**Answer Key: Making Seitan from Flour**

**Sample Observation Tables/Expected results**

<table>
<thead>
<tr>
<th></th>
<th>Wheat Berries</th>
<th>Flour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations</td>
<td>Small, tan, hard</td>
<td>Powdery, lighter in color than wheat berries, some brown pieces present (that is the bran)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Dough after kneading</th>
<th>Gluten after washing</th>
<th>Seitan after simmering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations after stretching</td>
<td>Stretches easily, retracts slightly</td>
<td>Stretches easily, looks “stringy,” retracts greatly</td>
<td>Does not stretch as easily, retracts; easier to rip apart</td>
</tr>
<tr>
<td>General observations</td>
<td>Light in color, could feel it getting “tougher” with kneading</td>
<td>Deeper in color, can see gluten strands, peppered with small brown pieces of bran</td>
<td>Similar color to gluten, firm, when cut can see evidence of gluten strands</td>
</tr>
</tbody>
</table>

**Analysis**

1. Elasticity describes the ability of dough to retract to its initial position after being stretched. Which sample demonstrated the greatest elasticity: dough, gluten, or seitan?

   *Most likely the gluten will have had the greatest elasticity.*

2. What evidence from the activity supports the following statement: Some components of dough are water-soluble?

   There was visual evidence of a milky white substance (starch) dissolving in the water upon washing. Also, during the washing step, the volume of the dough decreased.

3. Look up the chemical structure of starch. What features of its structure allow for starch to be soluble in water?

   Glucose molecules serve as the monomers of starch. Glucose molecules have many polar hydroxyl (−OH) groups, which hydrogen bond with water molecules and allow the starch to dissolve in water.
4. Why is it essential to knead the dough before washing it?

Gluten must be developed and is done so through kneading. Without kneading, glutenin and gliadin would not have aligned and interacted sufficiently and the gluten matrix would not have formed. Upon washing it, the gliadin and glutentin proteins would have separated from the dough (they wouldn’t dissolve, but would just settle to the bottom of the bowl).

5. Bread doughs contain an essential ingredient that our dough lacked, a leavening agent, usually in the form of yeast. Leavening agents serve to produce gas. Predict how gluten and gas may interact to produce bread.

The gluten matrix serves to “trap” gas bubbles and allows for doughs to rise. The baked product is light and airy. Look at a slice of bread to see evidence of the gluten structure and air pockets.

6. Compare the texture of the seitan to that of meats you have eaten—DO NOT eat the seitan prepared in lab! Do you think seitan is a good meat replacement based on texture? Why or why not?

Answers will vary. This question/answer is enhanced if the taste-test extension described below is implemented.

Conclusion
In your own words, using three or four sentences, summarize how seitan is prepared. In your summary, be sure to use and underline the following terms: seitan, soluble, flour, starch, gluten, elasticity.

Answers will vary