

ACT Aspire Science Practice Questions

Students did 2 experiments to estimate the mass of water present in margarines and in hand lotions.

Experiment 1

The students measured out a 25 gram (g) sample of Margarine A in a glass beaker. The sample was heated until it completely melted. Upon cooling, a solid layer formed on top of a liquid water layer. A small hole was made in the solid layer, and the liquid water was poured out. The mass of solid remaining in the beaker was measured. Then, the mass of water in the margarine sample was calculated. The procedure was repeated for Margarines B, C, and D (see Table 1).

Margarine	Mass of solid remaining (g)	Mass of water in margarine sample (g)
A	24	1
B	13	12
C	19	6
D	11	14

Experiment 2

The students measured out a 25 g sample of Lotion E in a glass beaker. The sample was heated to boiling and then allowed to gently boil for 30 minutes. After the mixture cooled to room temperature, the mass of lotion remaining in the beaker was measured. Then, the mass of water in the lotion sample was calculated. The procedure was repeated for Lotions F, G, and H (see Table 2).

Lotion	Mass of lotion remaining (g)	Mass of water in lotion sample (g)
E	19	6
F	21	4
G	20	5
H	18	7

1.

Based on Table 1, the mass of solid remaining for Margarine A was how much greater than the mass of solid remaining for Margarine D ?

- A. 5 g
- B. 11 g
- C. 13 g
- D. 24 g

2.

What was the *minimum* mass of lotion needed to perform Experiment 2 ?

- A. 50 g
- B. 100 g
- C. 150 g
- D. 200 g

3.

The students need to use their results to calculate the percent of water in each sample. Drag values from the box into the empty equation below to produce the equation the students should use to calculate the **percent** of water in Margarine B.

$$\frac{\boxed{}}{\boxed{}} \times 100 = \text{percent of water in Margarine B}$$

6 g

12 g

13 g

25 g

4.

Suppose that before the experiments, a student had predicted that the mass of water in one of the margarine samples would be less than the mass of water in each lotion sample. The results for which margarine sample were consistent with this prediction?

- A. Margarine A
- B. Margarine B
- C. Margarine C
- D. Margarine D

5.

Based on the results of Experiments 1 and 2, order these samples by the mass of water present in each sample. Drag each sample to the correct position in the diagram.

Samples

Greatest mass of water

Least mass of water

Lotion G

Margarine A

Margarine D

Lotion H

6.

Suppose the students had mixed a 12.5 g sample of Margarine B and a 12.5 g sample of Margarine C. Further suppose that they had tested this mixed sample using the procedure from Experiment 1. Based on Table 1, predict the most likely mass, in grams, of water in the mixed sample. Explain your answer using specific numbers from Table 1.

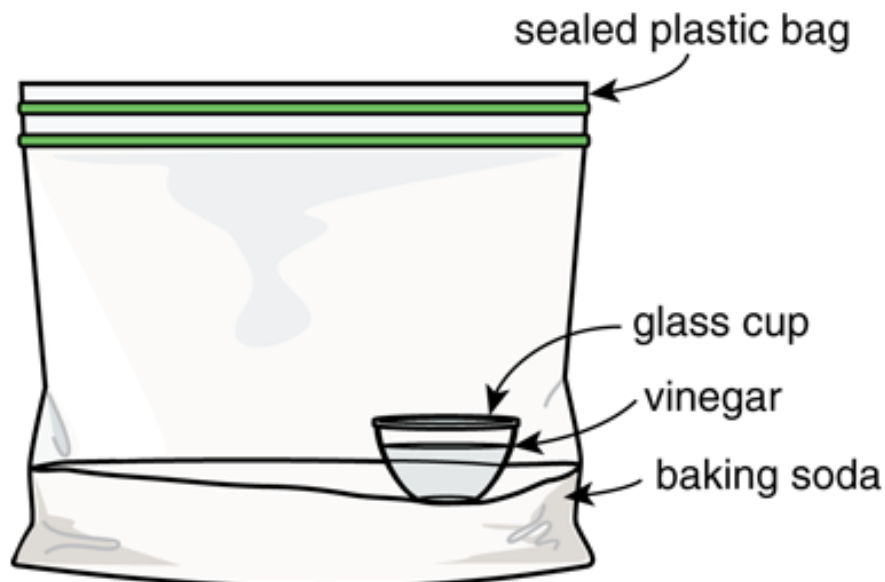
7.

