Civilittee

اللجنة الأكاديمية للهندسة المدنية

دفتر

فيزياء 1

رهف هماش

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ch.1 : physics and measuremnt   ch II 1   13. oct. 2020

S.I	unit	Dim
* Time	s	T
* Mass	Kg	M
* Length	m	L

nano : $n = 10^{-9}$ — Ex, $7\,nm = 7\times10^{-9}\,m$

Micro : $\mu = 10^{-6}$ — $7\,\mu m = 7\times10^{-6}\,m$

milli : $m = 10^{-3}$ — $7\,mm = 7\times10^{-3}\,m$

Killo : $K = 10^{3}$ — $7\,Km = 7\times10^{3}\,m$

giga : $G = 10^{9}$ — $7\,Gm = 7\times10^{9}\,m$

v = valocity

$v = \frac{x}{t}$ = unit $[m/s]$ = dim $[L/T]$

Ex
q1 force $F = G\,\frac{mM}{r^2}$ ← قانون الجذب العام

(m) $\xrightarrow{F}$ $F \leftarrow$ (M)
$\rightarrow r \leftarrow$

find the unit of G?

$G = \frac{m^3}{s^2}\cdot\frac{1}{Kg}$

Dim?

$G = \frac{L^3}{T^2}\cdot\frac{1}{M}$

F. force $[N]$ = ma $[Kg \cdot m/s^2]$

$Kg\,\frac{m}{s^2} = [G]\,\frac{Kg\cdot Kg}{m^2}$

$G = \frac{m^3}{s^2}\,\frac{1}{Kg}$ ← unit

q2 :- $s = R\cdot a^n\cdot t^o$

if s : distance $[m]$

R : Constant $[\cancel{\xi}]$ ← بدون وحدة

a : accelaration $[m/s^2]$

t : time $[s]$

find the u of n and o?

$\rightarrow m = \left(\frac{m}{s^2}\right)^n (s)^o$

$m^1 = m^n\cdot s^{-2n}\cdot s^o$

$m^1 = m^n\cdot s^{o-2n}$

$s^0\cdot m^1 = m^n\cdot s^{o-2n}$

$m^1 = m^n \Rightarrow \boxed{n=1}$

$0 = o-2n$

$o = 2n = 2(1)$

$\boxed{o = +2}$

R = ثابت

$s^0 = 1$

$s^1 = s$

$(s^2)^3 = s^6$

$s^2\cdot s^3 = s^5$

$s^{-4} = \frac{1}{s^4}$

physics . Ch 1 — 13 . oct . 2020

$S = R \cdot a^n \cdot t^o + v^w t^K$ ← لما انو جمع

Find the values of n, o, w, K? — متغير u ← R

$S = R \cdot a^n \cdot t^o$ — فلما نعوضها

$S = \cancel{tt}\, v^w \cdot t^K$ — اذا كان الها u تتحول

$n = 1$, $o = 2$ — نفس القانون الاول $[\Delta x = v_i t + \frac{1}{2} a t^2]$

h.w $\{$ $w = 1$ $K = 1$

$S = R \cdot a^n \cdot t^o + v^w t^K$

$S = R \cdot a^n \cdot t^o$

$S = v^w \cdot t^K$

$m = (\frac{m}{s})^w \cdot (s)^K$

$m = m^w \cdot s^{-w} \cdot s^K$

$m = m^w \cdot s^{K-w}$

$s^0 \cdot m = m^w \cdot s^{K-w}$

$m^1 = m^w$

$\boxed{w = 1}$

$s^0 = s^{K-w}$

$0 = K - w$

$0 = K - 1$

$\boxed{K = 1}$

$S = R \cdot a^1 \cdot t^2 + v^1 \cdot t^1$

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physics CH2 — 15 oct. 2020

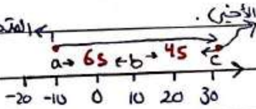
Motion in one Dimension

1 - position
2 - Velocity
3 - acrelation

1 - position → Distance ← مسافة
ازاحة → displacement $= \Delta x = x_f - x_i \; / \; \Delta t = t_f - t_i$

2- velocity → Avarage speed $= \frac{\text{distance}}{\text{time}}$ ← متوسط السرعة
$u = m/s$
→ Avarage velocity $= \frac{\text{displacement}}{\text{time}}$ ← السرعة المتوسطة
→ $\frac{\Delta x}{\Delta t}$

* Ex, find the distance, displacement, average speed and avarage volecity.



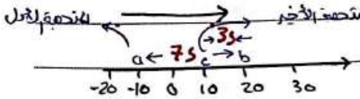
* distance → $\overline{ab} + \overline{bc}$
$20 + 20 = 40\ m$ ← ما عنده اشارة

* displacement → $\Delta x = x_f - x_i$
$30 - (-10) = +40\ m$ ← in x-axis positive

* Avarage speed → $\frac{\text{distance}}{\text{time}} = \frac{40}{6+4=10} = 4\ m/s$
↳ ما عنده اشارة

Avarage velocity → $\frac{\text{displacement}}{\text{time}}$
$\frac{\Delta x}{\Delta t} = \frac{40}{10} = +4\ m/s$ ← in x-axis positive

Ex_2 - find the distance, displacement, avarage speed and avarage velocity.



- Distance = $\overline{ab} + \overline{bc}$

  $30 + 10 = 40$ m ← متغير اشارة

- Displacement = $\Delta x = x_f - x_i$

  $= 10 - (-10) = +20$ m in x-axis positive

- Avarage speed = $\frac{\text{distance}}{\text{time}}$

  $\frac{40}{7+3=10} = 4$ m/s

  متغير اشارة

- Avarage velocity = $\frac{\text{displacement}}{\text{time}}$

  $\frac{\Delta x}{\Delta t} = \frac{20}{10} = +2$ m/s in x-axis positive

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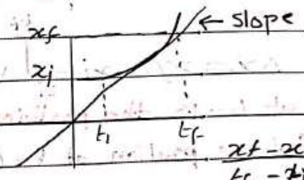
physics 18. oct. 2020

position → Distance
position → Displacement $= \Delta x = x_f - x_i$

velocity → Ave. speed $= \frac{\text{distance}}{\text{time}}$
velocity → Ave. velocity $= \frac{\Delta x}{\Delta t}$
velocity → Instantanous velocity $= \vec{V}$



$$\vec{V} = \lim_{\Delta t \to 0} \frac{\Delta x}{\Delta t}$$

$$\vec{V} = \frac{dx}{dt} = \text{slope}$$

$$\frac{x_f - x_i}{t_f - t_i}$$

* Ex, $x = 3t^2 - t + 4$

Find the ave velocity from $t = 1s$ t.$t = 3s$

$$v = \frac{x_f - x_i}{t_f - t_i} = \frac{28 - 6}{3 - 1} = +11 \text{ m/s}$$

→ ave. speed = |ave. velocity|

→ $t(1) = 3 - 1 + 4 = 6m$

→ $t(3) = 27 - 3 + 4 = 28\,m$

* Find the velocity at $t = 2s$ (instant anous)

$x = 3t^2 - t + 4 \rightarrow 6t - 1$

$v = 6 \times 2 - 1 = 12 - 1 = \boxed{11 \text{ m/s}}$

7/15, $x = 3t^2 - 2t + 3$

position $t = (2 - 3)s$ h.m

velocity $t = 2s$

$t_{(2)} = 3(2)^2 - 2(2) + 3 = 12 - 4 + 3 = 11\,m$

$t_{(3)} = 3(3)^2 - 2(3) + 3 = 27 - 6 + 3 = 24m$

$$v = \frac{x_f - x_i}{t_f - t_i} = \frac{24 - 11}{3 - 2} = 13 \text{ m/s}$$

$t = 2s$
$= 6t - 2$
$= 6(2) - 2$
$= 12 - 2$
$= +10$ m/s

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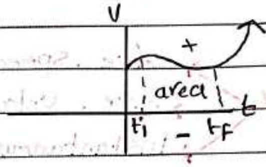
Physics 18. oct. 2020

$v = \frac{dx}{dt}$

$dx = v . dt$

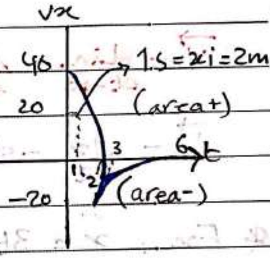
$\int_{x_i}^{x_f} dx = \Delta x = \int_{t_i}^{t_f} v . dt$



$\Delta x = x_f - x_i = \int_{t_i}^{t_f} v . dt = \text{area}$

at $t = 1s$ the position = equal 2m

find the position at $t = 6s$? يبدأ من 1 إلى 6



$\Delta x = x_f - x_i = \text{area}$

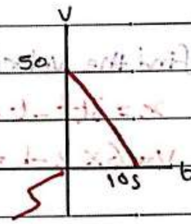
$x_f - x_i = x_f - 2 = \text{area}_1 + -\text{area}_2$

$x_f - 2 = \frac{1}{2}(1)(20) - \frac{1}{2}(4)(20)$ ← بس عوضناها بالقانون (−20) لما اخذناها عامل مشترك

$= 10 - 40 = -30$

$x_f = -30 + 2 = -28 m$

* At t = zero, the position = equal 5m
find the position at $t = 10s$



$x_f - x_i = \text{area}$

$x_f - 5 = \frac{1}{2}(10)(50)$

$x_f = 5 + 250 = \boxed{255 m}$

* find the displacement from t=0 to t=10s

$\Delta x = \text{area} = 250 m$ ✓

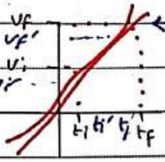
or

$x_f - x_i = 255 - 5 = 250 m$ ✓

physics 20.oct.2020

Acrelation → Ave. acrel $= \bar{a} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$

Acrelation → Instant. acrel $= \vec{a} = \lim_{\Delta t \to 0} \frac{\Delta v}{\Delta t}$



$\vec{a} = \frac{dv}{dt} = \frac{d^2x}{dt^2}$

$\text{Slope} = \frac{v_f' - v_i'}{t_f' - t_i'}$

Q15 $x = 3t^2 - 2t + 3$

A) find the acrelation from $t = 2$ sec $t - t = 3s$?

$\bar{a} = \frac{v_f - v_i}{t_f - t_i} = \frac{16 - 10}{3 - 2} = 6 \, m/s^2$

$v = \frac{dx}{dt} = 6t - 2$

$t_i = 2s \rightarrow 6 \times 2 - 2 = 10 \, m/s$

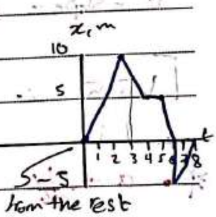
$t_f = 3s \rightarrow 6 \times 3 - 2 = 16 \, m/s$

B) find the acrelation at $t = 5s$?

$\vec{a} = \frac{dv}{dt} = 6$

$\vec{a}(t = 5s) = 6 \, m/s^2$

Q_A) find the avarage velocity



$\boxed{1}$ 0 — 2s

$\bar{v} = \frac{x_f - x_i}{t_f - t_i} = \frac{10 - 0}{2 - 0} = +5 \, m/s$ ← اتجاه ال x موجب

$\boxed{2}$ 2s → 4s

$\bar{v} = \frac{5 - 10}{4 - 2} = -2.5 \, m/s$ ← اتجاه ال x سالب

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[3] 4s → 5s?

$\bar{V} = \frac{5-5}{5-4} = \text{Zero}$

[4] 0 → 7

$\vec{V} = \frac{-5-0}{7-0} = \frac{-5}{7}$ m/s

QB) find the avarage speed? مقدار المتغير

[1] 0 → 2s?

$\frac{\text{distance}}{\text{time}} = \frac{10}{2} = 5$ m/s

[2] 2s → 4s?

$\frac{5}{2} = 2.5$ m/s

[3] 4s → 5s?

$\frac{0}{1} = 0$ m/s

[4] 0s → 7s?

$\frac{10+5+0+5+5}{7} = \frac{25}{7}$ m/s

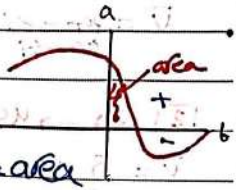
QC) find the velocity at t=1s? ← at 0, 2, 4, 5, 7, 8s?

$\vec{V} = \text{slope} = \frac{x_f' - x_i'}{t_f' - t_i'} = \frac{10-2}{2-0} = 5$ m/s $\qquad \vec{V} = 0$ (zero)

[H.W $\dot{\iota}$: 0.7s (5m/s), 1.5s (5m/s), 3s (−2.5m/s), 4.5s (0), 6s? (−5m/s)]

* $a = \frac{dv}{dt} = \int_{v_i}^{v_f} dv = \int_{t_i}^{t_f} a \cdot dt$

$v_f - v_i = \Delta v = \int_{t_i}^{t_f} a \cdot dt$



$\Delta v = \text{area}$

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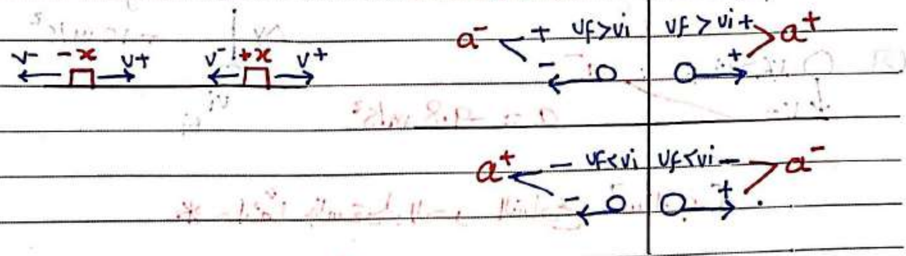
Motion in one dimension with constant acrelation.



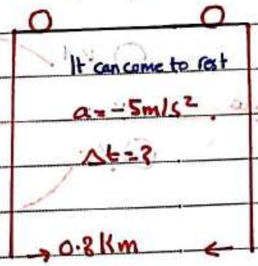
[1] $v_f = v_i + a\Delta t$

[2] $v_f^2 = v_i^2 + 2a\Delta x$ معادلات

[3] $\Delta x = v_i t + \frac{1}{2}a t^2$ التسارع

Q 19 → 7 A jet plan

$v_i = 100\ m/s$ $a = 5\ m/s$ $v_f = 0$



800 m

[1] $v_f = v_i + a\Delta t$

$0 = 100 - 5\Delta t$

$\frac{+5\Delta t}{5} = \frac{100}{5}$

$\Delta t = 20$

[2] $v_f^2 = v_i^2 + 2a\Delta x$

$0^2 = (100)^2 + 2(-5\Delta x)$

$= 10000 - 10\Delta x$

$\frac{10\Delta x}{10} = \frac{10000}{10}$

$\Delta x = 1000 > 800$ x

physics 22.oct.2020

free falling objects

[1] ↑ v^+ ○ $v_f < v_i$ − → a^- $\quad a = -9.8\ m/s^2$

v_f t_f ○ Δy ○ v_i t_i $\quad a = g = 9.8\ m/s^2 = 10\ m/s^2$

[2] ○ $v_f > v_i$ + ↓ v^- → a^- $\quad a = -9.8\ m/s^2$

* دائمًا بالسقوط الحر التسارع [سالب]

[1] $v_f = v_i - g\,\Delta t$
[2] $v_f^2 = v_i^2 - 2g\,\Delta y$
[3] $\Delta y = v_i\,\Delta t - \frac{1}{2} g\,\Delta t^2$

} قوانين السقوط الحر

$\Delta y = y_f - y_i$

○ y^+ → ○ y^+ ↑ v^+ ↓ v^-

مرجعية $y = 0$

○ y^- → ○ y^- ↑ v^+ ↓ v^-

physics 25.oct.2020

Free falling objects

$+$ $\uparrow$ $v_f < v_i$ $-$ → $g-$ $g = -9.8 \approx 10$

$g = -10\ m/s^2$

$+$ $\uparrow$ $v_f > v_i$ $+$ → $a^+/g^+ \leftarrow 9.8\ m/s^2$

$+$ $\uparrow$ $v_f < v_i$ $-$ → $a^-/g^- = -9.8\ m/s^2$

*

$\uparrow$ $v_i = 8\ m/s^2$

30m $\Delta T = ?$

$\downarrow$ $v_f = ?$

$\Delta y = -30\ m$

$v_i = -8\ m/s$

[1] Find the velocity (speed)?

