

## State Examination Commission – Physics Higher Level, 2007

### Question 12

A car of mass 750 kg is travelling east on a level road. Its engine exerts a constant force of 2.0 kN causing the car to accelerate at  $1.2 \text{ m s}^{-2}$  until it reaches a speed of  $25 \text{ m s}^{-1}$ .

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What is friction? (6)

A force opposing motion between two surfaces in contact

Calculate (i) the net force, (ii) the force of friction, acting on the car. (12)

$$\begin{aligned}\text{Net force} &= ma \\ &= 750 \times 1.2 \\ &= 900 \text{ N east.}\end{aligned}$$

$$\begin{aligned}\text{Net force} &= \text{Engine force} - \text{Friction force} \\ \text{Friction force} &= \text{Engine force} - \text{Net force} \\ &= 2000 - 900 \\ &= 1100 \text{ N west.}\end{aligned}$$

If the engine is then turned off, calculate how far the car will travel before coming to rest. (10)

$$\begin{aligned}u &= 25 \\ v &= 0 \\ f &= -1100 \Rightarrow a = -1100/750 = -1.47 \text{ ms}^{-2} \\ v^2 &= u^2 + 2as \\ s &= (v^2 - u^2)/2a \\ &= (0 - 625)/-2.94 \\ &= 213 \text{ m (east)}\end{aligned}$$