Suppose that, in Experiment 2, the students had gently boiled the sample of Lotion H for 30 seconds instead of 30 minutes. Would the mass of water that would have been calculated for Lotion H be higher, lower, or the same as the mass of water listed for Lotion H in Table 2 ?

Explain your answer. In your explanation, be sure to cite the mass of water in the sample of Lotion H that is listed in Table 2.

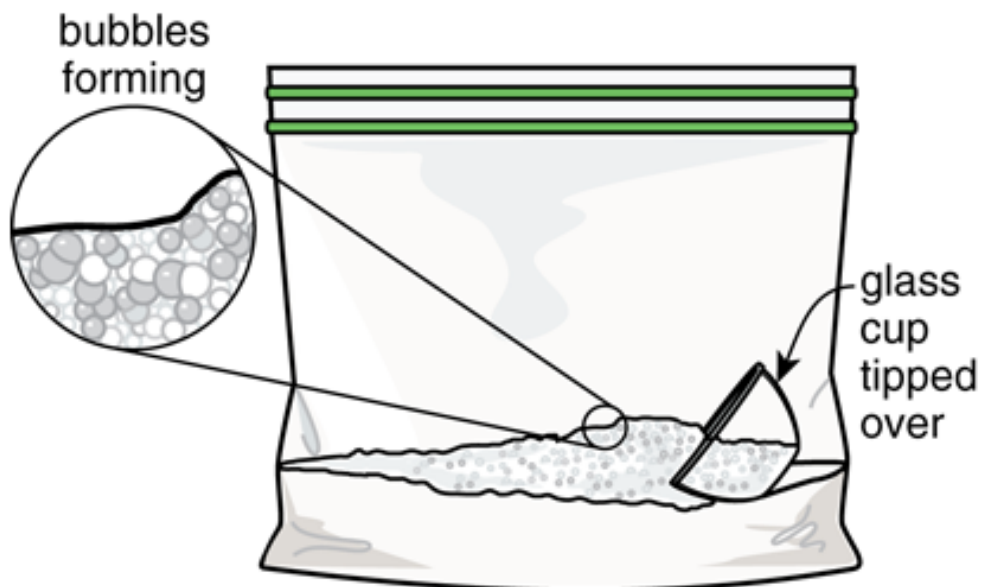
A teacher placed 2 kilograms of baking soda into a large plastic bag. Next, she placed a glass cup containing vinegar into the bag and sealed the bag (see Figure 1).

Figure 1



She then tipped the cup over, and bubbles started forming (see Figure 2).

Figure 2



The sides of the bag expanded. After the bubbles stopped forming, the bag remained expanded. Some powder and some liquid were still left in the bag. The teacher asked two students to explain the reaction that had happened inside the bag.

Liam's Explanation

The reaction produced a new liquid and a new gas. The only reason the bag expanded was because the reaction released heat. The reaction stopped once all the vinegar was used up, and that is when the bubbles stopped forming. The liquid left in the bag could not have been vinegar, because vinegar would have reacted with the solid baking soda that was left in the bag.

Juan's Explanation

The reaction only produced a new gas. The bag expanded because the new gas was trapped in the bag. The reaction stopped once the bag was full, and that is when the bubbles stopped forming. The only liquid left in the bag was vinegar that did not react. The powder left in the bag was baking soda that did not react.