$v_f^2 = v_i^2 - 2g\Delta y$

$v_f^2 = (-8)^2 - 2(10)(-30)$

$v_f^2 = 64 + 600$

$\sqrt{v_f^2} = \pm\sqrt{664}$

$v_f = 2\sqrt{166} = 25.7$

$v_f = 25.7$

[2] Find ΔT?

$\Delta y = v_i t - \frac{1}{2} g T^2$

$-30 = -8T - \frac{1}{2}(10)T^2$

$-30 = -8T - 5T^2$

بالآلة الحاسبة

$5T^2 + 8T - 30 = 0 \leftarrow$ Mood,5,3

$[t_1 = 1.77 \approx 1.8$ ✓ $]$

$t_2 = -3.37$ ✗

* طريقة حساب الزمن → $ax^2 + bx + c = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ الزمن بالقانون العام.

$\Delta y = v_i t - \frac{1}{2} g t^2$ $= 5T^2 + 8T - 30 = 0$ $t = 1.8$ ✓

$-30 = -8T - \frac{1}{2}(10)T^2$ $t = \frac{-8 \pm \sqrt{(8)^2 - 4(5)(-30)}}{2(5)}$ $t = -3.4$ ✗

$-30 = -8T - 5T^2$

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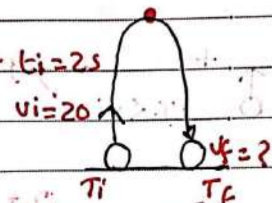
physics

25.oct.2020

1 find the velocity?

$V_f = -20\ m/s$



2 find the velocity at the top point?

$V_f =$ Zero

$g = -9.8\ m/s^2$

3 $\Delta T = ?$ 2X زمن الصعود

or

$V_f = V_i - g\,\Delta T$

$-20 = 20 - 10T$

$-20 - 20 = -10T$

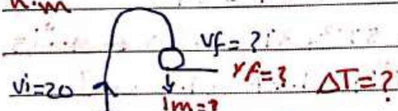
$\frac{-40}{-10} = \frac{-10T}{-10}$

" $T = 4s$ "

الشارع نكفن حرفز
لما الجسم يكون مشكل
مستقيم

Constant speed

h.w



$\Delta T = ?$

↑ $19.5\ m/s^2$ ↓ $-19.5\ m/s^2$

$T =$

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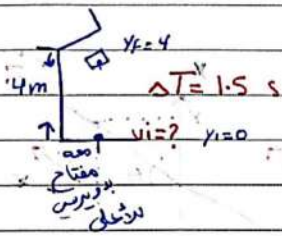
physics CH2 27. oct. 2020



1- find v_i?

$dy = v_i t - \frac{1}{2} g t^2$

$4 = v_i(1.5) - \frac{1}{2}(10)(1.5)^2$

$4 = 1.5\, v_i - 11.25$

$1.5\, v_i = 11.25 + 4$

$\frac{1.5\, v_i}{1.5} = \frac{15.25}{1.5}$

" $v_i = 10$ "

2- Find the velocity after 1.5s?

$v_f = v_i - g\,\Delta t$

$v_f = 10 - (10)(1.5)$

$v_f = 10 - 15$

$v_f = -5$ m/s

$v_f = -5$ m/s العالب يعني باتجاه الأسفل (نازل)

3- Find the velocity at $y = 4$ m?

* At $y = 4$ m
  after 1.5 s $\longrightarrow -5$ m/s

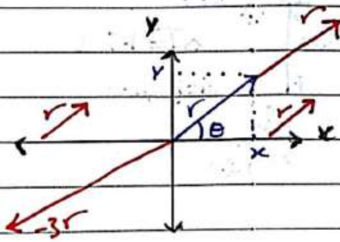
* At $y = 4$ m
  $\hookrightarrow +5$ m/s صاعد / -5 m/s نازل

* وهو صاعد الزمن اقل من 1.5 s

physics 27.oct.2020

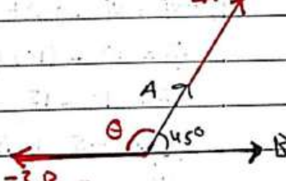
CH3 → vectors.

$(x,y) = (r,\theta)$



① اذا بضرب الـ r بـ 2 .
بصير الضعف بس زاوية عليا نفسها .

② اذا: بضرب الـ r بـ -3
بنعكس الاتجاه وتصير 3 اضعاف

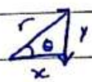


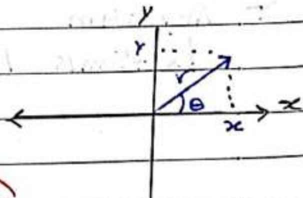
- If the angule between A and B 45°
  find the angule between 2A and -3B

$180 = 45 + \theta$

$180 - 45 = \theta$

$\theta = 135°$

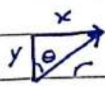


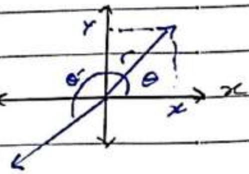


* $\sin\theta = \frac{y}{r}$
  $y = r\sin\theta$
* $\cos\theta = \frac{x}{r}$
  $x = r\cos\theta$

* الزاوية القريبة من المحور
محورها يأخذ cos θ

$x = r\sin\theta$
$y = r\cos\theta$





Physics

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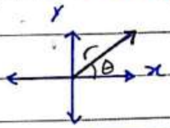
الربع الأول

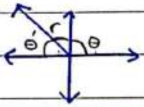


$r = \sqrt{x^2+y^2}$

$\tan\theta = \frac{y}{x} \rightarrow \theta = \tan^{-1}\left(\left|\frac{y}{x}\right|\right)$

$\theta = \theta'$

الربع الثاني



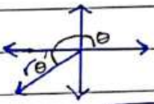
$r = \sqrt{x^2+y^2}$

$\theta' = \tan^{-1}\left(\left|\frac{y}{x}\right|\right)$

above $-x$-axis

$\theta = 180 - \theta'$

الربع الثالث



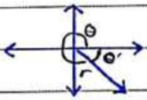
$r = \sqrt{x^2+y^2}$

$\theta' = \tan^{-1}\left(\left|\frac{y}{x}\right|\right)$

below $-x$-axis

$\theta = 180 + \theta'$

الربع الرابع



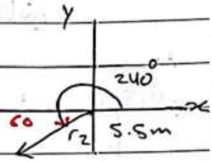
$r = \sqrt{x^2+y^2}$

$\theta' = \tan^{-1}\left(\left|\frac{y}{x}\right|\right)$ or $\theta' = \tan^{-1}\left(\frac{y}{x}\right)$

below $+x$-axis (تعطيني جواب بالسالب)

$\theta = 360 - \theta'$

$Q_1 = r = 5.5\,m$, $\theta = 240^\circ$ $x = ?$, $y = ?$



[1] $x = r\cos 240 = 5.5 \cdot \cos 240$

$x = -2.75\ m$

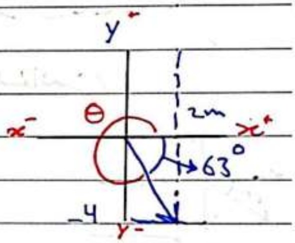
[2] $y = r\sin 240 = 5.5 \cdot \sin 240$

$y = -4.8\ m$

$(5.5\,m, 240^\circ) = (-2.75\,m, -4.8\,m)$

$Ex = (\overset{x}{2m}, \overset{y}{-4m})$

- Find the magnitude and direction of the vector?



* $r = \sqrt{(2)^2 + (-4)^2}$, $r = \sqrt{20}$

$r = 2\sqrt{5}$

* direction?

$\theta' = \tan^{-1}\left(\left|\frac{-4}{2}\right|\right)$

$= \tan^{-1}(2)$

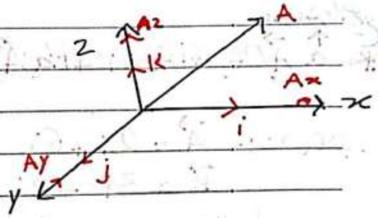
$= 63.4^\circ$ ✓

$\theta = 360 - 63.4 = 296.6^\circ$ ✓

$\theta = \tan^{-1}\left(\frac{-4}{2}\right) = \tan^{-1}(2)$

$= -63.4$ ✓

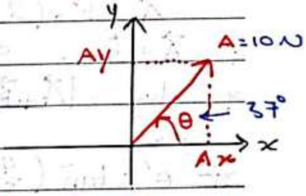
physics 1-nov.2020



* $|i| = |j| = |K| = 1$ unit.

$\vec{A} = A_x i + A_y j + A_z K$

Componeal of the vectors



* $Ax = A\cos\theta$
* $Ay = A\sin\theta$
* $\vec{A} = Ax i + Ay j$

$(A, \theta) = (Ax, Ay)$

* find the components of vectors A ?

Ax?? , Ay??

* $Ax = A\cos 37^\circ = 10\cos 37^\circ$

$\therefore Ax = 8N$

* $Ay = A\sin 37^\circ = 10\sin 37^\circ$

$\therefore Ay = 6N$

$\vec{A} = 8i + 6j$

$\left.\begin{aligned}\vec{A} &= Axi + Ayj + Az\hat{K}\\ \vec{B} &= Bxi + Byj + Bz\hat{K}\end{aligned}\right\}$

* $\vec{A} + \vec{B} = (Ax + Bx)i + (Ay + By)j + (Az + Bz)\hat{K}$
* $\vec{A} - \vec{B} = (Ax - Bx)i + (Ay - By)j + (Az - Bz)\hat{K}$
* $a\vec{A} = aAxi + aAyj + aAz\hat{K}$

عدد عشري / حقيقي

physics

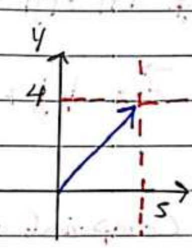
1-nov-2020

"physics _ CH3"

Q 20: $\vec{A} = 2i + 6j$

$\vec{B} = 3i - 2j$

find the mag, and dir.



$\boxed{1}$ $\vec{A} + \vec{B}$?

$\vec{A} + \vec{B} = (2+3)i + (6+(-2))j$

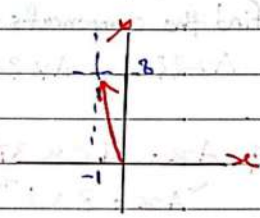
$\vec{A} + \vec{B} = 5i + 4j$

Mag $= |\vec{A}+\vec{B}| = \sqrt{5^2+4^2} = \sqrt{41}$ m

Dir:

$\theta' = \tan^{-1}\left(\frac{4}{5}\right) = 38.6°$

$\boxed{2}$ $\vec{A} - \vec{B}$?



$\vec{A} - \vec{B} = (2-3)i + (6-(-2))j$

$\vec{A} - \vec{B} = -1i + 8j$

Mag $= \sqrt{(-1)^2 + (8)^2} = \sqrt{65}$

Dir:

$\theta' = \tan^{-1}\left(\left|\frac{8}{-1}\right|\right) = 82.8°$

above $\bar{x}$

$\theta = 180 - \theta'$

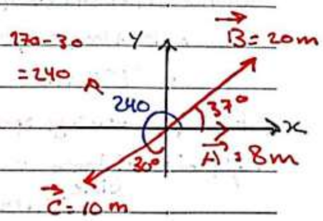
$180 - 82.8$

$= 97.2°$

Physics — 3-nov-2020

Ex. find the resultant vectors?

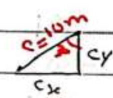
* $\vec{A} = (8i + 0j)$ m
* $\vec{B} = (16i + 12j)$ m
* $\vec{C} = (-5i + (-8.7j))$ m



↓كيف طلعت ال $\vec{B}$ وال $\vec{C}$↓

* $B_x = B\cos 37 = 20\cos 37 = 16$ m
  $B_y = B\sin 37 = 20\sin 37 = 12$ m
* $C_x = C\cos 240 = 10\cos 240 = -5$
  $C_y = C\sin 240 = 10\sin 240 = -8.7$

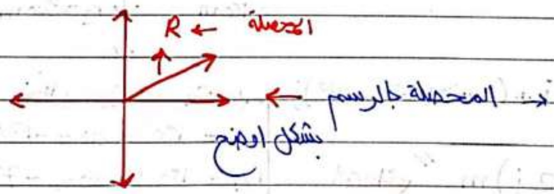
لايجاد المحصلة ::

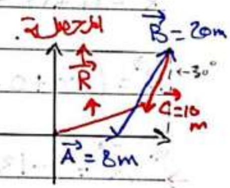


$R = \vec{A} + \vec{B} + \vec{C}$

$\vec{R} = (8 + 16 - 5)i + (0 + 12 - 8.7)j$

$= 19i + 3.3j$ m





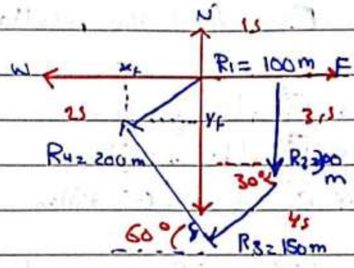
physics 3-nov-2020

1) Find the distance?

distance = $r_1 + r_2 + r_3 + r_4$

$= 100 + 300 + 150 + 200$

$= 750\ m$



2) Find the avarage speed?

$$\text{Av. speed} = \frac{\text{distance}}{\text{time}_{(1+3+4+2)}} = \frac{750}{10}$$

$= 75\ m/s$

3) find the displacement / find the resultant vectors?

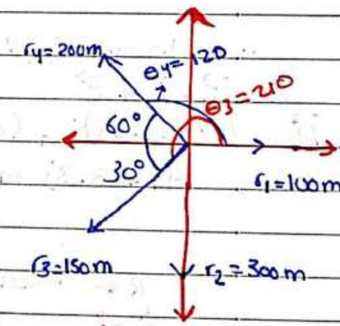
displacement : $\Delta x i + \Delta y j = (x_f - x_i) i + (y_f - y_i) j$

$\vec{r_1} = 100 j + 0 j$

$\vec{r_2} = 0 j - 300 j$

$\vec{r_3} = -130 j - 75 j$

$\vec{r_4} = -100 j + 173 j$



$\vec{R} = \vec{r_1} + \vec{r_2} + \vec{r_3} + \vec{r_4}$

$\vec{R} = (100 + 0 - 130 - 100) i + (0 - 300 - 75 + 173) j$

نحلل r_4 و r_3

$r_{3x} = 150 \cos 210 = -130\ m$

$r_{3y} = 150 \sin 210 = -75\ m$

$r_{4x} = 200 \cos 120 = -100\ m$

$r_{4y} = 200 \sin 120 = +173\ m$

→ " $\vec{R} = (-130 i - 202 j)\ m$ " ← الحل

4) find the avarage velocity? / find the magnitude

$$\vec{v} = \frac{\Delta R}{\Delta t} = \frac{-130}{10} i - \frac{202}{10} j$$

$= (-13 i - 20.2 j)\ m$

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physics 5.nov.2020

Q38, $\vec{A} = 6i - 8j$

$\vec{B} = -8i + 3j$

$\vec{C} = 26i + 19j$

* $a\vec{A} + b\vec{B} + \vec{C} = 0$
* find the value a and b ?

