

35. A teacher gives a student a non-toxic, odorless, white powder to identify. Generate four questions, each regarding a different property of the unknown powder, that could be safely tested and answered in the laboratory.
Respond in the space provided in your **Answer Document**. (4 points)

Sample Response for Item 35 (Extended Response):

Other Correct Response(s):

- Does the powder dissolve in anything (water, dilute acid or base)?
- Is there any reaction when the powder is dissolved in a liquid (e.g., fizzing or bubbles)?
- What is the melting point of the powder?
- When a flame is administered, is there a color change?
- What is the pH of the powder when dissolved in water?
- Does the powder act as an electrolyte when dissolved in water?
- What is the crystalline structure when examined under a microscope or hand lens?
- What is its density?
- What is the decomposition rate of the powder?
- Other acceptable responses.

Scoring Guidelines for Item 35

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| 4 points | The student response demonstrates a complete understanding of the task by generating four questions regarding the properties of the unknown powder that could be safely tested and answered in the laboratory. The response is focused and relevant to the task. |
| 3 points | The student response demonstrates an understanding of the task by generating three questions regarding the properties of the unknown powder that could be safely tested and answered in the laboratory. The response is focused and relevant to the task. |
| 2 points | The student response demonstrates a partial understanding of the task by generating two questions regarding the properties of the unknown powder that could be safely tested and answered in the laboratory. The response is relevant to the task, but there may be gaps in focus. It provides some evidence of understanding. |
| 1 point | The student response demonstrates an unclear understanding of the task by generating only one question regarding the properties of the unknown powder that could be safely tested and answered in the laboratory. The response fails to adequately address the task or omits significant aspects of the task and may provide unrelated or unclear information. There is little evidence of focus. |
| 0 points | The student response does not meet the criteria required to earn one point. The response indicates inadequate or no understanding of the task. It may only repeat information from the passage or prompt or provide incorrect or irrelevant information. The student may have written on a different topic or written, "I don't know." |

- Does the powder have a scent?²
- Does it feel like any other powder?
- How does it feel when you use it on your body?
- Can you use it to stop an odor?

Score Point: 0

The response provides no acceptable questions that could be safely tested and answered in the laboratory. Questions 1, 2 and 3 are unsafe practices and are unacceptable. Question 4 is not acceptable.

- ① Does this unknown substance have proteins in it?
- ② Does the unknown substance have carbohydrates in it?
- ③ Does the substance have any types of sugars?
- ④ Does the substance have fats or oils in it?

Score Point: 0

The response provides no acceptable questions that could be safely tested and answered in the laboratory. The four questions do not refer to properties, therefore this response receives no credit.

Is the powder thin?
Is the powder clumpy?
Is it miscolored?
Does it have a strong odor?
Describe the powder in detail.

Score Point: 1

The response provides essentially one acceptable question that could be safely tested and answered in the laboratory. Questions 1 and 2, regarding texture, are the same thing and together earn one point. Question 3 is not acceptable. The prompt tells the student that the powder is white. Question 4 is unsafe practice and is not acceptable.

- 1-) does it create a sticky substance when added with water
- 2-) does it shoot up like dust when blown on!

Score Point: 1

The response provides one acceptable question that could be safely tested and answered in the laboratory. Question 1, regarding what happens to the texture when adding water, is acceptable. Question 2 is an unsafe practice and is unacceptable.

1. Find out what kind of powder it is by comparing / contrasting it to the powders.
2. Find out the mass of the powder.
3. Find out if it has any taste to it.
4. See if its able to float in water

Score Point: 1

The response provides one acceptable question that could be safely tested and answered in the laboratory. Statement 4, regarding density, is acceptable. Statement 1 is too vague to earn a point. Statement 2, regarding mass, is not acceptable. Statement 3, regarding tasting the powder, is unsafe practice and is unacceptable.

1. Does the powder feel dense?
2. What is the texture of the powder?
3. Is the powder clumped together or spread out?
4. Is one pebble of the powder thick or very small and hard to tell?

Score Point: 1

The response provides essentially one acceptable question that could be safely tested and answered in the laboratory. Question 1, regarding feeling the powder, is an unsafe practice and is unacceptable. Questions 2, 3 and 4 all refer to texture and together earn one point.

Since he is sure it is non-toxic the student can taste the powder. The student can examine what the powder does in the presence of water. The student can look under a microscope and see the makeup of the particles of the powder. Then the student for his final observation can compare the unknown powder to powders he does know that may seem reasonably correct. He cannot however smell the powder because it is already labeled as odorless.

Score Point: 2

The response provides two acceptable questions that could be safely tested and answered in the laboratory. Question 2, regarding mixing with water, is acceptable. Question 3, regarding examining the crystalline structure, is acceptable. Question 1, regarding tasting the powder, is unsafe and therefore not acceptable. Question 4 is not acceptable.

- 1) What happens when you heat it?
- 2) Does it mix well with water?
- 3) Is it safe for humans to touch?
- 4) What chemicals are in it?

Score Point: 2

The response provides two acceptable questions that could be safely tested and answered in the laboratory. Question 1, regarding application of heat, is acceptable. Question 2, regarding mixing with water, is acceptable. Question 3, regarding touching the powder, is unsafe and therefore not acceptable. Question 4 is not acceptable.

What does the powder react with?

