

IB · DP · Physics

 26 mins 26 questions

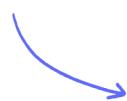
Multiple Choice Questions

Kinematics

Distance & Displacement / Speed & Velocity / Acceleration / Kinematic Equations / Motion Graphs / Projectile Motion / Fluid Resistance / Terminal Speed

Easy (10 questions)	/10
Medium (6 questions)	/6
Hard (10 questions)	/10
Total Marks	/26

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Easy Questions

1 A sprint walker completes a 200 m race in 40 s. What is their average speed during the race?

A. 5 m s^{-1}

B. 6 m s^{-1}

C. 7 m s^{-1}

D. 8 m s^{-1}

(1 mark)

2 A car accelerates from rest to a speed of 40 m s^{-1} in 5 seconds. What is the car's acceleration?

A. 5 m s^{-2}

B. 8 m s^{-2}

C. 20 m s^{-2}

D. 35 m s^{-2}

(1 mark)

3 What is the definition of acceleration?

A. The length between two points

B. The length between two points in a certain direction

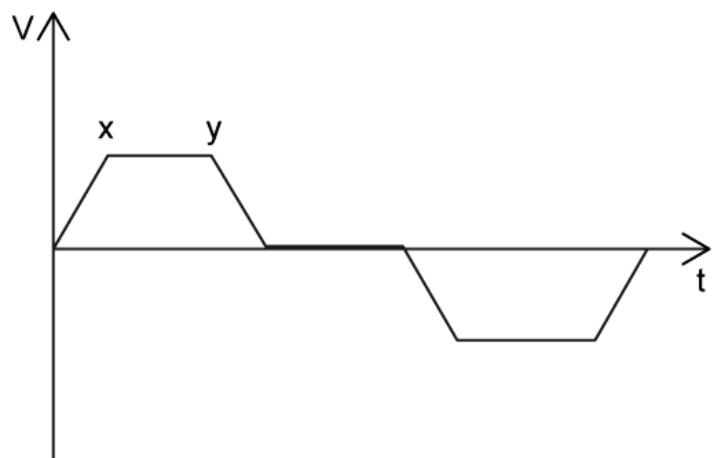
C. The rate of change of displacement

D. The rate of change of velocity

(1 mark)

4 A velocity-time graph is shown for an object. Which statement describes the object's

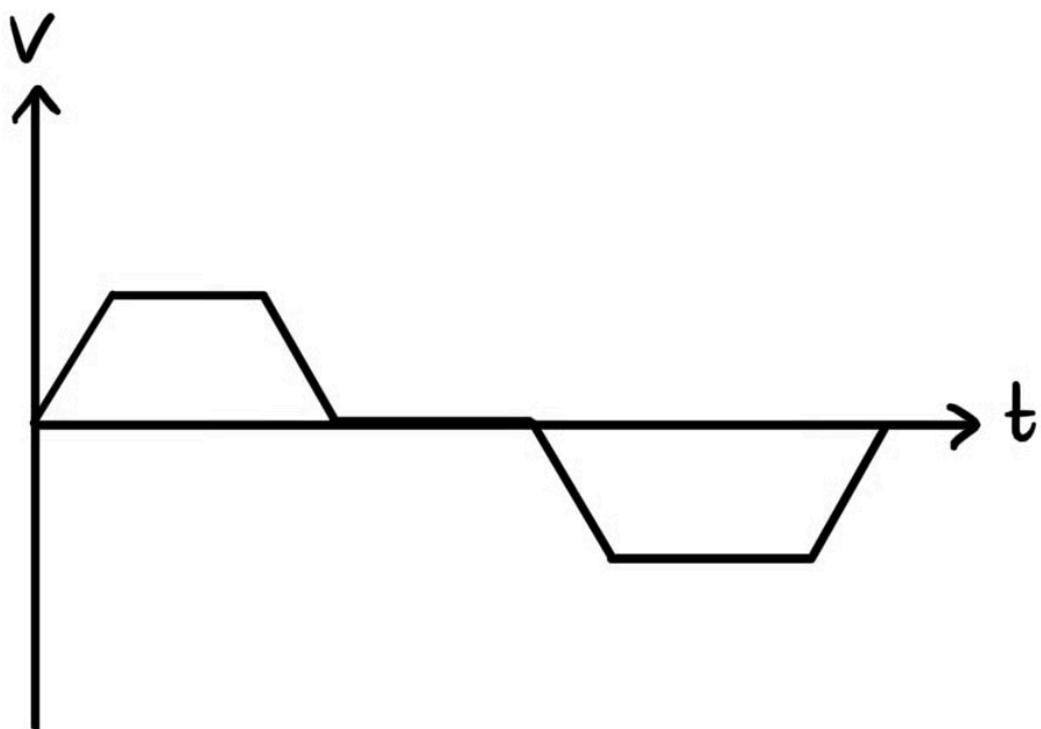
motion between X and Y correctly?



