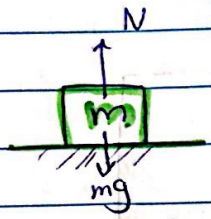
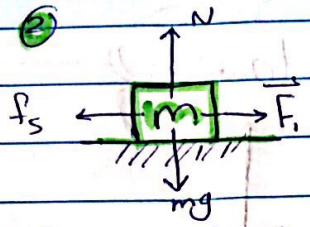
Chapter 6

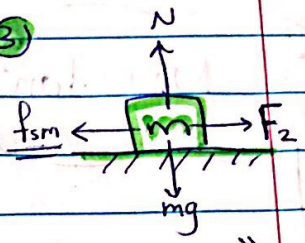
Force & motion II

1) 

"no motion, no friction"

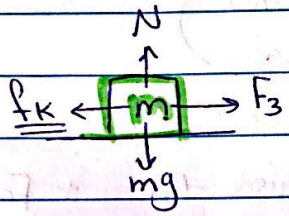
2) 

"no motion"
$f_s = F_1$

3) 

"about to" move

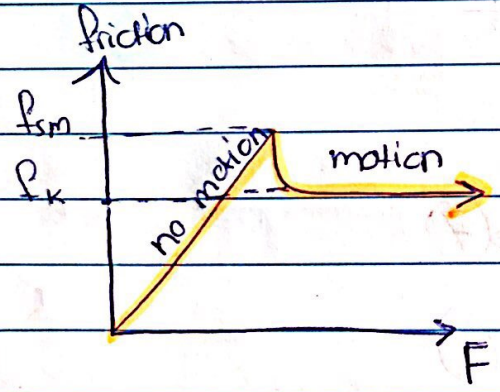
Friction Force

4) 

"there is motion"

معامل الاحتكاك الستاتيكي ⟹ $f_{sm} = \mu_s N$, μ_s = Coefficient of static friction.

معامل الاحتكاك الحركي ⟹ $f_K = \mu_K N$, μ_K = Coefficient of kinatic friction.



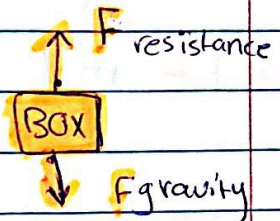
$\mu_s > \mu_K$

* لا وحدة لمعامل الاحتكاك

→ The drag force and terminal speed :-

Drag force "a force from fluid medium"
"causes the velocity"

$$D = \frac{1}{2} C \rho A v^2$$



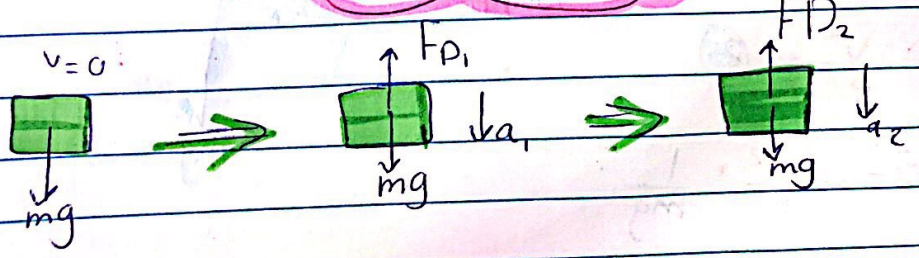
- D: drag force
- C: The medium resistance
- A: effective cross-section area of the body (m)
- V: velocity (m/s)
- ρ: medium density (air)

ground

* If $D = mg \Rightarrow a = 0 \Rightarrow$ the body falls at a constant speed called "Terminal Speed".

$$V_{terminal} = \sqrt{\frac{2mg}{C \rho A}}$$

$$\Rightarrow 0 < C < 1$$



$a_1 > a_2$

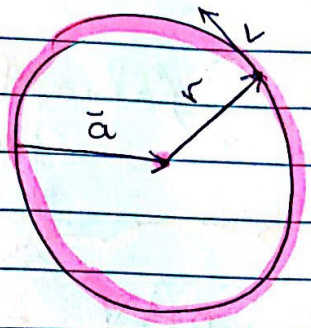
* السرعة تزداد التسارع يقل

* Uniform circular motion:-

$\rightarrow V = \frac{2\pi r}{T}$

$\rightarrow a = \frac{V^2}{r}$

$\rightarrow F = \frac{mV^2}{r}$



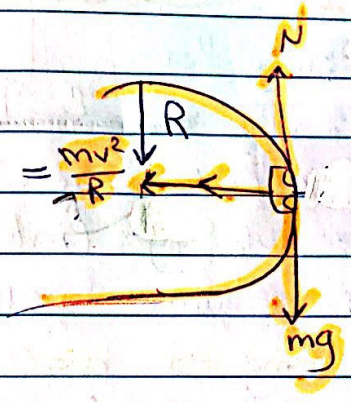
* Cars in flat turn:-

$\frac{mV^2}{R} = \mu_s N$

$\frac{mV^2}{R} = \mu_s mg$

$V = \sqrt{\mu_s Rg}$

$F_{sm} = \frac{mv^2}{R}$



* Cars in abanked circular turn:-

$\Sigma F_y = 0$

$\Rightarrow N\cos\theta - mg = 0$ ---(1)

$\Sigma F_x = ma$

$\Rightarrow N\sin\theta = \frac{mV^2}{R}$ ---(2)

$\frac{(2)}{(1)} \Rightarrow \tan\theta = \frac{mv^2}{R} \times \frac{1}{mg}$

$\tan\theta = \frac{V^2}{Rg}$

$V_{max} = \sqrt{Rg\tan\theta}$