A1 - MCQ

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1

A car has an initial velocity 20 m s^{-1}. It decelerates at 5.0 m s^{-2}. After which distance will the car stop?

A 4.0 m

B 40 m

C 80 m

D 100 m

2

An object with initial speed 2.0 m s^{-1} accelerates to a speed of 8.0 m s^{-1} in 4.0 s.
What is the distance covered?

A 8.0 m

B 16 m

C 20 m

D 32 m

3

A block accelerating on a straight line with constant acceleration a increases its speed from u to v in a time t.
The following are suggested expressions for the displacement of the block during this time:

I $\frac{v^2 - u^2}{2a}$

II $ut + \frac{1}{2}at^2$

III $vt - \frac{1}{2}at^2$

Which of the following are correct expressions for the displacement?

A I and II

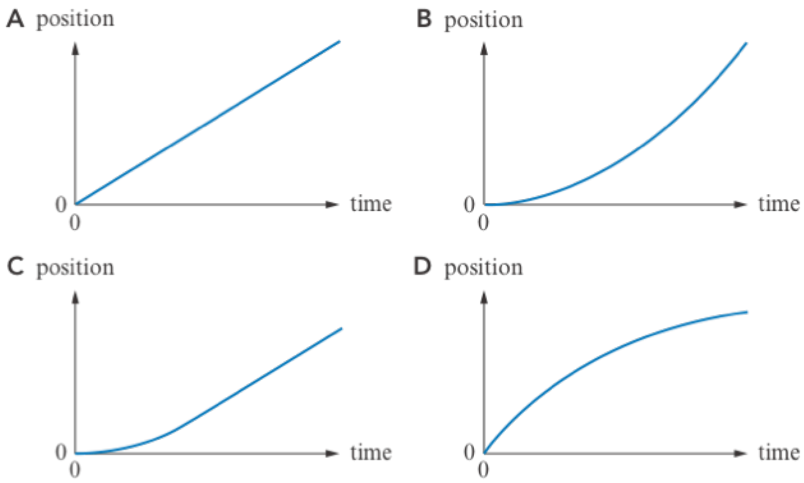
B I and III

C II and III

D I, II and III.

4

A ping-pong ball is released from rest and falls vertically. The ball attains terminal speed.
Which graph shows the variation of the position of the ball with time?



5

On Earth the magnitude of the acceleration of free fall is $g = 9.8\ \mathrm{m\,s^{-2}}$. A ball is thrown upwards and after reaching its maximum height falls down again. Taking the upward direction as positive, what is correct about the acceleration of the ball during its motion?

	Ball moving upward	Ball at maximum height	Ball moving downward
A	g	zero	$-g$
B	$-g$	$-g$	$-g$
C	$-g$	zero	g
D	g	g	g

6

A projectile is launched horizontally from a vertical cliff with a speed $30\ \mathrm{m\,s^{-1}}$. The cliff is 80 m high.
How far from the base of the cliff does the projectile land?

A 240 m
B 120 m
C 90 m
D 80 m

7

A projectile is launched horizontally from a cliff and hits the ground 5.0 s later. How high is the cliff?

A 125 m

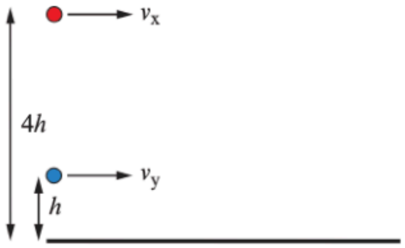
B 75 m

C 50 m

D Cannot be determined without knowing the launch speed.

8

Two projectiles, X and Y, are launched horizontally. X is launched with speed v_X from a height $4h$ and Y with speed v_Y from a height h.



X and Y land at the same point on horizontal ground. What is the ratio $\frac{v_X}{v_Y}$?

A $\frac{1}{4}$

B $\frac{1}{2}$

C 2

D 4

9

A projectile is projected at 45° to the horizontal. The magnitude of its momentum at launch is p. What is the magnitude of its momentum at the highest point of its path?

