Identifying Reasoning

Teacher key

1. Choose the best reasoning to complete the argument below.

**Observation**  Two light tan mice had a baby mouse pup with dark brown fur.

**Question**  How did light parents produce a pup with dark fur?

**Claim**  In at least one of the parents’ gametes (reproductive cells), mutation of the MC1R gene generated a new allele that caused the mouse pup to have dark fur.

**Evidence**  
- Genetic testing showed that the two light-colored mice are definitely the parents of the dark-colored pup.
- DNA sequencing revealed that the mouse pup has an allele of the MC1R gene that causes more black pigment to be made in the fur.
- Neither parent has a copy of this dark MC1R allele.

Which of the following statements provides the best reasoning to justify why the evidence supports the claim?

- **a.** Mutation is a natural process that generates genetic variation.
- **b.** DNA is passed from parents to offspring so that each offspring gets half of their genetic information from their father and half from their mother.
- **c.** The dark MC1R allele is dominant to the light MC1R allele.
- **d.** Since offspring inherit DNA from their parents, if neither parent carried the dark MC1R allele, mutation in a parent’s sex cell must have generated the allele.
- **e.** Mutation happens when errors are made in copying the DNA, sometimes as a result of environmental causes.
2. Complete the argument: Draw a line to match the evidence to the relevant reasoning.

**Claim:** A disease in rats is caused by having an allele of the C gene called C\(^2\).

<table>
<thead>
<tr>
<th>EVIDENCE</th>
<th>(connect the dots)</th>
<th>REASONING</th>
</tr>
</thead>
<tbody>
<tr>
<td>No healthy rats have the C(^2) allele.</td>
<td>![connection]</td>
<td>If a single copy of the C(^2) allele causes the disease, then diseased rats will always have at least one copy of the C(^2) allele.</td>
</tr>
<tr>
<td>Every rat with the disease has at least one copy of the C(^2) allele.</td>
<td>![connection]</td>
<td>If a single copy of the C(^2) allele causes the disease, then putting the C(^2) allele into rats with normal C alleles will give them the disease.</td>
</tr>
<tr>
<td>When a C(^2) allele is put into rat embryos whose parents had only normal alleles of the C gene, the embryos have the disease when they grow up.</td>
<td>![connection]</td>
<td>If a single copy of the C(^2) allele causes the disease, then healthy rats will never have the C(^2) allele.</td>
</tr>
</tbody>
</table>

3. a. Use the information below to fill in the table.

**Observation** Some dogs have curly hair, and others have straight hair.

**Question** Does the K gene influence hair texture in dogs?

**Claim** Having at least one K\(^C\) allele causes curly hair in dogs.

<table>
<thead>
<tr>
<th>EVIDENCE</th>
<th>Supports claim</th>
<th>Does not support claim</th>
<th>Opposes claim</th>
</tr>
</thead>
<tbody>
<tr>
<td>All dogs have two alleles of the K gene.</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>All dogs with a K(^C) allele have curly hair.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No dogs with straight hair have a K(^C) allele.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some dogs have wavy hair.</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

b. For one piece of evidence that supports the claim, provide the reasoning that connects the evidence to the claim.

*You may want to prompt your students to model their answers on the evidence in the table.*

(All dogs with a K\(^C\) allele have curly hair)
If having a K\(^C\) allele causes curly hair, then all dogs that have a K\(^C\) allele should have curly hair.

(No dogs with straight hair have a K\(^C\) allele)
If having a K\(^C\) allele causes curly hair, then no dogs that have a K\(^C\) allele should have straight hair.