5.

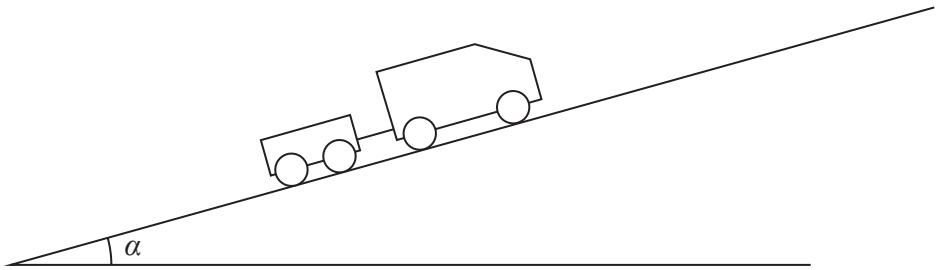


Figure 4

A van of mass 600 kg is moving up a straight road inclined at an angle α to the horizontal, where $\sin\alpha = \frac{1}{14}$. The van is towing a trailer of mass 200 kg. The trailer is attached to the van by a rigid towbar which is parallel to the direction of motion of the van and the trailer, as shown in Figure 4.

The resistance to the motion of the van from non-gravitational forces is modelled as a constant force of magnitude 250 N.

The resistance to the motion of the trailer from non-gravitational forces is modelled as a constant force of magnitude 150 N.

The towbar is modelled as a light rod.

At the instant when the speed of the van is $16\,\text{m}\,\text{s}^{-1}$, the engine of the van is working at a rate of 10 kW.

(a) Find the deceleration of the van at this instant.

(5)

(b) Find the tension in the towbar at this instant.

(4)

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Question 5 continued

(Total for Question 5 is 9 marks)