

Part C: Falling Problem with Heat Loss!**Heat Loss:**

Friction and air resistance turn kinetic energy into *thermal energy*.
This is called *heat loss* because we can't use this energy for anything anymore!

Big Question:

A ball that is 4.00 kg is dropped off a short cliff that is 12.0 m tall.

At the bottom, the ball has a speed of 13.2 m/s.

How much energy was lost to heat?

To answer the question, fill out the following table:

Mass = 4.00 kg

Initial height = 12.0 meters

POINT	Speed	Height	KE	GPE	Heat Loss (thermal)	Total Energy
A	0	12.0	0		0	
B	6.60	9.00				
C	9.35	6.00				
D	11.4	3.00				
E	13.2	0		0		

** Heat loss is thermal energy in the environment and outside of the system.

Rules:

The Conservation of Energy: The Total energy is always the same. It only changes form:

$$KE = \frac{1}{2}mv^2$$

$$GPE = mgh$$

$$g = 9.8 \text{ m/s}^2$$

Part D: Abstract algebra on the energy equations.

If you are skilled at doing algebra on symbols, rather than numbers, you can *derive* your own formulas for height and velocity, and make solving these problems much quicker.

To *solve* a formula for a variable means only that variable is on one side of the equation.

D.1.

Solve the following equation for h .

$$GPE = mgh$$

D.2.

Solve the following equation for v .

$$KE = \frac{1}{2}mv^2$$

Part E: Energy in food

1 kilocalorie = 4184 Joules

E.1. A glazed jelly donut from Dunkin donuts has 310 kilocalories. [from Dunkin Donuts website]How many *Joules* of energy are inside of a jelly donut?

Convert from:	To:	Conversion Factor:
Answer in a complete sentence <i>with unit</i> :		

E.2. Imagine you eat the jelly donut, then you climb up the stairs. What kind of energy did the jelly donut have? What kind does it have now?

A jelly donut.

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You, at the top of the stairs.

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E.3. A student at ACHS has a mass of 55 kg. They climb the stairs to the third floor of the Cherry and Webb building, which is 25 meters up. How much of their *chemical potential energy* is converted into *gravitational potential energy*?

Looking For	Formula
Already Know	
Answer in a complete sentence with unit	

E.4. How many times would the student need to climb the stairs to convert all of the chemical potential energy in the jelly donut to gravitational potential energy?

Use *conversion factors* to solve this problem.

1 jelly donut = 310 kilocalories.

1 kilocalorie = 4184 joules

1 stair climb = xxx joules (answer to part _)

Convert from 1 jelly donut to stair climbs in 3 steps.

Convert from:	To:	Conversion Factors:
Answer in a complete sentence <i>with unit</i> :		

(Thankful fact: because your body releases over half of it's energy as heat, you don't actually need to climb the stairs that many times to burn off the jelly donut.