**Can life always be seen?**

**Question:** What are the characteristics of life and can it always be seen?

**Purpose:** To observe living organisms and contrast them to non-living objects in order to define the characteristics of life.

**Hypothesis**

*Create a hypothesis by answer the following question and explaining why:*

*If you cannot see a sample well, then how could you test whether it was alive or not? Why? (5 points-see CER rubric at end)*

**Materials**

* Hand lenses
* 4 test tubes and 1 test tube holder: 1 tube for each sample, 1 for water (control)
* Samples A, B, and C
* Spoons
* Sugar
* Measuring spoon (teaspoon)

**Procedure**

1. Observe the characteristics of each sample one at a time. You may use all of your senses other than taste.

2. Use the hand lens to take a closer look and add more description to your observations as well as a drawing.

3. Beginning with cup A, add one ½ teaspoon of sugar. Stir the sugar in with the sample.

4. Continue with all three cups, recording observations.

5. Stir in a ½ teaspoon of water into Sample A. Observe and record.

6. Continue with all three samples, recording observations.

7. Add another ½ teaspoon of sugar to each container and record observations.

8. Discuss observations with partners and decide which samples contain a living organism and which do not. Be ready to support your claim with evidence.

9. Allow the samples to sit for 10-15 minutes while you complete your observations and discussion

**Observations** (30 points)

| **Observation** | **Sample A** | **Sample B** | **Sample C** |
| --- | --- | --- | --- |
| Drawing |  |  |  |
| Description |  |  |  |
| What happened when sugar was added? |  |  |  |
| What happened when warm water was added? |  |  |  |
| What happened when additional sugar was added? |  |  |  |
| Other Observations |  |  |  |
| Questions to Ask or ideas to ponder or further investigations |  |  |  |

**Discussion**

*Create a claim, evidence, and reasoning for each sample following the example.*

**Claim:** Crushed rock isn’t living.

**Evidence:** There was no reaction to water or sugar.

**Reasoning:** The sample did not use the water and sugar to create energy through cellular respiration. The lack of carbon dioxide produced indicates the sample contains no life.

**Did the sample contain a living organism? Why or why not?**

Use complete sentences. (15 total points per sample)

| **Sample A** |  |
| --- | --- |
| **Sample B** |  |
| **Sample C** |  |

**Rubric (CER)**

| **Element** | **Sophisticated (3 pts)** | **Emerging (2 pts)** | **Early (1 pt)** | **Missing (0)** |
| --- | --- | --- | --- | --- |
| **Claim**  statement | Makes an accurate and complete claim (statement) in response to the question. | Accurate but incomplete claim | Responds to question with inaccurate claim. | No claim made that responds to question. |
| **Evidence**  (data) | The evidence contains all appropriate data from an observation | Evidence contains most of the appropriate data | Evidence contains some of the appropriate data | No evidence from observations are included |
| Interprets all of the data accurately. | Interprets most of the data accurately | Interprets some of the data accurately | Does not interpret any evidence. |
| **Reasoning**  (the how and the why) | Answers how or why the evidence supports the claim with sufficient (enough) relevant scientific information | Answers why or how the evidence supports the claim with insufficient relevant  scientific information | Answers why or how the evidence supports the claim with no relevant scientific information | Does not provide any reasoning |
| Uses all pieces of evidence and relevant scientific vocabulary to explain the relationship between the claim and evidence (how & why) | Uses most pieces of evidence and relevant scientific vocabulary to explain the relationship between the claim and evidence (how & why | Uses some pieces of evidence and relevant scientific vocabulary to explain the relationship between the claim and evidence (how & why | Uses no evidence and relevant scientific vocabulary to explain the relationship between the claim and evidence (how & why |