MOMENTUM 2

(Take $g = 9.8$ ms^{-2} unless otherwise stated)

1. Water flows at 3 ms^{-1} from a pipe 0.1 m in diameter and then strikes a vertical plate near the outlet of the pipe at right angles.
Calculate:
(a) the change of momentum of the water
(b) the force exerted by the plate (Density of water = 1000 kgm^{-3})

2. During a storm rain falls steadily at an angle of 45° onto a flat roof. If 5 cm of rain falls in one hour and the mean terminal velocity of rain drops is 6 ms^{-1} calculate the additional pressure of the roof assuming that no rain collects on it.

3. A 20 000 kg helicopter hovers above the ground. If the radius of the rotor blades is 7m and the density of air is 1. 2 kgm^{-3} calculate:
(a) the weight of the helicopter
(b) the vertical velocity if the air column beneath the rotor blades

4. Coal is deposited uniformly at a rate of 25 kgs^{-1} and with negligible kinetic energy onto a conveyor belt moving horizontally at 1.5 ms^{-1}.
Calculate:
(a) the force required to maintain the belt's constant velocity
(b) the power required to maintain the belt's constant velocity
(c) the rate of change of kinetic energy of the moving coal

5. When a collision takes place between a neutron and a stationary nucleus kinetic energy is lost by the neutron.
Why is this important in the effects of neutron radiation on the human body and the choice of materials used to protect us from this radiation?

6. A mass m moving left to right with a speed v collides elastically with a mass M (which is »m) moving in the opposite direction also with speed v.
Calculate:
(a) the velocity of m immediately after collision
(b) the change in momentum of m
(c) the change in kinetic energy of m