- A.** Constant acceleration
- B.** Increasing acceleration
- C.** Constant velocity
- D.** Decreasing velocity

(1 mark)

5 A velocity-time graph for an object is shown.



Which property of the graph represents the total displacement of the object?

- A.** The gradient of the line
- B.** The total area between the line and the axis
- C.** The y -intercept
- D.** The x -intercept

(1 mark)

6 What does the gradient of a displacement-time graph represent?

- A.** Distance
- B.** Speed
- C.** Velocity
- D.** Acceleration

(1 mark)

- 7 A luxurious speed boat travels down the French Riviera with an initial velocity of 10 m s^{-1} . The owner wishes to show off the power of its engine, accelerating at a rate of 2 m s^{-2} for 5 seconds. What is the final velocity of her speed boat?

A. 20 m s^{-1}

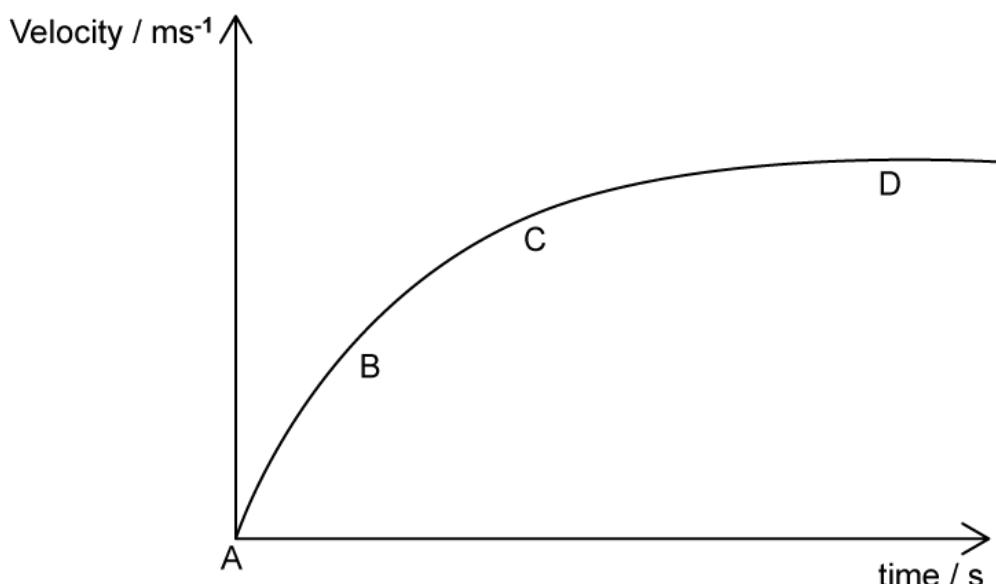
B. 22 m s^{-1}

C. 24 m s^{-1}

D. 26 m s^{-1}

(1 mark)

- 8 The graph below shows the motion of a skydiver in free fall.



What point on the graph represents the skydiver reaching terminal velocity?

(1 mark)

- 9 A ball is thrown upward with an initial velocity of $+3 \text{ m s}^{-1}$. Which SUVAT equation will correctly calculate the maximum height reached by the ball?

