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

independant variable = manipulated

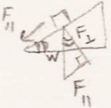
X-axis

dependent - changes as result of independent

y-axis

Gabe Staples

Ch. 6 Inclined Plane



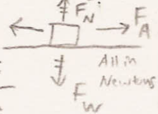
derived units — combinations of fundamental units

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, $N = 1\,kg\,m/s^2$



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

$W = mg$

average acceleration $\bar{a} = \frac{\Delta V}{\Delta t} = \frac{V_f - V_i}{t_f - t_i}$

*

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

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

instantaneous velocity = slope of line tangent to curve

$V_f = v_i + at$ - - - - - v_i, a, t, v_f

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

Displacement During Constant Acceleration

* Velocity-Time Graphs (y, x)

slope = acceleration

area under = displacement

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 $y = kx^{-1}$

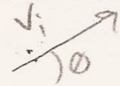
linear $y = mx + b$

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

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

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

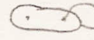
$ax^2 + bx + c = 0$



$V_x = V_i \cos\theta$

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

$F = ma$
$W = Fd$

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

Force Between 2 bodies

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

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


inelastic collision - "stick" lose some E to heat
elastic - conserves all KE

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

T = revolution

r = radii

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

$PE = mgh$

Ch. 5 4 kinds of force $\quad E = KE + PE$

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

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

Period of pendulum of length l

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

frequency $f = l/T$

$Q = mH_f$ $\quad Q = mH_v$

	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 $\quad K = °C + 273.15$

K → °C $\quad °C = K - 273.15$

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

Q = heat $\quad \boxed{Q = mC\Delta T}$ $\quad$ 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 ${}^4_2He$

β 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

entropy - disorder by adding E

2nd Law of Thermodynamics

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

Adhesion - capillary motion - attraction to diff substance

Cohesion - surface tension

α & β = units $(°C)^{-1}$

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

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

$\Delta L = \alpha L_i \Delta T$

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

amorphous solids - butter, glass

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

density
$P = \rho h g$ $\quad P = \frac{W}{A}$ $\quad W = \rho V g$

Archemedes Principle: buoyed up by weight of fluid dispersed

Bernoulli's principle: fluid in motion = lower pressure