A 0

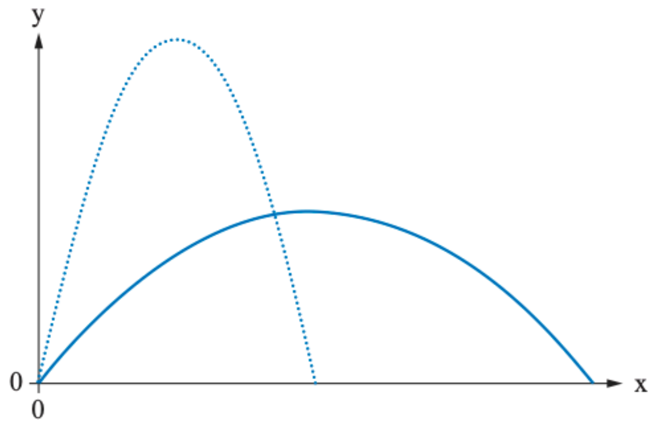
B $\frac{p}{4}$

C $\frac{p}{2}$

D $\frac{p}{\sqrt{2}}$

10

Two projectiles are launched at the same time and with the same speed at different angles to the horizontal. The graph shows the path of each projectile. Air resistance is negligible.



Which is correct about which projectile reaches the ground first?

A Both reach the ground at the same time.

B The projectile with the solid line path reaches the ground first.

C The projectile with the dotted line path reaches the ground first.

D Cannot be determined with the information given.

11

An object thrown vertically upwards reaches a maximum height H. The same object is thrown upwards with the same speed on a planet where the acceleration of free fall is $\frac{g}{3}$. What is the maximum height attained?

A $\frac{H}{3}$

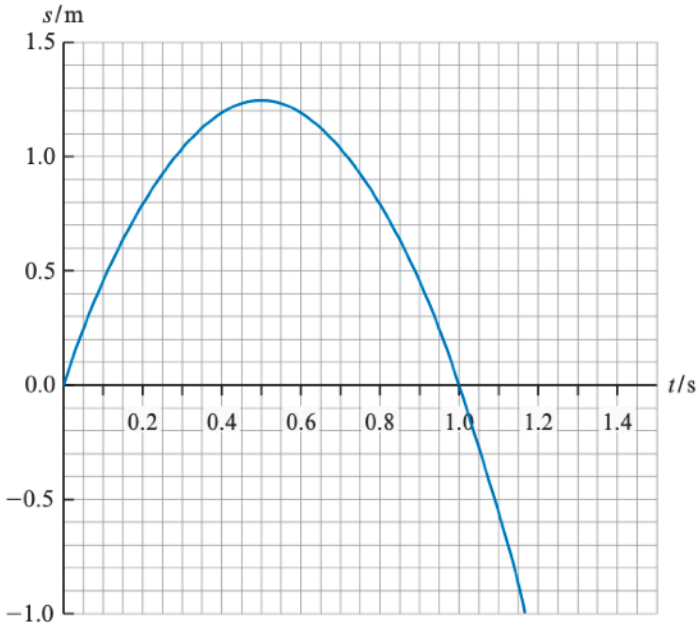
B $\frac{H}{\sqrt{3}}$

C $H\sqrt{3}$

D $3H$

12

The graph shows how the position of an object varies with time. The shape of the graph is a parabola.



What is correct about the acceleration of the object?

A It is zero.

B It is constant and positive.

C It is constant and negative.

D The acceleration is not zero and not constant.

13

A projectile is projected at 45° to the horizontal with kinetic energy K. What is the kinetic energy of the projectile at the highest point of its path?

A 0

B $\frac{K}{4}$

C $\frac{K}{2}$

D $\frac{K}{\sqrt{2}}$

A1 - MCQ

Key

1	B	7	A	13	C
2	C	8	B		
3	D	9	D		
4	C	10	B		
5	B	11	D		
6	B	12	C		

Reference - Cambridge press - IBDP Physics - exam style questions

Solution :

$$v^2 - u^2 = 2as$$

$$0 - (20)^2 = 2(-5)(s)$$

$$s = \frac{400}{10} = 40\ m$$

2) $$s = \left(\frac{v+u}{2}\right)t = \left(\frac{8+2}{2}\right)(4)$$

$$= 5(4) = 20\ m$$

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3) I ✓

II ✓

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

$v - u = at$

$\Rightarrow (u = v - at)$

$s = (v - at)t + \frac{1}{2}at^2$

$= vt - at^2 + 1/2\, at^2$

$= vt - \frac{1}{2}at^2$

∴ option D all are correct

4) Initially it accelerates and eventually attains terminal speed so option C

5) as g is always same at all positions of motion and downward so -ve direction. → B