A. $v = u + at$

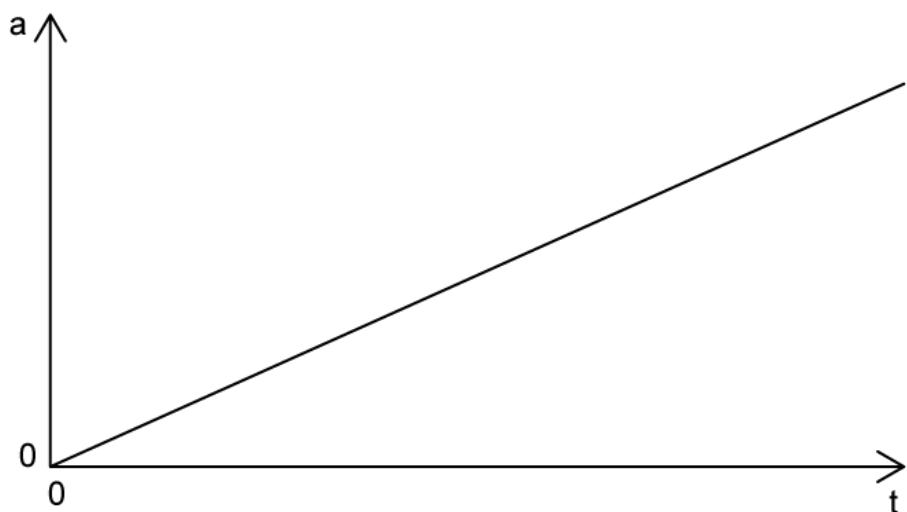
B. $s = ut + \frac{1}{2}at^2$

C. $v^2 = u^2 + 2as$

D. $s = \frac{(v+u)t}{2}$

(1 mark)

- 10** Ashika draws a graph to show the variation of acceleration a with time t of an object.



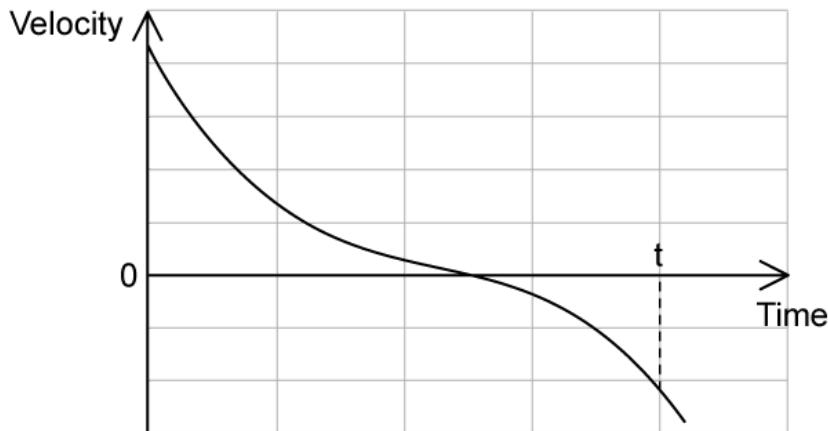
What can she deduce from this graph only, and what quantity from the graph is used to make this deduction?

	Deduction	Quantity used
A.	change in velocity	gradient of graph
B.	change in velocity	area under line
C.	change in position	gradient of graph
D.	change in position	area under line

(1 mark)

Medium Questions

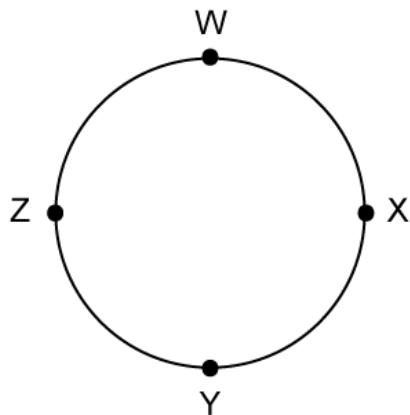
- 1 The graph shows the variation with time of the velocity of a car of fixed mass.



