# PHYSICS NOT ON ICE FOR 4U NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Activities and Questions: Learning Your Principles (physics that is!)**

Please answer using complete sentences and try to use concepts of physics in your answer.

1. **Newton’s first law: Inertia**

a) Describe an example of inertia from your life experiences in terms of Newton's first law.

b) Draw a diagram of the **forces** **only** on the object (free-body diagram) in your example above.

c) Explain how shoveling snow exemplifies Newton’s first law of motion.

d) Do #1 page 36 in you text.

1. **Static and Kinetic Friction**
2. When you are pushing a stalled car is it harder to get the car going or to keep it going? Explain in terms of static and kinetic friction.
3. Pick a sport you are familiar with and explain two different actions in terms of the friction involved. Be sure to explain which type of friction is involved.

1. **Newton’s Second Law: Force and motion**
2. Do question #4 page 39.
3. Read example 20 on page 40. Explain why the two skaters do not have the same acceleration.
4. **Newton’s Third Law: Action - Reaction**
5. Do question #1 page 42. Draw a free body diagram for each object involved. Example: #1a) there should be an fbd for the soccer player's foot and for the soccer ball.
6. Two people of different mass (person A is twice the mass of person B) stand next to each other on the ice. Person A pushes on person B. Describe their motions thoroughly. Use Newton's Second Law to calculate their relative accelerations.
7. **Friction**
8. Write out the definitions of static and kinetic friction stating which is greater.
9. A block is placed at the top of a ramp. The ramp is slowly raised until the block **starts** to slide. Draw an fbd of the block just at that time. Does the block accelerate?
10. What would you have to do to get the block to slide down the ramp at a constant velocity? Draw an fbd of the block now.

(Please be certain to differentiate between static and kinetic friction in your fbd's.)

1. **Conservation of Momentum**
2. Define momentum and conservation of momentum.
3. Describe how one observes that momentum is conserved in collisions on a pool table or air table between objects of the same mass.
4. Repeat your observations between two objects where the mass of one is twice that of the other. Have the smaller object smash into the larger.
5. Reverse the collision and describe their motions due to conservation of momentum again.
6. Read section 4.6 and explain what happens to the momentum of the centre of mass throughout an entire collision.
7. Why does someone who is spinning with their arms out spin faster when they pull them in?
8. **Torque**
9. Define torque. What two things can you do to increase torque on (say) a door when you try to open it?
10. Why is it so difficult to turn a wrench doing repairs outside the International Space Station?