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.

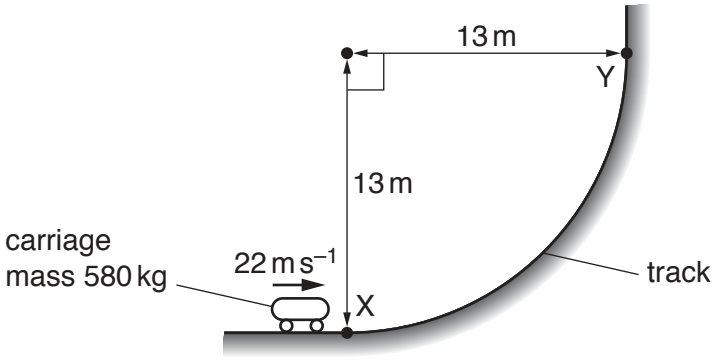

Fig. 2.1

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

(i) For the carriage moving from X to Y

1. show that the decrease in kinetic energy is 9.9×10^4 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]