



Conceptual Physics Labs – Chapter 4

Name _____

Where appropriate – ALWAYS show your formulas and your work!
Use the back of your paper if you need to.

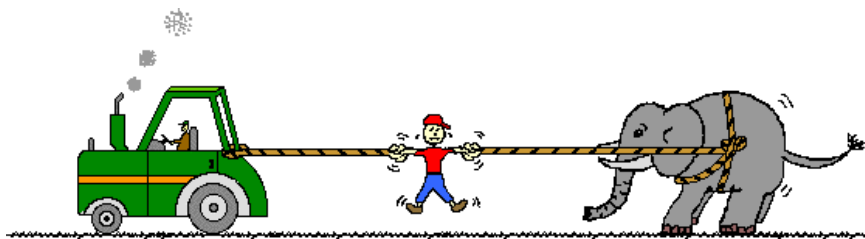
Work

Using a spring scale, drag a weight across the width of your table. Calculate the work done.

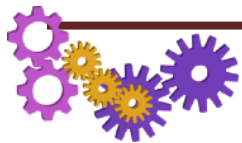
Now using the same weight, drag it across the length of your table. Calculate the work done.

Action-Reaction Pairs

Draw all the action/reaction forces in this diagram:



State Newton's Third Law of Motion here:



Momentum and Impulse

A 4500-kilogram truck travels in a straight line at 10 m/s. What is its momentum?

A 1500-kilogram car is also traveling in a straight line. Its momentum is equal to that of the truck above. What is the velocity of the car?

Remember that impulse (Ft) = **change** in momentum ($mv_2 - mv_1$)

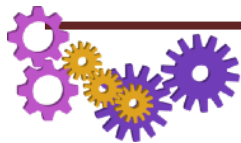
A 2000-kilogram car uses a braking force of 12,000 newtons to stop in 5 seconds. 3 questions:

- 1) What impulse acts on the car?

- 2) What is the change in momentum of the car?

- 3) What is the initial speed of the car?

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Potential Energy

Have the tallest person in your group hold your textbook above their head. The textbook has a mass of approximately 1.6 kg. Calculate the book's potential energy.

Now – don't do this because it will hurt your toes and mess up the book – BUT, should Mr/Ms Tall drop the book, calculate its velocity right before it hits the floor and stops. *Hint: $E_p = E_k$*

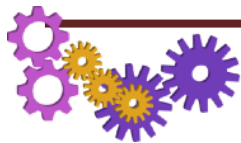
Collisions

Using the two pool cue balls provided, find an empty space on the floor and conduct two demonstrations:

- 1) Leaving one ball at rest, from approximately 1 meter away, roll the second ball at the resting ball and observe what happens
- 2) With the two cue balls 1 meter apart, roll them at each other (at as close to the same speed as possible) and observe what happens.

Explain what happened in each case – using your science words!

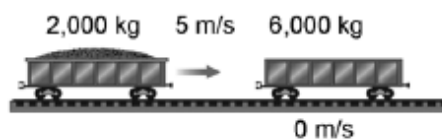
Is this an elastic or inelastic collision? Why?



Conservation of momentum

Calculate V_3

Before collision



After collision



The greatest speed with which an athlete can jump vertically is around 5 m/s. Determine the speed at which Earth would move down if you jumped up at 5 m/s. *And, by the way, today your mass is 60 kg.*