pico	1×10^{-12}	p	tera	1×10^{12}	T
nano	10^{-9}	n	giga	10^{9}	G
micro	10^{-6}	μ	mega	10^{6}	M
milli	10^{-3}	m	kilo	10^{3}	k
centi	10^{-2}	c	hecto	10^{2}	h
deci	10^{-1}	d	deka	10^{1}	da

Gabe Staples

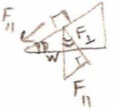
independent variable = manipulated

X-axis

dependent - changes as result of independent

y-axis

Ch. 6 Inclined Plane



Newton's Laws
1) outside force causes change (at rest stays at rest)
2) $F = ma$, $\boxed{a = \frac{F}{m}}$
3) every action has an equal + opposite reaction, $N = 1\,kg\,m/s^2$

derived units — combinations of fundamental units

* Position-Time Graphs
y X (X) $v = \frac{d}{t}$

slope = average velocity $= \frac{\Delta d}{\Delta t}$

instantaneous velocity = slope of like tangent to curve

* Velocity-Time Graphs (y = velocity, x = time)

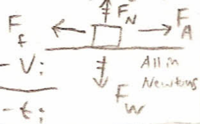
slope = acceleration

area under = displacement

$F = ma$

$W = mg$

$F_f = \mu F_N$ $\quad F_{net} = F_{applied} + F_f$



average acceleration $\bar{a} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$

$v_f = v_i + at$ — — — v_i, a, t, v_f

$\boxed{\mu = \frac{F_f}{F_N}}$

Displacement During Constant Acceleration

Average Velocity $\bar{v} = \frac{1}{2}(v_f + v_i)$ — — v_i, v_f

(y) d when v + t are known $d = \frac{1}{2}(v_f + v_i)t$ — — v_i, d, t, v_f

(y) d when a + t are known $d = v_i t + \frac{1}{2}at^2$ — — v_i, a, d, t

(y) d when v + a are known $v_f^2 = v_i^2 + 2ad$ — — v_i, a, d, v_f

Quadratic Relationship $y = kx^2$

inverse $y = kx^{-1}$

linear $y = mx + b$

g = gravity: $-9.80\ m/s^2$ $\quad v = \frac{d}{t}$ — — v, d, t

$a^2 + b^2 = c^2$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$ax^2 + bx + c = 0$

Force Between 2 bodies

$$F = G\frac{m_1 m_2}{d^2}$$

$$\left(\frac{T_a}{T_b}\right)^2 = \left(\frac{r_a}{r_b}\right)^3$$ ← Kepler's 3rd Law

T = revolution

r = radii

Velocity of orbiting satellite *

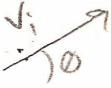
$$V = \sqrt{\frac{GM_E}{r}}$$

$G = 6.67 \times 10^{-11}\ Nm^2/kg^2$

period of each revolution *

$$T = 2\pi\sqrt{\frac{r^3}{GM_E}}$$

r = avg. orbital radius



$F = ma$

$W = Fd$

$V_x = V_i \cos\theta$

$V_{iy} = V_i \sin\theta$

orbit: any given time area is equal Kepler's 2nd Law

Ch. 5 4 kinds of force

1) gravitational
2) electromagnetic
3) strong nuclear
4) weak - radioactive decay

Period of pendulum of length l

$T = 2\pi\sqrt{l/|g|}$

frequency $f = 1/T$

Kepler's 1st Law

eliptical orbit planet orbit

Tycho Brahe → Kepler ← Newton

* Momentum, $p = mv$ Einstein impulse

* Impulse - Momentum Theorem $\underbrace{F\Delta t}_{J} = \Delta p$

closed, isolated system - no objects enter or leave, & no external forces influence it.

Closed - no objects enter or leave, can have ext. forces

inelastic collision - "stick" lose some E to heat

elastic - conserves all KE

$KE = \frac{1}{2}mv^2$ $\quad v = \sqrt{\frac{2KE}{m}}$ $\quad \therefore W_{net} = \Delta KE$

$KE = mad$

$PE = mgh$

$E = KE + PE$

$Q = mH_f$ $Q = mH_v$

	H_f (J/kg) fusion	H_v (J/kg) vaporization
copper	2.05×10^5	5.07×10^6
gold	6.30×10^4	1.64×10^6
iron	2.66×10^5	6.29×10^6
lead	2.04×10^4	8.64×10^5
mercury	1.15×10^4	2.72×10^5
methanol	1.09×10^5	8.78×10^5
silver	1.04×10^4	2.36×10^6
water (ice)	3.34×10^5	2.26×10^6

Thermal E = sum of PE + KE

Temperature - measures avg. KE

thermometer ↑

- absolute 0 = 0 Kelvins

°C → K K = °C + 273.15

K → °C °C = K - 273.15

- specific heat - J req. to raise one kg one Kelvin
  ↳ units of J / kg·K → = C

Q = heat $\boxed{Q = mC\Delta T}$ heat = E flow from high temp. to low temp.

calorimeter - measures temp change

$$T_f = \frac{m_A C_A T_{Ai} + m_B C_B T_{Bi}}{m_A C_A + m_B C_B}$$

α gives off ^4_2He

B N → p⁺ gives off $^0_{-1}e + ^0_0\bar{v}$

γ pure E wave

Bohr Model : electromagnetism doesn't exist in an atom, no E loss w/acceleration

Adhesion - capillary motion - attraction to diff substance

Cohesion - surface tension

α & B = units $(°C)^{-1}$

Length of solid at temp T $L = L_i + \alpha L_i (T - T_i)$

amorphous solids - butter, glass $\Delta L = \alpha L_i \Delta T$

liquid water expands above 4°C ; 0° - 4° it contracts when heated

entropy - disorder by adding E

2nd Law of Thermodynamics

1st Law : sum of W done & heat added = increase in Thermal E

Pressure $P = \frac{F}{A} = N/m^2$ or $\frac{kg}{m \cdot s^2}$

Pascal's principle : pressure applied on fluid is equally dispersed

$P = \rho hg$ (ρ: density) $P = \frac{W}{A}$ $W = \rho V g$

Archemedes Principle : buoyed up by weight of fluid dispersed

Bernoulli's principle : fluid in motion = lower pressure