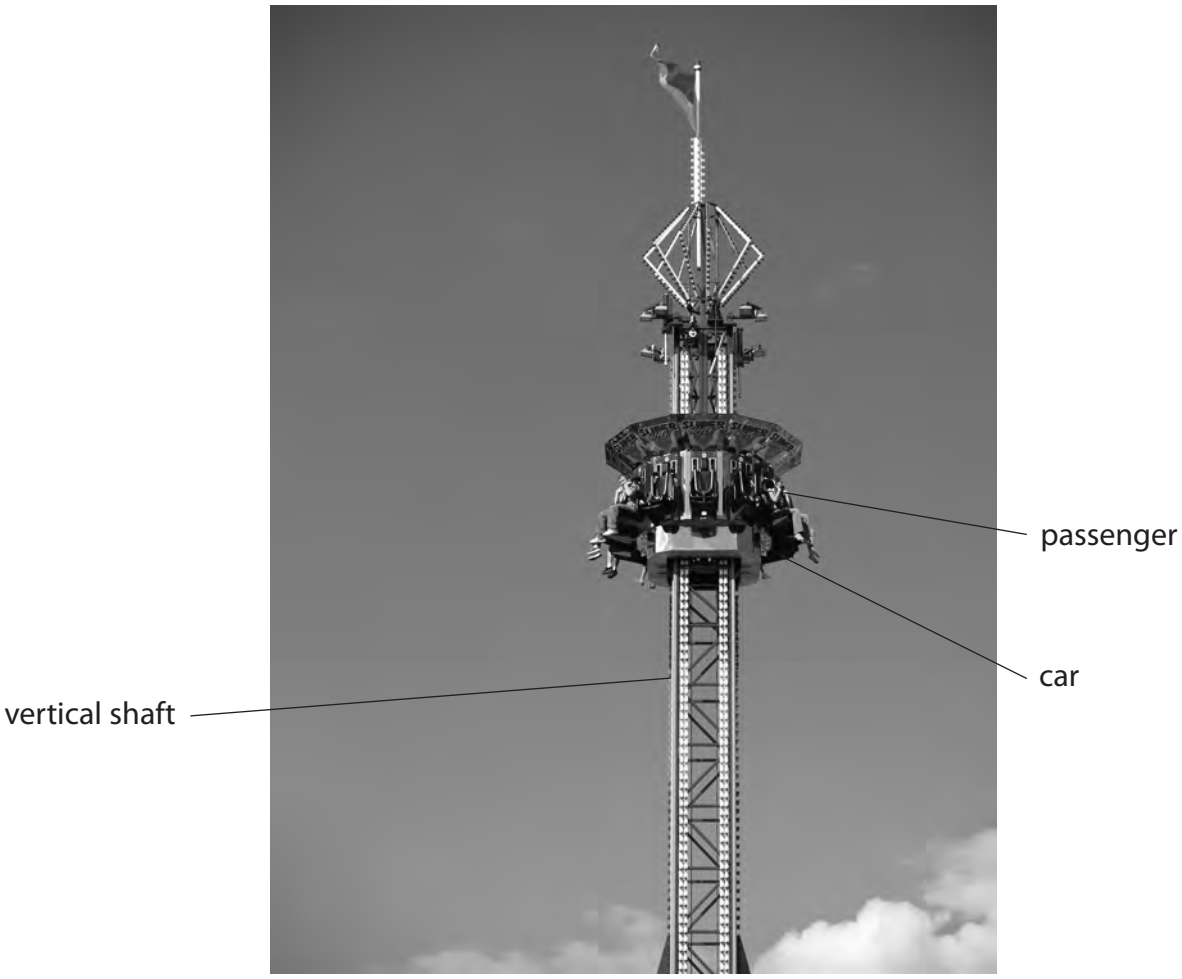
10 The photograph shows a vertical drop ride at an amusement park.



(Source: Kenneth Sponsler/Shutterstock)

The car is pulled to the top of a vertical shaft and then released from rest.

The car then falls freely because of the force of gravity.

(a) Calculate the speed of the car when it has fallen 18 m.

(3)

speed = ... m / s

(b) (i) State the formula linking kinetic energy, mass and speed.

(1)

(ii) The mass of the car and its passengers is 2.1 tonnes.

Calculate the kinetic energy of the car when it has fallen 18 m.

[1 tonne = 1000 kg]

(2)

kinetic energy = ... J

(c) The actual speed of the car when it has fallen 18 m is lower than the value calculated in (a).

Describe the energy transfers occurring from immediately before the car was released to when the car has fallen 18 m.

Refer to stores and transfers in your answer.

(4)

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(Total for Question 10 = 10 marks)