The effect of temperature in energy loss in a basketball

Science, Physics

My topic for the science fair project is " The effect of temperature in energy loss in a basketball". Some of my subtopics for my project include the pressure air and height in a basketball, the material a basketball is made out of and the size of the ball. Different sports require different size balls to correspond with the correct bounce it needs to be used during the sport. Thats why you would not be able to use a tennis ball to play basketball because it is too bouncy and a soccer ball because it would be too flat. When a ball is thrown to to the floor, gravity pulls downward on the ball but while it is on the move, kinetic energy is at work. When the energy-driven ball hits the floor, the physical forces that are in play flatten and deform the shape of the ball which compresses the molecules that make up tha ball. The Law of Conservation of Energy states that energy cannot be lost or gained so in this case the energy would have to be transferred. Since a properly inflated ball is normally round in shape, it quickly recovers it's round shape and the energy involved in this process causes the ball to recover its round shape. Balls and the surface that it bounces on gets distorted or twisted out of shape when they bounce. Surfaces such as Styrofoam and cork deform as a ball hits against them and save molecules in the ball from having to do most of the flattening and distorting. In contrast, other surfaces such as metal or ceramic tile acts like a trampoline and allows the ball to bounce back higher and faster than it originally did. When a ball bounces it warms up. During the process of a ball bouncing, energy is constantly being convertesd and transferred. An inflated ball such as a basketball performs better when the temperature is warmer because the air molecules within the ball will expand which will overinflate the ball so that it does not easily lose its shape on

impact. On cooler days, the air molecules contract as do the molecules in the material of the ball itself causing underinflation and less elasticity. On the other hand. rubber balls with tightly packed molecules lose little energy to heat or surface distortion and bounce better under a variety of temperatures. It has been known that the outer coverings of balls have an effect on the bounciness of a ball. As the ball is being used in play, the fuzz on the outside of the ball wears off which changes the total mass of the ball. Basketball courts act like sandpaper which gradually wears the outer covering of the ball until it changes the weight and shape of the ball. The same holds for other balls such as tennis balls and baseballs. As you hold a ball in the air while waiting to drop it, the ball contains potential energy since nothing has happened because you have not yet dropped the ball. Height has a lot to do with potential energy, the higher the ball is positioned the more potential energy the ball has. As the ball is dropeed and gravity forces the ball downwards, the velocity of the ball increases because of the accelerating effects of gravity. The ball then falls thru the air converting stored energy to the energy of motion and impacts the the floor then bouncing higher. How bouncy a ball is depends on the fraction of the energy which is lost in collision between the ball and the floor. For hard and solid balls, this depends on the floor as much as it depends on the ball. Ballsw with more air pressure in them bounce better because when air is compressed, it uncompresses which causes the ball to spring back up with little to no energy loss. When the rubber on the ball flexes, it heats up and makes a noise which causes the ball to make a noise, dispersing energy. A ball that has higher air pressure will not squish as much as a ball with lower

air pressure during collision which will cause for there to be less energy loss in the ball. A ball with a lower temperature tends to have more air pressure than a ball with a higher temperature due to the fact that air expands when it is hot. Also, the rubber of the ball tends to be less stiff when the temperature is higher so less energy is dispersed when it squishes. On the other hand, some balls are just not very bouncy to begin with such as squash balls. Some kinds of stiff materials are not very good at dispersin energy such as a steel ball. If you drop a steel ball on a steel floor then the ball is amazingly bouncy, but if you drop it on an unvarnished wood flor then it will just go thud and make a dent in the floor depending on how hard you throw it. Even though a squash ball is not very bouncy to begin with, it is possible to make it bouncier by cooling it to liquid nitrogen temperatures and dropping it on a hard but springy floor. Since a squashy ball becomes less bouncy as it freezes and turns into a rigid solid, it will become less bouncy as it becomes colder. On a molecular level, the rubber of a ball is made from long chains of polymers. These polymers are tangled together and stretch upon impact. However, they only stretch for an instant before atomic interaction forces them back into their original, tangled shape and the ball shoots upward. The reason a ball does not bounce back to it's original height is because the energy that is not being used to cause motion is chanfed to heat energy or sound energy. After playing a game, you may notice that the ball is warmer at the end of the game than at the beginning because some of the motion energy has been changed to heat energy. Because bouncy balls have tightly linked polymers, most of the energy is transferred back to motion so little is lost to heat or sound energy, and the ball bounces well.