

PHYSICS REVISION BOOKLET



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1 GENERAL PHYSICS

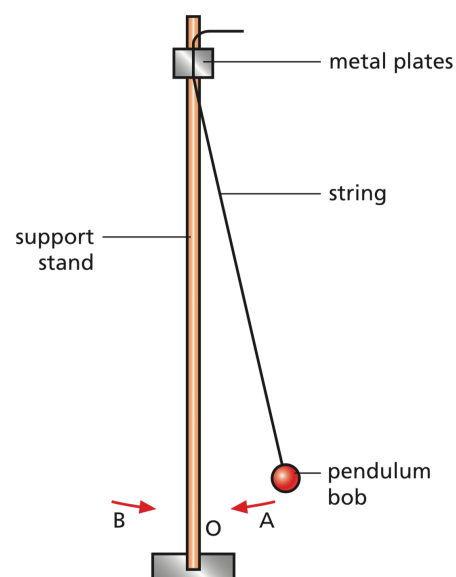
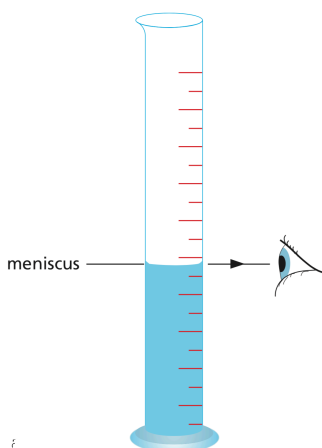
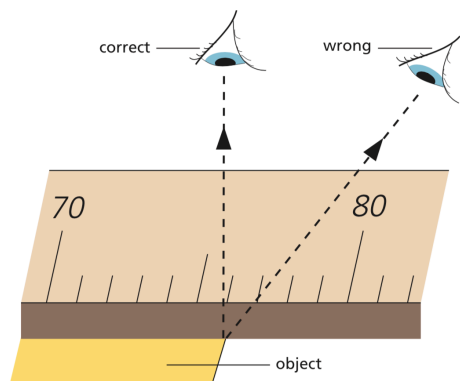
LENGTH AND TIME

1A

INTRODUCTION

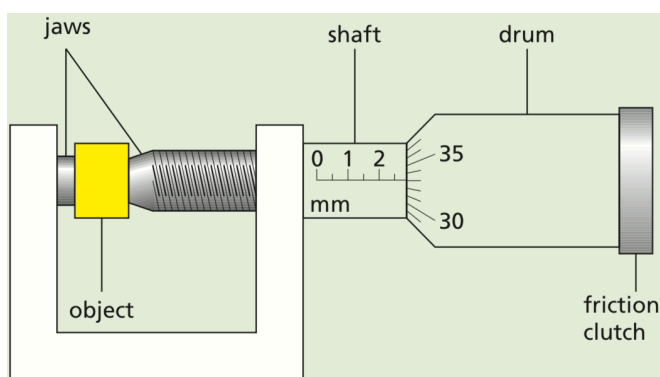
Numbers are important empirical evidence. Units qualify what these numbers represent.

INSTRUMENTS



stopwatch is flawed by reaction time (0.2s)

better: a light-beam stopwatch, or average (e.g. 20 oscillations)



UNITS

speed — scalar

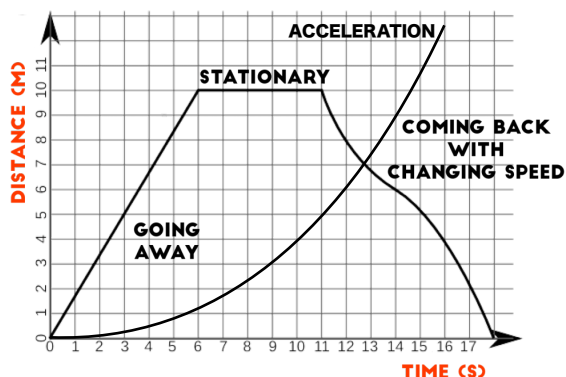
velocity — vector

FORMULAS

$$v = \frac{s}{t} \quad \text{speed} = \frac{\text{distance}}{\text{time}}$$

$$a = \frac{(v - u)}{t} \quad \text{acceleration} = \frac{(\text{initial velocity}) - (\text{final velocity})}{\text{time}}$$

SKILLS



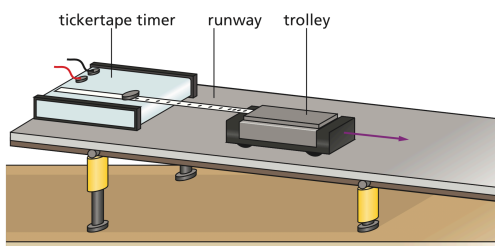
distance-time graph

$$\text{slope} = \frac{dy}{dx} = \frac{\text{distance}}{\text{time}} = \text{speed}$$

velocity-time graph

straight line = acceleration

EXPERIMENT



Timer punches dots 50 times/s

Every five dot in a group

Measured length of each group

FALLING OBJECTS

10 m/s^2

Terminal Velocity = max. acceleration (resistance = weight)
= 180 kph (usually)

MASS AND WEIGHT

1C

VOCABULARY

Mass — (kg) — how much “stuff” there is

Weight — (N) — how much gravity is pulling on that “stuff”

FORMULAS

$$W = mg \quad \text{weight} = \text{mass} \times \text{gravitational field strength}$$

DATA

g = gravitational field strength = $9.81 \text{ N/kg} \approx 10 \text{ N/kg}$ (smaller moon)

TECHNIQUE

Balance vs. Spring Balance

DENSITY

1D

DEFINITION

“How dense something is”

UNITS

ρ — (g/cm^3 or kg/m^3) density

EXAMPLES

Convection currents

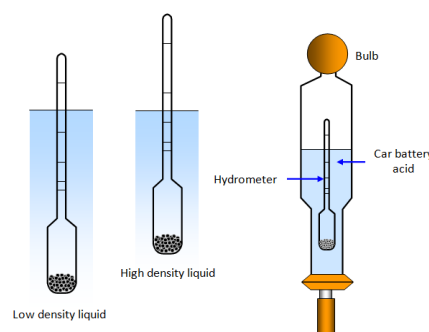
FORMULAS

$$\rho = \frac{m}{v} \quad \text{density} = \frac{\text{mass}}{\text{volume}}$$

TECHNIQUE

Hydrometer measures the density of a liquid

Density of solid can be found by dividing its mass by the rise of water in a measuring cylinder



DEFINITION

Force — (N) — Energy of movement

Change speed, direction, or shape of an object

Friction — a force that impedes motion & results in heating

e.g. air resistance

Can be wanted / unwanted (e.g. screeching tires vs breaks)

Centripetal force — always towards the center of circle

e.g. tension in string

EQUATIONS

$F = kx$ *force = spring constant $\times$ extension of spring*

(Hooke's Law)

$F = ma$ *Force = mass $\times$ acceleration*

1 Newton is defined as “the force to accelerate 1 kg @ 1m/s²”

moment = Fd moment = product force $\times$ perpendicular distance

ELECTROSTATIC FORCES

Forces between charges (e.g. electrons)

ADDING FORCES

Resultant force = Force 1 + Force 2 ...

Negative if force in opposite direction

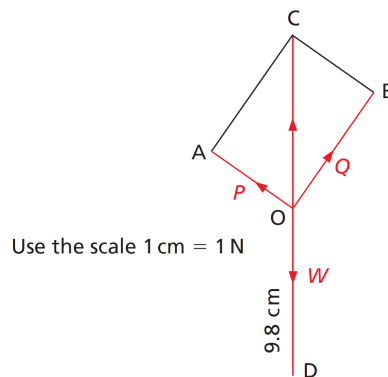
Resultant force = 0, then object unaffected

(balanced forces)

acceleration is 0; speed is constant

Forces always act in pairs (opposites)

Resulting force for non-perpendicular and non-parallel found by graphs



HOOKE'S LAW

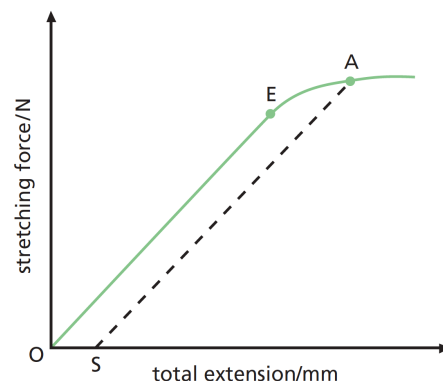
Stretching a wire/spring = partially linear force/extension graph

Proportional Behavior — extension is proportion to load

Elastic Behavior — spring restores when load dropped

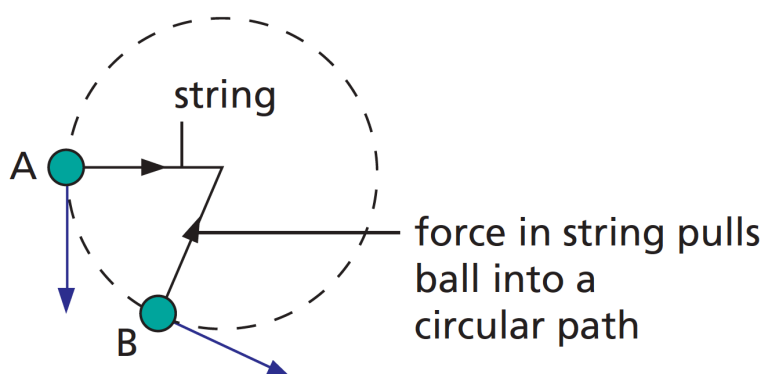
Material stretch until they reach the Limit of Proportionality

