Name: Omar Faruk
Reg: 2019831055

Ans: to the que: No - 1

(a)

given that,

$x = 20\,cm + 4\,(cm.s^{-2})\,t^2$

the displacement between $t_1 = 2s$ and $t_2 = 5s$

$$x = \left[20 + 4t^2\right]_2^5$$

$$= (20 + 4\times 25) - (20 + 4\times 4)$$

$$= 120 - 36$$

$$= 84\ cm$$

(b)

The average velocity in the interval

$$\bar{V} = \frac{X}{t_2 - t_1} = \frac{84}{5-2} = 28\,cm.s^{-1}$$

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(C)

Give that,

$x = 20\ cm + 4\ (cm \cdot s^{-2})\ t^2$

$\frac{dx}{dt} = \frac{d}{dt}(20 + 4t^2)$

$v = ~~20~~ + 8t$

The instance velocity at time $t = 2s$.

$V = 8 \times 2\ cm \cdot s^{-1}$

$= 16\ cm \cdot s^{-1}$

Ans: to the que: NO-2

Given that,

the angle of first ball, $\theta_1 = 15°$

the angle of second ball, $\theta_2 = 45°$

the angle of third ball, $\theta_3 = 75°$

we know,

gravitational acceleration, $g = 9.8\ ms^{-2}$

Now,

Horizontal distance for the first ball,

$$R_1 = \frac{V_0^2 \sin 2\theta_1}{g} = \frac{10^2 \times \sin(2\times 15^\circ)}{9.8} m$$

$$= 5.1 m$$

Horizontal distance for the second ball,

$$R_2 = \frac{10^2 \times \sin(2\times 45^\circ)}{9.8} = 10.2 m$$

Horizontal distance for the third ball,

$$R_3 = \frac{10^2 \times \sin(2\times 75^\circ)}{9.8} = 5.1 m$$

$\therefore R_1 \neq R_2$ and $R_2 \neq R_3$ but $R_1 = R_2$

So, we can say,

the three projectile do not cover same horizontal distance.

Ans: to the que: No-3

Given that,

the angle of launch, $\theta = 22^\circ$

Horizontal angle, $\alpha = 10^\circ$

initial velocity $V_0 = 15 ms^{-1}$

we know,

$$R = \frac{2v_0^2\{\sin\theta \times \cos(\theta+\alpha)\}}{g\cos^2\alpha} = \frac{2\times15^2\times\{\sin22^\circ \times \cos32^\circ}{9.8\times\cos10^2}$$

$= 15.041$ m

An

Ans: to the que: No-4

we know that,

Mass of the earth, $M = 6\times10^{24}$ kg

Gravitational constant, $G = 6.673\times10^{-11}\ Nm^2 kg^{-2}$

Radius of the earth, $R = 6.4\times10^6$ m

escape velocity, $V_e = ?$

we know,

$$V_e = \sqrt{\frac{2GM}{R}}$$

$$= \sqrt{\frac{2\times6.673\times10^{-11}\times6\times10^{24}}{6.4\times10^6}}\ ms^{-1}$$

$= 11185.65\ ms^{-1}$

$= 11.185\ km\cdot s^{-1}$

So, the minimum ~~initial~~ speed for a projectile to escape from the earth is $11.185\ km\ s^{-1}$

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Ans: to the que: No-5

Given that,

Mass of block A, $m_a = 4kg$

Mass of block, B, $m_b = 2kg$

Co-efficient of friction, $\mu_k = 0.5$

Angle $\theta = 30°$

we know,

$F_k = \mu_k \times g \times m_b$

$= 0.5 \times 9.8 \times 2$

$= 9.8$ N

Net $F = m_a \cdot g \cdot \sin 30°$

$= 4 \times 9.8 \times \sin 30°$

$= 19.6$ N

So the acceleration of the blocks.

$F = ma$

$\Rightarrow a = \dfrac{F - f_k}{m} = \dfrac{F - f_k}{(m_a + m_b)}$

$= \dfrac{19.6 - 9.8}{4+2} = \dfrac{9.8}{6} \, ms^{-2}$

$= 1.633 \, ms^{-2}$

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The tension in the cord,

$= 19.6 - 1.633 \times 4$

$= 13.08 N$

So,

a) The tension in the cord is 13.08 N and

b) Acceleration is $1.633 ms^{-2}$