examnotes

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1 Orbits

Angular velocity: W = $\frac{\Delta\theta}{t}$
Angular acceleration a = $\frac{\Delta w}{\Delta T}$
W = $\frac{2\pi}{t}$
W in units rad/sec
Centripetal acceleration (towards the center)
Gravity is responsible for centripetal acceleration
Centripetal acceleration: a = $\frac{v^2}{r} = w^2 * r$
Tangential speed v = w $\times r$
"Centripetal force" Fe = $\frac{m \times v^2}{r}$
Period of orbit w = $\frac{2\pi}{T}$
Launch velocity for circular orbit:

$$v = \sqrt{aR}$$

Launch velocity for escape:

$$v = \sqrt{\frac{2MG}{r}}$$

2 Forces

Tangetial speed: v = wr
$F_g = \frac{mMG}{r^2}$
$F_g = \frac{mv^2}{r}$ when a is centripetal acceleration
PE = $\frac{-mMG}{r}$(not on Earth Surface)
PE = mgh$(on Earth Surface)$
KE = $\frac{-PE}{2}$
KE = $\frac{mMG}{2r}$
The escape velocity of an object from the surface of the Earth when KE=-PE
a = $\frac{MG}{r^2}$
$\frac{1}{2}mv^2 = \frac{mMG}{r}$

3 Spring

$F_{spring} = -kx$

4 Electrostatics

Charges are align if stacked. Charge alternate if line up.

Gauss's Law

$$E * A = \frac{Q_{enclosed}}{E_0}$$

Force: Newton
Field(E): Newton/Coulumb
Potential Enery(PE): Joule
Potential(Voltage): Joule/Coulumb(Volt)
E=Sigma$\frac{}{A}$
With infinite charge plate:

$$E = \frac{Sigma}{E_0 * 2}$$

With 2 plates: E=Sigma$\frac{}{E_0}$
Separation between two points:

$$E = \frac{-\Delta v}{\Delta x}$$

Force of electric field on a charge:

$$F = Eq$$

Change in PE:

$$PE = Vq$$

Power = $\frac{\Delta energy}{time}$
$F_B = q_v B$
$q_v B = qE$
I =$\frac{Q}{T}$

How capacitor functions as a battery: There is electric field in the capacitor so it can push charge to create current.

The voltage in the capacitor will focus on the resistor, which will cause current flow.

Displacement current.

How parallel wires in opposite directions can define the Ampere:

Both Is are the same because they do not need to consider direction since they are in opposite directions. Therefore, the directions of the $F_B areoppositeandthetwowiresattract.$

Charge moves straight through a capacitor when $F_E = F_B$

Electrostatics charge:
$F_(e) = \frac{q.Q.K_e}{r^(2)}$
$E = \frac{QK_e}{r^2}$
$PE = \frac{qQK_e}{r}$
$V = \frac{QK_e}{r}$

5 Circuit

V = IR
E = -$\Delta V \overline{\Delta inx}$
C = Q$\overline{V}$
I = $\Delta Q \overline{\Delta t}$
P = IV
Series: Req = R1 + R2

6 Torques

$\tau = rFsin\Delta\theta$r=m
I= moment of inertia = sum (mr^2)(kgm^2)
for disk I=$\frac{MR^2}{2}$

7 Thermodynamics

Monatomic: KE =$\frac{3}{2}$K$_B T$
Diatomic: KE =$\frac{5}{2}$ K$_B T$
U = mCT
$\Delta v = mc\Delta T$
$\Delta U = mC_p\Delta T$
$\Delta U = mL$
L=C$_p\Delta T$
PV=nRT
n= of mols

8 Magnetism

$F_B = gvB$
$\frac{m}{g} = \frac{rB}{V}$