$a\vec{A} = 6ai - 8aj$

$b\vec{B} = -8bi + 3bj$ +

$\vec{C} = 26i + 19j$

$(6a - 8b + 26)i + (-8a + 3b + 19)j = 0 = 0i + 0j$

$(6a - 8b + 26 = 0)\,8 = \cancel{48a} - 64b + 208 = 0$

$(-8a + 3b + 19 = 0)\,6 = -\cancel{48a} + 18b + 114 = 0$

$\frac{-46b}{-46} = \frac{-322}{-46}$

$\boxed{b = 7}$

* $6a - 8(7) + 26 =$

$6a - 56 + 26 = \frac{6a}{6} = \frac{+30}{6}$

$\boxed{a = 5}$

$a\vec{A} + b\vec{B} + \vec{C} = 5i + 0j$ -

$a\vec{A} + b\vec{B} + \vec{C} = 5i + 3j$ واجب.

physics 5.nov.2020

Q24 $\vec{A} = -8.7i + 15j$

$\vec{B} = 13.2i - 6.6j$

* IF:

$\vec{A} - \vec{B} + 3\vec{C} = 0$

Find the vector $\vec{C} = ?$

$$3\vec{C} = \vec{B} - \vec{A}$$

$$\vec{C} = \frac{1}{3}(\vec{B} - \vec{A})$$

$$\vec{B} - \vec{A} = (13.2 - (-8.7))i + (-6.6 - 15)j$$

$$= 21.9i - 21.6j$$

$$\vec{C} = \frac{1}{3}(\vec{B} - \vec{A}) = \frac{1}{3}(21.9i - 21.6j)$$

$$\boxed{\vec{C} = (7.3i - 7.2j)\ \text{cm}}$$

* $\vec{A} = A_x i + A_y j + A_z K$

find the magnitude of the vectors?

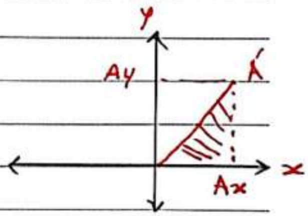
$A = \sqrt{A_x^2 + A_y^2 + A_z^2}$

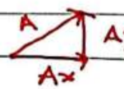
* $\vec{A} = A_x i + A_y j$

Mag = 2D

$A = \sqrt{A_x^2 + A_y^2}$

dir $= \theta' = \tan^{-1}\left(\left|\frac{A_y}{A_x}\right|\right)$





physics CH4 مفهوم 5.nov.2020

$\vec{V} = V_x i + V_y j + V_z k$

Magnitude =

$V = \sqrt{V_x^2 + V_y^2 + V_z^2}$

= Speed

$\vec{v} = -5\ m/s = -5j + 0j$

$-5i + 0j + 0k$

speed = 5 m/s ← ما عنا اشارة.

$speed = \sqrt{(-5)^2 + (0)^2 + (0)^2}$

$= \sqrt{25} = 5\ m/s$

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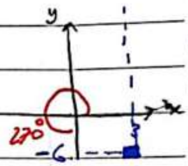
physics 5.nov.2020

Motion in 2 Dimension

	1D	2D
position:		
Distance	Distance	Distance
Displacement	Δx	$\Delta x i + \Delta y j = \Delta R$
velocity		
1- Avarage speed	$\frac{distance}{time}$	$\frac{distance}{time}$
2- Avarage velocity	$\vec{v} = \frac{\Delta x}{\Delta t}$	$\vec{v} = \frac{\Delta x i}{\Delta t} + \frac{\Delta y j}{\Delta t}$
3- Instantanous velocity	$\vec{v} = \frac{dx}{dt}$	$\vec{v} = \frac{dx}{dt} i + \frac{dy}{dt} j$
acceleration		
1- avarage acceleration	$\vec{a} = \frac{\Delta v}{\Delta t}$	$\vec{a} = \frac{\Delta v x i}{\Delta t} + \frac{\Delta v y j}{\Delta t}$
2- Instantnous acceleration	$\frac{dv}{dt}$ or $\frac{d^2 x}{d^2 t}$	$\frac{dvx i}{dt} + \frac{dvy j}{dt}$ or $\frac{d^2 x i}{d^2 t} + \frac{d^2 y j}{d^2 t}$

"physics"   8. nov. 2020

Q6, $\vec{r} = (3i - 6t^2 j)\ m$



* $t = 1s$, find the position?

$\vec{r}(t=1s) = 3i - 6(1)^2 j$

$= (3i - 6j)\ m$

* find the velocity?

$\vec{v} = \frac{d\vec{r}}{dt} = \frac{dx}{dt} i + \frac{dy}{dt} j$

$= 0i - 12t j$

$\vec{v} = (t=1s) = -12\ m/s$

* find the speed?

speed $= 12\ m/s$

* Find the acceleration?

$\vec{a} = \frac{dv_x}{dt} i + \frac{dv_y}{dt} j$

$0i - 12j$

$\vec{a}(t=1s) = -12j\ m/s^2$

* find the magnitude?

$a = \sqrt{0-12^2 + 0^2 + 0^2}$

$= 12\ m/s^2$ بدون اتجاه.

* find the avarage velocity from $t=1s$ to $t=3s$?

$\vec{v} = \frac{\Delta x}{\Delta t} i + \frac{\Delta y}{\Delta t} j$

$= \frac{3-3}{2} i + \frac{-54-(-6)}{2} j = 0i - \frac{48}{2} j \quad \vec{v} = 0i - 24j\ m/s$

$x_i = 3m \quad x_f = 3m$

$y_i = -6\ m \quad y_f = -54\ m$

$\vec{v} = 0i - 24j\ m/s$

* $t_i = 1s \rightarrow x_i = 3m \rightarrow x_f = 3m$

$t_f = 3s \rightarrow x_f = 3m \rightarrow y_f = -6 \cdot 3^2 = -54\ m$

Physics

8. nov. 2020

$r = 3t\,i + (8t - 16t^2)\,j$

* Find the position when the object change direction at y-axis?

$v_y = \frac{dy}{dt} = \text{zero}$

$8 - 32t = 0$

$t = \frac{8}{32} = 0.25\,s$

$\vec{r}(t = 0.25\,s) = 3(0.25)\,i + (8(0.25) - 16(0.25)^2)\,j$

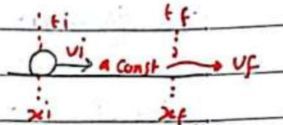
$\vec{r} = (0.75\,i + 1\,j)\,m$ ← بالربع الأول.

2D motion with Constant

$v_f = v_i + a\Delta t$

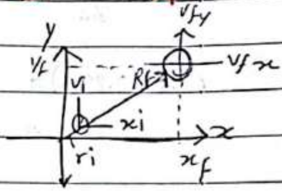
$v_f^2 = v_i^2 + 2a\Delta x$

$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$



* $\vec{v_i} = v_{iy}\, i + v_{iy}\, j$

speed $= \sqrt{v_{ix}^2 + v_{iy}^2}$



① $\begin{cases} v_{fx} = v_{ix} + a_x \Delta t \\ v_{fy} = v_{iy} + a_y \Delta t \end{cases}$

② $\begin{cases} v_{fx}^2 = v_{ix}^2 + 2a_x \Delta x \\ v_{fy}^2 = v_{iy}^2 + 2a_y \Delta y \end{cases}$

③ $\begin{cases} \Delta x = v_{ix} \Delta t + \frac{1}{2} a_x \Delta t^2 \\ \Delta y = v_{iy} \Delta t + \frac{1}{2} a_y \Delta t^2 \end{cases}$

3 Q8 at the

$x_i = y_i =$ zero

$\vec{a} = 3j\ m/s^2$

$\vec{a} = (0i + 3j)\ m/s^2$

$\vec{v_i} = (5i + 0j)\ m/s = 5i\ m/s$

Find the coordinate and speed at the particle at $t = 2s$?

x-axis:

$x_i =$ zero / $a_x = 0\ m/s^2$ / $v_i = 5\ m/s$ / $\Delta t = 2s$

$\Delta x = x_f - x_i = v_{ix} \Delta t + \frac{1}{2} a \Delta t^2$

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

$x_f = 10\ m$

Y-axis:

$y_i =$ zero / $v_i =$ zero / $a_y = 3\ m/s^2$ / $\Delta t = 2s$

$\Delta y = y_f - y_i = v_{iy} \Delta t + \frac{1}{2} a_y \Delta t^2$

$y_f - 0 = 0(2)^2 + \frac{1}{2}(3)(2)^2$

$y_f = 6\ m$

$\vec{r} = (10i + 6j)\ m$

physics 12.nov.2020

1** Magintude :
$r = \sqrt{(10)^2+(6)^2}$
$r = \sqrt{136}$ m

2. final velocity.
. x-axis
$v_{fx} = v_{ix} + a_x \Delta t$
$v_{fx} = 5 + 0(2)$
$v_{fx} = 5$ m/s
. y-axis
$v_{fy} = v_{iy} + a_y \Delta t$
$v_{fy} = 0 + 3(2)$
$v_{fy} = 6$ m/s
$\vec{v_f} = (5i + 6j)$ m/s

3. Speed :-
$= \sqrt{(5)^2+(6)^2}$
$= \sqrt{61}$ m/s

Q5 : $\vec{v_i} = (4i + 1j)$ m/s / $\vec{R_i} = (10i - 4j)$ m
$\Delta t = 20$ s / $\vec{v_f} = (20i - 5j)$ m/s

① What are the components of the acceleration? $a_x = ?$ $a_y = ?$
x-axis
$\vec{v_{ix}} = 4$ m/s / $x_i = 10$ m / $\Delta t = 20$s / $\vec{v_{fx}} = 20$ m/s / $a_x = ?$
$v_{fx} = v_{fi} + a_x \Delta t$
$20 = 4 + a_x \cdot 20$
$20 = 4 + 20 a_x$
$\frac{16}{20} = \frac{20 a_x}{20}$
$a_x = 0.8$ m/s^2

→

physics 12.nov.2020

y-axis

$\vec{v_{iy}} = 1\ m/s$ / $y_i = -4\ m$ / $\Delta t = 20s$ / $v_{fy} = -5 m/s$ / a_y

$v_{fy} = v_{iy} + a_y \Delta t$

$-5 = 1 + a_y \cdot 20$

$-5 = 1 + 20 a_y$

$\frac{-6}{20} = \frac{20}{20} a_y$

$a_y = -0.3\ m/s^2$

[2] find the acceleration?

$\vec{a} = \vec{a_x} + \vec{a_y}$

$\vec{a} = (0.8i - 0.3j) m/s^2$

[3] find the magintude of the acceleration?

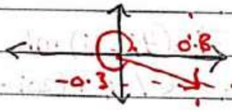
$a = \sqrt{(0.8)^2 + (-0.3)^2}$

$= 0.85\ m/s^2$

[4] find the direction of the acceleration?

$\theta' = \tan^{-1}\left(\left|\frac{0.3}{0.8}\right|\right) = 20.5$

below x-axis +



or $= 360 - 20.5$

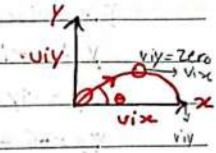
$= 339.5$

$\tan^{-1}\left(\frac{a_y}{a_x}\right) = \tan^{-1}\left(\frac{-0.3}{0.5}\right) = -20.5$

projectile motion.

$v_{ix} = v_i \cos\theta$

$v_{iy} = v_i \sin\theta$



* y-axis = free falling object.

$\therefore$ $v_{fy} = v_{iy} - g\Delta t$

$v_{fy}^2 = v_{iy}^2 - 2g\Delta y$

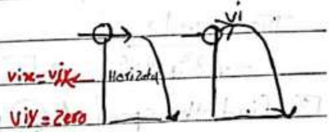
$\Delta y = v_{iy}\Delta t - \frac{1}{2} g \Delta t^2$

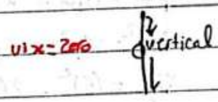
Δt = مشتركة x و y

* x-axis = constant speed

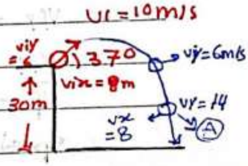
$v_{fx} = v_{ix}$

$\Delta x = v_{ix} \Delta t$





Ex/ find the speed of the following cases?



1. at the top point?

- $v_{ix} = v_i \cos 37^\circ = 10 \cos 37^\circ$
  $= 8\ m/s$
- $v_{iy} = v_i \sin 37^\circ = 10 \sin 37^\circ$
  $= 6\ m/s$

$v_{fx} = v_{ix} = 8\ m/s$

v_{fy} = zero

$\vec{v_f} = (8i + 0j)\ m/s$

$\vec{v_f} = 8i\ m/s$

Speed = 8 m/s

[2] find the speed after 2s?

$v_{fx} = v_{ix} = 8\ m/s$ ← راح تضل نفس السرعة

y-axis

$v_{fy} = v_{iy} - g\Delta t$

$v_{fy} = +6 - 10(2)$

$v_{fy} = -14\ m/s$

The velocity?

$\vec{v_f} = (8i - 14j)\ m/s$

The Speed?

$= \sqrt{8^2 + (14)^2} = 2\sqrt{65} = 16\ m/s$

[3] find the speed at A point?

$v_{fx} = v_{ix} = 8\ m/s$

$v_{fy}^2 = v_{iy}^2 - 2g\Delta y$

$v_{fy}^2 = (6)^2 - 2(10)(-30-0)$

$v_{fy}^2 = 36 + 600$

$v_{fy} = \sqrt{836}$

$v_{fy} = -25.2$

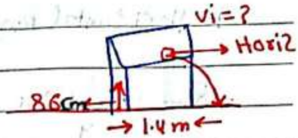
$\vec{v_f} = (8i - 25.2j)\ m/s$

$\text{Speed} = \sqrt{(8)^2 + (25.2)^2}$

$= 26.4\ m/s$

physics 17.nov.2020

Q1 find the initial velocity?



* $v_{ix} = v_i$, $v_{iy} = zero$
* $\Delta x = v_{ix} . \Delta t$

$\Delta y = y_f - y_i = v_{ix} \Delta t - \frac{1}{2} g \Delta t^2$

$0.86 - 0 = 0 - \frac{1}{2}(10) \Delta t^2$

$\Delta t = \sqrt{\frac{0.86}{5}}$

$\boxed{\Delta t = 0.41 s}$

$\Delta x = v_{ix} . \Delta t$

$\frac{1.4}{0.41} = \frac{v_{ix} . \cancel{0.41}}{\cancel{0.41}}$

$v_{ix} = 3.4 i\ m/s$

$v_{ix} = \boxed{v_i = 3.4 i\ m/s}$

Q2 find the final velocity?

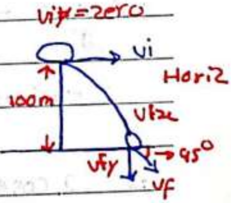
$v_{fy} = v_{iy} - g \Delta t$

$= 0 - 10(0.41)$

$\boxed{v_{fy} = -4.1\ m/s}$

" $\vec{v_f} = (3.4i - 4.1j)\ m/s$. "

Q1 find the initial velocity?