May break after this point (a.k.a. elastic limit)



CURVED MOVEMENT

Moving in a circle = direction always changing = always a force



MOMENT

Moment — (Nm) — sum of turning effect

Principle of Moments

If (Total clockwise moment = Total counterclockwise moment):

Balanced (“in equilibrium”)

CENTER OF MASS

The assumed point where all mass of an object concentrates at

Geometric center of simple shapes

Hanging mass to identify lines of mass symmetry

If (center of mass → weight passes through its base):

Stable Equilibrium (won't fall)

MOMENTUM

1F

DEFINITION

Momentum — kg m/s — quantity of a moving object's motion

Impulse — Ft — change in momentum

FORMULAS

$$F = ma \quad \text{force} = \text{mass} \times \text{acceleration}$$

$$p = mv \quad \text{momentum} = \text{mass} \times \text{velocity}$$

$$F = \frac{m(v - u)}{t} \quad \text{Force} = \frac{\text{mass}(\text{final velocity} - \text{initial velocity})}{\text{time}}$$


$$\begin{aligned} F &= ma \\ a &= v / t \\ F &= m(v / t) \\ Ft &= mv \end{aligned}$$

APPLICATION

Since $Ft = m(v-u)$, we can manipulate the force by changing the time.

e.g. seat belts increase t , so for any given collision, F is smaller

e.g. batters “follow through”, so for any F , momentum increases



TYPES OF ENERGY

Kinetic — movement

Internal (heat) — vibrating particles

Electrical — moving charge

Light — visible light

Sound — vibrating longitudinal waves

Gravitational Potential — earth's attraction

Chemical — molecular energy

Elastic — stretched rubber bands or other material

Nuclear — atoms

EQUATION

$$\text{kinetic energy} = \frac{1}{2}mv^2$$

$$\text{gravitational potential energy} = mgh$$

$$\text{efficiency} = \frac{\text{power out (useful)}}{\text{power in}}$$

$$W = Fd \quad \text{Work done} = \text{force} \times \text{distance}$$

$$P = \frac{E}{t} \quad \text{Power} = \frac{\text{energy}}{\text{time}}$$

ENERGY TRANSFER

Energy transferred by forces, electrical currents, heating, & waves

Such transfers are never 100% efficient — lost: internal energy

Energy always tends to get disputed (spread out)

ENERGY CONSERVATION

“Energy cannot be created or destroyed”

$$\text{i.e. } mgh = \frac{1}{2}mv^2$$

SOURCES OF ENERGY

Chemical (from fuel, esp. fossil fuel — coal, oil, natural gas)

Water (from waves, tides, and altitude)

Geothermal

Nuclear fission

Solar (fusion produces heat & light)

Wind

*Criteria: Renewability; Cost; Reliability; Scale; Environmental

DEFINITION

Pressure — ($\text{Pa} = \text{N/m}^2$) — Force exerted per unit area

EQUATIONS

$$p = \frac{F}{A} \quad \text{pressure} = \frac{\text{force}}{\text{area}}$$

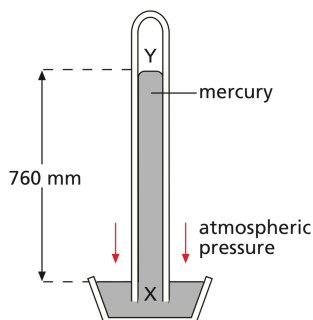
$$p = \rho gh \quad \text{pressure} = \text{density} \times \text{gravity constant} \times \text{height}$$

EXPLANATION

In solids, pressure is by definition the force over pressure.

In fluids particles move randomly & collide w/ each other & walls

APPLICATION



Mercury Barometer

Weight of mercury & atmospheric pressure balances

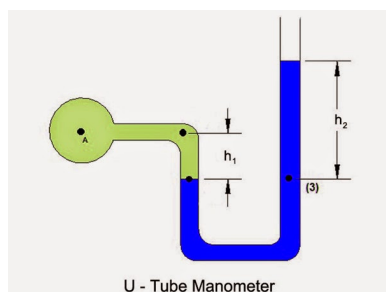
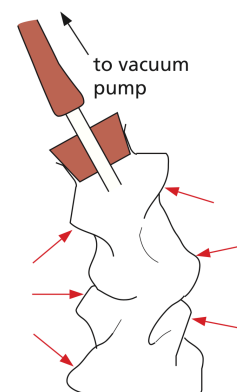
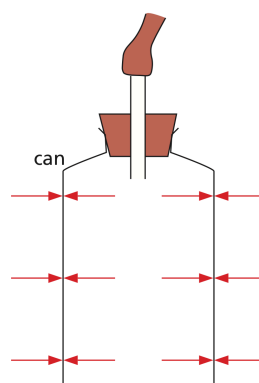
Atmospheric Pressure quoted in inches / mm

1 a.t.p. $\approx$ 760 mm of mercury

Atmospheric pressure $\approx$ 100 kPa

$\approx$ 1 Bar

$\approx$ 1000 mBar



Total Pressure Underwater

= Liquid Pressure + 100 kPa

Manometer - measures air pressure

THERMAL PHYSICS

SIMPLE KINETIC MOLECULAR MODEL

2A

STATES OF MATTER

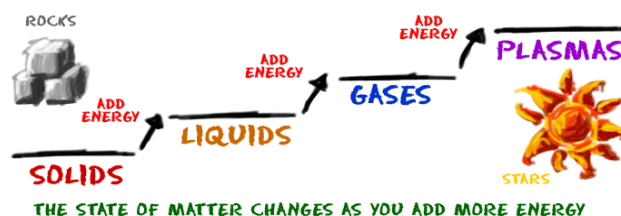
Solid — Fixed volume & shape

Liquid — Fixed volume but shape of container

Gas — Shape and volume of container; compressible

Plasma — V. High temperatures

Atoms — Locked in Solid; Touching
in Liquid; Distant in Gas



KINETIC MOLECULAR THEORY

“Particles are like tiny balls that collide and change direction”

Brownian Motion — Random molecular bombardments (e.g. dust)

BOYLE'S LAW

“At constant temperature, volume $\propto$ 1/pressure”

$$pV = \text{constant} \quad \text{pressure} \times \text{volume} = \text{constant}$$

EVAPORATION

More energetic particles escape from surface → Vapor → Cooling

Faster if: warmer; larger surface area; stronger air flow

*Not boiling unless at fixed boiling point

KELVIN

Absolute zero — theoretical point of no particle motion — 0° Kelvin

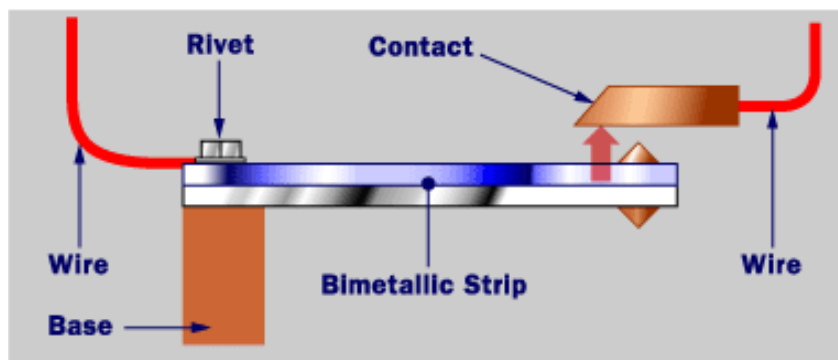
$$^{\circ} \text{Kelvin} = ^{\circ} \text{Celsius} + 273$$

THERMAL EXPANSION

Substances expand when $\uparrow T$ (particles move further apart)

APPLICATIONS

Bimetallic strip — stops heating from time to time



MEASURING TEMPERATURE

Possible Physical Properties:

Volume of Liquid

Length of Solid (in Bimetallic strip)

Pressure of Gas

Calibration = marking two points, 0°C and 100°C

FEATURES OF A THERMOMETER

Sensitivity — produces noticeable change

Range — possible to measure a lot

Linearity — follow a scale

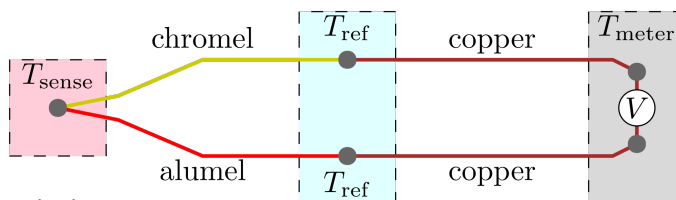
Accuracy — close to true value

THERMOCOUPLE

Read remotely, as it measures electricity

Very small $\rightarrow$ responds quickly

Two wires generate a small e.m.f. $\rightarrow$ Interpreted via table of data



THERMAL CAPACITY

Thermal Capacity = how much heat used to heat up 1kg by 1° C
differs by substance

$$\text{thermal capacity} = mc = \text{mass} \times \text{specific heat capacity}$$

$$\text{Specific heat capacity (J/kgC)} = \frac{\text{energy used (J)}}{\text{mass (kg)}} \times \text{temperature change (C)}$$

$$\text{energy} = mcT \quad \text{energy} = \text{thermal capacity} \times \text{temperature}$$

