

**11** An underground train enters a station.



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- (a) The mass of the train and its passengers is 250 000 kg.

The total kinetic energy is 18 MJ.

- (i) State the relationship between kinetic energy (KE), mass and velocity.

(1)

- (ii) Calculate the velocity of the train as it enters the station.

(3)

velocity = ..... m/s

- (iii) The driver applies the brakes to stop the train.

State what happens to the kinetic energy of the train.

(1)

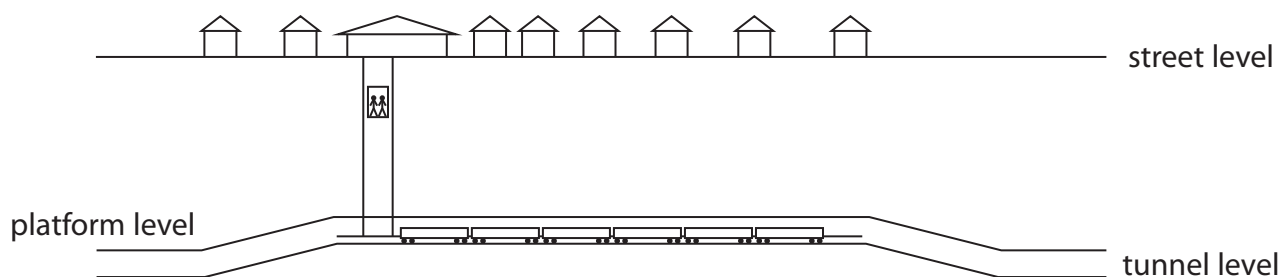
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(b) The diagram shows a section through the station.



- (i) The passengers who use the station are carried from platform level to street level in a lift.

Explain why these passengers gain gravitational potential energy in the lift, even when they are below ground.

(2)



- (ii) The tunnel is designed so that the trains go up a slope as they enter the station and go down a slope as they leave.

The driver uses brakes to stop the train in the station and a motor to make the train move away.

Explain how the sloping parts of the tunnel affect the amount of work that needs to be done on the train by the brakes and by the motor.

(4)

(Total for Question 11 = 11 marks)

