Physics 121

**Trig**

sin θ = o/h

cos θ = a/h

tan θ = o/a

area = πr2 (circle)

**Kinematics**

v = Δx/Δt

a = Δv/Δt

Δx = vot + ½ at2

vf2 = vo2 + 2aΔx

g = 9.8 m/s2

**Dynamics**

Fnet = ma

Fg = Gm1m2/r2

Fg = mg (near surface of earth)

fk = μk FN

fs < μs FN

ac = v2/r

**Work and Energy**

W = Fd cos θ

KE = ½ m v2

Wnet = ΔKE

Wnc = ΔKE + ΔPE

PE = mgh

**Impulse and Momentum**

Impulse = F t = Δp

p = mv

m1v1 + m2v2 = (m1+m2)vf (Inelastic)

Vcm = Σmivi/Σmi

**Elastic Collisions**

1) Find Vcm

2) Subtract Vcm from each velocity

3) Change sign of each velocity

4) Add Vcm to each velocity

**Springs**

F = -kΔx

PE = ½ k Δx2

**Rotations**

Rolling without slipping

x = θr

v = ωr

a = αr

**Rotations (cont.)**

Δθ = ωot + ½ αt2

ωf2 = ωo2 + 2αΔθ

ω = Δθ/Δt

α = Δω/Δt

KE = 1/2Iω2

τnet = I α

τ = f r sinθ

I = mr2

l = Iω (Angular momentum)

**Simple Harmonic Motion**

x(t) = A cos(ωt)

x(t) = A sin(ωt)

ω = √k/m (mass and spring)

ω = √g/L (pendulum)

T = 2π/ω

**Waves & Sound**

ω = 2πf

v = f λ

l2 – l2 = m λ (Constructive)

l2 – l2 = (m+ ½) λ (Destructive)

λn = 2L/n (string)

λn = 4L/n (Pipe open 1 end)

λn = 2L/n (Pipe open both ends)

**v =** √(T/(m/L))

fo = fs [(1 +/- vo/v)/(1 +/- vs/v)] (Doppler)

B = 10 log10 (I/Io)

**Fluids**

ρ = m/V

P = F/A

FB = ρfVdis f g

P2-P1 = ρgh

Q=v1A1=v2A2

P1+1/2ρv12+ρgy1= P2+1/2ρv22+ρgy2

**Expansion**

ΔL = αLoΔT

ΔV= βVΔT

**Heat**

oC = (oF – 32)5/9

Q=mcΔT

Q=mL

# Heat Transfer

Q= (k A ΔT)t/L

Q= eσT4At

# Thermodynamics

ΔU = Q – W

W = P ΔV (Isobaric)

e = W/QH = 1- QC/QH

e carnot= 1- TC/TH