**4** **(a)** Explain what is meant by *gravitational potential* energy and *kinetic* energy.

gravitational potential energy: .....

.....

kinetic energy: .....

.....

[2]

**(b)** A ball of mass 400 g is thrown with an initial velocity of 30.0 m s$^{-1}$ at an angle of 45.0° to the horizontal, as shown in Fig. 4.1.

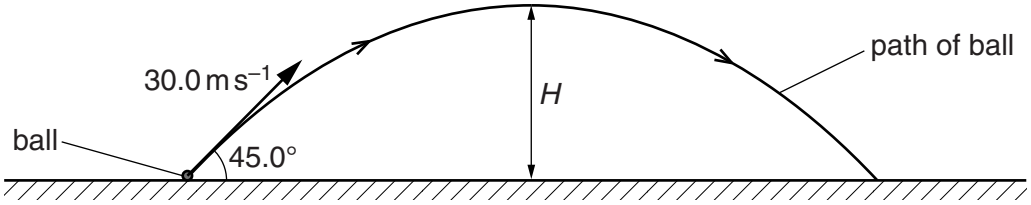


**Fig. 4.1**

Air resistance is negligible. The ball reaches a maximum height *H* after a time of 2.16 s.

**(i)** Calculate

**1.** the initial kinetic energy of the ball,

kinetic energy = ..... J [3]

**2.** the maximum height *H* of the ball,

*H* = ..... m [2]

**3.** the gravitational potential energy of the ball at height *H*.

potential energy = ..... J [2]

**(ii)** **1.** Determine the kinetic energy of the ball at its maximum height.

kinetic energy = ..... J [1]

**2.** Explain why the kinetic energy of the ball at maximum height is not zero.

.....

..... [1]