What can be deduced from the graph?

- A.** The car is never stationary
 - B.** The car is always moving backwards
 - C.** The car is always accelerating
 - D.** The acceleration of the car is in the opposite direction to its velocity after time t
- (1 mark)**
- 2 An object moves through one complete circle from point W to X to Y to Z and finally to W

again.



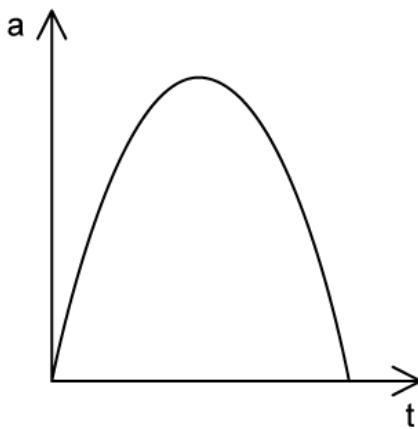
The distance between X and Z is 6 km.

Which row is correct about the displacement and distance of the object?

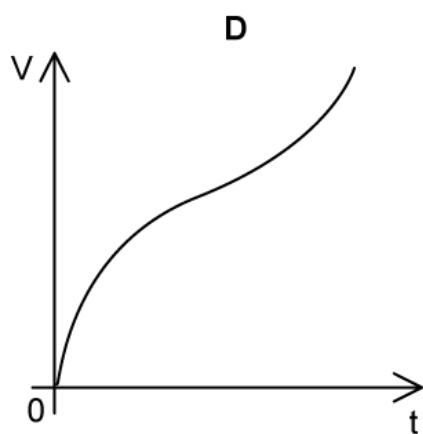
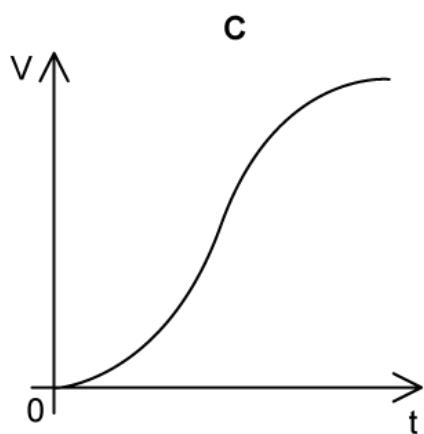
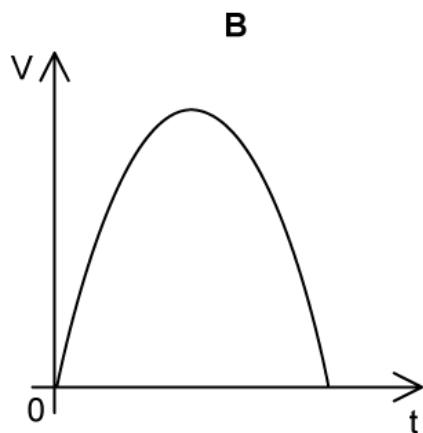
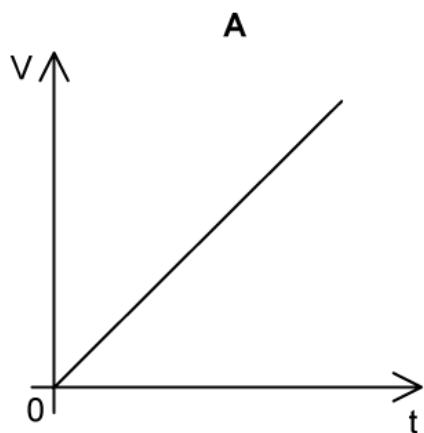
	Displacement / km	Distance / km
A.	0	9π
B.	0	6π
C.	6π	0
D.	6π	9π

(1 mark)

