13 A toy train consists of an engine of mass 0.5 kg pulling a coach of mass 0.4 kg. The coupling between the engine and the coach is light and inextensible. The train is pulled along with a string attached to the front of the engine.

At first, the train is pulled from rest along a horizontal carpet where there is a resistance to motion of 0.8 N on each part of the train. The string is horizontal, and the tension in the string is 5 N.

(a) Determine the velocity of the train after 1.5 s. **[4]**

The train is then pulled up a track inclined at 20° to the horizontal. The string is parallel to the track and the tension in the string is P N. The resistance on each part of the train along the track is R N.

(b) Draw a diagram showing all the forces acting on the train modelled as two connected particles. **[3]**

(c) Find the equation of motion for the train modelled as a single particle. **[2]**

(d) The acceleration of the train when $P = 5.5$ is double the acceleration when $P = 5$.

Calculate the value of R. **[3]**