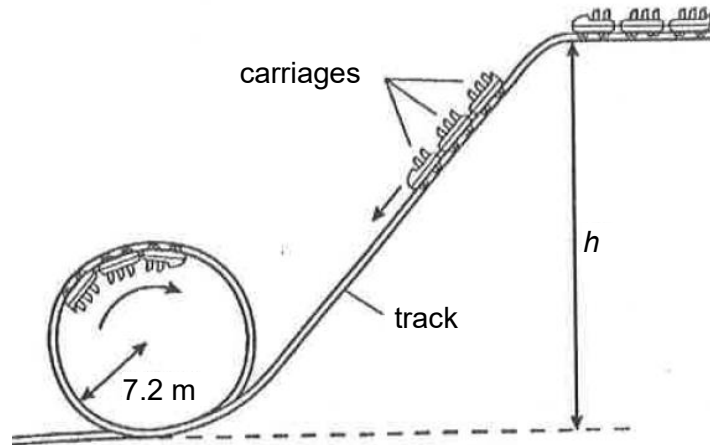**2** A theme park ride is illustrated in Fig 2.1.

Fig. 2.1

The carriages accelerate down the slope and then loop the loop on a circular section of the track. The radius of the circular section of the track is 7.2 m. Each carriage and its passengers has total mass 800 kg. At the top of the loop, the carriage travels at 17 m s^{-1}.

(a) Calculate the force that the track exerts on the carriage at the top of the loop.

force = ………………….. N   [2]

(b) Explain qualitatively how the centripetal acceleration of the carriage changes, if any, when the carriage is moving from the bottom to the top of the loop.

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(c) For the carriage to have a speed of 17 m s^{-1} at the top of the loop, it must have fallen from a height of h. Assume no dissipative forces.

(i) Determine the value of h.

h = ………………….. m   [2]

(ii) State how the value of h should change when the total mass of the carriage and passengers is increased.

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[Total: 8]