MEASURING SPECIFIC HEAT CAPACITY

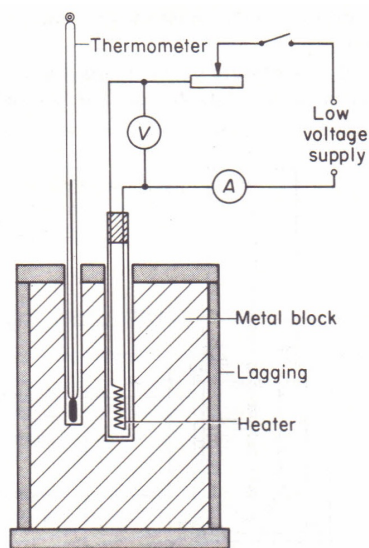


Fig. 42.1. Simple solid block calorimeter

1. Connect to power supply
2. Attach Ammeter & Voltmeter
3. Add thermal insulation
4. Start timer & connect power
5. Thermometer Reading @ timed intervals
6. Stop after reasonable $\uparrow T$ obtained

$$\text{energy} = mL$$

$$\text{energy} = \text{mass} \times \text{latent heat of fusion}$$

Latent heat of fusion = extra energy in 0° C water after melting

WATER

High specific heat capacity

Excellent coolant

Temperature in ocean changes little but holds a lot of energy

INTRODUCTION

Thermal Transfer = Heat tends to spread out

CONDUCTION

Part of medium heated → Particles vibrate more → Passed on

Free electrons in metals → Good conductor of heat

No particles → Vacuum perfect insulator

CONVECTION

Heat → Different densities → Fluids circulate → Energy spreads

RADIATION

No medium needed — works also in a vacuum

e.g. Infrared Radiation (part of the electromagnetic spectrum)

Best emitted and received on dumb black surface

IMPACT ON HEAT ABSORPTION

Color — Black traps more heat

Texture — Rough traps more heat

APPLICATION

Cavity Wall insulation

Loft insulation (fiber to trap air on attic)

Carpets

Draughts — block gaps between door/window and its frame

Double Glazing — windows more effective at heat insulation

PROPERTY OF WAVES

GENERAL WAVE PROPERTIES

3A

→ All waves are moving left-to-right →

Longitudinal Waves

Waves "pile up" left to right

e.g. Sound waves



Transverse Waves

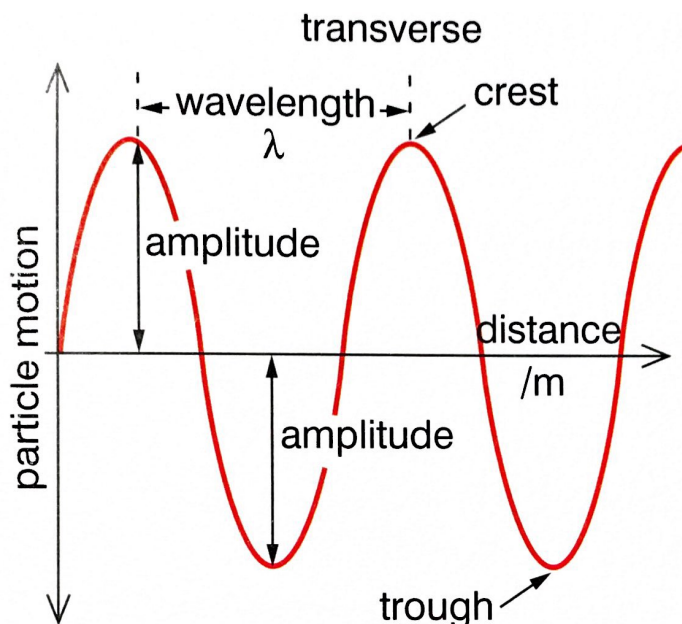
Waves "pile up" up-and-down

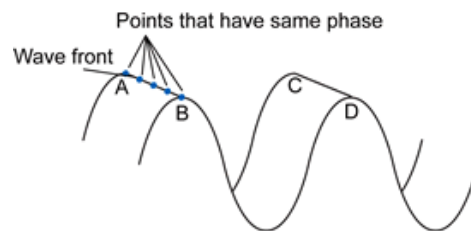
e.g. electromagnetic waves



Rarefaction — Low density part of Longitudinal wave

Compression — High density part of Longitudinal wave





Transfer of Energy

Wavefront

DEFINITIONS

Speed — How fast it travels, depending on substance & medium (m/s)

—> constant in a given medium

Frequency — Number of complete waves that pass per second (Hz)

Wavelength — distance between two adjacent peaks/troughs (m)

Amplitude — maximum particle displacement / half crest-to-trough

EQUATIONS

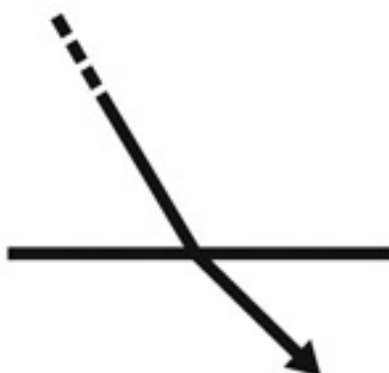
$$v = f \times \lambda$$

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

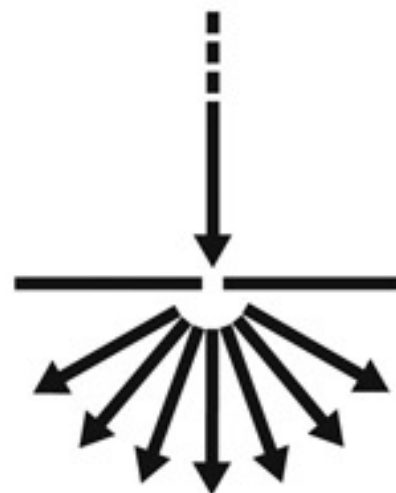
Reflection



Refraction



Diffraction



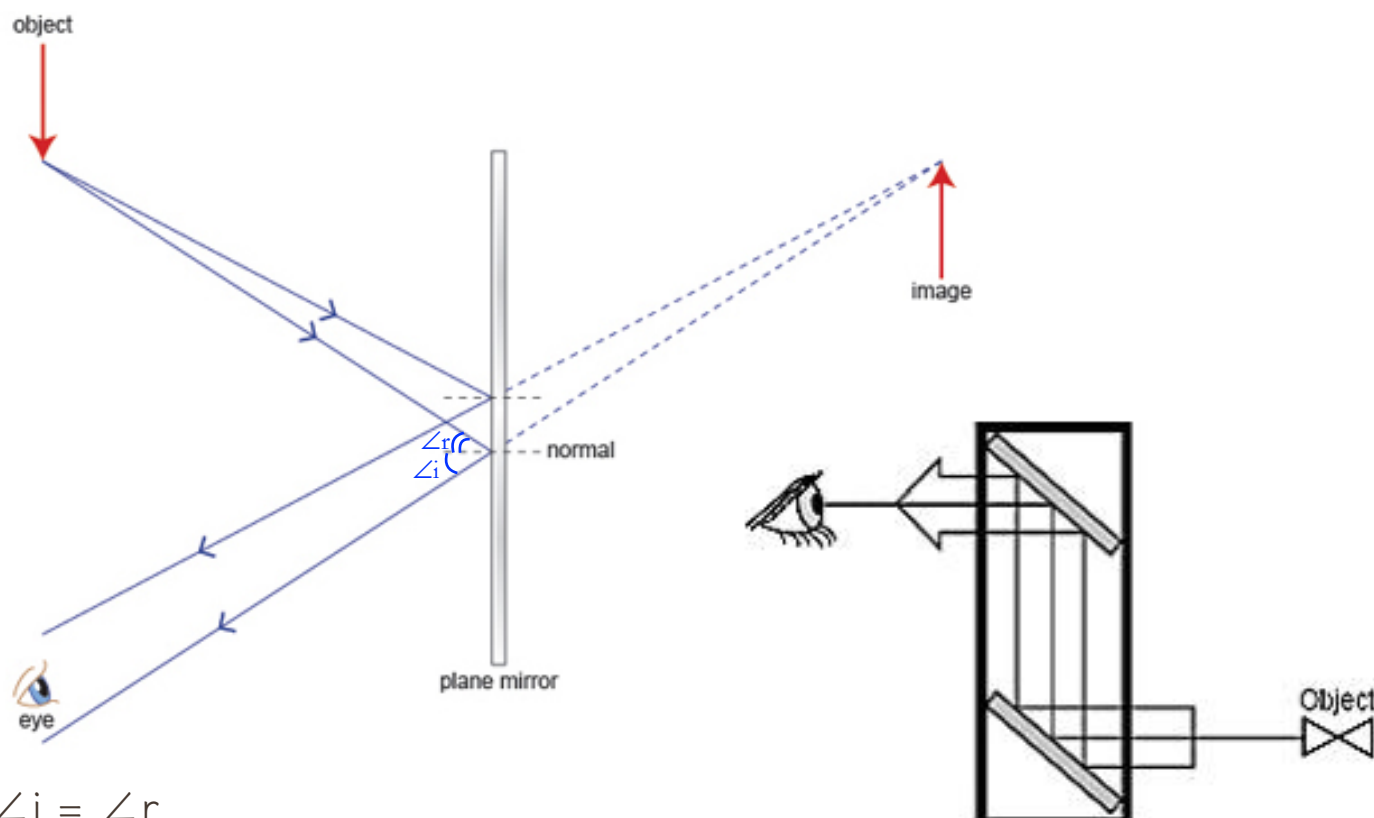
DIFFRACTION

Strongest when gap is close to wavelength

LIGHT

Short wavelength → Diffraction hard to see

Plane Mirror → Laterally inverted (left/right inverted)



$$\angle i = \angle r$$

REAL OR NOT?

