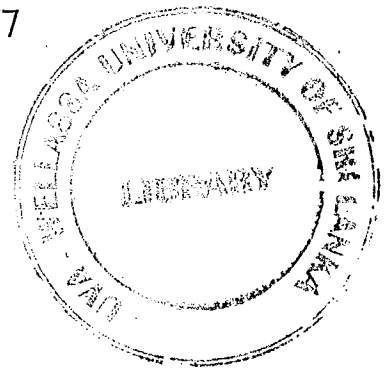
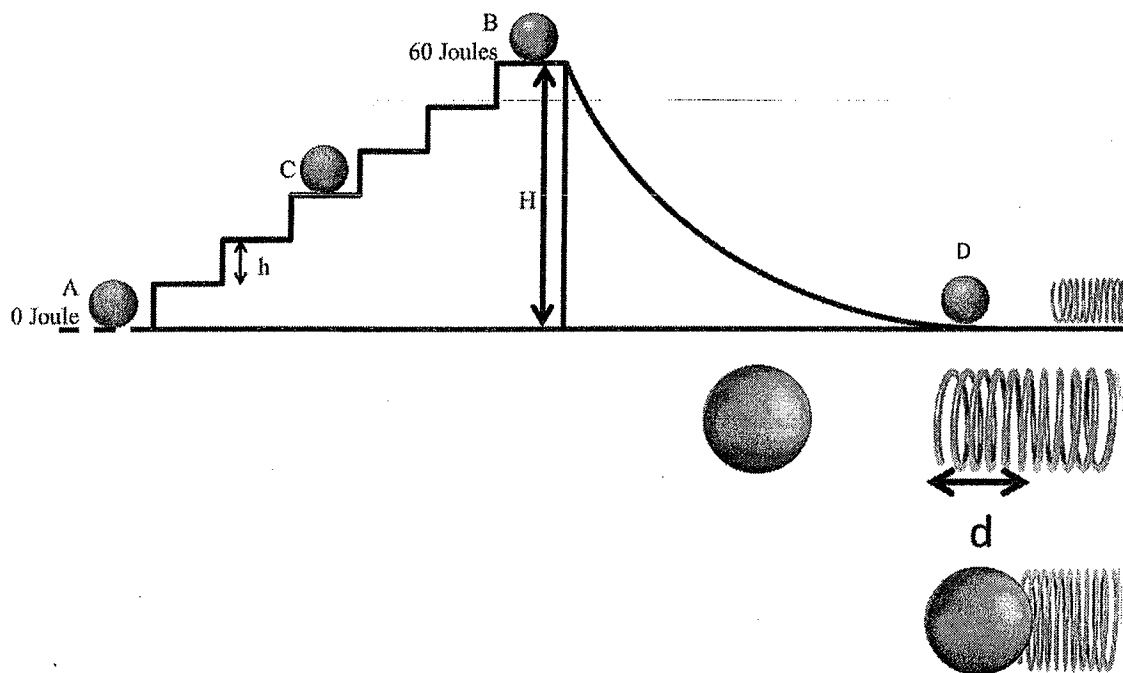




Part B

01. The figure below shows the steel ball that on a stairs. The position A assigned to be the zero height position and the potential energy of the steel ball at the position B is 60 J relative to the position A. Consider all the surfaces are frictionless.



- (I) Calculate the amount of energy required to transfer the ball from A to B.
(1 mark)
- (II) If the mass of the ball is equal to 1 kg what will be the value of the height H?
(2 marks)
- (III) If the stairs are equally separated, calculate the potential energy stored in the ball when it is at C.
(2 marks)
- (IV) If the ball is dropped along the frictionless curved plane,
 - a) Calculate the gravitational potential energy of the ball when it is at D.
(2 marks)
 - b) Calculate the kinetic energy of the ball at D.
(3 marks)

c) What will be the speed of the ball when it is at D?

(2 marks)

(V) The ball then runs into a spring and compresses. The ball is momentarily stopped by the spring. Spring constant(k) is 480 N m^{-1} .

a) Write down the expression for elastic potential energy stored in the spring using the spring constant k and amount of compression x .

(1 mark)

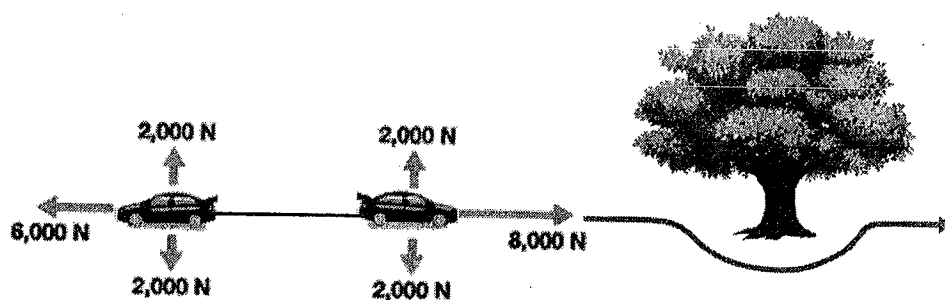
b) What is the distance(d) that spring compressed (maximum compression distance)?

(4 marks)

c) When the ball is re-bounced by having all the energy that is stored in the spring, what will be the maximum height that ball can reach? Without using calculations briefly explain your answer.

(3 marks)

02. Consider Car A and Car B doing a tug of war (pulling each other in opposite directions). Assume that the cars are stationary when starting. As the game starts, Car A is pulling the system to leftward direction by 6000 N force and Car B is pulling the system to rightward direction by 8000 N force.



(I) If both the Cars A and B have the same weight 2000 N , what will be the mass of a car if the earth's gravitational acceleration g is equal to 10 m s^{-2} ?

(2 marks)

(II) What is the name that is referred to the upward 2000 N force by the earth?

(1 mark)

(III) Calculate the acceleration of the system along the rightward direction.

(3 marks)

(IV) If the chain that binds the two cars together suddenly breaks, calculate the accelerations of two cars separately. Clearly state the directions of the accelerations.

(4 marks)

(V) After the breakdown of the chain the driver of the Car B managed to go around the tree in a circular motion with a constant linear speed of 36 km h^{-1} .

a) Show that the linear speed of the car is equal to 10 ms^{-1} .

(2 marks)

b) If the angular velocity of the car is 1 rad s^{-1} show that the radius of the curved path is 10 m .

(2 marks)

c) Calculate the centripetal acceleration of the car.

(3 marks)

d) What will be the centripetal force acting on the car?

(3 marks)

03.

(I) Matter (substance) can be found as elements, compounds, and mixtures. Briefly describe each case providing appropriate examples.

(6 marks)

(II) How many orbitals are possible when principal quantum number (n) is 3. Write down the set of quantum numbers for these orbitals.

(6 marks)

(III) MgO has higher melting point than NaCl , why?

(4 marks)

(IV) HF has a higher boiling point than HCl , why?

(4 marks)

[End of Part B]

