

1. The point  $A$  is 1.8 m vertically above horizontal ground.

At time  $t = 0$ , a small stone is projected vertically upwards with speed  $U \text{ m s}^{-1}$  from the point  $A$ .

At time  $t = T$  seconds, the stone hits the ground.

The speed of the stone as it hits the ground is  $10 \text{ m s}^{-1}$

In an initial model of the motion of the stone as it moves from  $A$  to where it hits the ground

- the stone is modelled as a particle moving freely under gravity
- **the acceleration due to gravity is modelled as having magnitude  $10 \text{ m s}^{-2}$**

Using the model,

(a) find the value of  $U$ , (3)

(b) find the value of  $T$ . (2)

(c) Suggest one refinement, apart from including air resistance, that would make the model more realistic. (1)

In reality the stone will not move freely under gravity and will be subject to air resistance.

(d) Explain how this would affect your answer to part (a). (1)