Will it dissolve if mixed in water?

Is it a compound element powder?

Does the powder weigh anything?

Score Point: 2

The response provides two acceptable questions that could be safely tested and answered in the laboratory. Question 1, regarding reaction with another substance, is acceptable. Question 2, regarding dissolving in water, is acceptable. Question 3 is not acceptable. Question 4, regarding weight of the powder, is not acceptable.

1. Does it conduct heat?

2. can it be combined with liquid to make a different liquid?

3. does it react with anything?

4. When mixed with vinegar does it rise and bubble?

Score Point: 2

The response provides essentially two acceptable questions that could be safely tested and answered in the laboratory. Question 1, regarding conduction of heat, is not acceptable. Question 2, regarding combining with liquid, is acceptable. Questions 3 and 4, regarding reaction with liquids, are the same thing and together earn one point.

1. What happens when it's added to water?
2. how does it react to cold?
3. how does it react to heat?
4. What does look like when you dissolve it?

Score Point: 3

The response provides three acceptable questions that could be safely tested and answered in the laboratory. Question 1, regarding mixing with water, is acceptable. Question 3, regarding reaction to heat, is acceptable. Question 4, regarding appearance when dissolved, is acceptable. Question 2, regarding reaction to cold, is not acceptable.

- 1) is the powder flammable?
- 2) does it react with any other chemicals?
- 3) What is the pH level?
- 4) Can it be broken down into elements?

Score Point: 3

The response provides three acceptable questions that could be safely tested and answered in the laboratory. Question 1, regarding flammability, is acceptable. Question 2, regarding reaction with other chemicals, is acceptable. Question 3, regarding pH level, is acceptable. Question 4 is not acceptable. The powder cannot be broken down into elements in a school lab.

1. What is the texture of the powder?
2. What is the mass of the product?
3. What is the reaction to water?
4. What is the Density?

Score Point: 3

The response provides three acceptable questions that could be safely tested and answered in the laboratory. Question 1, regarding texture, is acceptable. Question 3, regarding reaction to water, is acceptable. Question 4, regarding density, is acceptable. Question 2, regarding mass, is not acceptable.

How to ^{safely} test White, odorless powder

- Does it dissolve in water?
- What is its melting point?
- How does it react with a common acid such as HCl?
- What is its mass?

All of the above questions can be determined safely in the laboratory because even though the powder is non-toxic, it should not be touched, inhaled or eaten by the student conducting the experiment, none of the above questions require that.

Score Point: 3

The response provides three acceptable questions that could be safely tested and answered in the laboratory. Question 1, regarding dissolving in water, is acceptable. Question 2, regarding the melting point, is acceptable. Question 3, regarding reaction with acid, is acceptable. Question 4, regarding mass, is not acceptable.

Question 1: Add to boiling water
2nd attempt re-crystallization, what
happens to the powder?

Question 2: Find the density of
the powder, and compare it
to the density of common white
powder substances, are there
any similarities?

Question 3: If you put a flame
to the substance what
happens to it?

Question 4: If you were to
make a scientific guess, what
do you think the substance
really is?

Score Point: 3

The response provides three acceptable questions that could be safely tested and answered in the laboratory. Question 1, regarding adding to boiling water and attempting re-crystallization, is acceptable. Question 2, regarding density, is acceptable. Question 3, regarding putting a flame to the substance, is acceptable. Question 4 is not acceptable.

1. What does it react with?
2. What happens when you heat it up?
3. What happens when you mix it with water?
4. Does it decompose over time?

Score Point: 4

The response provides four acceptable questions that could be safely tested and answered in the laboratory. Question 1, regarding reaction with other chemicals, is acceptable. Question 2, regarding application of heat, is acceptable. Question 3, regarding mixing with water, is acceptable. Question 4, regarding decomposition, is acceptable.

- 1) What is the density of the powder?
- 2) Is the powder water soluble?
- 3) Is the powder flammable?
- 4) What is the shape of the powder?

Score Point: 4

The response provides four acceptable questions that could be safely tested and answered in the laboratory. Question 1, regarding density, is acceptable. Question 2, regarding water solubility, is acceptable. Question 3, regarding flammability, is acceptable. Question 4, regarding shape of the powder, referring to crystalline structure, is acceptable.

When the student is given the powder, he could ask whether or not the substance is soluble or insoluble; to test this, he could mix the powder with water. If the substance dissolves, it's soluble; if it doesn't, it's insoluble. The student could find the density of the substance because once he found that he could try to find the specific substance that matched that found density. The student could react this powder with another substance and check to see if his observations are similar to other observations that would prove what his substance is. Lastly, the student could try to heat the substance until it boiled. He could record that boiling point and find a substance with the same boiling point and similar properties; then he might be able to name that substance. So the four questions that can be safely tested in the lab regarding this substance are: what is its density? Is it soluble or insoluble? Does it react with other substances? What is its boiling point? By finding the answer to these questions, the student will be closer to naming the substance.

Score Point: 4

The response provides four acceptable questions that could be safely tested and answered in the laboratory. Question 1, regarding solubility, is acceptable. Question 2, regarding density, is acceptable. Question 3, regarding reaction with other substances, is acceptable. Question 4, regarding heating the powder, is acceptable. Note that mention of "boiling point" is an error; solids melt, but this does not keep the response from earning a score of 4.