2 **(a)** A force F acting on an object moving in the straight line. Derive the expression

$$P = Fv$$

where P is the power delivered to the object and v is the velocity of the object.

[1]

(b) A car of mass 1500 kg can generate a constant power of 2.0×10^5 W to the wheels. The resistive forces can be taken to be constant at 5000 N at all speeds.

(i) The car travels on along a horizontal surface ground.

Calculate the maximum speed the car can attain.

maximum speed = ... m s^{-1} [2]

(ii) The car travels up a 10° slope.

Determine the new maximum speed the car can attain.

maximum speed = ... m s^{-1} [3]

(iii) Describe the energy conversion when the car is driven at its maximum speed when it is going up a slope.

.....

.....

..... [2]

(c) The car is driven over the top of a hill, the cross-section of which can be approximated by a circle of radius R = 250 m as shown in Fig. 2.1.

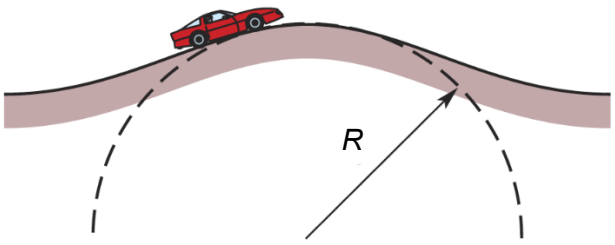

Fig. 2.1

Determine the maximum speed the car can be driven without losing contact with the road at the top of the hill.

maximum speed = ... m s^{-1} [4]