$v_i = v_{ix}$, $v_{iy} = Zero$ ← Horizontal

Y-axis

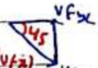
$v_{fy}^2 = v_{iy}^2 - 2g(\overset{\Delta y}{y_f - y_i})$

$= 0 - 2(10)(-100-0)$

$v_{fy} = \sqrt{2000} = 44.7\ m/s = v_{fx}$

" $v_{ix} = v_{fx} = 44.7\ m/s$ "

$\tan 45 = 1$



$v_{fx} \left(\frac{v_{fy}}{v_{fx}}\right) = 1(v_{fx})$

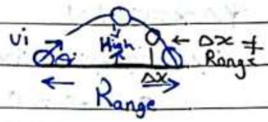
$v_{fy} = v_{fx}$

" $v_{fx} = v_{fy}$ "

$v_{ix} = v_{fx}$

Horizantal range and maximum haight of projectile

$$R = \frac{v_i^2 \cdot \sin 2\theta_i}{g}$$



$$H = \frac{v_i^2 \cdot \sin^2\theta_i}{2g}$$

* $\sin(2\theta) = 2\sin\theta\cos\theta$

* $\theta_i = \frac{\pi}{4} \rightarrow R = \frac{v_i^2}{g} \rightarrow$ لأنه $\sin 2(\frac{\pi}{4}) = 1$

$\quad \hookrightarrow H = \frac{v_i^2 \cdot (\frac{1}{\sqrt{2}})^2}{2g} = \frac{v_i^2}{4g}$

* $\theta_i = 90^\circ = \frac{\pi}{2} \rightarrow R = \text{Zero}$ أي جسم مقذوف = 90 يتحرك Zero أفقيًا

$\quad \hookrightarrow H = \frac{v_i^2}{2g} \rightarrow$ لأنه $\sin^2(90) = 1$

Q: $R = 3H$

Find θ_i?

$$R = 3H$$

$$\frac{\cancel{v_i^2} \cdot \sin 2\theta}{\cancel{g}} = 3\left(\frac{\cancel{v_i^2} \cdot \sin^2\theta_i}{2\cancel{g}}\right)$$

$$2\,\cancel{\sin\theta_i}\cos\theta_i = \frac{3 \cdot \sin^{\cancel{2}}\theta_i}{2}$$

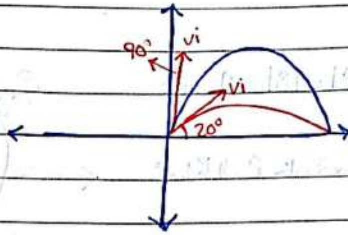
$$= 2\cos\theta_i = \frac{3\sin\theta_i}{2}$$

$$= \frac{\sin\theta_i}{\cos\theta_i} = \frac{2}{\frac{3}{2}}$$

$$= \tan\theta_i = \frac{4}{3}$$

$$\tan^{-1}\left(\frac{4}{3}\right) = 53.1$$

" $\theta_i = 53.1^\circ$ "



* الزاوية ومتممة الزاوية الـ Range الهم واحد

Range 20° = Range 70°

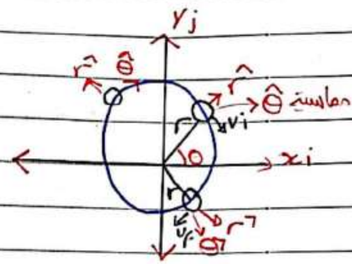
↑ الزاوية ↑ متممة الزاوية

physics — 19.11.nov

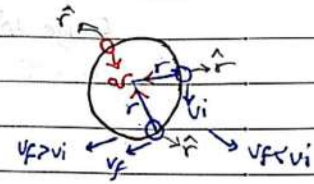
Circule motion . (acceleration).

$|\hat{i}| = |\hat{j}| = |\hat{k}| = |\hat{r}| = |\hat{\theta}| = 1$ unit

"دائمًا ال $\hat{r}$ خارجة من الدائرة حال $\hat{\theta}$ مماسية على الدائرة"



1- $(v_i) = (v_f)$, Constant speed



Change direction = a_r

a_r: radial acceleration

حساب ال a_r (مقدار) $\left[a_r = \frac{v^2}{r}\right] \Rightarrow \left[\vec{a_r} = -\frac{v^2}{r}.\hat{r}\right]$

كـ كمية متجهة

* $v = \frac{dis}{time}$

$\vec{v} = \frac{2\pi r}{T}$, T: period

عدد الدورات الكلي

$\vec{v} = \left(\frac{2\pi r}{T}\right) n$, T: total time

بالحركة الدائرية:

Constant Speed $\neq$ zero

اما بالحركة الانتقالية

Constant speed = zero

* a_r ← اتجاه المركز

$\hat{r}$ ← خارج الدائرة.

a_r و $\hat{r}$ متعاكسات.

② $v_i \neq v_f$

$a_r = \frac{v^2}{r}$

$a_t = \frac{dv}{dt}$

Tengential acceleration.

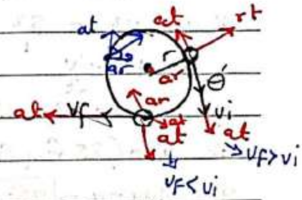
physics 22.nov.2020

[1] $|v_i| = |v_f|$

$a_r = \frac{v^2}{r}$

كمية متجهة ← $\vec{a_r} = -\frac{v^2}{r}\hat{r}$

$v = \frac{2\pi r}{T}$ ← الزمن الدوري , $\frac{(2\pi r)\,e}{t}$ ← جزء من الدورات



[2] $|v_f| \neq |v_i|$ كمية متجهة

$a_r = \frac{v^2}{r} \rightarrow \vec{a_r} = -\frac{v^2}{r}\hat{r}$

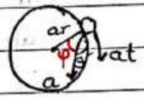
a_t . tangential acceleration $= \vec{a_t} = \pm\frac{dv}{dt}\hat{\theta}$

a_t: $+ \leftarrow v_f > v_i$ / $- \leftarrow v_f < v_i$

* Total acceleration $\vec{a} = \vec{a_r} + \vec{a_t}$

قانون الـ $\vec{a}$ ←

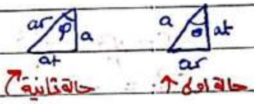
* $\vec{a} = -\frac{v^2}{r}\hat{r} + \frac{dv}{dt}\hat{\theta}$



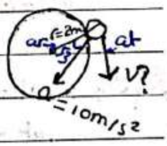
Mag $= \sqrt{a_r^2 + a_t^2}$

Dir $= \theta' = \tan^{-1}\left(\left|\frac{a_r}{a_t}\right|\right)$

يعني $\varphi = \tan^{-1}\left(\left|\frac{a_t}{a_r}\right|\right)$



*Ex, Find the radial and tangential acceleration and the velocity at this moment ?



$a_r = \frac{v^2}{r}$

$6 = \frac{v^2}{2}$

$v = \sqrt{6 \cdot 2} = \text{"}\sqrt{12}\ m/s\text{"}$

$\cos 53 = \frac{a_r}{a}$ | $\sin 53 = \frac{a_t}{a}$

$0.6 = \frac{a_r}{10}$ | $0.8 = \frac{a_t}{10}$

$\boxed{a_r = 6\ m/s^2}$ | $\boxed{a_t = 8\ m/s^2}$

Total acceleration $= a_r$

physics End of CH4 22.11.2020

1 $a_r = ??$ / $a_t = ??$, $a = ??$

* $a_r = \frac{v^2}{r} = \frac{5^2}{1} = 25\ m/s^2$

* $a_t = \frac{dv}{dt}$

* $a_t = g = 9.8\ m/s^2$

* $\vec{a} = (25\hat{r} + 9.8\hat{\theta})\ m/s^2$

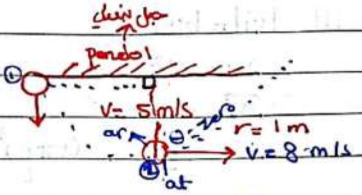
* Mag $= a = \sqrt{(25)^2 + (9.8)^2} = 26.8\ m/s^2$

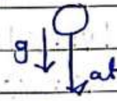
Dir $= \theta = \frac{a_t}{a_r}$

$\theta = \tan^{-1}\left(\left|\frac{a_t}{a_r}\right|\right)$

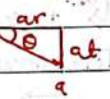
$= \tan^{-1}\left(\frac{|9.8|}{|25|}\right)$

$= 21.4°$





$a_t = g = 9.8\ m/s^2$



2 ∴ $a_r = \frac{v^2}{r} = \frac{8^2}{1} = 64\ m/s^2$

$\vec{a_r} = -64\hat{r}\ m/s^2$

$a_t = zero$ ← صفر لأن يحيا للتغير الفيزيائي .. لأنه بين السرعة بالتناقص والتزايد

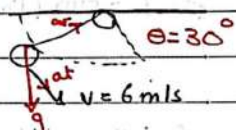
$\vec{a} = -64\hat{r}\ m/s^2$, $+64\hat{j}\ m/s^2$

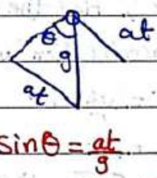
$a_r = \frac{v^2}{r} = \frac{6^2}{1} = 36\ m/s^2$

$\vec{a_r} = -36\hat{r}\ m/s^2$

$a_t = \pm 4.9\ m/s^2$

$\vec{a} = -64\hat{r} + 4.9\hat{\theta}\ m/s^2$





بالأولى ∴ $a_t = 9.8 \sin 90° = 9.8\ m/s^2$

$a_t = 9.8 \sin 0 = zero$

$\sin\theta = \frac{a_t}{g}$

$a_t = \sin\theta . g$

بالبندول نحسب ال at هيك

$a_t = 9.8 . \sin 30$

$a_t = 4.9\ m/s^2$

Scanned with CamScanner

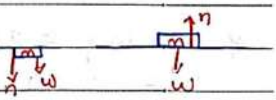
physics — 24.nov.2020

CH5

The laws of motion

* W: weight ← دائمًا لتحت

$W = m \cdot g$

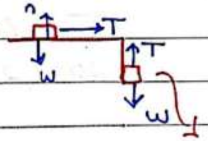


* N: normal force عمودي على السطح

N: لازم يلامس السطح

* T: tension 

T: لازم يكون في حبل

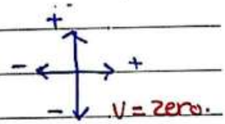


* ما عندي n ← لأنه مالامس السطح

1 Equilibrium ← حالة اتزان ← الحالة الأولى

1 $V = zero$

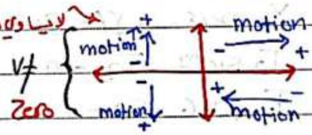
إذا كان ساكن ← $\sum F = zero \rightarrow \sum F_x = zero \rightarrow \sum F_y = zero$



2 الحالة الثانية = $V_i = V_f$ (constant speed).

$\sum F = zero$

$\sum F_x = zero \rightarrow \sum F_y = zero.$



3 الحالة الثالثة = $V_i \neq V_f$ (constant acceleration).

$\sum \vec{F} = m\vec{a} \rightarrow \sum F_x = m a_x \rightarrow \sum F_y = m a_y.$

$\vec{F}_{12} = \vec{F}_{21}$

الـ motion بحط اتجاهه افتراضي

a^+ ← يعني اتجاه الـ motion الافتراضي صح

a^- ← يعني اتجاه الـ motion الافتراضي غلط

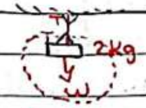
علشان يصير صح نعكس اتجاه الـ motion

physics — 24. nov. 2020

* Find the tension?

* $W = mg = 2 \times 10$

$W = 20\ N$



* y-axis $= \Sigma F_y = zero$

$T - W = zero$

$T = zero$

$20 = 20\ N$

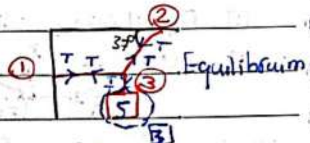
الـ T الصاعد الأعلى جاي من بالحكاية و يهمني

اما الـ T النازل فجاي على الحيط ، مايهمني

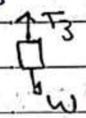
[3] $W = mg = 5 \times 10 = 50\ N$

y-axis $= \Sigma F_y = zero$

$T - W = zero = T_3 = W = 50$



* كل جسم معلق بحبل يكون متزن.



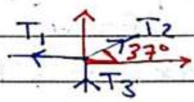
Y-axis $\rightarrow \Sigma F = zero$

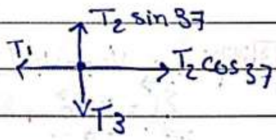
$T_2 \sin 37 - T_3 = 0$

$T_2 \cdot 0.6 - 50 = 0$

$T_2 = \frac{50}{0.6}$

$\boxed{T_2 = 83.3\ N}$





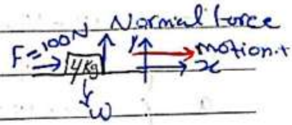
X-axis $\rightarrow \Sigma F = zero$

$T_2 \cos 37 - T_3 = 0$

$83.3 \times 0.8 - T_1 = 0$

$\boxed{T_1 = 66.7\ N}$

* Find the weight and normal force tenstion and acceleration?



[1] $w = mg = 4 \times 10$

$w = 40N$

y-axis $\rightarrow \Sigma F = zero$

$n - w = 0$

$N = w = 40$

x-axis $\rightarrow m.a_x \Leftarrow a = a_x = \overset{total}{\hat{T}}.a$ هي a_x فيتبقى $zero = a_y$ لأن

$+F = ma$

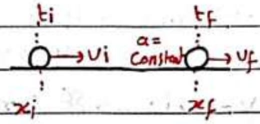
$100 = 4a$

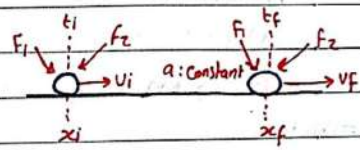
$a = +25 \ m/s^2 \leftarrow$. الـ a موجبة فـ اتجاه الـ motion صح ✓

physics — CH5 — 26.nov.2020

The laws of motion.

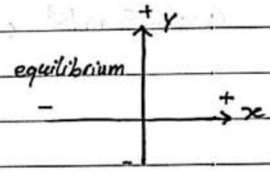
Δx, V, a, Δt }
$V_f = V_i + at$
$V_f^2 = v_i^2 + 2a\Delta t$
$\Delta x = v_i \Delta t + (\frac{1}{2}) a \Delta t^2$





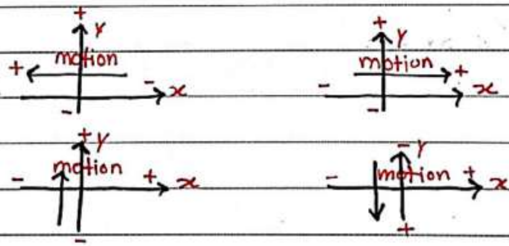
$V = 0 \rightarrow$ Equilibrium $\rightarrow \Sigma F = Zero$
$V_f = V_i \rightarrow$ Constant speed $\rightarrow \Sigma F = Zero$
$V_f \neq V_i \rightarrow$ Constant accel $\rightarrow \Sigma F = ma$

اذا كان الجسم متزن وهو للأعلى فهو موجب،
و اذا كان الجسم متزن وهو للأسفل فهو سالب،
واذا كان الجسم متزن وهو لليمين فهو موجب،
واذا كان الجسم متزن وهو اليسار فهو سالب.



