PHYSICS MID TERM FORMULAS

CONVERSIONS : 1 km/hr is 5/18 meters per second exactly
1 km is 1000 meters, 1 hr is 3600 seconds
1 meter/second is 2.236936292054402 miles/hour
1 mph = 0.44704 m/s

General Equations of motion (for constant acceleration)

$D=\frac{(V_i+V_f)\,T}{2}$ $\qquad V_f=V_i+A\,T$

$D = V_iT + 1/2\,A\,T^2$

$V_f^2 = V_i^2 + 2\,A\,D$

g=A=9.81 m/s/s

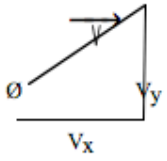
For Projectiles/Vectors: $T_x=T_y$, $A_x = 0$, usually, so

Pythogarean: $(\overrightarrow{V})^2= V_x^2 + V_y^2$

$V_x= \overrightarrow{V}\cos(Ø)$

$V_y= \overrightarrow{V}\sin(Ø)$

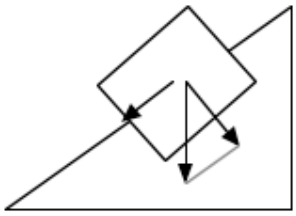
$Ø= \tan^{-1}(V_y/V_x)$



X	Y
$D_x = V_{ix}T$	$D_y = V_{iy}T + 1/2\,A_y\,T^2$
$D_x = \overrightarrow{V}\cos(Ø)\,T$	$D_y = \overrightarrow{V}\sin(Ø)T + 1/2\,A_y\,T^2$
	$V_{fy}^2 = V_{iy}^2 + 2\,A_y\,D_y$
	$V_{fy}=V_{iy} + A_y\,T$

V_{fy} at top = zero, $T=1/2T_f$ if $D_y=0$ (up then down

F(net) =Sum all forces on object F(net) could be
F(net) =Tension-Weight, or F(net) =Pull-Friction, or F(net) =Parallel Force-Pull-friction, etc....
NL I: Inertia
NL II F(net)=mA
W=mg
NL III F1 = F2



Force(Friction)= μF(Normal)
μ = Ff/FN where μ is the coefficient of friction between two surfaces.
ON RAMP:
Perpendicular Force=Wcosø
Sliding Force= Parallel Force=Wsinø

MIDTERM REVIEW ANSWERS

EXAMPLE WORD PROBLEMS: PRACTICE DRAWING PICTURES AND LISTING VARIABLES!!!!

Police find skid marks of 50 meters on a road from a car that has a maximum deacceleration of -40 m/s2. Was the car exceeding the 20 m/s speed limit?
How long did it take the car to stop?

D=50
A=-40
Vf=0
Vi=???, T=???
$Vf^2 = Vi^2 + 2\ A\ D$
Vi = sqrt(2 40 * 50)*
Vi= 63.2 m/s yes,
Vf=Vi+AT T= 63.2/40 T=1.58 sec

If an object is dropped from a tower and it hits the river 20 seconds later, how high is the tower?
Vi=0, T=20, A=-9.8
$D = ViT + ½\ A\ T^2$
$D=0-4.9 * (20)^2$
D=1960 m

If a diver dives off of a platform that is 20 meters above the pool with an upwards velocity of 0.5 meters per second, what is the final velocity of the diver as he hits the water, and how long till he hits the water?
Vi = +0.5 , A= - 9.8 , D= -20
$Vf^2 = Vi^2 + 2\ A\ D$
$Vf = sqrt\ (.5^2 – 2\ * -9.8\ * -20\ )$
Vf=-19.8 m/s ,

Vf=Vi+AT T= (-19.8 - .5)/-9.8 /40 , T=2.072 sec

A 4500 kg car is traveling along a surface with the coefficient of friction of 0.4 at a speed of 54 m/s . He sees the light and slams on his brakes, locking the tires and skids to a halt.... What is the distance he travels before he halts?
m=4500
*W=mg= 4500*9.8=44100 N*
FN=W=44100
Ff= .4 (44100)= 17640 N
Fnet=Fp-Ff = Ff = 17640 N
Fnet=ma
17640 = 4500 a
a= -3.92

Vi= 54
Vf=0
$Vf^2=Vi^2 + 2 A D$
$0= 54^2 +2 * -3.92 * D$
D=2916/7.84 = 371.94 m
D=371.94 m

An arrow is shot in the air with a velocity of 61 meters per second at an angle of 20 degrees. How high will the arrow go?
Dy=22.2 m
Vx = 61 cos 20 =57.32
Dx=VxT

Viy=61sin20=20.86
A=-9.8
At top Vfy=0
Vfy=Viy+AyT
*0 = 20.86 -9.8*T*
T=2.13 sec

$Vf^2=Vi^2 + 2 A D$
$0= 20.86^2 +2 * -9.8 * D$
D=435.27/19.6 = 22.2 m

A truck is stopped at a stoplight. When the light turns green, it accelerates at 2 m/s 2 . At the same instant, a car passes the truck going 30 m/s. Where and when does the truck catch up with the car? draw the accuarate distance time and velocity time graph
Truck, vi=0, A = 2
$D=ViT+1/2 A T^2$
$D= ½*2*T^2$

Car, A=0, Vi=30
D=30T

So car=truck
$30T=1T^2$
*T=30, D=30*30=900m*
T=30 sec, D=900 m

What is the mass of a brick that I need 800 Newtons of force to lift upwards and accelerate at 2 m/s/s ?
Fnet=mA=Fup-W
ma=Fup-mg
m(2)=800-m(9,8)
m(11.8)=800

m=800/11.8=67.8 kg

A 50 Kg block sits on a 45 degree ramp and starts sliding down. If the ramp has a coefficient of friction of .5, what acceleration does the block have as it slides down the ramp?

M=50
*W=50*9.8=490*
FN=490cos45=346.48 N
Ff= .5 (346.48) =173.24 N
Fp=490sin45=346.48 N
Fnet=Fp-Ff = 346.38 -173.24=173.24 N
Fnet=ma
173.24 = 50 a
A=3.465 m/s2