What Goes up Must Come Down

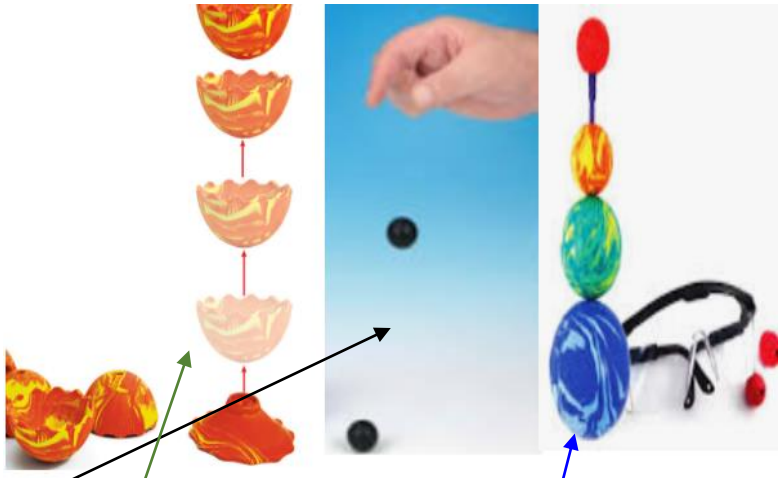
ENERGY

Introduction: You will be provided with a series of toys that can be used to represent energy transitions, specifically when dropped. Energy can be stored (E_p) by deforming, raising objects, or in the Chemical Bonds of a compound. You will be studying the first two (elastic and gravitational potential energy.

Background Research:

1. Define the following terms:
    a. Elastic Potential Energy
    b. Gravitational Potential Energy
    c. Kinetic Energy
    d. Collision (physics)
    e. Elasticity in Collisions
    f. Formula for Kinetic Energy
    g. Rate of Restitution
    h. Coefficient of Friction
    i. Vulcanization
    j. Activation Energy
    k. Law of Conservation of Momentum

2. Differentiate Low vs High Hysteresis.



Investigations: WEAR SAFETY GLASSES OR GOGGLES. We don't want anyone losing an eye.

Happy/Unhappy Balls: *Here you have two black rubber balls; however, not all rubber balls are vulcanized equally.*	***Dropper Popper:*** *works somewhat like a super ball. You can deform it, but it can easily/quickly return to its original shape.*	***Astroblaster:*** *A toy consisting of 5 bouncy balls of different sizes/mass stacked on a stick.*
➔ Drop the two balls on the floor and see what happens ➔ Simultaneously roll the balls on the floor or down an incline and see what happens ➔ Place the balls in a freezer for at least 20 minutes and perform the drop & roll tests again. Are there any differences?	➔ Load the popper by turning its edges down. ➔ Drop the Popper from a height of 1 m. ➔ Drop the Popper from a height of 2 m. ➔ Drop the Popper onto different materials with various coefficients of friction. (carpet, tile, cardboard, etc…)	➔ Assemble the astroblaster as shown in the image above. ➔ Drop the astroblaster from various heights, such as 0.5m., 1m, 1.5m, etc…

ANALYSIS/DRAWING CONCLUSIONS

3. Which type of rubber (happy or sad) would make better race car tires? Why?
4. What effect does temperature have on the properties of the different balls?
5. Relate activation energy E_a to the dropper popper investigations.
6. When dropping the dropper popper onto different materials, how does that materials coefficient of friction impact the height the popper pops up to?
7. One of the balls on the astroblaster acts differently from the rest, what does it do & why?
8. Explore what percentage of the initial energy the ball can end up having. (slow motion recording may be helpful)
9. Use the law of conservation of momentum to explain how the astroblaster does what it does.
10. How does Rate of Restitution effect a materials ability to bounce?
11. Would the vulcanization process/results be useful knowledge for material scientist and engineers? Why?