## *Part 1.*            *(1.0 point each)*

**Please circle ◯ the correct answer, to the nearest number for quantitative questions, for each of the following questions:**

1.      Which has zero acceleration? An object

      A) at rest.     B) in mechanical equilibrium.      C) moving at constant velocity.     D) all of the above.     E) none of the above.

2.      IF you push a crate across a level floor at a constant speed, the friction between the crate and the floor is

      A) less than the your pushing force.   B) the same amount as your pushing force.
      C) more than the your pushing force.     D) none of the above.
      E) all of the above.

3.      A package falls off a truck that is moving at **30 m/s**. Neglecting air resistance, the horizontal speed of the package just before it hits the ground is

      A) zero.     B) less than 30 m/s.   C) more than 30 m/s.  D) 30 m/s.
      E) more information is needed.

4.      An object is thrown vertically up at **50 m/s.** one second later its speed is about

      A) 30 m/s.     B) 40 m/s.     C) 60 m/s.     D) 70 m/s.     E) 100 m/s.

5.      Starting from rest, the distance a freely falling object will fall is **10 s** is about

      A) 10 m.     B) 500 m.     C) 100 m.     C) 50 m.     E) 20 m.

6.      One half second after starting from rest, a freely falling object will have a velocity of

      A) 20 m/s.     B) 10 m/s.     C) 2.5 m/s.     D) 5 m/s.     E) none of the above.

7.      If a basketball is thrown from zero to **30 m/s** in **0.1 s**, its average acceleration is

      A) $3.0 \text{ m/s}^2$.     B) $30 \text{ m/s}^2$.     C) $300 \text{ m/s}^2$.     D) $3000 \text{ m/s}^2$.   E) none of the above.

8.      How many joules of energy in **1.0 kWh?**

      A) 1.0 J     B) 60 J     C) 60 kJ     D) 36 kJ     E) 3600 kJ

9.      A **2500 N** pile driver ram falls **10 m** and drives a post **0.1 m** into the ground. The average impact force on the ram is

        A) 25x $10^2$ N   B) 25 x$10^3$ N   C) 25 x$10^4$ N   D) 25 x$10^6$ N   E) 25 x$10^5$ N

10.     If a power plant is **30%** efficient and the transmission system that delivers the power is **60%** efficient, then the over all efficiency is

        A) 90%          B) 30%          C) 60%          D) 18%          E) none of the above.

## *Part 2:*
**Please read each of the following questions carefully and show your work in the space provided. Include the appropriate units with your answer.                    *(2 points each)***

**P1**.     A car moving at **50 km/h** skids **20 m** with locked brakes. How far the car skids with locked brakes if it is traveling at **150 km/h?**

*Answer*_____

**P2.**     A rocket is fired from rest accelerates at a rate of **50 m/s$^2$** for **10 s**. What is the distance covered during this time?

*Answer*_____

**P3.**    A ball with a mass of **0.15 kg** and a speed of **5.0 m/s** strikes a wall and bounces straight back with a speed of **3.0 m/s**. What is the change in momentum of the ball?

*Answer*_____

Good Luck