3 The graph shows the variation of acceleration a of an object with time t .

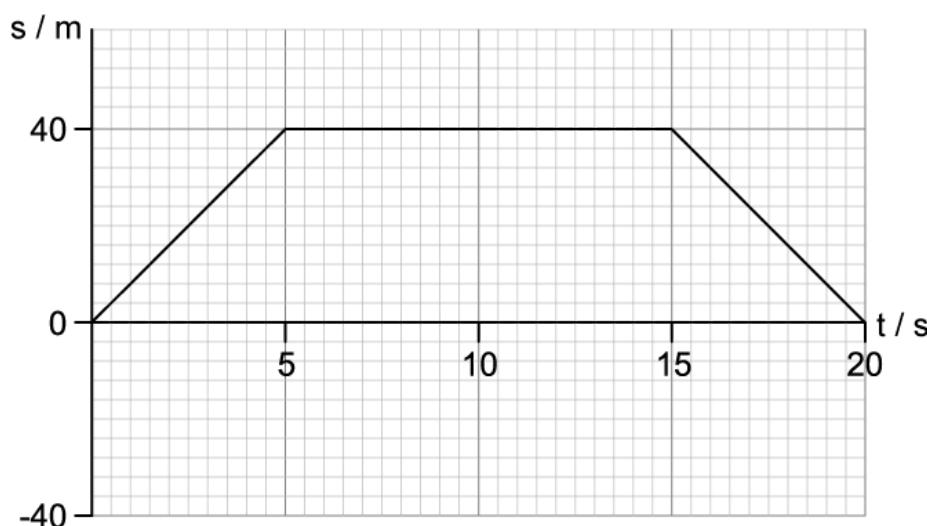


Which graph shows how the velocity v of the object varies with t ?



(1 mark)

- 4 A particle moving in a straight line has the displacement-time graph shown.



Which row is correct about the average speed and average velocity of the particle?

	Average speed / m s ⁻¹	Average velocity / m s ⁻¹
A.	0	4
B.	0	2
C.	4	0
D.	2	16

(1 mark)

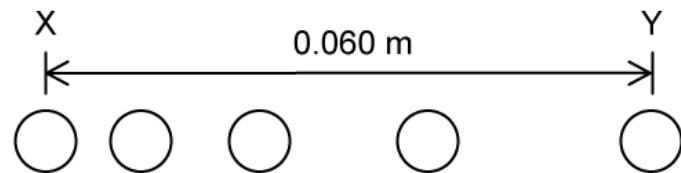
- 5 An object is released from rest near the surface of the Earth and allowed to fall freely.

Which of the following correctly describes the speed and acceleration before the object reaches terminal velocity?

	speed	acceleration
A.	remains constant	remains constant
B.	remains constant	decreases
C.	increases	remains constant
D.	increases	decreases

(1 mark)

- 6 A ball starts from rest and moves horizontally. Five positions of the ball are shown at time intervals of 0.50 ms. The horizontal distance between X, the initial position, and Y, the final position, is 0.060 m.



