

## Assignment 5

### Energy

1. Show that  $1 \text{ joule} = \text{kg (m/sec)}^2$  is equivalent to  $1 \text{ joule} = \text{Newton meter}$ .
2. A weightlifter raises 250 kg from the floor to a height of 2 meters.
  - a) How much work does he do if:
    - i) The object is raised straight up
    - ii) The object is first raised one meter straight up, then sideways 3.5 meters to the left followed by another meter straight up and finally 3.5 meters to the right
  - b) The mass is then released. What is the velocity of the mass when it hits the weightlifter's toe?
3. A mass 20 kg is projected vertically upward with an initial speed of 50 m/sec.
  - a) What is the original kinetic energy?
  - b) What is the kinetic energy after 2 sec?
  - c) What is the change in its gravitational potential energy during these 2 sec?
4. A 5 kg mass falls from an initial height of 100 meters.
  - a) What are the initial potential and kinetic energies of the mass?
  - b) What are the potential and kinetic energies of the mass when it hits the ground?
  - c) What is the speed of the particle when it hits the ground?
5. Estimate the energy generated by water falling over Niagara Falls in 1 day. Assume that the Falls have a height of 20 meters and a water flow of  $10^4 \text{ meters}^3/\text{sec}$ .