Virtual image — cannot be projected onto a screen — e.g. Mirror

REFRACTION

Bending of light

Light slows down upon approaching glass (towards normal)

Refractive index (n) how much a material changes direction of light

$$n = \frac{\sin(i)}{\sin(r)} \quad \text{or} \quad n = \frac{\text{speed of light in vacuum}}{\text{speed of light in medium}}$$

TOTAL INTERNAL REFLECTION

Critical Angle: Limit where refraction not possible ($\angle r = 90^\circ$)

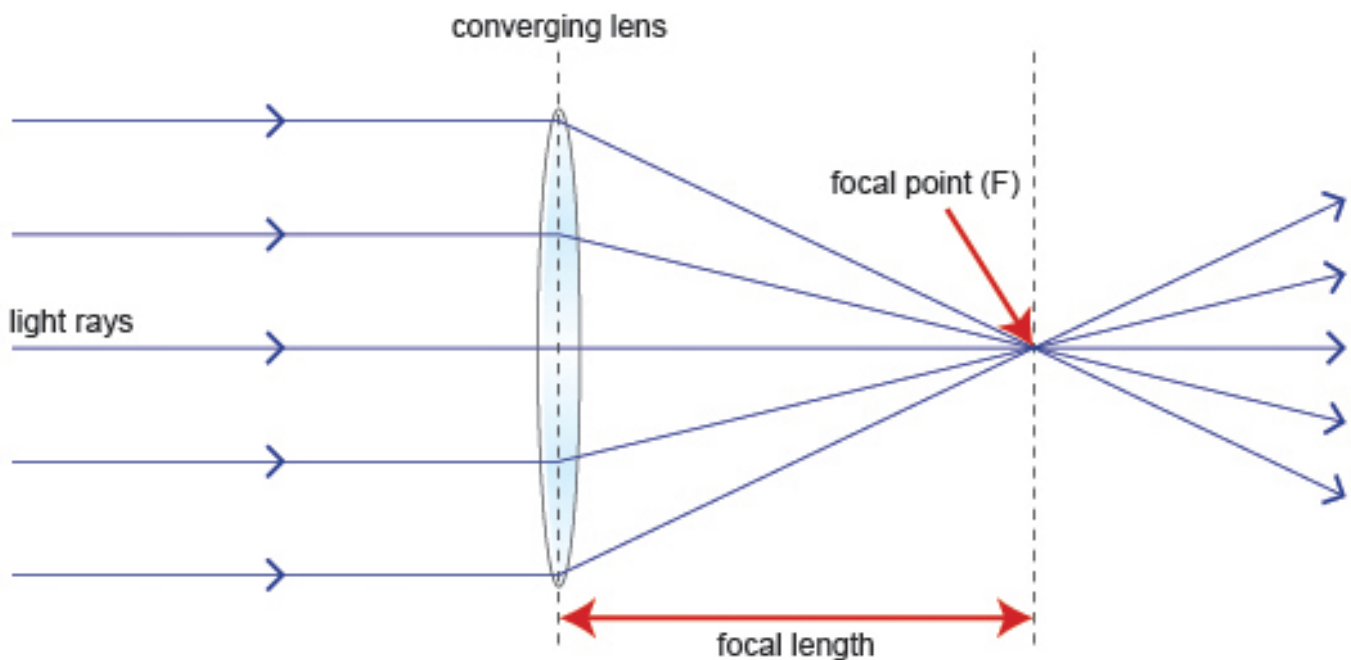
$$n = \frac{1}{\sin(c)} \quad \text{where } c \text{ is the critical angle}$$

CONVERGING LENS

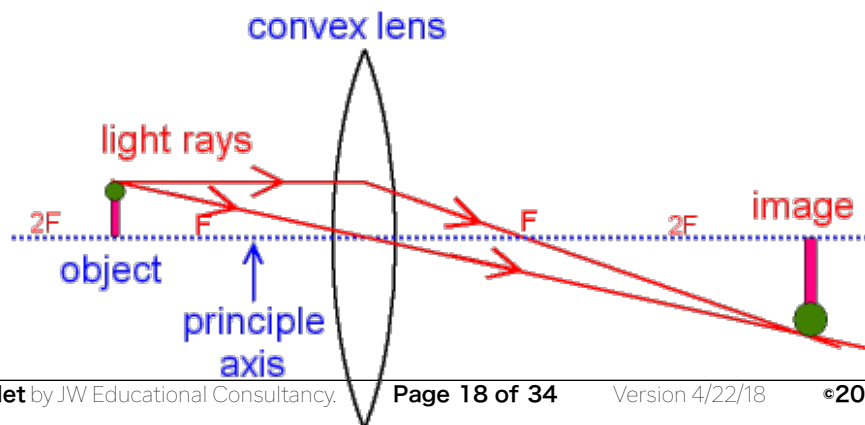
Convex (Converging, Positive) Lens ==> Positive light rays converge

Principle Focus / Focal Point — Where light rays intersect

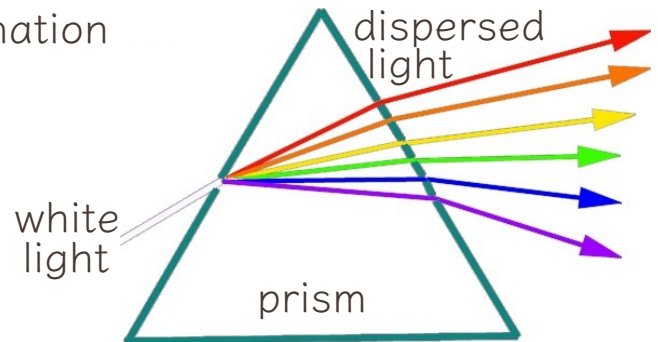
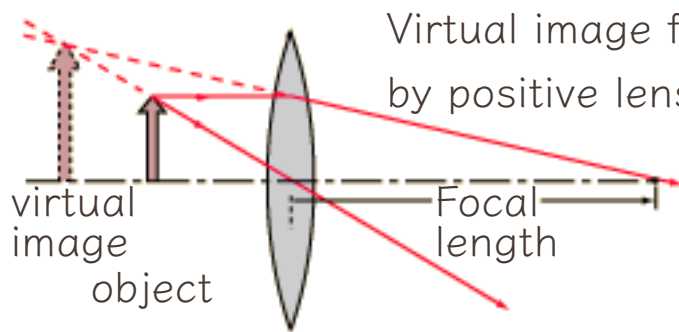
Focal Length — Distance from principle focus to lens



Locating an Image — light ray above will pass through F (focal point)



