Physics Problem Set

**CORE – Force, Work & Energy Problems**

**(You must do all core questions and receive 100% in order to pass this section of the course).**

1. Consider the falling and rolling motion of the ball in the following. In one situation, the ball falls off the top of the platform to the floor. In the other situation, the ball rolls from the top of the platform along the staircase-like pathway to the floor.
   1. For both situations, indicate what types of forces may be doing **work** upon the ball.

**2 marks**

* 1. Indicate whether the energy of the ball is conserved and explain. **2 mark**

**Use a separate piece of paper to show your calculations for the following problems. Incomplete work will not count for marks. (Use the formulas PE= mgh & KE= ½ mv2 )**

1. An Elevator with a mass of 800kg moves from the lobby to the 40th floor of an office tower in Vancouver. Given that each floor is 2.5m tall, what is the potential Energy gained by the elevator? **2 marks**
2. A 3000 kg rocket is launched to an altitude of 2000m.
   1. At the peak of its trajectory, how much potential energy does the rocket gain? **2 marks**
   2. Ignoring friction and given that PE = KE, approximately at what velocity was the rocket launched? **2 marks**
   3. What would be the force of gravity acting on the rocket? (F = ma) **1 mark**
   4. Negating air friction, what is the **work** done by the rocket to get itself to 2000m?

**2 marks**

* 1. If we took into consideration friction, we would consider friction as a force. Do you agree of disagree? Explain. **1 marks**

1. What is the mass of a 900N person? **2 marks**
2. What is the Weight of 700kg cow? **2 marks**
3. During a 15kg objects fall, it reaches 2000J of kinetic energy. What is the velocity of the object at this moment? **2 marks**
4. What is the potential energy gained by a 30 000N plane given and altitude of **5000 ft**.?

(1m = 3.28ft) **2 marks**

**MASTERY – Force, Work & Energy Problems (11 marks)**

1. A **Net Force** is required to keep an object moving. True or False. Justify your answer. **1 mark**
2. A 4500 Kg helicopter accelerates 2.0m/s2 upwards (meaning the helicopters acceleration is greater than gravity). What lift force is exerted by the air on the propellers? Recall the concept of Net force. You may need add forces or acceleration. **3 marks**
3. A 55 kg jogger accelerates from 4.0 m/s to 8.0 m/s. How much work is done by the jogger to change speeds? **(KE = 1/2mv2)** **3 marks**
4. Mr. Ocampo’s1200kg Mazda is travelling at 20 m/s when it slams on the brakes.
   1. How much kinetic energy does the car have before it hits the brakes? **2 marks**
   2. Where does this energy go when the driver brakes to a stop? **1 mark**
   3. What is the work done by the car’s brakes to get the car to fully stop? **1 mark**

**Scholarly – Force, Work & Energy** Problems **(7 marks)**

1. A drink 2.6 kg pitcher is filled with 200g of coke. Mr. Ocampo applies 8.8N of force to advance the pitcher 48cm to a student in his class. If the table applies 7.7N of friction,
2. What is the acceleration of the pitcher? (Recall Net force = Force applied – Force opposed & Force = m x a)

**Ask for assistance if you are having difficulty answering this question.** **2 marks**

1. How much work is done by Mr. Ocampo on the pitcher? **1 mark**
2. How much work is done by friction? **1 mark**
3. What is the net work done on the pitcher? **1 marks**
4. Given that you’ve calculated Net Force and the total work, which one would you use to calculate Kinetic Energy? Explain why? **1 mark**
5. What is the velocity of the pitcher? **1 marks**