4 A lorry of mass 18 000 kg is travelling along a straight road.

(a) On a horizontal section of the road, the power of the lorry's engine is constant. There is a constant resistance to motion of 1600 N.

(i) The steady speed which the lorry can maintain with the engine working at power P W is $30\,\text{m s}^{-1}$.

Find the value of P. [1]

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(ii) At an instant when the speed of the lorry is $16\,\text{m s}^{-1}$, its engine is working at a power of 40 kW.

Find the acceleration of the lorry at this instant. [2]

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(b) When the lorry has reached a speed of $20\,\text{m s}^{-1}$, it begins to ascend a section of road inclined at an angle $\alpha°$ to the horizontal. The engine now works at a power of 120 kW. There is no change in the lorry's speed as it ascends the hill. The constant resistance to motion remains 1600 N.

Find the value of α. [3]

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