

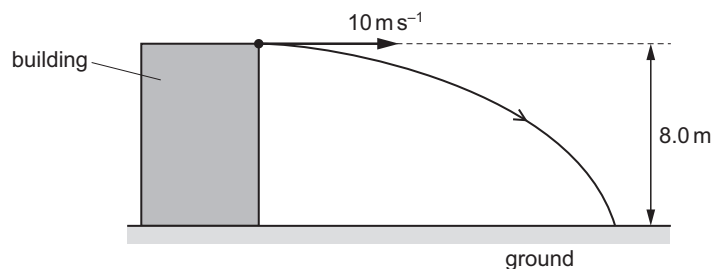
- 5 A projectile is launched at an angle of 25° to the horizontal with a horizontal component of velocity of 13 ms^{-1} .

What is the vertical component of the velocity of the projectile when it is launched?

- A** 5.5 ms^{-1} **B** 6.1 ms^{-1} **C** 12 ms^{-1} **D** 14 ms^{-1}

A-Level Physics: **w24 13**

- 4 A boy throws a stone with a horizontal velocity of 10 ms^{-1} from the top of a building. The height of the building is 8.0 m . The stone travels along a curved path until it hits the horizontal ground, as shown.



Air resistance is negligible.

How long does it take the stone to reach the ground?

- A** 0.61 s **B** 0.80 s **C** 1.3 s **D** 1.6 s

A-Level Physics: **s22 11**

- 6 A ball is thrown horizontally with a speed of 10.0 ms^{-1} above horizontal ground. The ball hits the ground after a time of 3.0 s .

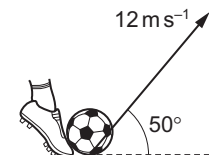
Air resistance is negligible.

What is the speed of the ball just before it hits the ground?

- A** 10 ms^{-1} **B** 29 ms^{-1} **C** 31 ms^{-1} **D** 39 ms^{-1}

- 6 A ball is kicked so that it has an initial velocity of 12 ms^{-1} at an angle of 50° to horizontal ground.

Assume that air resistance is negligible.

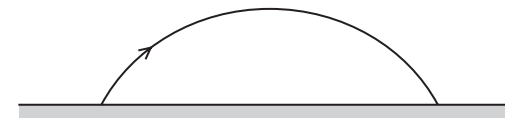


What is the maximum height above the ground that is reached by the ball?

- A** 0.47 m **B** 3.0 m **C** 4.3 m **D** 7.3 m

A-Level Physics: **s24 11**

- 7 The diagram shows the path of a golf ball.



Which row describes changes in the horizontal and vertical components of the golf ball's velocity when air resistance is ignored?

	horizontal	vertical
A	constant deceleration	constant acceleration downwards
B	constant deceleration	acceleration decreases upwards then increases downwards
C	constant velocity	constant acceleration downwards
D	constant velocity	acceleration decreases upwards then increases downwards

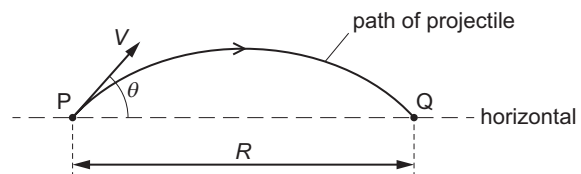
A-Level Physics: **w24 12**

- 6 A ball is thrown horizontally off a tall building. The ground is horizontal. Air resistance is negligible.

Which statement about the motion of the ball is correct?

- A** The acceleration of the ball is always at right angles to the path of the ball.
B The ball follows a circular path until it hits the ground.
C The ball has constant acceleration.
D The ball's time in the air is proportional to the velocity at which the ball is thrown.

- 6 A projectile is fired from point P with velocity V at an angle θ to the horizontal. It lands at point Q, a horizontal distance R from P, after time T .

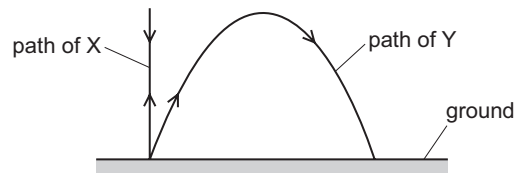


The acceleration of free fall is g . Air resistance is negligible.

Which equation is correct?

- A $R = VT \cos \theta$
 B $R = VT \sin \theta$
 C $R = VT \cos \theta - \frac{1}{2}gT^2$
 D $R = VT \sin \theta - \frac{1}{2}gT^2$

- 6 Two projectiles, X and Y, are fired into the air from the same place on level ground and reach the same maximum height, as shown.