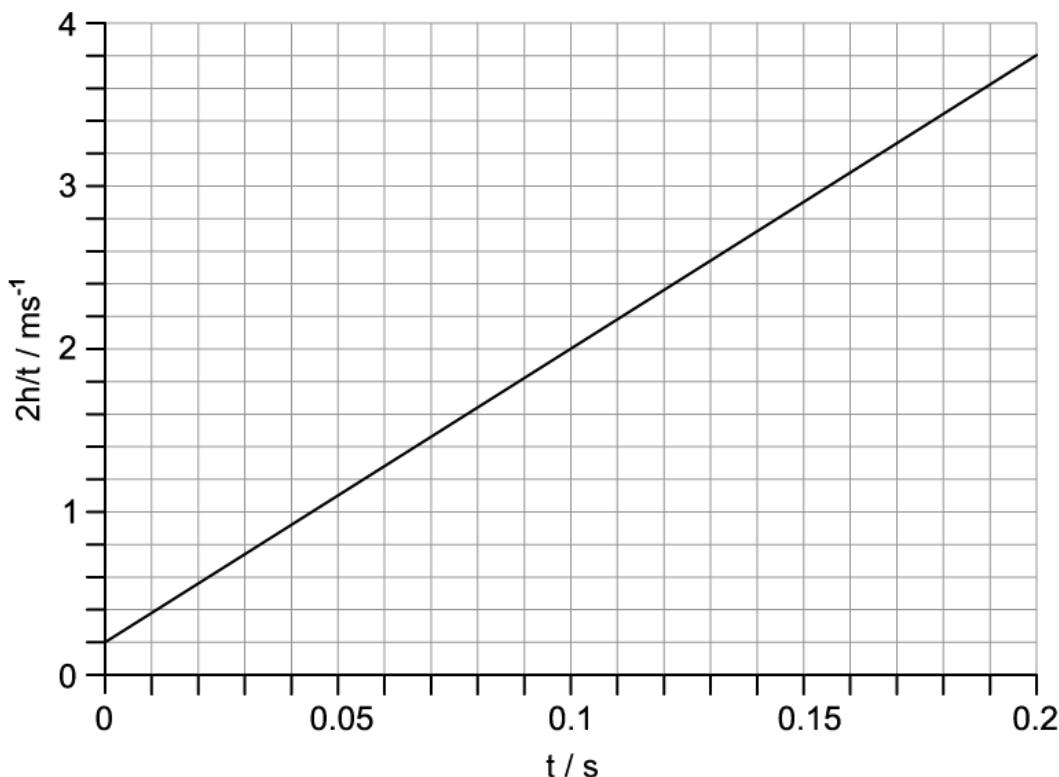
What is the average acceleration of the ball between X and Y?

- A. 48 m s^{-2}
- B. 60 m s^{-2}
- C. $19\ 200 \text{ m s}^{-2}$
- D. $30\ 000 \text{ m s}^{-2}$

(1 mark)

Hard Questions

- 1 The graph shows the results obtained by a student who designed an experiment to determine the value of the acceleration due to free fall, g , using a falling ball bearing and a pair of light gates. The value obtained is inaccurate.



Which of the following could have contributed to the inaccurate value of g obtained by the student?

- A. Measured values of h are too large due to parallax error
- B. Plotting $\frac{2h}{t}$ against t
- C. The ball bearing colliding with the light gate when travelling through
- D. An increase in measured values of t due to residual magnetism in the release mechanism

(1 mark)

- 2 An object is released from a stationary hot air balloon at height s above the ground. Air resistance is negligible.

An identical object is released at the same height above the ground from another balloon that is rising at a constant speed.

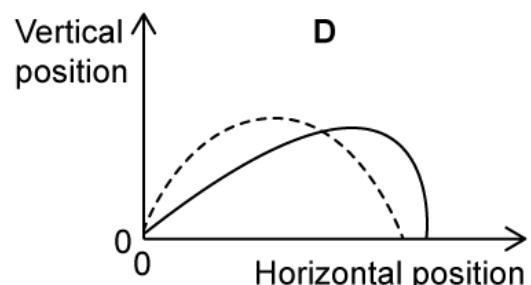
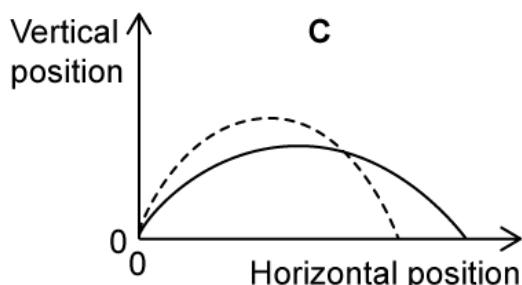
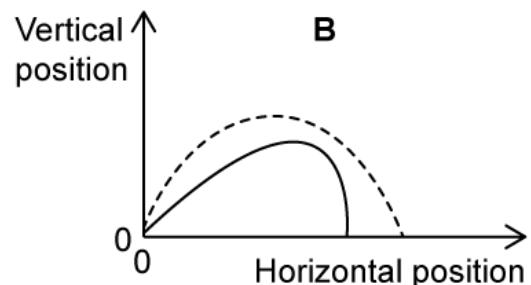
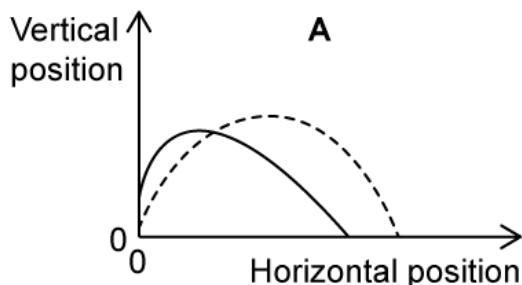
Which of the following does not increase for the object released from the rising balloon?

