

- 3 A car of mass 1500 kg is travelling along a straight horizontal road at constant velocity v . The car is subject to a total resistive force F , as shown in Fig. 3.1.

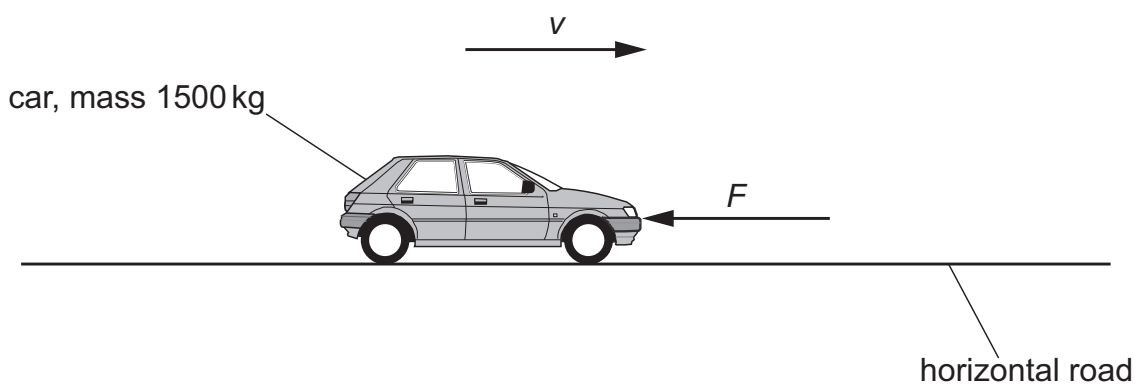


Fig. 3.1

- (a) Show that the power P developed by the engine in overcoming the total resistive force is given by the equation

$$P = Fv.$$

[2]

- (b) The car now moves up a slope at a constant speed of 30 m s^{-1} . The slope is at an angle to the horizontal of 6.0° , as shown in Fig. 3.2.

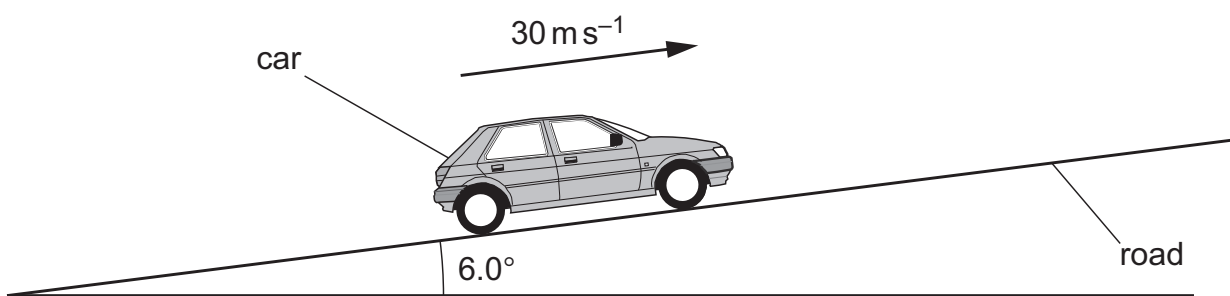


Fig. 3.2

The total resistive force acting on the car is 1600 N.

- (i) Show that the increase in gravitational potential energy of the car in a time of 1.0 s is 46 000 J.

[2]

- (ii) Use the information in (b)(i) to determine the power developed by the engine to move the car up the slope.

power = W [2]

- (c) The car picks up a passenger and then continues up the slope at the same speed as in (b).

State and explain the effect, if any, that the passenger has on:

- (i) the air resistance acting on the car

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 [1]

- (ii) the power developed by the engine.

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 [1]

[Total: 8]