive alleles
   b. investigate whether the T allele was dominant or recessive
   c. model random inheritance of two different alleles by the offspring
   d. model that all the offspring had blue rather than orange tails
Fill the answers in on the lines (points in parentheses):

6. Name at least one limitation of the coin toss model (1 point): __________________________
__________________________________________________________________________
__________________________________________________________________________

7. What does “random” mean? (1 point) ____________________________________________
__________________________________________________________________________

8. What is an “allele”? (1 point) ________________________________________________
__________________________________________________________________________

9. What does “recessive trait” mean? (1 point) ______________________________________
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10. A man has one B allele, and one b allele for an eye color gene. Will all his sperm cells be identical for this gene? ______ Explain your answer (2 points): ____________________________
__________________________________________________________________________
__________________________________________________________________________

11. Is it possible for one phenotype to have more than one genotype? _____ Explain your answer (3 points): ____________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

12. Why do sisters with the same parents not look identical (2 points)? ______________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
13. Suki says: “A puppy inherits its genes from its mom and dad (not from its grandparents), so it will always look more like its parents than like its grandparents.” Is she right? _______

Explain your reasoning (3 points):
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

14. Can genes skip generations? _______

Explain your answer (2 points):
__________________________________________________________________________
__________________________________________________________________________

15. In humans, curly hair is dominant (H) to straight hair (h). A man with a genotype of Hh and a woman with a genotype of hh are wondering what their children’s hair may look like. Complete the sides and inside of the Punnett square below, and fill in the predicted genotypes and phenotypes of the children on the lines in the box (3 points).

Predicted percentages (%) for children:

Genotypes:

Phenotypes:
16. Fish color is caused by a single gene with two different alleles (R and r). You buy a red male fish (called “Jim”) and a yellow female fish (called “Mary”) from the pet store. Jim and Mary produce 50 offspring that are all red. You name one of these red offspring “Bob”, and another one “Sally”. When Bob and Sally produce offspring of their own, there are 31 red fish and 9 yellow fish.

a. List the genotypes of the parents (1 point):
Jim: _______  Mary: _______  Bob: _______  Sally: _______

b. Complete the Punnett square with Bob and Sally as the parents (3 points):

Bob

<p>| | | |</p>
<table>
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<tbody>
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</tbody>
</table>
Sally

Predicted offspring:
Genotype:
____% _______ (Phenotype: __________)
____% _______ (Phenotype: __________)
____% _______ (Phenotype: __________)

C. Write a paragraph using science concepts and evidence (numbers and ratios of the offspring) to explain how genes cause the pattern of inheritance of fish color in Bob and Sally’s offspring (4 points)

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Part D: EVALUATION CRITERIA for Assessment 5.2

Standards evaluated are:
MS-LS3-2 (abbreviated LS3-2 below)
EARL4 6-8 LS3D (abbreviated LS3D below)
EARL2 6-8 INQE (abbreviated INQE below)

MULTIPLE CHOICE (questions 1-5)
(1 point each, 5 Points Total)

<table>
<thead>
<tr>
<th>Answer number</th>
<th>Correct answer</th>
<th>Aligned with Learning target</th>
<th>Aligned with standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>d</td>
<td>LT4</td>
<td>LS3-2; LS3D</td>
</tr>
<tr>
<td>2</td>
<td>c</td>
<td>LT4</td>
<td>LS3-2; LS3D</td>
</tr>
<tr>
<td>3</td>
<td>d</td>
<td>LT2</td>
<td>INQE</td>
</tr>
<tr>
<td>4</td>
<td>a</td>
<td>LT5</td>
<td>LS3-2; LS3D</td>
</tr>
<tr>
<td>5</td>
<td>c</td>
<td>LT3, LT4</td>
<td>LS3-2; LS3D; INQE</td>
</tr>
</tbody>
</table>

WRITE-IN ANSWERS (questions 6-15)
(Variable as indicated, 19 Points Total)

