Elasticity – Bouncy Balls

Apparatus

several balls, some bouncy, some not bouncy, steel ball and steel plate or other hard surface to bounce it off, plasticine or blu-tac rolled into a ball.

Action

The students rank the balls in order of bounciness and explain what makes a ball bouncy.

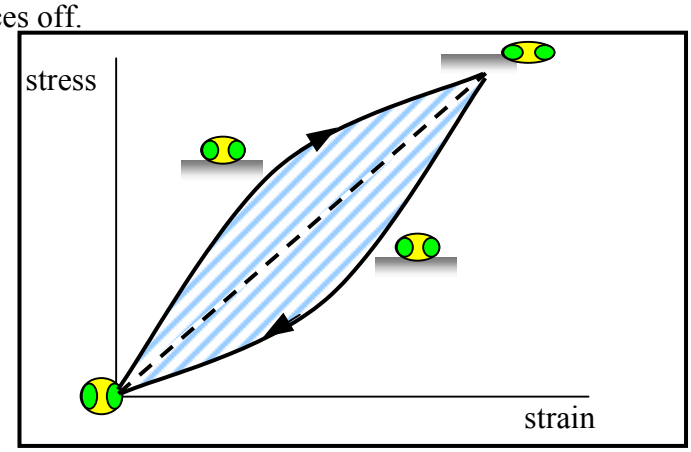
The Physics

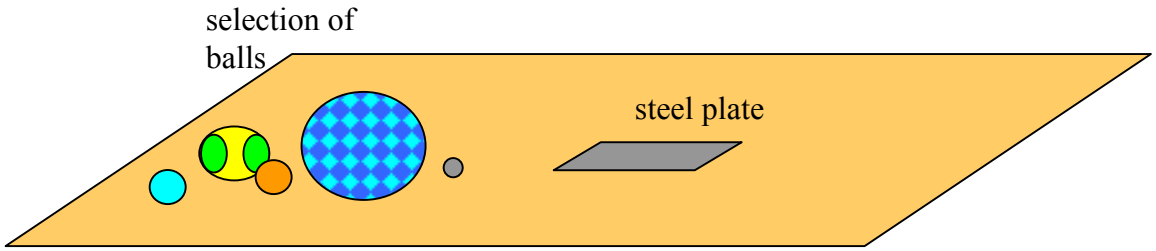
There are several ways of explaining the bounciness.

In energy terms, the more efficient the ball is at converting kinetic energy to elastic potential energy and back to kinetic, the better it will bounce as less energy is lost. This will also depend on the energy absorbing properties of the surface it bounces off.

In terms of stress and strain, the more linear the relationship the less energy is lost. Most materials show hysteresis, and during the collision the stress-strain curve is different for the compressing phase and the expanding phase. The difference between the two curves (shaded region) gives the energy lost.

The less difference between the curves, the less energy is lost and the more bouncy the ball is.





Accompanying sheet

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Bounce the various balls and rank them in order of their bounciness.

Why are some balls bouncier than others?

Why does the steel ball bounce better off the steel plate than off the carpet?