2. A train travels along a straight horizontal track from station P to station Q.

In a model of the motion of the train, at time $t = 0$ the train starts from rest at P, and moves with constant acceleration until it reaches its maximum speed of $25\,\text{m s}^{-1}$

The train then travels at this constant speed of $25\,\text{m s}^{-1}$ before finally moving with constant deceleration until it comes to rest at Q.

The time spent decelerating is four times the time spent accelerating.

The journey from P to Q takes $700\,\text{s}$.

Using the model,

(a) sketch a speed-time graph for the motion of the train between the two stations P and Q.

(1)

The distance between the two stations is $15\,\text{km}$.

Using the model,

(b) show that the time spent accelerating by the train is $40\,\text{s}$,

(3)

(c) find the acceleration, in m s^{-2}, of the train,

(1)

(d) find the speed of the train $572\,\text{s}$ after leaving P.

(2)

(e) State one limitation of the model which could affect your answers to parts (b) and (c).

(1)