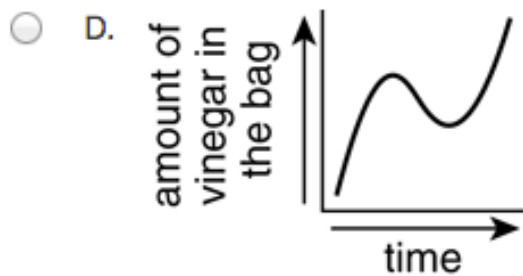
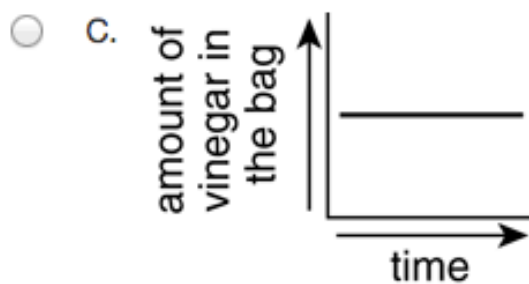
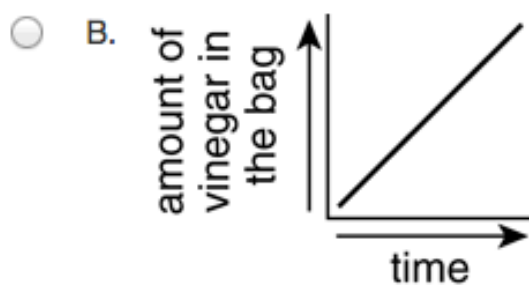
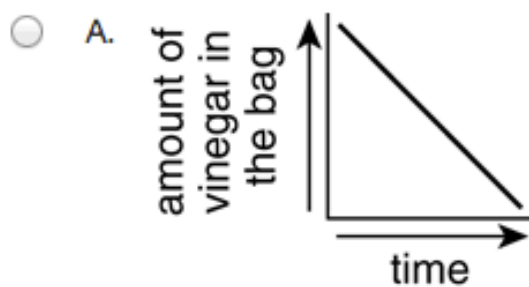
8.

According to the students' explanations, which substance do both students agree was left in the bag after the reaction had stopped?

- A. A new liquid
- B. A new solid
- C. Baking soda
- D. Vinegar

9.

Based on Liam's explanation, which of the following graphs best shows what Liam would most likely expect to happen to the amount of vinegar in the bag during the reaction?



10.

Based on the passage, the mass, in **grams**, of baking soda that the teacher added to the bag was

Choose...
Choose...
0.2 grams.
2 grams.
20 grams.
200 grams.
2,000 grams.

11.

Based on the students' explanations, does Figure 2 more likely show the bag and its contents before the reaction stopped or after the reaction stopped?

- A. Before, because Figure 2 shows bubbles forming.
- B. Before, because Figure 2 shows powder left in the bag.
- C. After, because Figure 2 shows no bubbles forming.
- D. After, because Figure 2 shows no powder left in the bag.

12.

Drag the correct word to each box to complete the sentence.

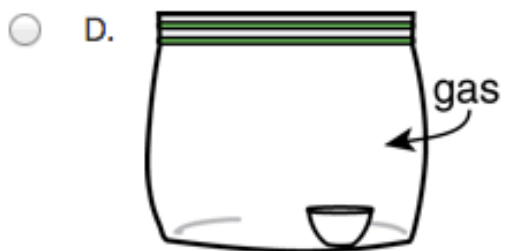
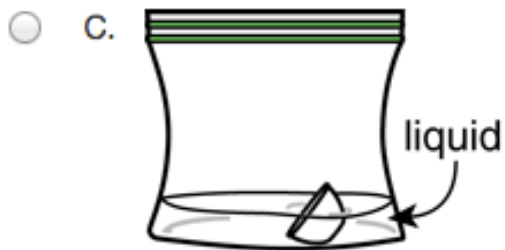
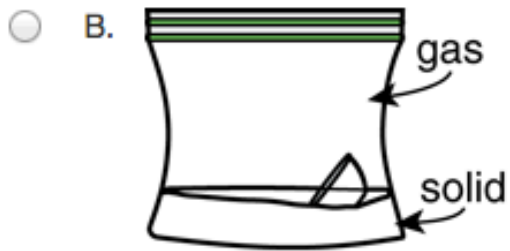
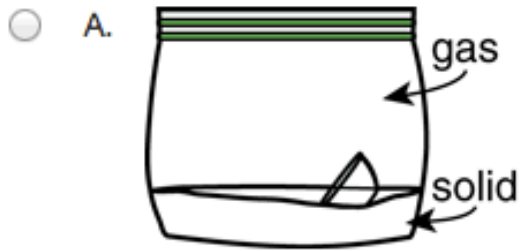
bag cup empty full

According to Juan's explanation, the reaction stopped because the

was

13.

Suppose all the baking soda had reacted with all the vinegar. If the bag had stayed sealed, which of the following diagrams best shows what Juan would expect to see after the reaction had stopped?



14.

Based on Liam's explanation only:

- Identify the **TWO** things that the reaction produced.
- Identify what the reaction released that caused the bag to expand.