Virtual Images — Rays do not actually pass; can't project on screen



DISPERSION

Colors separated bcuz refractive index of glass different for colors

“ROY G BIV” — Red, Orange, Yellow, Green, Blue, Indigo, Violet

APPLICATION

Optic Fiber — Light constantly internally reflected

Medical — several thousand optic fibers

Communication — alternating electrical pulses

Single Lens

Magnifying Glass

Electromagnetic Waves

Radio & TC

Satellite & Telephone

Electrical Appliances

Remote Control & Intruder Alarms

Medicine & Security

ELECTROMAGNETIC SPECTRUM

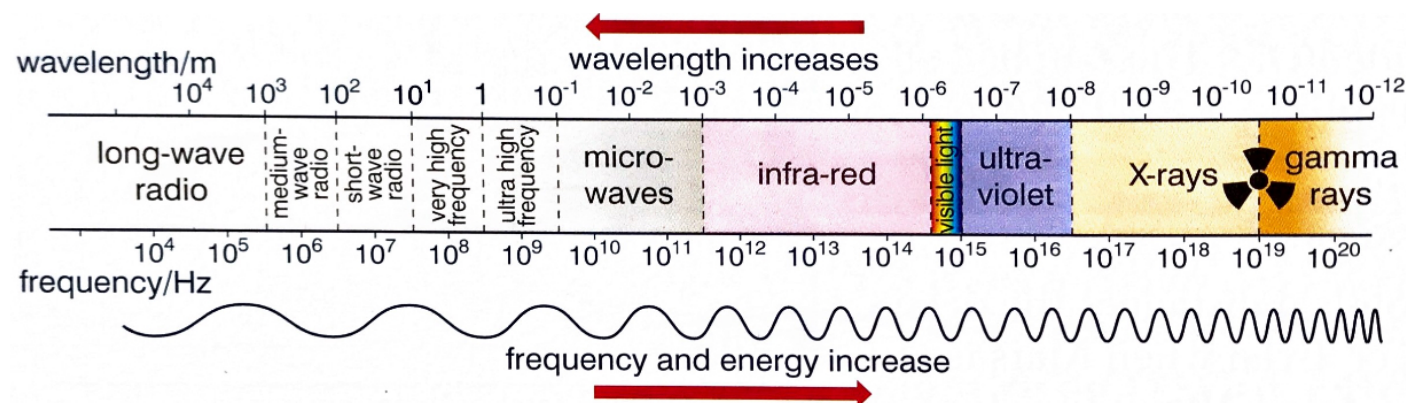
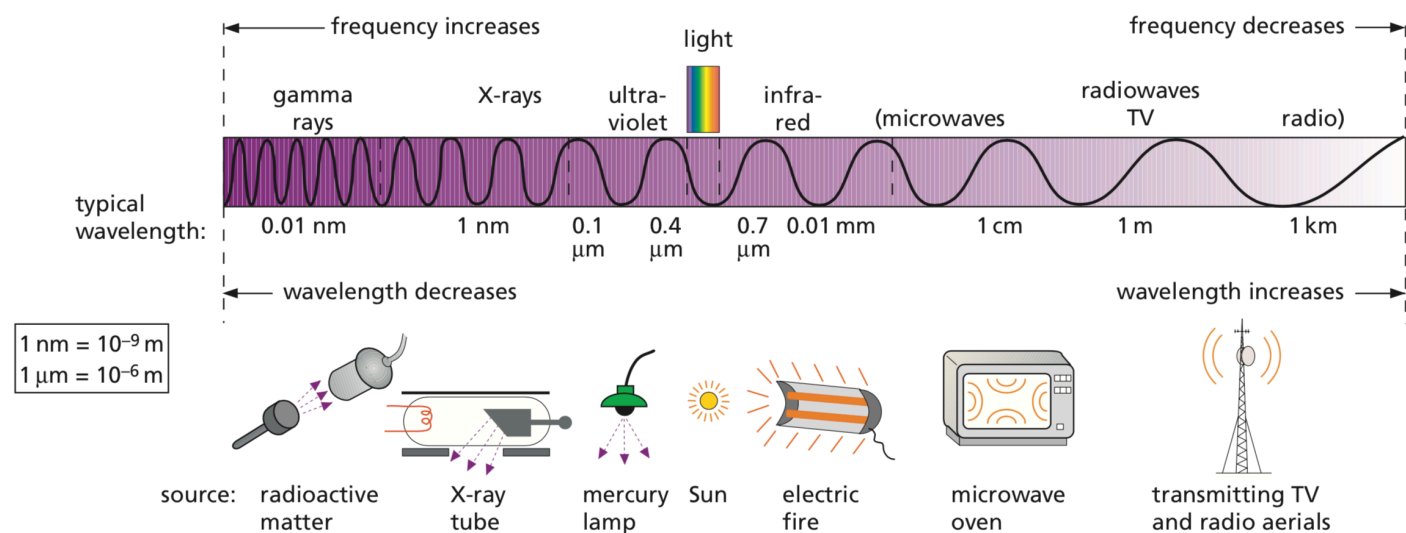
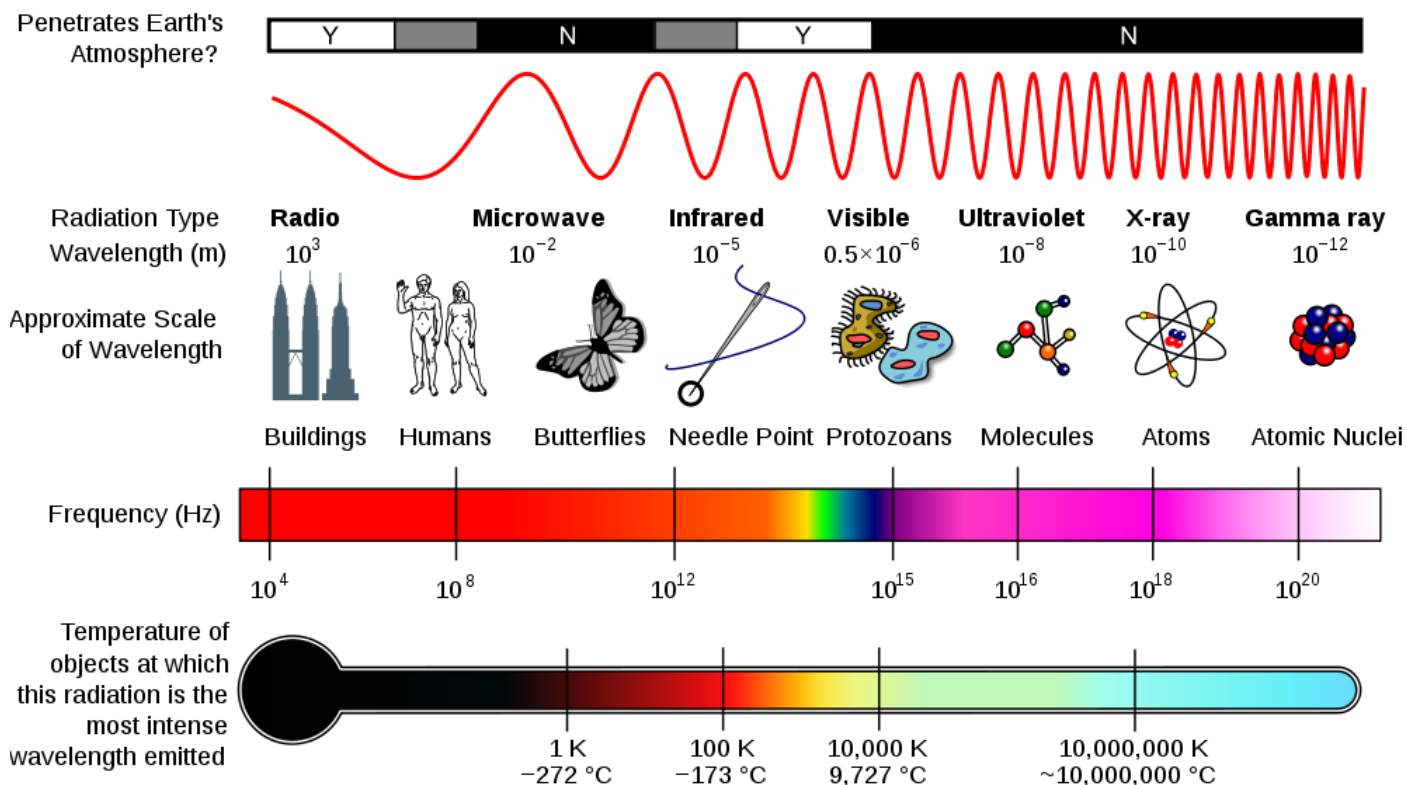
Range: 10^4m — 10^{-12}m

Visible Light: 10^{-6}m — 10^{-7}m

All EM waves in vacuum = $3 \times 10^8\text{m/s}$

Energy $\propto$ Frequency (higher f. = hazardous)

Monochromatic = Light of one wavelength, i.e. one color



DANGERS OF EM RADIATION

Gamma Rays

Shortest Wavelength → Longest Frequency / Energy

Radioactive nuclei → Cancer & mutation in body cells

Used as tracers: track the flow of a substance

X-Rays

High energy electrons → metal target

(disproportionally absorbed more by bones)

Damage / Destroy body cells & cause cancer

Also treat cancer (target infected tumors)

Screen bags (diff. items absorb diff. amounts of X-rays)

Ultraviolet (UV) Radiation

From sun & fluorescent light tubes

Damages surface cells → skin cancer; Blindness

Microwaves

High Frequency Radio Waves

Radar (pos. of ships)

Cooking — Water particles absorb energy

Few cm into substance → danger of heating body tissues

Radio waves — Longest wavelengths & lowest frequencies

UHF — Ultra-high frequency — TV signals

VHF — Very high frequency — Local radio programs

Medium/Long Radios — Longer dist. (diffract around buildings)

Satellite — High Freq. Short rad. waves — across the world

INTRODUCTION

Sound = vibrating sources (Longitudinal)

Compressions & Rarefactions (small diff. in air pressure)

SPEED OF SOUND (MEDIUM NEEDED)

air	340 m/s	[Particles linked most
liquids	1484 m/s (Water)	strongly in solids]
solids	5120 m/s (Iron)	*X pass through vacuum

RANGE OF AUDIBLE FREQUENCIES

20Hz to 20k Hz

Above this range = Ultrasound (used by bats & fetal imaging)

EXP. SPEED OF SOUND

1. Sound source + 2 microphones
2. Dist. Between 2 microphones (x)
3. Time of arrival (delay) measured (t)
4. Speed = x/t

LOUDNESS & PITCH — AMPLITUDE & FREQUENCY

Measured by Oscilloscope

Pitch $\propto$ Frequency

Loudness $\propto$ Amplitude

REFLECTION OF SOUND (ECHO)

Hard surfaces, larger than wavelength

4 ELECTRICITY & MAGNETISM

SIMPLE PHENOMENA OF MAGNETISM

4A

INTRODUCTION

Ends of bar magnet (poles) = strongest magnetism

N-S = Attraction

N-N or S-S = Repulsion

Earth has a magnetic field

Some materials are magnetic, others are not

Magnetically hard — permanent magnet (e.g. steel)

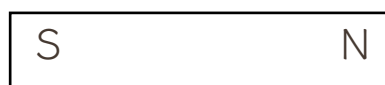
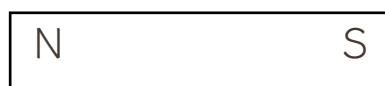
Magnetically soft — electromagnets (e.g. pure iron)

Ferrous alloy = containing iron (oppo. Non-Ferrous)

Alloys = melting various metallic elements together

INDUCED MAGNETISM

Magnetically soft + Magnet = induced magnetism



Permanent

Induced

FORCES BETWEEN MAGNETS

Interactions between magnetic fields

uniform magnetic field if field lines are parallel



MAGNETIZATION AND DEMAGNETIZATION

Magnetize:

- coil of wire + large D.C.

