



Chapter 9: Quick Activities

How Chemicals React

Warming and Cooling Mixtures

The focus of this chapter is chemical changes. For practical reasons, however, we begin with a hands-on activity involving physical changes that aptly illustrate the role that energy plays when different materials are brought together.

PROCEDURE

1. Hold some room-temperature water in the cupped palm of your hand over a sink. Predict whether this water will become cool or warm as a small amount of rubbing alcohol is added to it. (Warning: rubbing alcohol causes severe and painful stomach problems if ingested. Never ingest rubbing alcohol.)
2. Add lukewarm water to two clear plastic cups. Transfer the water back and forth to ensure equal temperatures. Predict whether this water will become cool or warm as salt is added to it.
3. Stir several tablespoons of table salt into only one of the cups. Compare the temperatures of the two cups by holding them up to your temperature-sensitive cheeks.



ANALYZE AND CONCLUDE

1. If two round magnets were to roll toward each other, would they accelerate to faster speeds just before they collided? If two attracting molecules were to float toward each other, would they accelerate to faster speeds just before they collided? What happens to the temperature of a material when its molecules are accelerated to faster speeds?
2. Do you get energy from pulling two magnets apart from each other, or do you lose energy? Is energy released or absorbed when sodium and chloride ions are pulled away from their crystal-line structure? Why do many athletic "cold packs" contain salts?

Smell the Ozone

If you ever have the opportunity to play with an electric train set, be sure to smell the engine car after it has been operating. You will note a slight "electric smell". This is the smell of ozone gas, which is created as the oxygen in the air is zapped with electrical sparks. Why is this smell also sometimes apparent during a lightning storm or when you pull your fuzzy sweater off in the dry of winter? Is the formation of ozone from oxygen an endothermic or exothermic reaction?





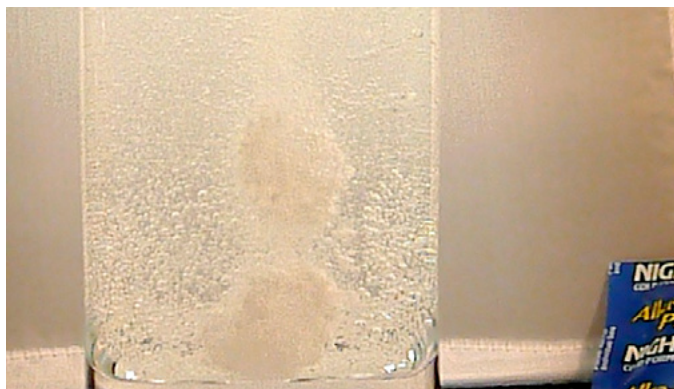
Yield from Yeast

Baker's yeast contains a biological catalyst known as catalase, which catalyzes the transformation of hydrogen peroxide, H_2O_2 , into oxygen, O_2 and water, H_2O . Write a balanced equation for this reaction. Wearing safety glasses, add a couple milliliters of 3% hydrogen peroxide to a glass containing a small amount of baker's yeast. What happens? Why? With careful supervision, touch the bubbles with a small lit match held by a pair of tweezers for safety. What happens and why?



Trouble with Bubbles

An Alka-Seltzer antacid tablet reacts vigorously with water. But how does this tablet react to a solution of half water and half corn syrup? Propose an explanation involving the relationship between reaction speed and the frequency of molecular collisions.





Author Responses to Quick Activities

Warming and Cooling Mixtures

1. The two magnets coming together accelerate to higher speeds as they get closer because of the magnetic force. Similarly, electrically attracting molecules coming together accelerate to higher speeds because of the electric force. Faster moving molecules means a higher temperature. The temperature rises and thermal energy released to the cooler surroundings when alcohol and water molecules come together by dipole-dipole interactions.
2. You lose energy in pulling to magnets apart from each other. This energy you lose is taken up (absorbed) by the magnets. Similarly, energy is absorbed to allow sodium and chloride ions to be pulled away from their crystalline structure. Many athletic cold packs consist of a concentrated salt solution packaged with a breakable bag of water. Punch the pack and this inner bag breaks allowing the salt and the fresh water to mix, which lowers the temperature.

Smell the Ozone

The energy of the lightning or electrostatic sparks passing through the air converts oxygen molecules into ozone molecules. This reaction is endothermic because it requires an input of energy.

Trouble with Bubbles

The bubbling occurs as the result of a reaction between the Alka-Seltzer tablet and the water. In the syrup water mixture, there is a lower proportion of water molecules, which leads to a slow rate of reaction. In terms of molecular collisions, with fewer water molecules around, the probability of collisions between the molecules of the Alka-Seltzer and the water is less.

Yield from Yeast

The balanced chemical equation is $2 \text{H}_2\text{O}_2 \rightarrow \text{O}_2 + 2 \text{H}_2\text{O}$. Bubbles of oxygen gas form upon the mixing of hydrogen peroxide and baker's yeast. That oxygen gas is formed can be demonstrated by inserting a glowing wood splint into the bubbles. The glowing splint will flame up as soon as it makes contact with the oxygen. Students should be directed to do so only under careful supervision.