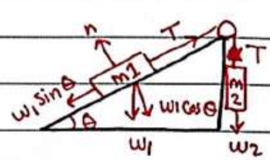
$\Sigma F = Zero$

$\Sigma F = Zero$
$\Sigma F = ma$



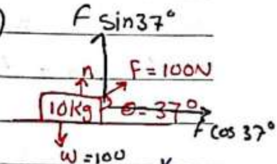
$\Sigma F = Zero$, $\Sigma F = ma$ $\quad \vec{F}_{12} = -\vec{F}_{21}$

- Weight : W
  $W = mg$
- Normal force : n
- Tension : T



Physics 26. Nov. 2020

Ex, find the weight, the normal force, tension and acceleration en the following cases? (frictionless)



[1] $w = mg = 10 \times 10 = \boxed{100\ N}$

* y-axis $\Rightarrow \Sigma F_y = \text{zero}$

$n + F\sin 37 - w = 0$

$n + 100(\sin 37) - 100 = 0$

$n + 60 - 100 = 0$

$\boxed{n = 40\ N}$

y motion x

$a_x = a$

لأنه ال y مالها a

* x-axis $\Rightarrow \Sigma F_x = ma$

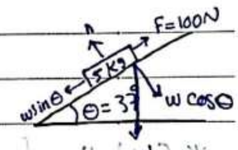
$F\cos 37° = ma$

$100(\cos 37°) = 10a$

$80 = 10a$

$\boxed{a = {}^{+}8\ m/s^2}$ ✓ افتراضي للـ motion اتجاه صحيح

[2] $w = mg = 5 \times 10 = \boxed{50\ N}$

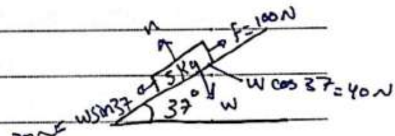


* y-axis $\Rightarrow \Sigma F_y = \text{zero}$

$n - w\cos 37 = 0$

$\boxed{n} = 50 \cdot 0.8 = \boxed{40\ N}$

* x-axis $\Rightarrow \Sigma F_x = ma$



$F - w\sin 37 = ma$

$100 - 50 \cdot 0.6 = 5a$

$\frac{70}{5} = \frac{5a}{5}$

$\boxed{a = {}^{+}14\ m/s^2}$

على محور ال y = 40N

على محور ال x = 30 N

x-axis → $50\sin 37 = 30\ N$

y-axis → $50\cos 37 = 40\ N$

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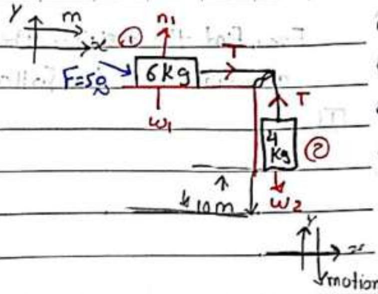
physics 26.nov.2020



* $w_1 = m_1 g_1$
* $= 6 \times 10 = 60N$
* $w_2 = 4 \times 10 = 40N$

الجسم الأول ① y-axis $\Rightarrow \Sigma F_y = zero$

$n_1 - w_1 = 0$

$n_1 = w_1 = 60 N$

x-axis $\Rightarrow \Sigma F_x = m_1 a$

$T = 6a$

$T = 6 \times 4$

$T = 24 N$

الجسم الثاني ② y-axis $\Rightarrow \Sigma F_y = m_2 a$

$w_2 - T = m_2 a$

$40 - T = 4a$

$T = 6a$

$40 - T = 4a$ +

$= 40 = 10 a \rightarrow \boxed{a = {}^{+}4 m/s^2}$

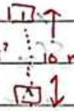
* Find the final velocity?

$v_f^2 = v_i^2 + 2a \Delta y$

$v_f^2 = 0 + 2(4)(10)$

$v_f = \sqrt{80} m/s$

$v_f = 4\sqrt{5} m/s$

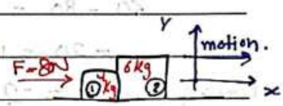


$* \quad v_f^2 = v_i^2 + 2a\,\Delta y$

$= 0 + 2(-4)(-10-0)$

$v_f = \sqrt{80} = 4\sqrt{5}\ m/s$ ← $-y$-axis بالسالب

* Find the acceleration ? , N_{12}?



① $\Sigma F = M_{total} \cdot a$

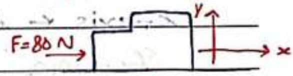
$\Sigma F = (M_1 + M_2)\,a$

$80 = (6+4)\,a$

$80 = 10\,a$

$a = 8\ m/s^2$

اخليهما جسم واحد



$\Sigma F = M_{total} \cdot a$ ← القانون

$\Sigma F = (M_1 + M_2)a$ ← تحليل الكتل

$80 = (6+4)a$ ← حساب الـ a

$80 = 10\,a$

$a = 8\ m/s^2$ ← قيمة الـ a

② $\Sigma F_x = m_1 a$ ← الجسم الأول

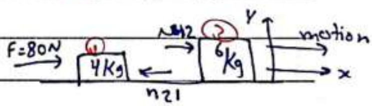
$F - N_{21} = m_1 a$

$80 - N_{21} = 4(8)$

$80 - N_{21} = 32$

$80 - 32 = N_{21}$

$\boxed{N_{21} = 48\ N}$ ← $N_{21} = N_{12}$



③ x-axis

$\Sigma F_x = m_2 a$ ← الجسم الثاني

$N_{12} = m_2 a$

$N_{12} = 6 \times 8$

$\boxed{N_{12} = 48\ N}$ ← $N_{12} = N_{21}$ ← التأكيد على انو نفس القيمة

قوة دفع الجسم الأول للثاني ← N_{12}

قوة دفع الجسم الثاني للأول ← N_{21}

* y-axis ← Normal force + الوزن نحسب عليه

physics 29 nov. 2020

* x-axis

$\Sigma f_x = m_{total} \cdot a$

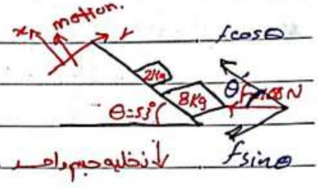
$f\cos 53 - w\sin 53 = 10 \leftarrow (2+8)a$

$100\cos 53 - 100\sin 53 = 10a$

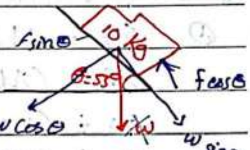
$60 - 80 = 10a$

$-20 = 10a$

عكس motion إذا $\rightarrow$ $a = -2\ m/s^2$ $\leftarrow$ يتحرك للأسفل



↓نخليه جسم واحد .



هو بنخلي الـ س بعد ماكان .

$\boxed{\begin{array}{l} x\text{-axis} \leftarrow \text{الجسم الأول.} \\ \Sigma f_x = m_1 a \end{array}}$

$+f\cos 53 - w_1\sin 53 - N_{21} = Mass_{(1)} \cdot a$

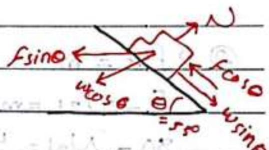
$(100 \cdot 0.6) - (80 \cdot 0.8) - N_{21} = 8(-2)$

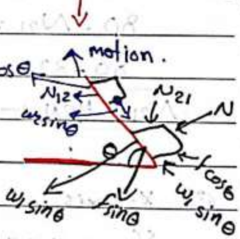
$60 - 64 - N_{21} = -16$

$-4 - N_{21} = -16$

$-4 + 16 = N_{21}$

$N_{21} = +12\ N = N_{12}$ ✓





physics 29. nov. 2020

Find the Normal force, accel, and N_{12}, N_{23}? h.w

① x-axis

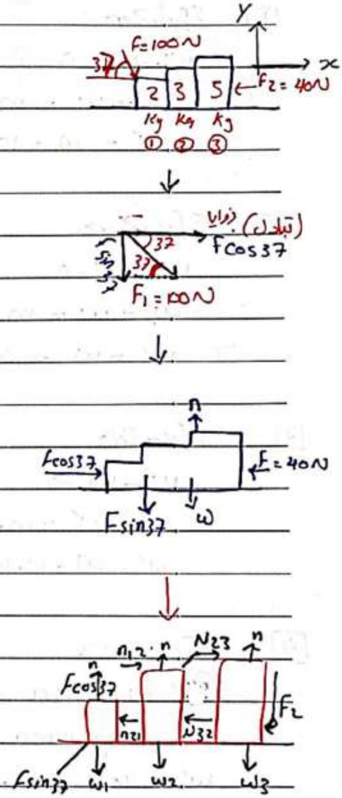
$\Sigma F_x = m_{total} \cdot a$

$+F_1 \cos 37 - F_2 = (M_1+M_2+M_3) \cdot a$

$(100 \cdot 0.8) - 40 = 10a$

$40 = 10a$

$\boxed{a = 4\ m/s^2}$



physics 1-Dec-2020

Elevator.

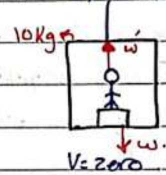
equilibrium.

1. $\Sigma F_y = zero$

$w' - w = 0$

$w' = w = m.g$

$w' = w = 10.10 = \boxed{100\,N}$

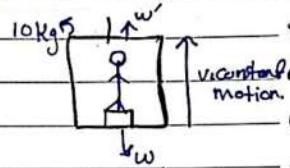


2. $\Sigma F_y = zero$

$w' - w = 0$

$w' = w = m.g$

$w' = w = 10.10 = \boxed{100\,N}$

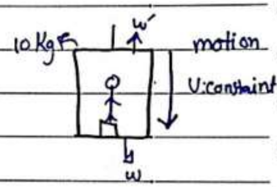


3. $\Sigma F_y = zero$

$w' - w = 0$

$w' = w = m.g$

$w' - w = 10.10 = \boxed{100\,N}$

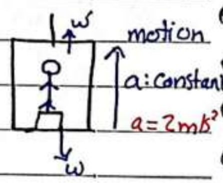


4. $\Sigma F_y = ma$

$w' - w = ma$

$w' = mg + ma$

$w' = 10.10 + 10.2 = \boxed{120\,N}$

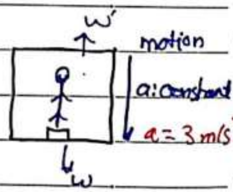


5. $\Sigma F_y = ma$

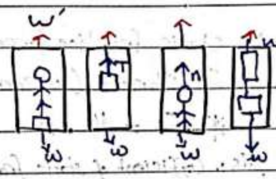
$w - w' = ma$

$w' = w - ma = mg . ma$

$= 100 - 30 = 70\,N$



* متى الـ T يساوي الوزن الحقيقي w ؟
- اذا كان المصعد ساكن ويتحرك بسرعة ثابتة للأعلى والاسفل.
- يزيد عن الـ w اذا تحرك المصعد بتسارع للأعلى.
- ويقل عن الـ w اذا تحرك المصعد بتسارع للأسفل.



$$\underbrace{w'}_{\text{بكافئ}} \equiv T = n \equiv w'$$

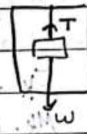
$\Sigma F_y = ma$

$w - T = ma$

$5 \cdot 10 - T = -10$

$50 - T = -10$

$T = 50 + 10 = 60\,N$



$a = -2\,m/s^2$

$T = ?$

الحالات السبعة Elevator

①	$v = zero$		$= \overset{\text{ظاهري}}{w'} = \overset{\text{حقيقي}}{w}$
②	$v_i = v_f \uparrow$		$= w' = w$
③	$v_i = v_f \downarrow$		$= w' = w$
④	$v_i \neq v_f \rightarrow$	$v_f > v_i \leftarrow {}^{+}a \leftarrow \uparrow \leftarrow$	$w' > w$
⑤	$v_i \neq v_f \rightarrow$	$v_f > v_i \leftarrow {}^{+}a \leftarrow \downarrow \leftarrow$	$w' < w$
⑥	$v_i \neq v_f \rightarrow$	$v_f < v_i \leftarrow {}^{-}a \leftarrow \uparrow \leftarrow$	$w' < w$
⑦	$v_i \neq v_f \rightarrow$	$v_f < v_i \leftarrow {}^{-}a \leftarrow \downarrow \leftarrow$	$w' > w$

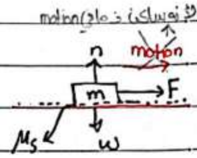
* $v = zero \rightarrow T = w$
* $v = constant \downarrow \rightarrow T = w$
* $a = constant \downarrow \rightarrow T < w$
* $a = g \quad \downarrow \rightarrow T = zero$
* $a > g \quad \downarrow \rightarrow \underset{\text{لا وجود للـ T}}{T = zero}$ ← بعضو (يقرب) الخيط يصير متداخل : ← Tension بصير ما في

physics — 3-Dec-2020

Fraction forces.

1- static fraction force : F_s

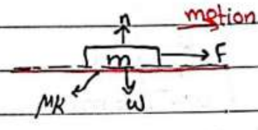
Equilibrium ($v = zero$) $\rightarrow \Sigma F = Zero$



* $F_s = \mu_s . n$

μ_s : Cofficient of static fraction $\rightarrow$ معامل الاحتكاك السكوني

2- Kinetic fraction force : F_K



* Constant speed ($v_i = v_f$) $\rightarrow \Sigma F = Zero$

* Constant accel ($v_i \neq v_f$) $\rightarrow \Sigma F = ma$

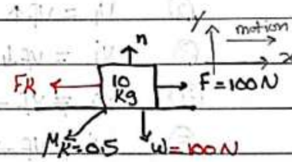
$F_K = \mu_K . n$

μ_K : Cofficient of kinetic fraction. ← معامل الاحتكاك الحركي

mostly — always

$1 > (\mu_s > \mu_K) > 0$

* Find the tension and the acceleration en the following Cases?



① y - axis $\rightarrow \Sigma F_y = zero$

$n - w = 0$

$n = w = \boxed{100\ N}$

② $F_K = \mu_K . n$

$F_K = 0.5 \times 100 = \boxed{50\ N}$

③ x - axis $\rightarrow \Sigma F_x = ma$

$F - F_K = ma$

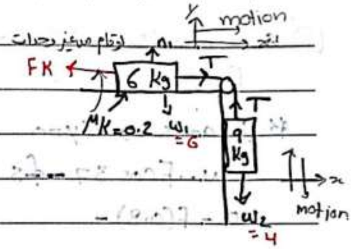
$100 - 50 = 10a$

$50 = 10a$

✓ $\boxed{a = +5\ m/s^2}$ افتراض الاتجاه motion صح

physics 3-Dec-2020.

* Find the tension and the acceleration?



$w_1 = m_1 g = 60\,N$

$w_2 = m_2 g = 40\,N$

① y-axis $\Rightarrow \Sigma F_y = zero$

$n_1 - w_1 = 0$

$n_1 = w_1 = \boxed{60\,N}$

$F_K = \mu_K \cdot n_1$

$F_K = 0.2 \times 60 = \boxed{12\,N}$

① x-axis $\Rightarrow \Sigma F_x = m_1 a$

$T - F_K = m_1 a$

$T - 12 = 6a$

$T = 6(2.8) + 12$

$\boxed{T = 28.8\,N}$

② y-axis $\Rightarrow \Sigma F_y = m_2 a$

$w_2 - T = m_2 a$

$40 - T = 4a$

$T = 40 - (4(2.8))$

$\boxed{T = 28.8\,N}$

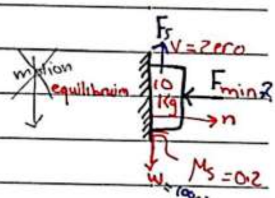
$\cancel{T} - 12 = 6a$

$40 - \cancel{T} = 4a$ +

$28 = 10a$

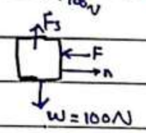
$\boxed{a = {}^{+}2.8\,m/s^2}$

Find the min force?