- molten alloy → solidify when magnetized

- hammering when in certain orientation

Demagnetize:

- Heat to Curie Temperature (v. high; varies by element)

- A.C. Current / Hammering (might not work)

MAGNETIC FIELD LINES OF A BAR MAGNET

The path a free north pole would take (i.e. N→S)

Experiment: Iron filings around bar magnet or plotting compass

ELECTROMAGNETS

Magnetism for a short period of time

- e.g. scrap yards → pick up scrap metal



INTRODUCTION

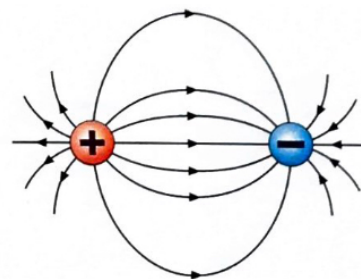
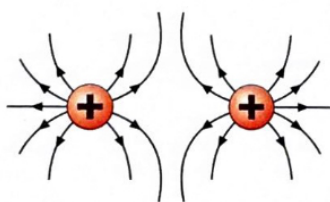
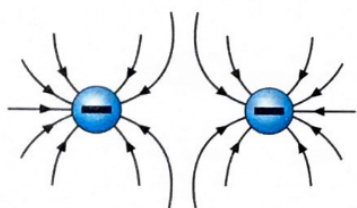
Electron Imbalance = charge (measured in coulombs)

More e^- = negative

Less e^- = positive

ATTRACTION & REPULSION

Electric field = region where electric charge experiences a force produced by every p^+ and e^-



Like charges repel each other.

Unlike charges attract each other.

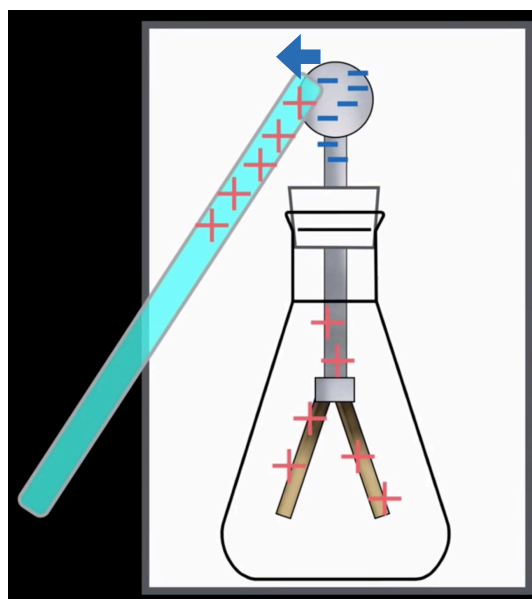
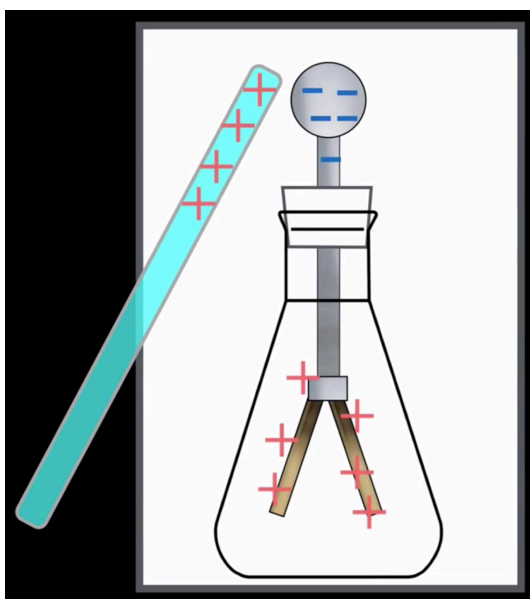
Like charges repel; Unlike charges attract

The extent of which varies: 1) how close; 2) how much charge

EXPERIMENTS

Production & Detection of electrostatic charges

Two charged polytene & acetate rods, when suspended, attract



ELECTRICITY

Current = flow of charge (measured by ammeter, in Amps)

Same throughout a series circuit

Conventional Current (+) to (-) [early scientists — wrong]

Electron flow (-) to (+) [real]

E.m.f. = energy supplied to move charge (measured by voltmeter)

Potential Difference (kinetic/electric ener. of e^-) (Voltmeter/Volts)

Resistance of wire $\propto$ length

Resistance of wire $\propto \frac{1}{\text{cross sectional area}}$

Energy transfer from cell $\rightarrow$ components $\rightarrow$ surroundings

EQUATIONS

$$I = \frac{Q}{t}$$

$$\text{Current} = \frac{\text{Charge}}{\text{time}}$$

$$1\text{A} = 1\text{C} / \text{s}$$

$$R = \frac{V}{I} \text{ (Ohm's Law)}$$

$$1\text{W} = 1\text{J/s}$$

$$1\text{V} = 1\text{J/C}$$

$$1\text{A} = 1\text{C/s}$$

$$P = IV$$

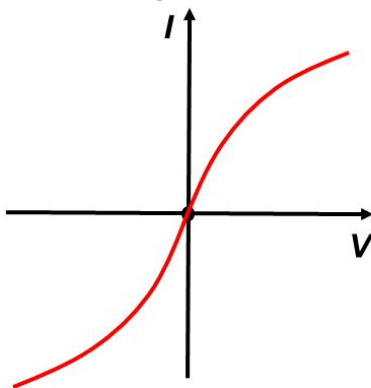
$$\text{Power} = \text{Current} \times \text{Voltage}$$

$$\begin{aligned} \text{Since } P &= E/t \\ E &= IVt \end{aligned}$$

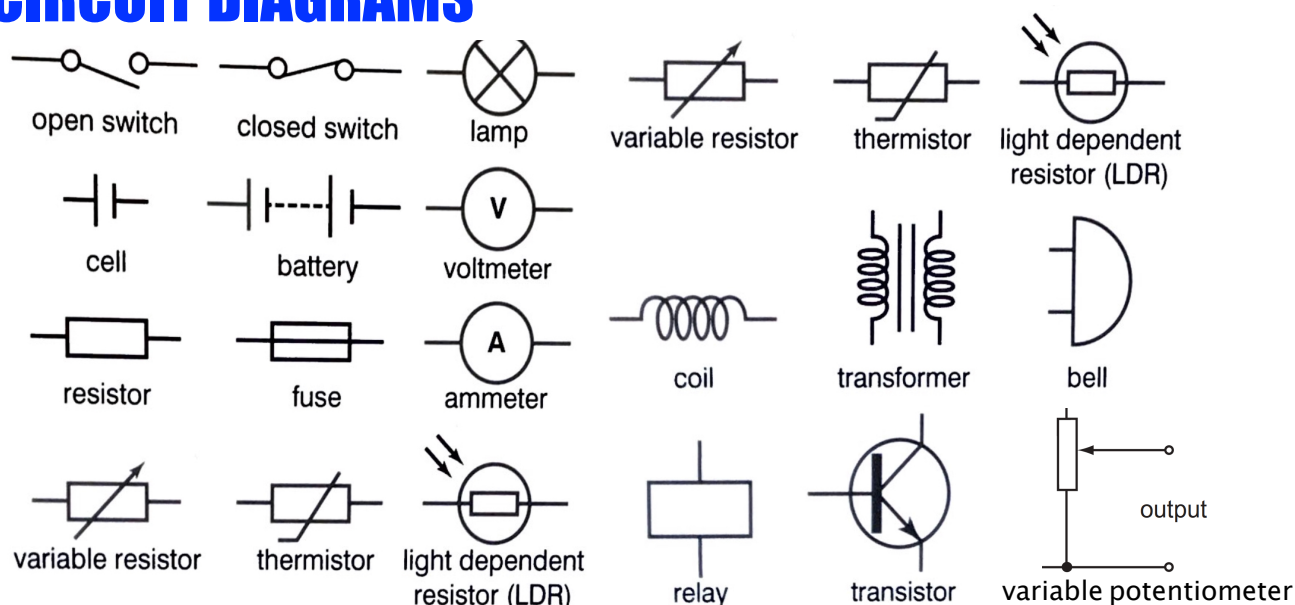
DISPROPORTIONAL RESISTOR

Some components increase R faster than increase in V

e.g. Filament Lamps (Heating increases R)