6) $s = ut + \frac{1}{2}gt^2$

$-80 = 0 + \frac{1}{2}(-10)t^2$

$\frac{80}{5} = t^2 \qquad t = 4$

$u_H = \frac{R}{t} \qquad R = 30 \times 4$
$= 120$

7) $s = ut + \frac{1}{2}gt^2$

$s = 0 + \frac{1}{2}(-10)5^2$

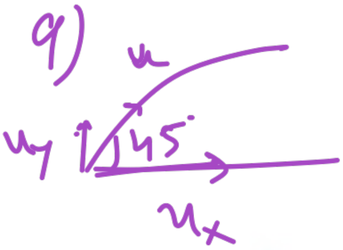
$s = 125\ m$

8) $v_x = \frac{R}{t_x}$ and $v_y = \frac{R}{t_y}$

$\Rightarrow v_x t_x = v_y \cdot t_y.$

or $\frac{v_x}{v_y} = \frac{t_y}{t_x} = \sqrt{\frac{2h/g}{8h/g}} = \frac{1}{2}$

$\left\{ \begin{array}{l} s = \frac{1}{2}gt^2 \\ t = \sqrt{\frac{2s}{g}} \end{array} \right.$

9) 

@ highest point

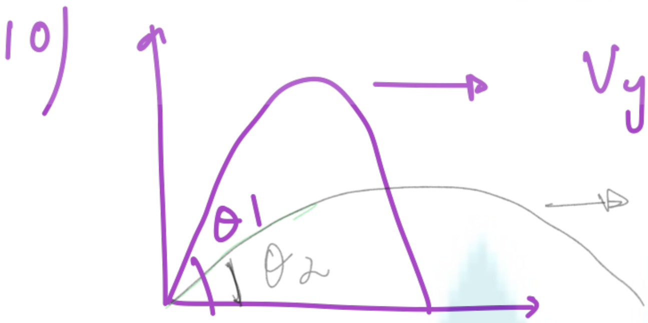
$v_y = 0$ $\quad v_x = u\cos 45$

$= \frac{u}{\sqrt{2}}$

$\therefore v_{net} = \sqrt{0 + \frac{u^2}{(\sqrt{2})^2}} = \frac{u}{\sqrt{2}}$

$\therefore p = m v_{net}$

$= \frac{mu}{\sqrt{2}} = \frac{p}{\sqrt{2}}$

10) 

$V_y = V\sin\theta_1$

$V_y = V\sin\theta_2$

$\sin\theta_1 > \sin\theta_2$ $\left\{ \begin{array}{l} \sin 0^\circ = 0 \\ \sin 90^\circ = 1 \end{array} \right.$

$\Rightarrow V_y \sin\theta_1 > V_y \sin\theta_2$

$\Rightarrow t_{solid} < t_{dotted}$

11) $v^2 - u^2 = 2gs$

$0 - u^2 = 2gH$ Earth

$u^2 = \frac{2g}{3} \cdot H_1$ Planet

$H = \frac{-u^2}{-2g}$ $H_1 = \frac{-u^2}{-2g/3}$ or $\frac{-3u^2}{-2g}$

$\frac{H_1}{H} = \frac{\frac{3u^2}{2g}}{\frac{u^2}{2g}} \Rightarrow H_1 = 3H$

12) c → Parabolic position time graph means constant acceleration and will be -ve as downward (only g)

13) @ highest point $v_y = 0$

$v_x = v\cos 45^\circ$

$K = \frac{1}{2}mv^2$

at height point

$K_1 = \frac{1}{2}m(v\cos 45)^2$

$= \frac{1}{2}mv^2 \cos^2 45$

$= K \cdot \frac{1}{2}$

$\Rightarrow K_1 = K/2$