- A. The time taken for it to reach the ground
- B. The distance through which it falls
- C. Its acceleration
- D. The speed with which it hits the ground

(1 mark)

- 3 An object is projected in a vacuum chamber and in a playing field (where air resistance is taken into account). Otherwise, all initial conditions are equivalent.

Which graph shows correct trajectory for the object in the vacuum chamber and in the playing field?



(1 mark)

- 4 A projectile is fired from level ground with speed v at an angle θ to the ground. Ignoring air resistance, which of the following is a correct expression for the maximum height reached by the projectile?

A. $\frac{v^2 \sin^2 \theta}{g}$

B. $\frac{v \sin^2 \theta}{2g}$

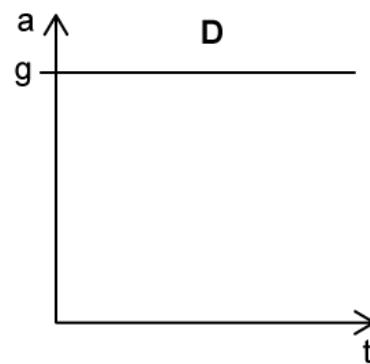
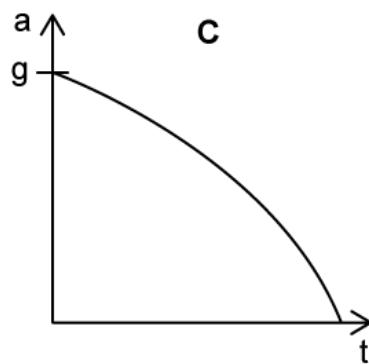
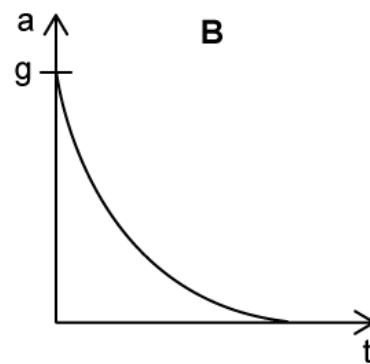
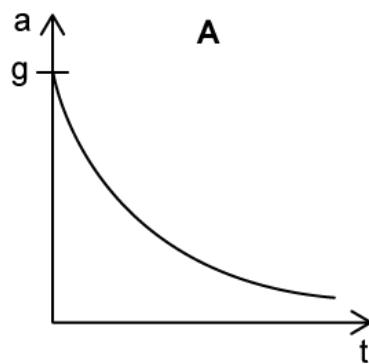
C. $\frac{v^2 \sin^2 \theta}{2g}$

D. $\frac{v \sin^2 \theta}{g}$

(1 mark)

- 5 An object is dropped from a height and falls through air of uniform density.

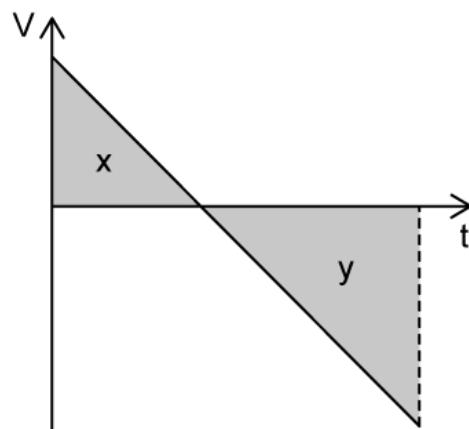
Which of the following is the correct acceleration-time graph for the object?



