Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Q1.

The following data refer to a dishwasher.

power of heating element	2.5 kW
time to heat water	360 s
mass of water used	3.0 kg
initial temperature of water	20°C
final temperature of water	60°C

(a) Taking the specific heat capacity of water to be 4200 J kg^{-1} K^{-1}, calculate

(i) the energy provided by the heating element,

_____

_____

(ii) the energy required to heat the water.

_____

_____

_____

_____

(4)

(b) Give **two** reasons why your answers in part (a) differ from each other.

_____

_____

_____

_____

(2)
(Total 6 marks)

Q2.

Downloaded from www.merit-minds.com

(a) State the principle of conservation of linear momentum for two colliding bodies.

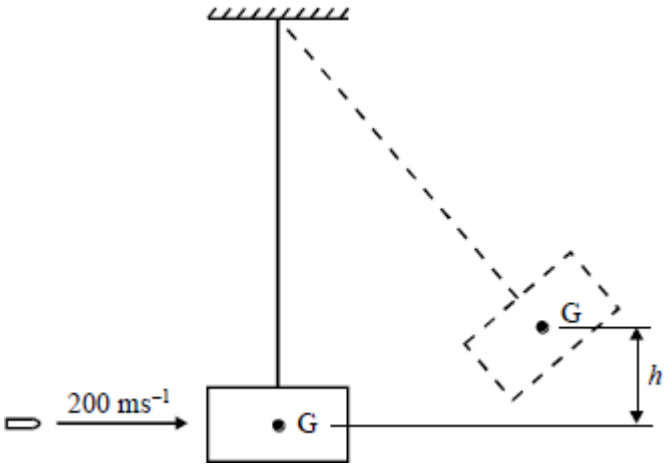
_____

_____

_____

(2)

(b)



A bullet of mass 0.010 kg travelling at a speed of 200 m s^{-1} strikes a block of wood of mass 0.390 kg hanging at rest from a long string. The bullet enters the block and lodges in the block. Calculate

(i) the linear momentum of the bullet before it strikes the block,

_____

(ii) the speed with which the block first moves from rest after the bullet strikes it.

_____

_____

(4)

(c) During the collision of the bullet and block, kinetic energy is converted into internal energy which results in a temperature rise.

(i) Show that the kinetic energy of the bullet before it strikes the block is 200 J.

_____

(ii) Show that the kinetic energy of the combined block and bullet immediately after the bullet has lodged in the block is 5.0 J.

_____

(iii) The material from which the bullet is made has a specific heat capacity of 250 J kg^{-1} K^{-1}. Assuming that all the lost kinetic energy becomes internal energy in the bullet, calculate its temperature rise during the collision.

_____

_____

Downloaded from www.merit-minds.com

(5)

(d) The bullet lodges at the centre of mass G of the block. Calculate the vertical height h through which the block rises after the collision.

(2)

(Total 13 marks)

Downloaded from www.merit-minds.com