PRACTICE

Activity 5: Interactions and Mass

Name Date Class

Hot and Cold Packs

(Questions 1–3) Perhaps you have used an instant cold pack or hot pack for an injury or to soothe sore muscles. There are two liquids inside the pack that are separated from each other. For the interaction between the two liquids to take place inside the pack, you must squeeze the pack to break the barrier between the liquids. Once the barrier is broken, the two liquids can interact. If it is a cold pack, the pack will get really cold; if it is a hot pack, it will become quite warm.

1. Is the pack an open system or a closed system? Write your reasoning.

2. After the interaction between the two liquids in the pack, does the amount of mass in the pack *increase*, *decrease*, or *stay the same*? Write your reasoning.

3. How would you set up an experiment to find out if the mass of the pack *increases*, *decreases*, or *stays the same*?

Determining Masses in Open Systems

(Questions 4–7) For systems with both mass inputs and mass outputs, you can use this mathematical statement to find the mass of objects:

Start Mass + Input Mass – Output Mass = End Mass

For example, imagine a system consisting of a 100g plastic pitcher. The pitcher is filled with 1000 g of orange juice, and 400 g is poured out. *What is the end mass of the pitcher and orange juice?*

To find the end mass, set up a mathematical statement like this:

Start Mass + Input Mass – Output Mass = End Mass

100 g + 1000 g – 400 g = 700 g

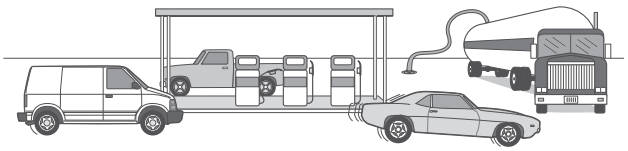
The mass of the pitcher and the 600 g of juice remaining in it would total 700 g.

100 g + (600) g = 700 g

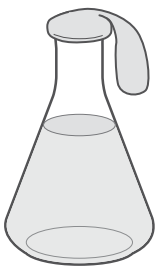
(Questions 4–6) Use the example above to answer the questions below.

4. **Rain Collector.** Meteorologists (weather scientists) wanted to determine the mass of rain falling during a one-week period. They used a large pan as a rain collector, and placed it on top of a mass scale. At the beginning of the week, the mass of the pan plus the water already in it was 4200 g. One week later, the mass was 4700 g. None of the water was allowed to evaporate or otherwise leave the system. What was the mass of the rain that landed in the pan during the week? *Show your work.*

5. At the Gas Station. During a two-week period at Bill's Gas Station, a gas tanker came once and put 30 metric tons of gasoline into one of the underground storage tanks. During the same two weeks, Bill sold a total of 20 metric tons of gasoline to customers. Bill started with 15 metric tons of gasoline in his storage tank. How much gasoline does Bill have left in his storage tank at the end of these two weeks? *Show your work.*



6. Gas Mass. A flask containing a chemical solution had a mass of 250 g. A mass of 115 g of another chemical was poured into the flask, and a balloon was quickly attached to seal the top of the flask. The combined solution bubbled for a few minutes, and the balloon filled up with gas. After removing the gas-filled balloon, the mass of the flask with its contents was 335 g. If the mass of the balloon is 10 g, what was the mass of the gas that escaped into the balloon? *Show your work.*



7. To solve Questions 4 to 6, what scientists' idea did you use? Write a couple of sentences to explain how the idea applies to these problems.