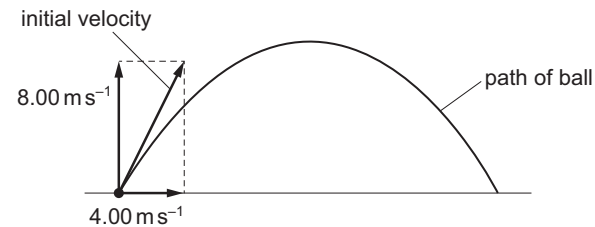
Projectile X is fired vertically upwards and projectile Y is fired at an angle to the horizontal.

Air resistance is negligible.

Which statement is correct?

- A X and Y are at rest at their maximum heights.
 B X and Y are fired with the same speed.
 C X and Y take the same time to return to the ground.
 D X and Y travel the same distance.

- 6 An astronaut on the Moon, where there is no air resistance, throws a ball. The ball's initial velocity has a vertical component of 8.00 m s^{-1} and a horizontal component of 4.00 m s^{-1} , as shown.

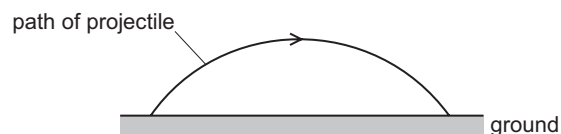


The acceleration of free fall on the Moon is 1.62 m s^{-2} .

What is the speed of the ball 9.00 s after being thrown?

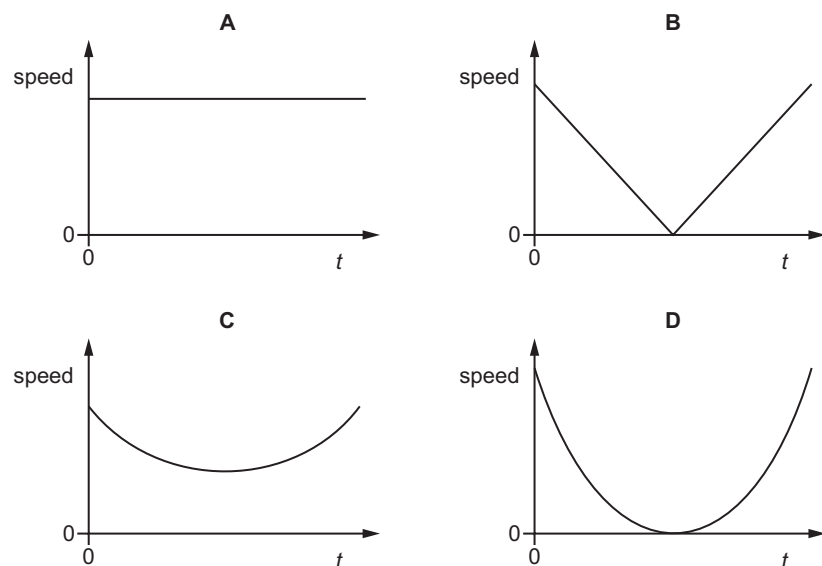
- A 6.58 m s^{-1} B 7.70 m s^{-1} C 10.6 m s^{-1} D 14.6 m s^{-1}

- 6** A projectile is launched at an angle to the horizontal at time $t = 0$. It travels over horizontal ground, as shown.



Air resistance is negligible.

Which graph best shows the variation with t of the speed of the projectile from when it is launched to when it lands on the ground?



- 2** Water leaves the end of a hose pipe at point P with a horizontal velocity of 6.6 ms^{-1} , as shown in Fig. 2.1.

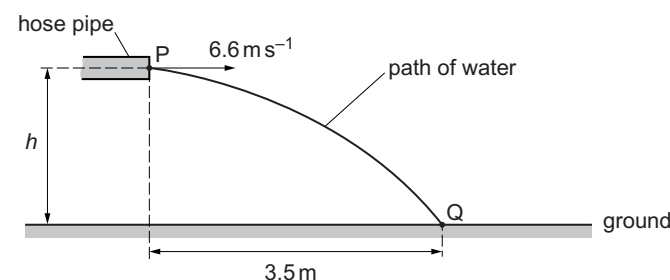


Fig. 2.1 (not to scale)

Point P is at height h above the ground. The water hits the ground at point Q. The horizontal distance from P to Q is 3.5 m.