(1 mark)

- 6 An object is thrown vertically upwards from the top of a cliff. It then falls directly below into the sea.

The graph shows the vertical component of velocity v varies with time t .

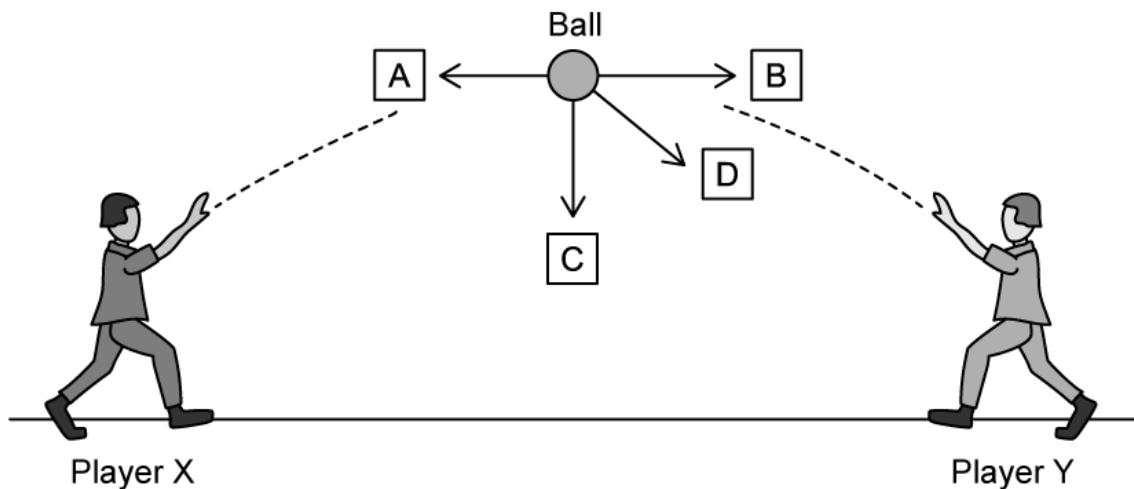


How high is the cliff-top from the surface of the sea?

- A.** X
- B.** Y
- C.** $Y + X$
- D.** $Y - X$

(1 mark)

- 7 Baseball player Y throws a ball to baseball player X as shown.



What is the direction of the net force on the ball at the instant shown, if air resistance is not neglected?

(1 mark)

- 8 On a clear day, in the absence of air resistance, a cannon ball is fired at an angle θ to the ground with an initial velocity u . Its horizontal range is s . Which of the following statements is incorrect?

A. The time of flight is $\frac{s}{u \cos \theta}$

B. The time of flight is $\frac{2u \sin \theta}{g}$ where g is the acceleration of free fall

C. The shadow of the cannon ball moves with a constant velocity while the ball is in flight

D. The resultant linear momentum of the cannon ball is constant during flight

(1 mark)

- 9** A body of mass m is projected at an angle φ to the horizontal in a gravitational field. Its trajectory is parabolic and follows the path PQRST. These points are the position of the body along its trajectory at equal time intervals, with T being the object's maximum height.

The displacements PQ, QR, RS and ST are:

- A.** equal
- B.** decrease at a constant rate
- C.** increase at a constant rate
- D.** have equal horizontal components

(1 mark)

- 10** A small uniform bob is attached to a simple pendulum, and set into motion from some angular displacement. When the bob passes through the lowest point of its motion, the pendulum is cut.

If, at this instant, the bob is moving with a speed of v and is at a height h above ground, how far away does the bob land from a position measured directly under the point at which the pendulum is cut?

- A.** $\sqrt{\frac{h}{g}}$
- B.** $v\sqrt{\frac{h}{g}}$
- C.** $v\sqrt{\frac{2h}{g}}$
- D.** $v\sqrt{\frac{h}{2g}}$

(1 mark)