* $F_s = \mu_S \cdot n = 0.2 \cdot n$

$100 = 0.2n \rightarrow \boxed{n = 500\,N}$



** x-axis $\Rightarrow \Sigma F_x = 0$

$n - F_{min} = 0 \Rightarrow n = F_{min} = \boxed{500\,N}$

** y-axis $\Rightarrow \Sigma F_y = zero$

$w - F_s = 0 \Rightarrow w = F_s = \boxed{100\,N}$

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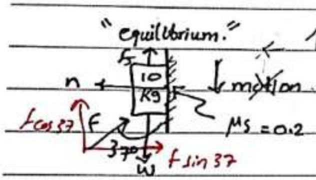
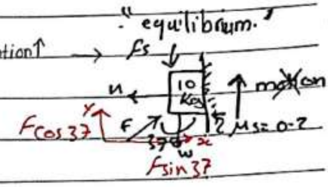
physics — 6-Dec-2020



← ↑ f_s, ↓ motion / ↓ f_s, motion ↑ →



* $w = m.g = 100\,N$
* $x\text{-axis} = \Sigma F_x = 0$

$F\sin 37° - n = 0$

$0.6F = n = 0.6(108.6) = n$

" $F = 65.16\,N$ "

* $f_s = \mu_s . n$

$f_s = 0.2(0.6F)$

$f_s = 0.12(108.6)$

" $f_s = 13.032\,N$ "

* $y\text{-axis} \Rightarrow \Sigma F_y = 0$ الوشن للأسفل

$W - F\cos 37 - f_s = 0$

$100 - 0.8F - 0.12F = 0$

$100 - 0.92F = 0$

$100 = 0.92F$

" $F_{min} = 108.6\,N$ "

{لو صار اقل من 108.6 بتزلق للأسفل.}

---

* $w = m.g = 100\,N$
* $x\text{-axis} = \Sigma F_x = 0$

$F\sin 37 - n = 0$

$0.6F = n = 0.6(108.6) = n$

" $F = 65.16\,N$ "

* $f_s = \mu_s . n$

$f_s = 0.2(0.6F)$

$f_s = 0.12(108.6)$

" $f_s = 13.032\,N$ "

* $y\text{-axis} \Rightarrow \Sigma F_y = 0$ ← الوشن للأعلى

$F\cos 37 - f_s - W = 0$

$0.8F - 0.12F - 100 = 0$

$0.68F = 100$

" $F_{max} = 147\,N$ "

{لو صار اكثر من 147 بتزلق للأعلى وتتسارع}

{(ما بين 108.6 و 147) ← وهو ساكن}

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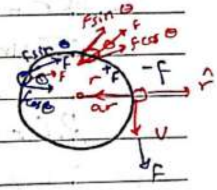
physics CH6 6-Dec-2020

"Circular motion"
and other Application of newton lows.

* r-axis $\Rightarrow \Sigma F_r = m a_r$

$\Sigma F_r = m \frac{v^2}{r}$

↳ T, W, N, F

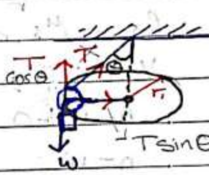


طب مجموع قوى = Zero على نفس القطر

* The Conical panduluim.

* r-axis $\Rightarrow \Sigma F_r = m \frac{v^2}{r}$

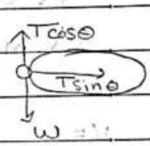
$T \sin\theta = m \frac{v^2}{r}$ (1)



* y-axis $\Rightarrow \Sigma F_y = 0$

$T \cos\theta - W = 0$

$T \cos\theta = mg$



$\boxed{1} \div \boxed{2}$

$\frac{\cancel{T}\sin\theta}{\cancel{T}\cos\theta} = \frac{\cancel{m} \frac{v^2}{r}}{\cancel{m} g}$

$\tan\theta = \frac{v^2}{rg}$

$v = \sqrt{r \cdot g \cdot \tan\theta}$

$v = \sqrt{L \cdot g \sin\theta \tan\theta}$

$\sin\theta = \frac{r}{L}$

$r = L \cdot \sin\theta$

• Resultant force. R.F

$R_f = \sqrt{(\Sigma F_r)^2 + (\Sigma F_y)^2} = \sqrt{(\Sigma F_r)^2 + 0}$

$R_f = \Sigma F_r$

عام $\left(R_f = m \frac{v^2}{r}\right) = \left(T \sin\theta\right)$ حالة خاصة

The Conical panduluim.

$\Sigma F_r = m\frac{v^2}{r}$

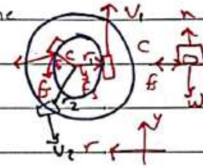
$T\sin\theta = m\frac{v^2}{r}$

$v = \sqrt{r g \tan\theta}$

$R.F = \Sigma F_r = m\frac{v^2}{r} = T\sin\theta$ ← حالة خاصة

طريق افقي دائري (دوار من غير ميلان) وفي عنا احتكاك

احتكاك * **The unbanked Roadway**. level of inner and outer edge of the road is same.



R_axis =

$\Sigma F_r = m\frac{v^2}{r}$

$f_s = m\frac{v^2}{r}$ ← 1

$f_s = \mu_s . n$ ← 2

ليش سكوني مش حركي؟

لانو لما الشدة للرصيف القطر ساكنة

y-axis =

$\Sigma F_y = zero$

$n - w = 0 \quad n = w$ ← 3

لعوضة 3 ب 2

$f_s = \mu_s . Mg \rightarrow 4$ ← $f_s = \mu_s . n = f_s = \mu_s . m = f_s = \mu_s . Mg$

لعوضة 4 ب 1

$\mu_s \cancel{M} g = \cancel{m}\frac{v^2}{r} = \mu_s . \cancel{m} . g = \cancel{m} . \frac{v^2}{r} = \mu_s . g = \frac{v^2}{r}$

$v = \sqrt{r . g . \mu_s}$ ← v_{max}

* $R.F = \sqrt{(\Sigma F_r)^2 + (\Sigma F_y)^2}$ 0

$R.F = \Sigma F_r = m\frac{v^2}{r} = f_s$ ← حالة خاصة

* اذا كانت القوة ثابتة وما تغيرت معناها *

$f_{s_1} = f_{s_2}$

$\cancel{m}\frac{v_1^2}{r_1} = \cancel{m}\frac{v_2^2}{r_2} = \frac{v_1^2}{r_1} = \frac{v_2^2}{r_2}$

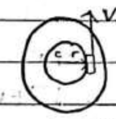
* The Banked Roadway.

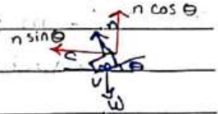
لا احتكاك ولا انشر

"طريقة التي لا يوجد به احتكاك والسطح الداخلي مائل للداخل"

كيف رح تتحرك بمسار دائرية ؟

علاقة الـ normal force





* r-axis:

$\Sigma F_r = m \frac{v^2}{r}$

$n \sin\theta = m \frac{v^2}{r} \rightarrow ①$

* y-axis:

$\Sigma F_y = zero$

$n\cos\theta - w = 0 \rightarrow n\cos\theta = w \qquad w = m.g$

$n\cos\theta = m.g \rightarrow ②$

لو عوضت وقسمت 1 على 2.

$\frac{n\sin\theta}{n\cos\theta} = \frac{\cancel{m} v^2/r}{\cancel{m}.g} = V = \sqrt{r.g.\tan\theta}$

$R.F = \sqrt{(\Sigma F_r)^2 + (\Sigma F_y)^2}$

$R.F = \Sigma F_r = m\frac{v^2}{r} = n\sin\theta$ ← حالة خاصة

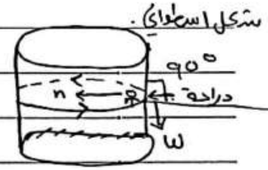
$\rightarrow \theta = 90° \rightarrow n = m\frac{v^2}{r}$

الـ normal force هي → القوة المركزية

$\sin 90 = 1$

$R.F = \sqrt{n^2 + w^2}$

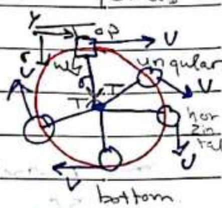
شكل اسطواني.



Physics 8. Dec. 2020

Circular vertical motion.

points



① Top point

$\Sigma F_r = m\frac{v^2}{r}$

$T + w = m\frac{v^2}{r} \leftarrow ① \quad T = m\frac{v^2}{r} - w$

$T = m\frac{v^2}{r} - m.g \leftarrow w = m.g$

الجواب إما موجب أو أكبر من صفر أو يساوي صفر

T لا = بالسالب

في أقل الأحوال 0

$T = m\left(\frac{v^2}{r} - g\right) \geq 0$

$= \frac{v^2}{r} - g \geq 0$

أقل حد للسرعة $\frac{V_{min}^2}{r} - g = 0$

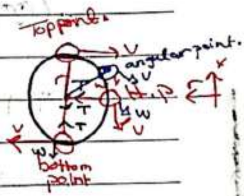
$V_{min} = \sqrt{r.g}$

القوة المحصلة $R.F = \sqrt{(\Sigma F_r)^2 + \cancel{(\Sigma F_y)^2}}$ لا يوجد قوة Y

$R.F = \Sigma F_r = m\frac{v^2}{r} = T + w \leftarrow$ حالة خاصة.

physics. 10. Dec. 2020

The circular vertical motion.



"Top point" { V_{min} ← Top point $= \sqrt{rg}$

R.F = $\Sigma F_r = m\frac{v^2}{r} = (T+W)$ خاصة

"Bottom point."

$\Sigma F_r = m\frac{v^2}{r}$

$T - W = m\frac{v^2}{r}$ ① $= T = m\frac{v^2}{r} + W$ [$W = m.g$]

$T = m\frac{v^2}{r} + m.g > 0$

$R.F = \sqrt{(\Sigma F_r)^2 + \cancel{(\Sigma F_y)^2}}$ y لا يوجد

$R.F = \Sigma F_r = m\frac{v^2}{r} = T - W$ ← حالة خاصة

" Horizantal point"

— R-axis

$\Sigma F_r = m\frac{v^2}{r}$

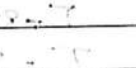
$T = m\frac{v^2}{r}$ ①

$R.F = \sqrt{(\Sigma F_r)^2 + (\Sigma F_y)^2}$ ← $y = W$ ← لا يوجد غير الوزن في حالة y

$R.F = \sqrt{(m.\frac{v^2}{r})^2 + (m.g)^2}$

$R.F = \sqrt{T^2 + W^2}$ ← 90° ← حالة خاصة

"angular point"



R-axis

بتحلل الـ w

$\Sigma F_r = m\frac{v^2}{r}$

$T + W\cos\theta = m\frac{v^2}{r}$ ①

$T = m\frac{v^2}{r} - mg\cos\theta \geq 0$

$T = m(\frac{v^2}{r} - g\cos\theta) \geq 0$

$= \frac{v^2}{r} - g\cos\theta \geq 0$ ②

$\frac{(V_{min})^2}{r} - g\cos\theta = 0$ ③

$V_{min} = \sqrt{r.g\cos\theta}$

$R.F = \sqrt{(T + W\cos\theta)^2 + (W\sin\theta)^2}$ هاي r, y

$R.F = \sqrt{(m.\frac{v^2}{r})^2 + (m.g\sin\theta)^2}$ هاي ع

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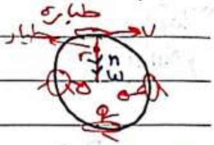
physics — 10-Dec-2020

Loop-The-Loop

بينا ال T بـ n



Top point.

$\Sigma F_r = m\frac{v^2}{r}$

$n + w = m\frac{v^2}{r}$

$n = m\frac{v^2}{r} - m\cdot g \geq 0$ اذا كان جدين و بنحط

← طيارة

← طيار

اذا كان اترين $\cancel{n} < 0$ ما بيكون في normal force

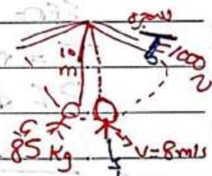
$= m\left(\frac{v^2}{r} - g\right) \geq 0$

$= \frac{v^2}{r} - g \geq 0$

$\frac{v_{min}^2}{r} - g = 0$

$v_{min} = \sqrt{rg} = 0$

6.9 Q13



bottom point

$\Sigma F_r = m\frac{v^2}{r}$

$T - w = m\frac{v^2}{r}$

$T - (85 \times 10) = 85 \cdot \frac{8^2}{10}$ ($w = m\cdot g$)

$T - 850 = 544$

$T = 544 + 850$

$T = 1394\,N > 1000$ ← اذا ح يتقطع breaking

اذا محبة ال T

وكان اقل من 1000

ما بنقطع، اذا اكبر

بنقطع

physics CH6 13-Dec-2020

Q1 ① 3Kg :-

R-axeis :

① $\Sigma F_r = m\frac{v^2}{r}$

$+T = m_1\frac{v^2}{r}$ ①

T,T مساويان بالمقدار

معاكسان بالاتجاه .

Y-axeis =

$\Sigma F_y =$ zero

$+T - W_2 = 0$ ②

$T = W_2 = 250\ N$

Rahaf

معادلة 2 تعويض ⇐ 1

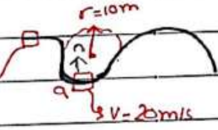
$250 = 3 \cdot \frac{v^2}{0.8}$

$V = \sqrt{250 \cdot \frac{0.8}{3}}$

$V = 8.1\ m/s$

7 - Q14 - What is the force exerted by the track on the car? at the bottom Point a?

normal force



$\Sigma F_r = m\frac{v^2}{r}$

$n - w = m\frac{v^2}{r} \Rightarrow n = 500\times10 + 500\left(\frac{20^2}{10}\right)$

$n = 25000\ N = 25\ kN$

b) What is the maximum speed of the vehile can have on point B?

point B $\Rightarrow \Sigma F_r = m\frac{v^2}{r}$

$w - n = m\frac{v^2}{r}$ ①

maximum speed $\Rightarrow$ normal force = Zero

$w = \cancel{m}\frac{V^2_{max}}{r} = \cancel{m}g$

$V_{max} = \sqrt{rg}$

$\boxed{v_{max}} = \sqrt{15\cdot10} = \sqrt{150} = \boxed{12.2\ m/s}$

If the speed equale 10 m/s, find the normal force?

$w - n = m\frac{v^2}{r} \Rightarrow n = 5000 - 3350$

$500\cdot10 - n = 500\cdot\frac{(10)^2}{15}$

$\boxed{n = 1650\ N}$

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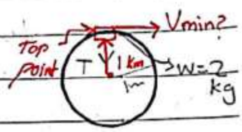
physics. 13-Dec-2020

Ex// Circular vertical motion.

① $r = 1\ Km$, Find the minimum speed at top Point?



$V_{min} = \sqrt{rg} = \sqrt{1000 \cdot 10} = 100\ m/s$

② at the top point, If the maximum tension equele 50N , find the velocity maximum ?

$\Sigma F_r = m \frac{v^2}{r}$

$T + W = m \frac{v^2}{r} = T_{max} + W = m \frac{V^2_{max}}{r}$

$50 + 2 \cdot 10 = 2 \cdot \frac{v^2_m}{1}$

$1000 \times 70 = 2 v^2_{max}$

$v_{max} = \sqrt{35000} = 187\ m/s$

Ex// Banked Roadway:-

$V_{max} = 10 m/s$, find Θ ?