CIRCUIT DIAGRAMS



SPECIAL COMPONENTS

Variable Resistor — Change the R , hence the I

Diode — Allows only 1 way of electron flow

Rectifier — Converts AC to DC

Thermistor — Resistance reduced by heating

Input Transducers — Turns heat/light energy into electrical signals

Light Dependent Resistors — Resistance falls with light intensity

* light frees electrons to move *

Relays — An electromagnet that operate switch contact(s)

Capacitor — Stores electricity and deliver it steadily

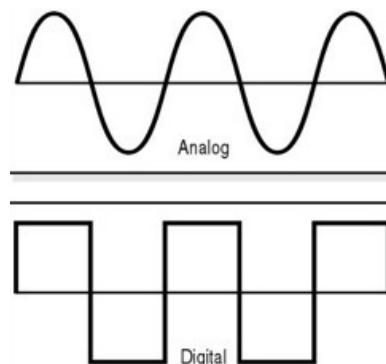
Time Delay Circuits

Transistors

DIGITAL ELECTRONICS

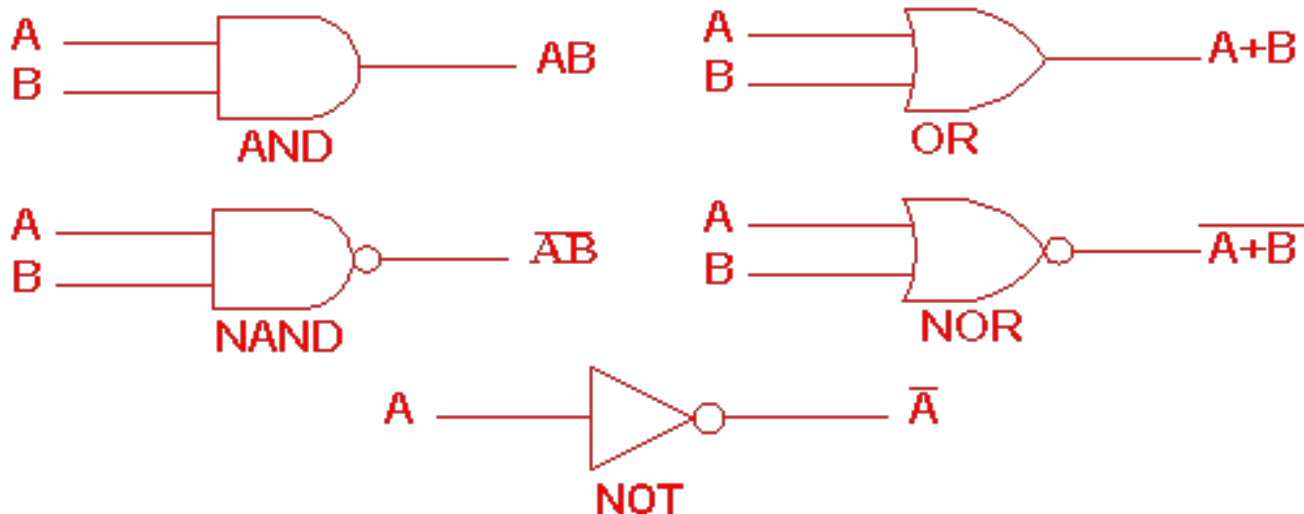
Analogue signal = varies continuously

Digital signal = only two states: high or low



LOGIC GATES

Input signal(s) → Output signal



CALCULATIONS

Resistance in Series: $R_{\text{TOTAL}} = R_1 + R_2$

Current in Series: Same throughout the circuit

Resistance in Parallel: $\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2}$

Current in Parallel: $I_{\text{TOTAL}} = I_1 + I_2$

DANGERS OF ELECTRICITY

4D

HAZARDS OF DAMAGED/COMPROMISED INSULATION

Exposed Wires = Electricity flows out

Overheated cables (Overloading) = Melts insulation/Fire

Damp Environments/Water = Electricity conducted

PROTECTION

Fuse = Breaks the circuit if sudden surge in current

→ Must be a rating larger but close in value

Earthing Metal Cases

Earth Wires = Carries excess current when shortage

ELECTROMAGNETIC EFFECTS

4E

EXP. MAGNET FIELD $\rightarrow$ E. M. F.

— Wire moved through magnetic field (“Cutting the field lines”)

E. M. F. AFFECTED BY:

— How fast the movement

— Field Strength

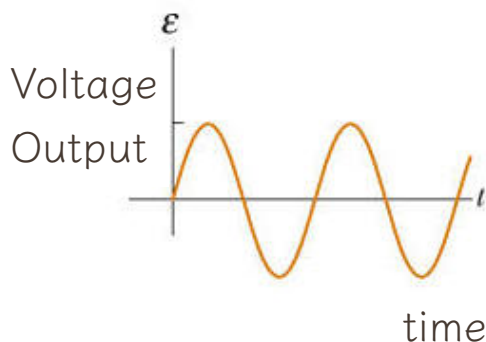
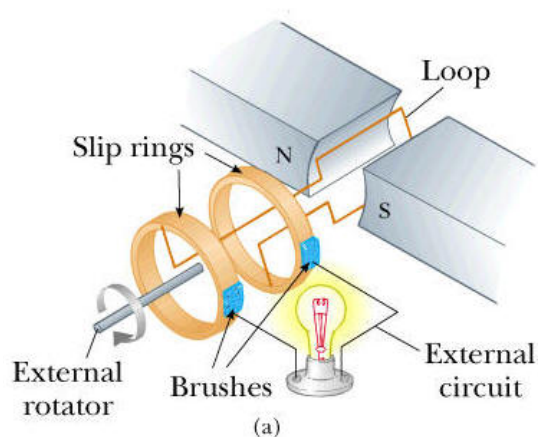
*Direction of E. M. F. opposes the change causing it

AC VS. DC (ALTERNATING CURRENT; DIRECT CURRENT)

DC = Steady Current; Voltage X change

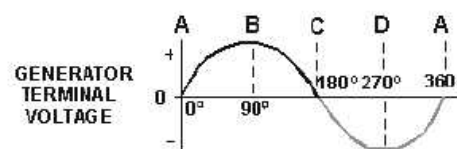
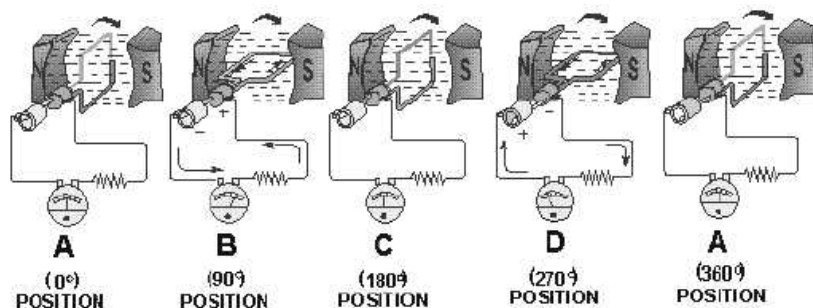
AC = Electricity moves back- and forwards (High V. Possible)

AC GENERATOR



Coil Perpendicular to Mag. Field (Most field lines cut) = Highest V.

Coil Parallel to Mag. Field (Least field lines cut) = Lowest V.



TRANSFORMERS

Iron Core Transformers — First coil → Magnetism → Induced AC

Step-Up Transformer = ↑ Voltage Output [More Turns Sec. Coil]

Step-Down Transformer = ↓ Voltage Out [Less Turns Sec. Coil]