<table>
<thead>
<tr>
<th>Answer number (LT) [standard]</th>
<th>Evaluation criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 (LT5) [INQE]</td>
<td>1 point Correctly identifies a limitation of the model related to inheritance of traits and genes. Possible answers include the inability of the model to explain incomplete dominance, inheritance of multigenic traits, or environmental effects. (Acceptable answers include an example instead of naming these concepts)</td>
</tr>
<tr>
<td>2 points</td>
<td>Demonstrates partial understanding of the question, for example answer relates to limitation due to bias introduced by weight of coin or tossing procedure.</td>
</tr>
<tr>
<td>0 points</td>
<td>No answer or does not demonstrate partial understanding of the question</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7 (LT4) [LS3-2; LS3D]</th>
<th>1 point Shows conceptual understanding of all outcomes being equally likely, such as in the coin toss model (for example, acceptable answers include 50-50 chance, cannot be predicted, or not controlled).</th>
<th>0 points</th>
<th>No answer or shows no understanding of equal likelihood of outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 (LT4) [LS3-2; LS3D]</td>
<td>1 point Correct definition, for example “a version of a gene” (Acceptable answers includes “a gene” or “the DNA”, but not “a trait”)</td>
<td>½ point</td>
<td>Only provides an example of notation, for example B or b OR Answer includes correct AND wrong statements.</td>
</tr>
<tr>
<td></td>
<td>0 points</td>
<td>No answer or does not demonstrate partial understanding (for example, “a trait” or “Bb”)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>1 point</td>
<td>½ point</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9</td>
<td>(LT4) [LS3-2; LS3D] 1 point Answer shows conceptual understanding of a trait that is hidden or masked by a dominant trait, or a trait that is only observed in the absence of the dominant allele.</td>
<td>½ point Shows partial understanding, or shows understanding but includes an erroneous statement (for example rare or uncommon trait)</td>
<td>0 points No answer or does not demonstrate partial understanding</td>
</tr>
<tr>
<td>10</td>
<td>(LT5) [LS3-2; LS3D] 2 points Answers the question with “no” AND shows understanding of the concept that each sperm contains just one gene/allele (B or b).</td>
<td>1 point Answers the question with “no” but provides an explanation which is insufficient, OR shows partial understanding</td>
<td>0 points No answer provided OR provides wrong explanation</td>
</tr>
<tr>
<td>11</td>
<td>(LT4) [LS3-2; LS3D] 3 points Answers the question with “yes”. Shows understanding of the concept that a genotype is a combination of two alleles, so one phenotype can result from two dominant alleles, or one dominant and one recessive allele. May use example to explain, such as TT and Tt both make blue tails.</td>
<td>2 points Answers the question with “yes” AND shows partial understanding of the concept, but lacks sufficient detail to infer complete understanding</td>
<td>1 point Answers the question with “yes” but explanation does not provide evidence or understanding, or provides only minimal connection</td>
</tr>
<tr>
<td>12</td>
<td>(LT4) [LS3-2; LS3D] 2 points Shows understanding that random inheritance of alleles or genes results in differences between siblings. (Acceptable answers include genetic material inherited from both parents, but different sperm and egg cells combine.)</td>
<td>1 point Answer demonstrates partial understanding</td>
<td>0 points No answer or does not demonstrate partial understanding</td>
</tr>
<tr>
<td>13</td>
<td>(LT4) [LS3-2; LS3D] 3 points Answers the question with “no” and answer includes concept that a TRAIT may skip a generation (or may be “hidden” in the parents).</td>
<td>2 points Answers the question with “no” But does not articulate concept of hidden or recessive traits, or contains a factual error</td>
<td>1 point Explanation includes factually correct concepts of inheritance of genes/traits from parents, but does not show evidence of understanding that traits can skip a generation.</td>
</tr>
<tr>
<td>14 (LT4)</td>
<td>2 points</td>
<td>1 point</td>
<td>0 points</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>[LS3-2; LS3D]</td>
<td>Answers the question with “no”, and shows understanding that genes are physically inherited from generation to generation (whereas traits may skip generations)</td>
<td>Answer is “yes”, but explanation shows understanding of inheritance of genes and traits OR answer is no, but explanation does not provide sufficient evidence of conceptual understanding</td>
<td>No answer or answer does not demonstrate partial understanding</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>15 (LT5)</th>
<th>3 points</th>
<th>2 points</th>
<th>1 point</th>
<th>0 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>[LS3-2; LS3D; INQE]</td>
<td>1) Punnett square is accurately filled out, showing alleles of parents (H and h), and genotypes (Hh, Hh, hh, hh, matched to allele locations in the squares).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2) Genotypes are 50% Hh and 50% hh</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3) Phenotypes are 50% curly and 50% straight</td>
<td>One of the three elements is missing or incorrect</td>
<td>Two of the three elements is missing or incorrect</td>
<td>No answer, or all three elements incorrect</td>
</tr>
</tbody>
</table>

**WRITE-IN ANSWER: Performance task of CF (question 16)**

(8 Points Total)

<table>
<thead>
<tr>
<th>16a (LT3, LT4)</th>
<th>1 point</th>
<th>½ point</th>
<th>0 point</th>
</tr>
</thead>
<tbody>
<tr>
<td>[LS3-2; LS3D]</td>
<td>Genotypes of parents are RR, rr, Rr and Rr (in order).</td>
<td>Contains at least two correct genotypes.</td>
<td>Genotypes not provided, or 3 or more errors.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>16b (LT5)</th>
<th>3 points</th>
<th>2 points</th>
<th>1 point</th>
<th>0 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>[LS3-2; LS3D; INQE]</td>
<td>1) Punnett square is accurately filled out, showing alleles of parents (R and r), and genotypes (RR, Rr, Rr, rr, matched to allele locations in the squares).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2) Genotypes are 25% RR, 50% Rr and 25% rr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3) RR and Rr red; rr yellow</td>
<td>One of the three elements is missing or incorrect</td>
<td>Two of the three elements is missing or incorrect</td>
<td>No answer, or all three elements incorrect</td>
</tr>
<tr>
<td>16c</td>
<td>4 points</td>
<td>3 points</td>
<td>2 points</td>
<td>1 point</td>
</tr>
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</tr>
<tr>
<td>(LT4)</td>
<td>Explanation demonstrates understanding of how genes cause the pattern of inheritance of traits (CF), by including: 1) the concepts of dominance (1 point) AND random inheritance (1 point), AND 2) a comparison of the numbers of actual offspring (data) with the expected ratio from random inheritance (2 points)</td>
<td>Explanation demonstrates conceptual understanding of how genes cause the pattern of inheritance of traits (CF), but lacks one of the four elements described (one of the concepts, numbers (data), OR expected ratio of 3:1)</td>
<td>Explanation demonstrates some understanding of how genes cause the pattern of inheritance of traits (CF), but lacks two of the four elements described</td>
<td>Some evidence of understanding provided, and explanation contains one of the 4 elements described</td>
</tr>
</tbody>
</table>