2000 HIGHER LEVEL SOLUTION & MARKING SCHEME

1. **(a)** A stone projected vertically upwards with an initial speed of u m/s rises 70 m in the first t seconds and another 50 m in the next t seconds.

Find the value of u.

$$s = ut + \tfrac{1}{2}ft^2$$

$$70 = ut - \tfrac{1}{2}gt^2 \quad \checkmark$$ 5

$$120 = u(2t) - \tfrac{1}{2}g(2t)^2 \quad \text{or} \quad 50 = (u - gt)t - \tfrac{1}{2}gt^2 \quad \checkmark$$ 5

$$140 = 2ut - gt^2$$

$$120 = 2ut - 2gt^2$$

$$20 = gt^2$$

$$\Rightarrow t = \sqrt{\frac{20}{g}}$$ 5

$$140 = 2u\left(\sqrt{\frac{20}{g}}\right) - 20$$

$$\Rightarrow u = 56 \text{ ms}^{-1}$$ 5

20