MOMENTUM 1

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

1. A body of mass 120 g falls from a height of 4 m onto a horizontal surface and bounces up to a height of 3 m. Calculate:
(a) the velocity on reaching the ground
(b) the velocity on leaving the ground
(c) the kinetic energy lost on impact
(d) the momentum change
(e) the force on the object if the collision lasts 0.02 s

2. A ball of mass 0.25 kg travelling at 20 ms^{-1} is hit by a bat so that it returns along is original path at 25 ms^{-1}. If the bat was in contact with the ball for 0.05 s calculate:
(a) the change of momentum of the ball
(b) the force of the bat on the ball during the impact

3. A gun of mass 150 kg fires a shell of mass 1.0 kg at a velocity of 200 ms^{-1}. Calculate:
(a) the kinetic energy of the gun
(b) the kinetic energy of the shell
(c) the momentum of the shell

4. A 4.5 kg ball (A) travelling at 8 ms^{-1} moving from left to right collides with a 10.0 kg ball (B) moving at 3 ms^{-1} right to left. If they stick together in 0.3 s calculate:
(a) the final velocity
(b) the momentum change of ball A
(c) the loss of energy of ball B in the impact
(d) the force of ball A on ball B during the impact

5. A stationary nucleus of mass 226 u disintegrates into an alpha particle of mass 4 u and a residual nucleus of mass 222 u. If the kinetic energy of the alpha particle is E calculate the kinetic energy of the residual nucleus.

6. A 2.5 kg ball (A) travelling at 6 ms^{-1} moving from left to right collides with a 10.0 kg ball (B) moving at 3 ms^{-1} right to left. If the velocity of the 10.0 kg ball after the collision is 1.25 ms^{-1} right to left and the collision lasts 0.2 s calculate:
(a) the final velocity
(b) the momentum change of ball A
(c) the loss of energy of ball B in the impact