PhET Motion and Forces simulation

Complete all parts and type your answers in this document. Save (so you can print it out later) and have it printed for your next Physics class. If you don’t totally finish, you can hand-write the rest of your answers. But please have a copy of this for our next Physics class.

**Purpose:** Toanalyze the effect of applied force and friction (sum = net force) on the motion of an object

**Part 1: Notes**

**Define the following:**

**Static Friction:**

**Dynamic (kinetic) Friction:**

**Coefficient of Friction**

Google: Phet Motion and Forces (do NOT use the “Basic” one! It doesn’t give you enough information.)

run Java simulation. Click on the tab “Friction”

1. For the coefficients of friction listed (s = \_\_\_\_\_\_; k = \_\_\_\_\_\_), calculate the predicted (expected) force that are necessary to:
   1. start the box in motion:
   2. Keep the box moving at a constant velocity:
   3. Hold the box at rest on the incline: ( Please open “The Ramp” simulation for the questions which are referring to incline )
2. Do it—check your predictions. (use the playback mode to get the values). What were the forces applied to:
   1. Start the box in motion: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Keep the box moving at a constant velocity: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Hold the box at rest on the incline: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. Were your measured values similar to your calculated values?
3. Predict what a graph of Friction vs. time would look like (sketch your prediction here):
4. Click on the “Force Graphs” tab, and check the box for “friction”. Sketch the appearance of the graph that appears when you apply a force the same way you did in #2.

For the next section of this activity, you need to go to the PhET simulation titled “**The Ramp**”. It’s a Java-based simulation, so click “play”, and then open the downloaded file (select “keep” if asked).

Apply a force to the **crate** to get it moving. As soon as it starts moving, keep pushing with the same applied force. Stop pushing as soon as the crate starts moving up the ramp.

* 1. How far up the ramp does the crate slide?
  2. Show calculations, using measurements from within the simulation, to verify this distance. Show your work clearly!

1. Change the angle of the ramp. How will this affect how far up the ramp it will slide?
   1. **Prediction:**
   2. **Actual:**
2. Change the mass of the box. How will this affect how far up the ramp it will slide?
   1. **Prediction:**
   2. **Actual:**
3. Increase the coefficient of static friction. How will this affect how far up the ramp it will slide?
   1. **Prediction:**
   2. **Actual:**
4. Increase the coefficient of dynamic friction. How will this affect how far up the ramp it will slide?
   1. **Prediction:**
   2. **Actual:**
5. What combination of mass, coefficients of friction, angle, and release point will allow you to push the crate so that it just reaches the top but does not fall off (remove the wall at the top)?