PHYS 1001 - PHYSICS 1 (REGULAR)
Sample Progressive Test

Time allowed: 40 minutes
Closed book
Formula Sheets Provided

The solutions to this Test can be found on the unit WebCT site under the *Experimental Physics Lab* and *Past Examination Papers* links

Question 1

If you throw a ball up in the air, it falls back to the ground. Briefly explain in terms of the relevant physics principles how a communications satellite can stay high above the earth's surface, and not fall back to the ground as a ball does.

[5 marks]

Question 2

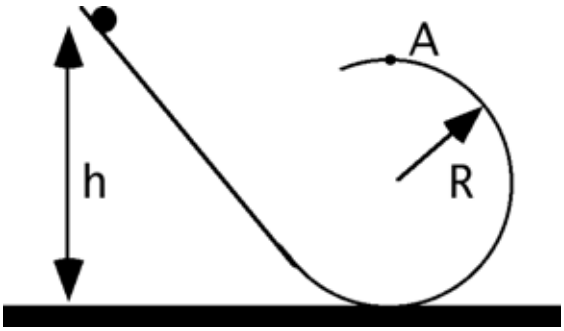
The diagram below depicts two ice hockey pucks which can move across the ice with negligible friction. One puck has a mass four times as great as the other. Starting from rest, the pucks are pushed across the ice by identical forces ***F***.

(a) Which puck will reach the finishing line first? Briefly explain your answer.

(b) It is observed at the finishing line that the more massive puck has greater momentum than the less massive one but that their kinetic energies are equal. Briefly justify why this would be so, in terms of physical principles.

[5 marks]

Question 3



A uniform cylinder of mass m and radius b is released from rest at height h above the ground, and it rolls without slipping along the track shown in the figure above. The rotational inertia(I) of a cylinder is $I = 1/2\ mr^2$

(a) If the velocity of the cylinder's centre of mass is v at a particular instant, show that the corresponding <u>total</u> kinetic energy of the cylinder is

$$\frac{3}{4}mv^2$$

(b) Show, with the aid of a free-body diagram, that the cylinder will stay on the track, and loop the loop, if it has a velocity v_A at point A given by

$$v_A \geq \sqrt{gR}\,,$$

where R is the radius of the loop-the-loop track and b is assumed to be much less than R.

(c) Using an energy argument, determine the minimum height h for releasing the cylinder so that it does not leave the track at the top of the loop (A).

[10 marks]