

**A Level Physics A**  
**H556/01** Modelling physics

**Question Set 12**

- 1 (a) A tennis ball is struck with a racket.  
 The initial velocity  $v$  of the ball leaving the racket is  $30.0 \text{ m s}^{-1}$  and it makes an angle of  $70^\circ$  to the horizontal as shown in Fig. 16.  
 Air resistance is negligible.

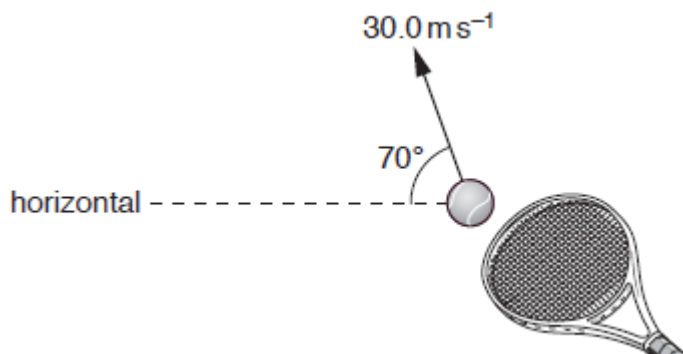


Fig. 16

- (i) Calculate the vertical component of the initial velocity of the ball.

vertical component = .....  $\text{m s}^{-1}$  [1]

- (ii) Use your answer in (i) to show that the ball reaches a maximum height  $h$  of about 40 m.

$h = \dots\dots\dots$  m [2]

- (iii) Explain why the kinetic energy of the ball is not zero at maximum height. [1]

- (iv) The mass  $m$  of the ball is 57.0 g.  
 Calculate the kinetic energy  $E_k$  of the ball when it is at its **maximum** height.

$E_k = \dots\dots\dots$  J [2]

- (b)\* A metal ball is rolled off the edge of a horizontal laboratory bench. The initial horizontal velocity of the ball is  $v$ . The ball travels a horizontal distance  $x$  before it hits the level floor.

Use your knowledge of projectile motion to suggest the relationship between  $v$  and  $x$ . Describe how an experiment can be safely conducted to test this relationship and how the data can be analysed.

[6]

**Total Marks for Question Set 12: 12**

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