4 A particle P of mass 0.1 kg is projected vertically upwards with speed $30\,\text{m}\,\text{s}^{-1}$ from horizontal ground. At the same instant a particle Q of mass 0.4 kg is projected vertically upwards with speed $10\,\text{m}\,\text{s}^{-1}$ from a height of 15 m above the ground. P and Q move in the same vertical line.

(a) Find the height above the ground at which P and Q collide. [4]

When P and Q collide, they coalesce.

(b) Find the speed of the combined particle at the instant that it reaches the ground. [5]