

2 (a) Explain what is meant by

(i) *work done*,

.....  
 .....[1]

(ii) *kinetic energy*.

.....  
 .....[1]

(b) A leisure-park ride consists of a carriage that moves along a railed track. Part of the track lies in a vertical plane and follows an arc XY of a circle of radius 13 m, as shown in Fig. 2.1.

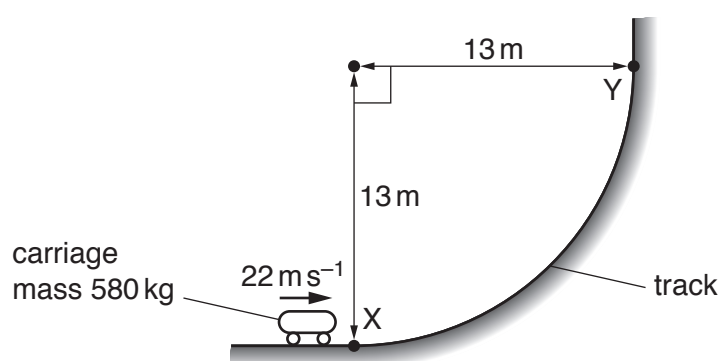


Fig. 2.1

The mass of the carriage is 580 kg. At point X, the carriage has velocity  $22 \text{ m s}^{-1}$  in a horizontal direction. The velocity of the carriage then decreases to  $12 \text{ m s}^{-1}$  in a vertical direction at point Y.

(i) the carriage moving from X to Y

1. show that the decrease in kinetic energy is  $9.9 \times 10^4 \text{ J}$ ,

[2]

2. calculate the gain in gravitational potential energy.

gain in gravitational potential energy = ..... J [2]

- (ii) Show that the length of the track from X to Y is 20 m.

[1]

- (iii) Use your answers in (b)(i) and (b)(ii) to calculate the average resistive force acting on the carriage as it moves from X to Y.

resistive force = ..... N [2]

- (iv) Describe the change in the direction of the linear momentum of the carriage as it moves from X to Y.

.....  
.....[1]

- (v) Determine the magnitude of the change in linear momentum when the carriage moves from X to Y.

change in momentum = ..... N s [3]

[Total: 13]