$V = \sqrt{rg \tan\theta}$

$10^2 = \sqrt{5 \cdot 10 \tan\theta}^{\,2}$

$100 = 50 \tan\theta$

$\Theta = \tan^{-1}\left(\frac{100}{50}\right)$

$\theta = \tan^{-1}(2) = 63.4°$

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Physics — CH 7 — 15-Dec-2020

Energy of a system

Dot product :

$\vec{A} = A_x i + A_y j + A_z \hat{k}$

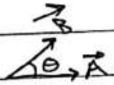
$\vec{B} = B_x i + B_y j + B_z \hat{k}$

$\vec{A}\vec{B} = (A_x B_x) i + (A_y B_y) j + (A_z B_z) k$

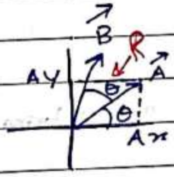
$A = \sqrt{(A_x)^2 + (A_y)^2 + (A_z)^2}$

$B = \sqrt{(B_x)^2 + (B_y)^2 + (B_z)^2}$

$\vec{A}\vec{B} = AB \cos\theta \rightarrow$



$\theta = \tan^{-1}\left(\left|\frac{A_y}{A_x}\right|\right) \rightarrow$



Ex1 = $\vec{A} = 2i + 3j$

$\vec{B} = -i + 2j + 2\hat{k}$

① find $\vec{A}\cdot\vec{B}$? $(2\cdot -1)i + (3\cdot 2)j + (0\cdot 2)k = -2 + 6 + 0$

$\vec{A}\vec{B} = 4$

② find the engule between A and B?

$A = \sqrt{2^2 + 3^2} = \sqrt{13}$

$B = \sqrt{(-1)^2 + 2^2 + 2^2} = \sqrt{9} = 3$

$\vec{A}\vec{B} = \vec{A}\vec{B} \cos\theta$

$4 = \sqrt{13} \cdot \sqrt{9} \cos\theta$

$4 = \cos^{-1}\left(\frac{4}{\sqrt{13}\sqrt{9}}\right) = \theta = 68.3^\circ$

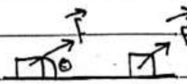
physics. CH 7. 15 - Dec - 2020

work $[N.m] = [J] = W$

$W = \vec{F} \cdot \vec{\Delta r}$

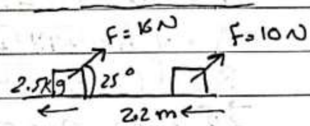
تعوضاته. $= F_x \Delta x + F_y \Delta y + F_z \Delta z$

$= F \Delta r \cos\theta$



Ex: Determine the work done By:-

1) the applied force? القوة الخارجية



$W_I = F \Delta r \cos\theta$

$16 \cdot 2.2 (\cos 25)$

$W_a = 31.9 \, J$

2) Normal force?

$W_n = n \cdot \Delta r \cos 90$

$W_n = \text{Zero}$

3) the gravitational force? "weight"?

$W_w = W \Delta r \cos 90$

$W_w = \text{Zero}$

4) find the total work?

$W_a + W_n + W_w$

$31.9 + 0 + 0$

$= +31.9 \, J$

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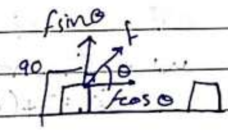
Physics. 15.12-2020

$= W = f_x \Delta x \cos\theta$ $\cos\theta = 1$

$(f\cos\theta)\Delta x$



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Ex, $\vec{F} = 6i + 4j$ find the total worth?

$\Delta\vec{r} = 3i - 3j$

$W = F \cdot \Delta r$

$(6 \cdot 3) + (4 \cdot -3)$

$= W = 6J$

* work done by

$W = \int \vec{F} \cdot d\vec{r}$

$W = \int^{x_f} F_x \cdot dx + \int^{y_f} F_y \cdot dx + \int^{z_f} F_z \, dx$

Ex/ $\vec{F} = (3x^2 i + 4j) N$

from the origin to $(2,3)$ m

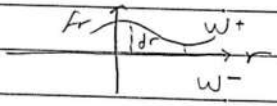
$W = \int_0^2 3x^2 dx + \int_0^3 4 dy$

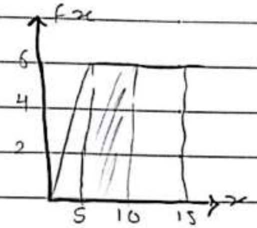
$\frac{3x^3}{3}\Big|_0^2 + 4y\Big|_0^3$

$= (2^3 - 0^3) + (4 \cdot 3 - 4 \cdot 0)$

$W = 8 + 12 = 20J$

$W = \int_{r_i}^{r_f} F_r dr$





[1] Find the work to $x = 0 \to x = 5m$?

[1] $W_1 = area_1 = \frac{1}{2} \cdot 5 \cdot 6 = 15J$

[2] $x = 5m \to x = 10m$?

$W_2 = area_2 = 5 \cdot 6 = 30J$

[3] Total work? from (0–10m)?

Total = work$_1$ + work$_2$ = $15 + 30 = 45J$

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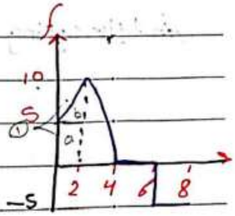


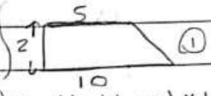
1. Find the work from 0-2m ?

$w_1 = w_a + w_b$

$= 2.5 + \frac{1}{2} \cdot 2.5$

$w_1 = 10 + 5 = 15J$

or $w_1 = \frac{(5+10)}{2} \cdot 2 = 15J$ ← لو اعتبرناه شبه منحرف (شكل واحد)



$\frac{1}{2} \times$ (مجموع القاعدتين) $\times$ الارتفاع

2. $2m \to 4m$?

$w_2 = \frac{1}{2}(2)(10) = W_2 = 10J$

3. $4m \to 6m$?

$w_3 =$ zero ← لانها ثابتة

4. $6m \to 8m$?

$w_4 = -2 \cdot 5 = -10J$

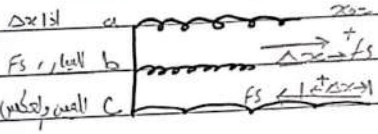
5. find the total work?

$w_1 + w_2 + w_3 + w_4$

$15 + 10 + 0 - 10 = T_w = 15J$

work done by a spring.

الشغل الناتج عن زنبرك



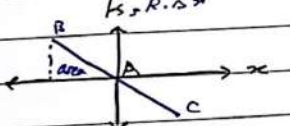
$f_s = R \Delta x$

$\vec{f_s} = -R \Delta x$

R : spring constant [N/m]

f_s : Spring force. [N]

$f_s = R \cdot \Delta x$



قاعدة ارتفاع

$W_s = area = \frac{1}{2}(\Delta x) f_s$

$= \frac{1}{2}(\Delta x)(R \cdot \Delta x)$

$W_s = \frac{1}{2} R \cdot \Delta x^2$

physics 17-Dec-2020

find the spring const ?

$\sum F_y = 0$

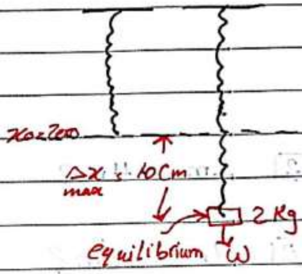
$f_s - w = 0$

$f_s = w$

$k \Delta x_{max} = mg$

$k(0.1) = 2 \cdot 10$

$k = \frac{20}{0.1} = 200 \, N/m$



20-Dec-2020.

physics.

$W = \vec{F} \cdot \Delta \vec{r}$

$= F_x \cdot \Delta x + F_y \Delta y + F_z \Delta z$

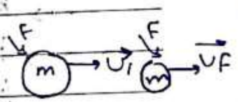
$= F \Delta r \cos\theta$

$= \int F_x \, dx + \int F_y \, dy + \int F_z \, dz$

$= \frac{1}{2} k \Delta x^2$

$=$ area

Kinetic Energy - work



$K = \frac{1}{2} m (\vec{v} \cdot \vec{v})$

$K = \frac{1}{2} m (v^2)$

$\hookrightarrow$ work $= \int \Sigma \vec{F} \cdot d\vec{r}$

$= \int m\vec{a} \cdot \vec{dr}$

$= m \int \frac{dv}{dt} \cdot dr$ نبدل العلاقة

$= m \int \vec{dv} \cdot \frac{\vec{dr}}{dt}$

$= m \int \vec{dv} \cdot \vec{v}$ نفسها

$= m \int \vec{v} \cdot d\vec{v}$

$= m \int_{v_i}^{v_f} \vec{v} \cdot d\vec{v}$

$= m \cdot \frac{1}{2} v^2 \Big|_{v_i}^{v_f} = \frac{1}{2} m v^2 \Big|_{v_i}^{v_f}$

$= \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2$

$= K_f - K_i$

$= \Delta K$

$\{ W = \Delta K \Rightarrow W = K_f - K_i \}$ النتيجة النهائية

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physics

20-Dec-2020

Q) $m = 3Kg$, $v_i = (6i - 2j)\ m/s$

(A) what is Kinetic energy at this time?

$K = \frac{1}{2} m v^2 \longrightarrow v_i = \sqrt{(6)^2 + (-2)^2}$

$K = \frac{1}{2}(3)(\sqrt{40})^2 \qquad v_i = \sqrt{36 + 4}$

$K = \frac{3}{2} \cdot 40^{20} \qquad v_i = \sqrt{40}$

$K = 60j$

(B) find the total work, if: $\vec{v_f} = (8i + 4j)\ m/s$.

$\rightarrow K = 60j$

$\rightarrow K_f = \frac{1}{2} m v_f^2 \longrightarrow v_f = \sqrt{(8)^2 + (4)^2}$

$K_f = \frac{1}{2} \cdot 3 \cdot (\sqrt{80})^2 \qquad v_f = \sqrt{64 + 16}$

$K_f = \frac{3}{2} \cdot 80^{40} \qquad v_f = \sqrt{80}\ m/s$

$K_f = 120J$

$\rightarrow W_{total} = K_f - K_i$

$120 - 60 = 60j \leftarrow W_{total}$

1 * الجسم عندما يتحرك حركة دائرية دائماً شغله " Zero "

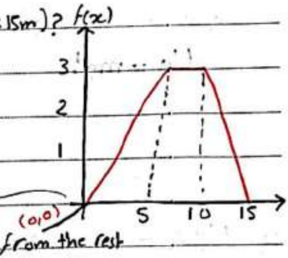
2 * اذا رجع الجسم لنفس النقطة التي انطلق منها " ΔV=zero " و " W=zero "

3 * اذا كانت الزاوية ($\theta = 90°$) ← ($\cos 90° = 0$) تكون " W=zero "

4 * اذا كانت السرعة (contact speed) ← ($\Delta v = zero$) ← ($\Delta K = zero$) ← ($W = zero$)

physics. 20-Dec-2020

Q) Find the speed at ($x = 5m$), ($x = 10m$) and ($x = 15m$)?



A) (0 - 5m):

$W_1 = area = \frac{1}{2} \cdot 5 \cdot 3 = \frac{15}{2}$

$W_1 = 7.5J$

$W_1 = \frac{1}{2} m v_{f_1}^2 - \cancel{\frac{1}{2} m v_{i_1}^2}$ ← from the rest

$7.5 = \frac{1}{2} \cdot 4 \cdot v_f^2$

$\frac{7.5}{2} = \frac{2}{2} v_f^2$

$\sqrt{v_f^2} = \sqrt{\frac{7.5}{2}}$

$v_{f_1} = 1.9 \ m/s$

$v_{f_1} = v_{i_2}$

→ speed at $x = 5m$

speed $= 1.9 \ m/s$

B) (5-10m) =

area $= 5 \cdot 3$ → $W_2 = 15J$

$W_2 = \frac{1}{2} \cdot 4 \cdot v_{f_2}^2 - \frac{1}{2} \cdot 4 \cdot (1.9)^2$

$15 = 2v_f^2 - 7.5$

$15 + 7.5 = 2v_f^2$

$\sqrt{\frac{22.5}{2}} = \sqrt{\frac{2v_f^2}{2}}$

$v_{f_2} = 3.35 \ m/s = v_{i_3}$

→ speed at $x = 10m$

speed $= 3.35 \ m/s$

طريقة اخرى. بقوانين الحركة.

علشان احل على قوانين الحركة لازم تكون القوة ثابتة

علشان اطلع التسارع (يعني A ...) ما بقدر اطلعه.

$(5-10)m = \Sigma F = ma = \frac{3}{4} = \frac{4a}{4}$ $\boxed{a = \frac{3}{4} \ m/s^2}$

$v_f^2 = v_i^2 + 2a\Delta x$

$v_f^2 = (1.9)^2 + 2 \cdot \frac{3}{4} \cdot 5$

$v_f^2 = 3.61 + 7.5$

$\sqrt{v_f^2} = \sqrt{11.11}$

$v_f = 3.35 \ m/s$

speed at $x = 10m$

C) (10-15m) =

$W_3 = area = \frac{1}{2} \cdot 5 \cdot 3 = W_3 = 7.5J$

$W_3 = \frac{1}{2} \cdot 4 \cdot v_f^2 - \frac{1}{2} \cdot 4 \cdot (3.35)^2$

$7.5 = 2v_f^2 - 22.5 \quad = 7.5 + 22.5 = 2v_f^2$

$\sqrt{\frac{30}{2}} = \sqrt{\frac{2v_f^2}{2}} \quad v_f = 3.87 \ m/s$

→ speed at $x = 15m$

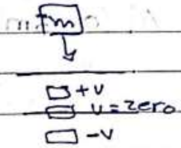
→ speed $= 3.87 \ m/s$

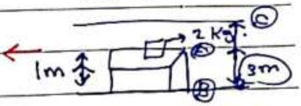
H.W.
(0→10m) and
(0→15m).

Physics. 22. ~~23~~. Dec 2020

potential energy of a system work.

$U_g = mgh$





$V_{gA} = mgh_A^{\,0} = \text{Zero}$

$V_{gB} = mgh_B = 2 \times 10 \times 1\,m$

$= {}^{+}20\,J$

$V_{gC} = mgh_C = 2 \times 10 \times 2$

$= -40\,J$

$W = -\Delta V_g$

$= -(V_{gf} - V_{gi})$

$= -(mgy_f - mgy_i)$

$W = \int f_x dx$

$W = -\Delta V_g$

$-\Delta V_g = \int_{x_i}^{x_f} f_x dx$

$\Delta V_g = V_{gf} - V_{gi} = \int f_x dx$

$\Delta U = \int_{x_i}^{x_f} F_x dx.$

$\longrightarrow f_x = -\frac{dU}{dx}$

$\vec{F} = -\left(\frac{dU}{dx} i + \frac{dU}{dy} j + \frac{dU}{dz} k\right)$

Ex) $V = -A/x^2 \rightarrow$ find the force at $x = 2m$ ← A : Constant.

$f = -\frac{dU}{dx} = -\frac{d(-Ax^{-2})}{dx}$

$= -2Ax^{-3} = -2A/x^3$

$f(x = 2m) = \frac{-2A}{2^3} = -\frac{A}{4}\,N$

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physics. 22 Dec. 2020.

① $\vec{F} = 3x^2 i$ ← find ΔU from x_i 1m to $x_f = 3m$?

$\Delta V = -\int_{x_i}^{x_f} F\,dx$

$\int_{x_i}^{x_f} 3x^2\,dx = -\frac{3x^3}{3}\Big|_1^3 = -[3 - 1^3] = \boxed{-26\,J}$

② If final, potential energy equal 10J, find U_i.

$\Delta V = V_f - v_i - \int_{x_i}^{x_f} F_x\,dx$

$10 - v_i = -26$

$U_i = 10 + 26$

$v_i = 36\,j$

physics. CH8 22 Dec 2020

CH8: Conservation of Energy:

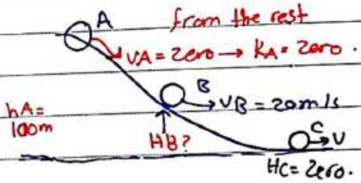
$E = K + U_g$

E = Mechanical energy.

fraction less + without spring

$E_i = E_f$

$K_i + V_{gi} = K_f + V_{gf}$.



Ex: $m = 2\,kg$

① find HB?

