



A train consists of an engine *A* of mass 50 000 kg and a carriage *B* of mass 20 000 kg. The engine and carriage are connected by a rigid coupling. The coupling is modelled as light and horizontal.

The resistances to motion acting on *A* and *B* are 9000 N and 1250 N respectively (see diagram).

The train passes through station *P* with speed  $15 \text{ m s}^{-1}$  and moves along a straight horizontal track with constant acceleration  $0.01 \text{ m s}^{-2}$  towards station *Q*. The distance between *P* and *Q* is 12.95 km.

(a) Determine the time, in minutes, to travel between *P* and *Q*.

[3]

For the train's motion between *P* and *Q*, determine the following.

(b) The driving force of the engine.

[2]

(c) The tension in the coupling between *A* and *B*.

[2]