Air resistance is negligible. Assume that the water between P and Q consists of non-interacting droplets of water and that the only force acting on each droplet is its weight.

- (a)** Explain, briefly, why the horizontal component of the velocity of a droplet of water remains constant as it moves from P to Q.

.....
 [1]

- (b)** Show that the time taken for a droplet of water to move from P to Q is 0.53 s.

[1]

- (c)** Calculate height h .

$h = \dots\dots\dots \text{m}$ [2]

- (d) For the movement of a droplet of water from P to Q, state and explain whether the displacement of the droplet is less than, more than or the same as the distance along its path.

.....
.....
..... [1]

- (e) Calculate the magnitude of the displacement of a droplet of water that moves from P to Q.

displacement = m [2]

[Total: 7]

- 2 A steel ball is projected horizontally from the top of a table, as shown in Fig. 2.1.

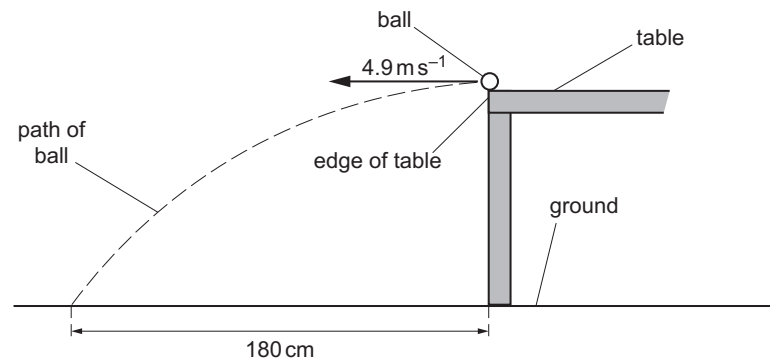


Fig. 2.1 (not to scale)

The ball is projected horizontally at a speed of 4.9 m s^{-1} . The ball lands on the ground a horizontal distance of 180 cm from the edge of the table.

Assume that air resistance is negligible.

- (a) (i) Calculate the time taken for the ball to reach the ground.

time = s [1]

- (ii) Calculate the vertical component of the velocity of the ball as it hits the ground.

velocity = m s^{-1} [2]

- (iii) Determine the magnitude and the angle to the horizontal of the velocity of the ball as it hits the ground.

magnitude of velocity = ms^{-1}

angle to the horizontal = $^{\circ}$
[3]

The variation with compression x of the applied force F for the spring is shown in Fig. 2.4.

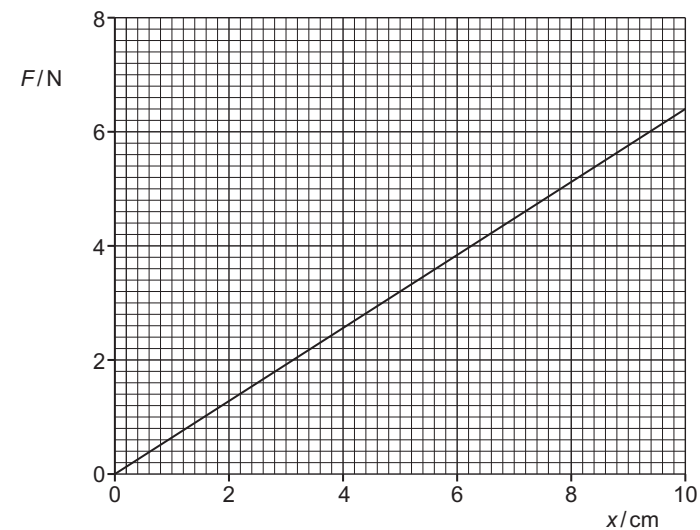


Fig. 2.4

The ball is a uniform sphere of steel of diameter 0.016 m and mass 0.017 kg.

- (i) Calculate the density of the steel.

density = kg m^{-3} [3]

- (ii) All of the elastic potential energy in the spring is converted into kinetic energy of the ball. The speed of the ball as it leaves the spring is 4.9 ms^{-1} .

Show that the maximum elastic potential energy of the spring is 0.20 J.

(iii) Use Fig. 2.4 to determine the spring constant k of the spring.

$$k = \dots\dots\dots \text{Nm}^{-1} \text{ [2]}$$

(iv) Use your answer in (b)(iii) and the value of energy given in (b)(ii) to determine the compression x_0 of the spring.

$$x_0 = \dots\dots\dots \text{m} \text{ [2]}$$