$E_A = E_B$

$\cancel{K_A}^{0} + V_{gA} = K_B + V_{gB}$

$0 + \cancel{m}gh_a = \frac{1}{2}\cancel{m}V_B^2 + \cancel{m}gh_B$

$10 \times 100 = \frac{1}{2}(20)^2 + 10\,HB$

$1000 = 200 + 10\,HB$

$HB = \frac{1000-200}{10}$

$HB = 80m$

② Find the speed at C point? Vc?

$E_A = E_C$

$\cancel{K_A}^{0} + V_{gA} = K_C + \cancel{V_{gC}}^{0}$

$\cancel{m}gh_A = \frac{1}{2}\cancel{m}V_C^2$

$2 \times (10(100)) = (\frac{1}{2}V^2) \times 2$

$V = \sqrt{2000}$

$V = 44.7\ m/s$

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physics 25.Dec.2020

$E = K + U_g$

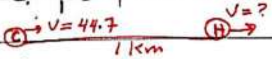
$E_i = E_f$

$K_i + U_{gi} = K_f + U_{gf}$

fraction less without spring

تكملة المسألة السابقة تاريخ 23 اخر سؤال .

③ find the speed at h point



$V_H = 44.7\ m/s$ ← لأنه مافي لاحتكاك ولا تحول للطاقة

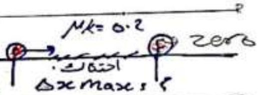
$K_C + \cancel{U_{gC}} = K_H + \cancel{U_{gH}}$

$\cancel{m} v^2_C = \cancel{m} v^2_H$

$v_C = v_H = 44.7\ m/s$. Relief

✗ $K_i + U_{gi} + U'_{si} = K_f + U_{gf} + U'_{sf} + |work|$

Find Δx max



$K_{iC} + U_{giC} + U'_{siC} = K_{fC} + U_{gfC} + U_{sfC} + |W_{fk\,C \to f}|$

$K_C = W_{fk\,C \to f}$

$\frac{1}{2} \cancel{m} v_C^2 = \mu_k \cdot \cancel{m} g \cdot \Delta x_{max}$

$\frac{1}{2} (44.7)^2 = 0.2 \cdot 10 \cdot \Delta x_{max}$

$\frac{1000}{2} = 2\ \Delta x_{max}$ Relief

$\Delta x_{max} = 500\ m$

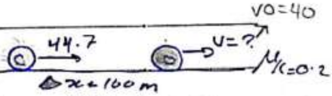
$\Sigma F_y = 0$

$n = w$

$f_k = \mu_k \cdot n$

$f_k = \mu_k \cdot m \cdot g$

$W_f = f\, \Delta x_{max}$



✱ find the speed at (o) point?

$K_A + U_{gA} + \cancel{U_{sA}} = K_O + \cancel{U_{gO}} + \cancel{U_{sA}} + |W_{fk\,C \to O}|$ ← مع عمل الاحتكاك

$U_{gA} = K_A + |W_{fk\,C \to O}|$

$m g h_A = \frac{1}{2} \cancel{m} v_O^2 + \mu_k \cdot \cancel{m} \cdot g \cdot \Delta x$

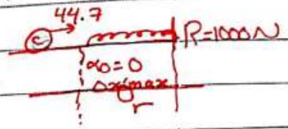
$10 \cdot 100 = \frac{1}{2} (v_O^2) + 0.2 (10)(100)$

$200 - 1000 = \frac{1}{2} v_O^2 + 200$

$\sqrt{2 \times (800)} = \left(\frac{1}{2} \sqrt{v^2}\right)^2 \quad V = \sqrt{1600} = V = 40\ m/s$

physics. 25.Dec.2020.

$K_c + \cancel{U_{gc}}^{0} + \cancel{V_{sc}}^{0} = \cancel{K_r}^{0} + \cancel{V_{gr}}^{0} + V_{sr} + \cancel{|\mu F_N \Delta x_{c\to r}|}$ صفر [illegible]



Find $\Delta x' max$?

$K_C = V_{sr}$

$\frac{1}{2} m v_C^2 = \frac{1}{2} \cdot R(\Delta x' max)^2$

$\frac{1}{\cancel{2}}(\cancel{2})(44.7)^2 = \frac{1}{2}(1000)(\Delta x' max)^2$

$2000 = 500(\Delta x' max)^2$

$\sqrt{(\Delta x' max)^2} = \sqrt{4}$

$\Delta x' max = 2m$

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physics. 27. Dec. 2020

$E_i = E_f$

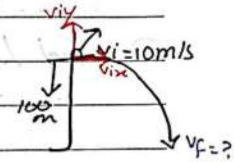
$K_i + U_{gi} = K_f + U_{gf}$

* fractional less without spring.

$K_i + U_{gi} + U_{si} = K_f + U_{gf} + U_{sf} + (W_{fK})$

fraction + spring.

Find the final speed?



$K_i + U_{gi} = K_f + U_{gf}$

$\frac{1}{2}\cancel{m}v^2 + \cancel{m}gH = \frac{1}{2}\cancel{m}v^2 + 0$

$\frac{1}{2}(10)^2 + (10)(100) = \frac{1}{2}v^2$

$2 \times (50 + 1000 = \frac{1}{2}v^2) \times 2$

$\sqrt{2100} = \sqrt{v^2}$

$v = \sqrt{2100}\ m/s.$

---

* power :- ← P

$P = \frac{W}{\Delta t}$ [J/s] ← [watt]

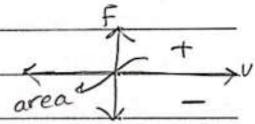
$= \vec{F} \cdot \frac{\vec{\Delta r}}{\Delta t} = \vec{F} \cdot \vec{V}$

$= F_x \cdot V_x + F_y \cdot V_y + F_z \cdot V_z$

$= F V \cos\theta$

$P =$ ① $\frac{W}{\Delta t}$

$P =$ ② $F \cdot v$



$P = \int F_x dv_x + \int F_y dv_y + \int F_z dv_z$

① Ex/ $\vec{F} = 2i + 3J$ / $\vec{V} = 5i - J$, find the power?

$P = (2 \times 5) + (3 \times -1) = 10 - 3 = 7$ watt

② $\Delta t = 3s$, find the total work?

$P = \frac{W}{\Delta t}$

$7 = \frac{W}{3} = W = 7 \times 3$

$W = 21 J$

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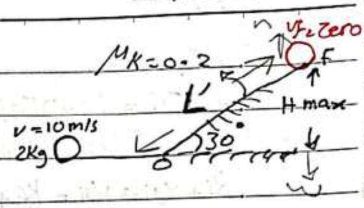
Physics. 27. Dec. 2020



① Ex/ find H max?

ال m بقدر الغيها

وبقدر احذفها

$K_i + U_{gi}^{\,0} = K_f^{\,0} + U_{gf}$

$\frac{1}{2} \cancel{m} v^2 = \cancel{m} g H_{max}$

$\frac{1}{2} (10)^2 = 10 H_{max}$

$\frac{50}{10} = \frac{10}{10} H_{max}$

$H_{max} = 5$ m

② find L max?

$\sin 30 = \frac{H_{max}}{L}$

$\frac{1}{2} = \frac{5}{L}$

$L = \frac{5}{0.5}$

$\boxed{L = 10 m}$

③ find W_{FK} o→F ?

$K_i + U_{gi}^{\,0} = K_f^{\,0} + U_{gf} + |W_{fk}|_{o \to F}$

$W_{fk} = F \times L'_{max}$

$(\mu_K n)(L'_{max})$

$(\mu_K n)(m g \cos\theta) L'_{max}$

$\frac{1}{2} \cancel{m} v^2 = \cancel{m} g h'_{max} + \mu_K \cancel{m} g \cos\theta \cdot L'_{max}$

$\frac{1}{2} (10)^2 = 10 h' + 0.2 \cdot 10 \cos 30 \cdot L'$

$\frac{1}{2} (10)^2 = 10 h' + 0.2 \cdot 10 \cdot 0.87 \cdot L'$

$50 = 10 h'_{max} + 1.74 \cdot L'_{max}$

$\sin 30 = \frac{h'_{max}}{L'_{max}} = 0.5$

$50 = 10 (0.5) L'_{max} + 1.74 \cdot L'_{max}$

$\frac{50}{6.74} = \frac{6.74}{6.74} L'_{max}$

$L'_{max} = 7.4$ m ←

عاملها L

بسبب الاحتكاك [?]

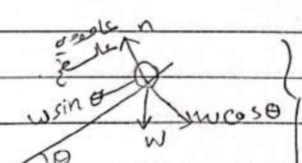
$H'_{max} = 0.5 \cdot L'_{max}$

$= 0.5 (7.4)$

$H'_{max} = 3.57$ m ←

عاملها H

بسبب الاحتكاك



$\Sigma F_y = 0 = n - w\cos\theta = 0 \quad n = w\cos\theta$

رسمة توضيحية ←

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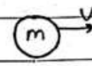
physics. CH9 29. Dec. 2020

Linear momentum and Collision.



$K = \frac{1}{2} m v^2$

$\vec{p} = m\vec{v}$

$\Sigma \vec{f} = m\vec{a} = m \frac{d\vec{v}}{dt}$

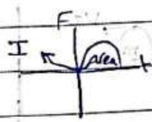
$\Sigma f = \frac{d(m\vec{v})}{dt}$

$\Sigma F = \frac{dp}{dt}$

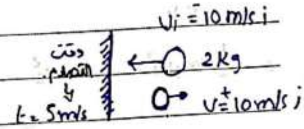
$\int d\vec{p} = \int \Sigma \vec{F} dt$

$\Sigma \Delta p = p_f - p_i = \int \Sigma F dt$

I = Impulse. $- I = \Sigma F_{ave} \Delta t$



1) Ex// Find the Impulse?



$\vec{I} = \vec{p_f} - \vec{p_i}$

$\vec{I} = m\vec{v_f} - m\vec{v_i}$

$\vec{I} = 2(10i) - 2(-10i)$

$\vec{I} = 20i + 20i$

$\vec{I} = 40$ Kg m/s i or 40 N.s i

2) Ex// find the avarage force?

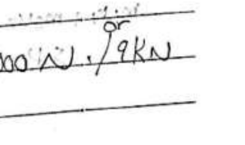
$\vec{I} = \Delta\vec{p} = F_{ave}\Delta t$

$40 = F_{ave} \cdot 5\times10^{-3}$

$F_{ave} = \frac{40}{5\times10^{-3}}$

$F_{ave} =$

Ex// Q9.



a) Find the Impulse?

$I = \text{area} = \frac{1}{2}(1.5\times10^{-3})(18000) = I = \boxed{13.5 \text{ N.s}}$

b) Find the avarage force?

$I = F_{ave}\Delta t = 13.5 = \frac{F_{ave}}{1.5\times10^{-3}} \cdot (1.5\times10^{-3}) = F_{ave} = 9000$ N or 9KN

$I = F_{ave}\Delta t = \text{area}$

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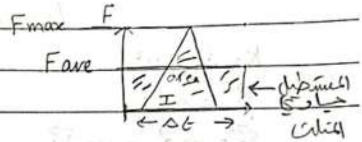
physics. 29. Dec. 2020

$I = \text{area}\,\triangle$ (شرح للسؤال اللي قبل.)

$= \frac{1}{2}(\Delta t)(F_{max})$

$I = \text{area}\,\square$

$(\Delta t)(F_{ave}) \Rightarrow F_{max} = F_{ave}$



1) Elastic Callision:

$m_1 \xrightarrow{v_1}$ $m_2 \xrightarrow{v_2}$ | $m_1 \xrightarrow{v_1'}$ $m_2 \xrightarrow{v_2'}$

$\Sigma P = \Sigma P'$

$m_1 v_1 + m_2 v_2 = m_1 v_1' + m_2 v_2'$

$\Sigma K = \Sigma K'$

$\frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2 = \frac{1}{2} m_1 v_1'^2 + \frac{1}{2} m_2 v_2'^2$

2) In elastic callision:

$m \xrightarrow{v_1}$ $m \xrightarrow{v_2}$ | $m \xrightarrow{v_1'}$ $m \xrightarrow{v_2'}$

$\Sigma P = \Sigma P'$

$m_1 v_1 + m_2 v_2 = m_1 v_1' + m_2 v_2'$

$\Sigma K \neq \Sigma K'$ ← (لأنه تصادم) يُفقد من الطاقة بصورة حرارة.

3) perfectly In elastic Collision:

$m \xrightarrow{v_1}$ $m \xrightarrow{v_2}$ | $m \xrightarrow{v_1} + m \xrightarrow{v_2}$ $\rightarrow V'$ ← صار كتلة ملتصقة

$\Sigma p = \Sigma p'$

$m_1 v_1 + m_2 v_2 = (m_1 + m_2) V'$

$\Sigma K \neq \Sigma K'$

Ex: elastic Collision:

$m_1 = 8K, v_1 = 5m/s$ / $m_2 = 2Kg, v_2 = 3m/s$, Find v_1' and v_2'?

$\Sigma p = \Sigma p'$

$m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$

$8.5 + 2.3 = 8v_1' + 2v_2'$

$2 \div \quad 46 = 8v_1' + 2v_2' \leftarrow \boxed{1}$

$\Sigma K = \Sigma K'$

$\frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2 = \frac{1}{2}m_1v_1'^2 + \frac{1}{2}m_2v_2'^2$

$\frac{1}{2}(8)(5)^2 + \frac{1}{2}(2)(3)^2 = \frac{1}{2}(8)v_1'^2 + \frac{1}{2}(2)(v_2')^2$

$109 = 4v_1'^2 + 1v_2'^2 \leftarrow \boxed{2}$

$109 = 4v_1'^2 + v_2'^2 \leftarrow \boxed{2}$

$23 = 4v_1' + v_2'$

$v_2' = 23 - 4v_1' \leftarrow \boxed{3}$

$\boxed{3} \rightarrow \boxed{2}$

$109 = 4v_1'^2 (23 - 4v_1')^2$

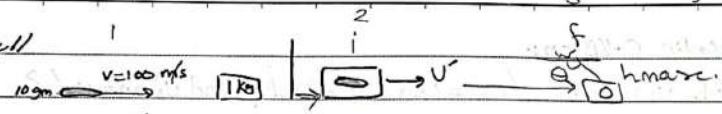
$109 = 4v_1^2 + 529 - 184v_1 + 16v_1^2$

$20v_1^2 - 184v_1' + 420 = 0$

$v_1' = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

physics. 5. Jan. 2020

Exell



$$\Sigma p = \Sigma p'$$

$$m_1 v_1 + m_2 v_2 = (m_1 + m_2) v'$$

$$\frac{10}{1000} \times 100 + 1 \times \text{zero} = (1 + 0.01) v'$$

$$1 = 1.01 v'$$

$$v' = \frac{1}{1.01} = 0.99 \text{ m/s}$$

At 2 - 3

$$K_i + U_{gi} = K_f + U_{gf}$$

$$\frac{1}{2}\cancel{(m_1+m_2)}v^2 = \cancel{(m_1+m_2)}g\,h_{max}$$

$$\frac{1}{2} \cdot (0.99)^2 = 10\, h_{max}$$

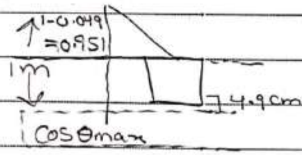
$$\frac{0.49}{10} = \frac{10}{10} h_{max}$$

$$h_{max} = 0.049 \text{ m} \approx 4.9 \text{ cm}$$

$$\frac{1 - 0.049}{1} = 0.951$$

$$\cos^{-1}(0.951)$$

$$\theta = 18^\circ$$



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