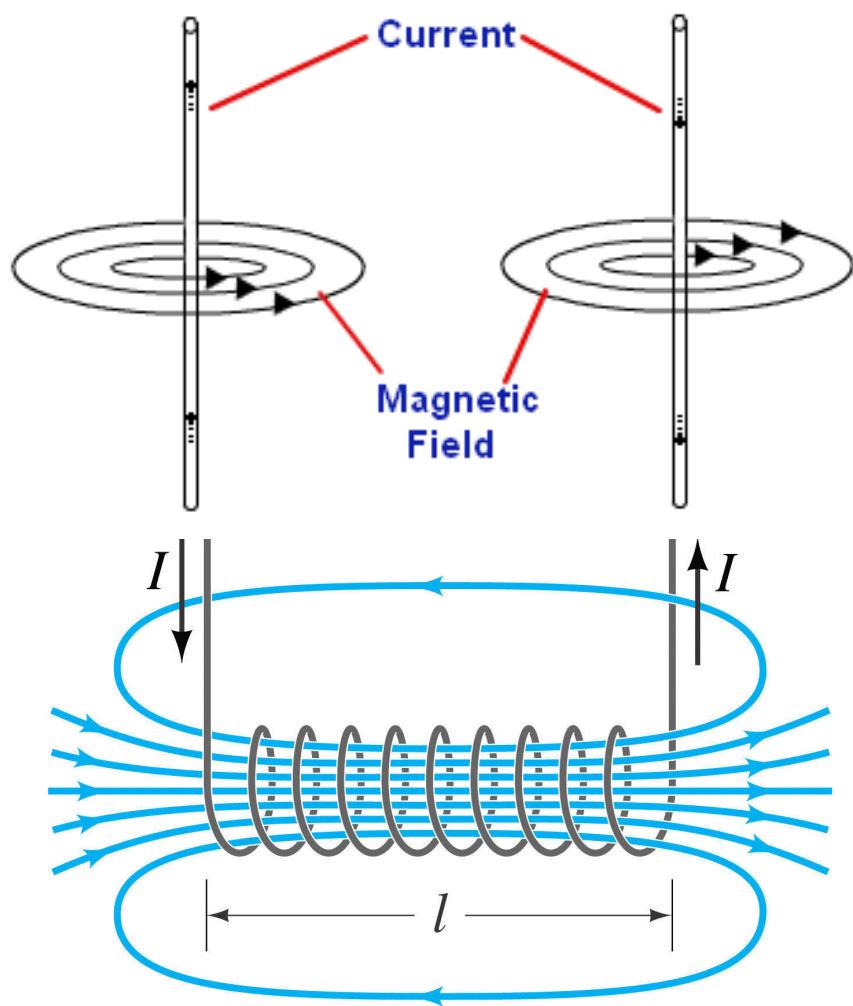
High V. Transmissions = Low I(Current) = Less Heat = ↑ Efficiency

EQUATIONS

$$\frac{V_p}{V_s} = \frac{N_p}{N_s} \quad V_p I_p = V_s I_s \text{ (100\% efficiency)}$$

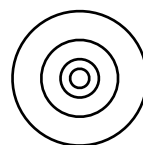
$$\frac{\text{Voltage(Primary Coil)}}{\text{Voltage(Secondary Coil)}} = \frac{\text{No. of turns(Primary Coil)}}{\text{No. of turns(Secondary Coil)}}$$

MAGNETIC EFFECT OF CURRENT



● = Towards you

✕ = Away from you



*Stronger near center

*Larger Current =
Stronger Mag. Field

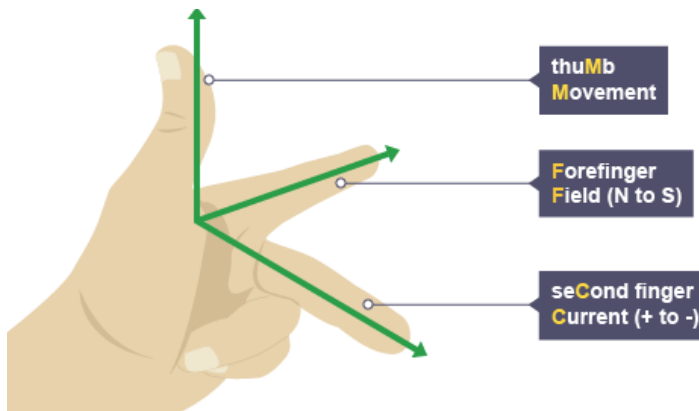
*Field Lines N → S

Solenoid = Coil of
wire like a magnet

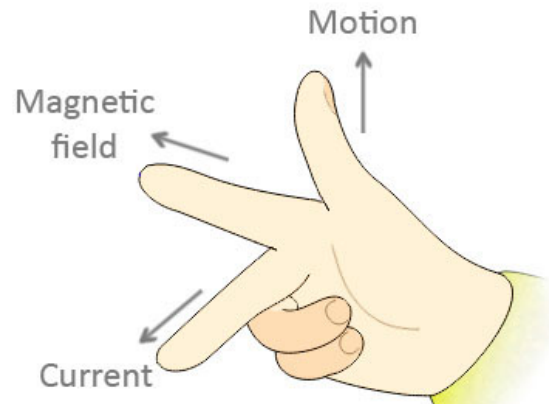
Application: Relays

FLEMING'S RULES

Left Hand Rule (Motors)



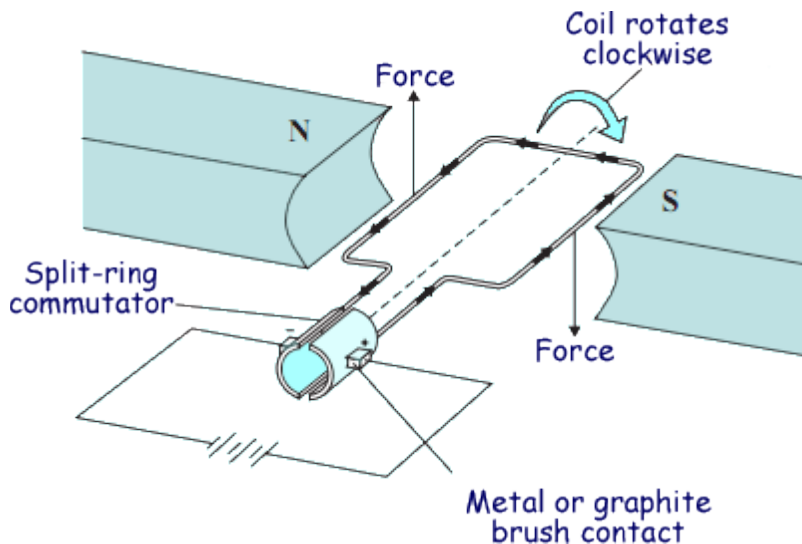
Right Hand Rule (Generators)



Magnets will also deflect charged particles (electrons)

1. Particle generator has cathode that fires electrons
2. It is deflected by a magnet / coil
3. It's seen on a fluorescent screen

MOTORS



Split-Ring Commutator reverses the direction of the current in the coil so that it continues to spin

↑ Speed by ↑ num. of turns in the coil; ↑ I (Amp); or ↑ mag. field

5 ATOMIC PHYSICS

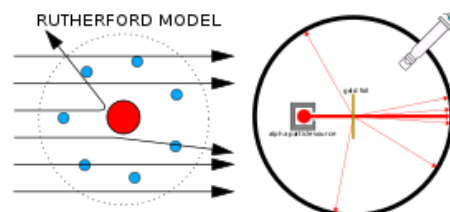
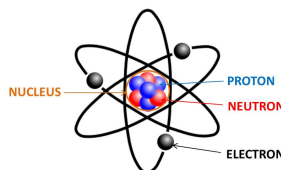
THE NUCLEAR ATOM

5A

STRUCTURE OF AN ATOM

Positive Nucleus

Negative e^-

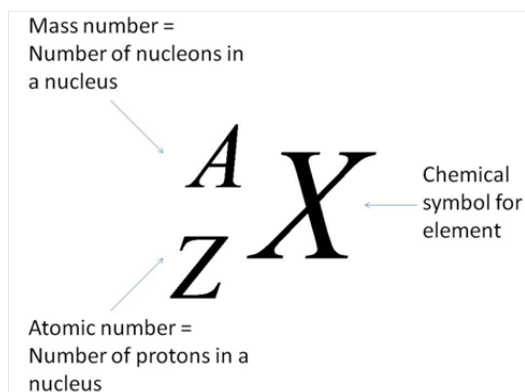


EVIDENCE: GEIGER AND MARSDEN'S EXPERIMENT

Most alpha particles got through gold foil, yet v. few deflected

$\therefore$ very massive nucleus w/ lots of empty space

CALCULATIONS



ISOTOPE

Same proton number (atomic number) but different neutron number

Sometimes unstable (therefore radioactive)

—> Can be used to treat cancer / detect pipe leaks

NUCLEAR FISSION & FUSION

Nuclear Fission = Splitting into two nuclei when hit by neutron

— Gives out a lot of heat energy (generates electricity)

Nuclear Fusion = occurs in the sun (nuclei join together)

RADIOACTIVE DECAY

Some unstable nuclei emit particles/waves to get stable nuclei
Spontaneous (Without External Cause) & Randomly (By Chance)

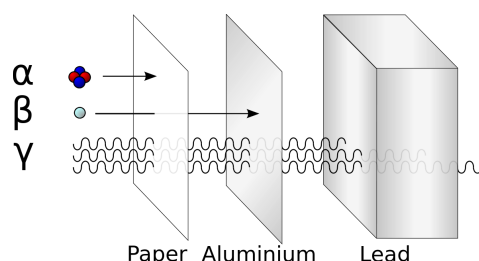
TYPES OF RADIATION

α (Alpha)	Positive	$2p^+ \text{ \& } 2n$	Most ionizing
β (Beta)	Negative	$1e^-$	More ionizing
γ (Gamma)	Electromagnetic Radiation		Least ionizing

DETECTION OF PARTICLES:

Geiger Müller Tube

Varying Penetration Power



DEFLECTION IN ELECTRIC/MAGNETIC FIELDS

α and β deflected in opposite directions; β deflected more
(since it is less massive)

BACKGROUND RADIATION

Always some radiation present (so needs subtracted from reading)

CALCULATIONS

Half Life — Time needed to hold the radioactive level

SAFE HANDLING & STORAGE OF RADIOACTIVE MATERIALS

Use Forceps, not hands

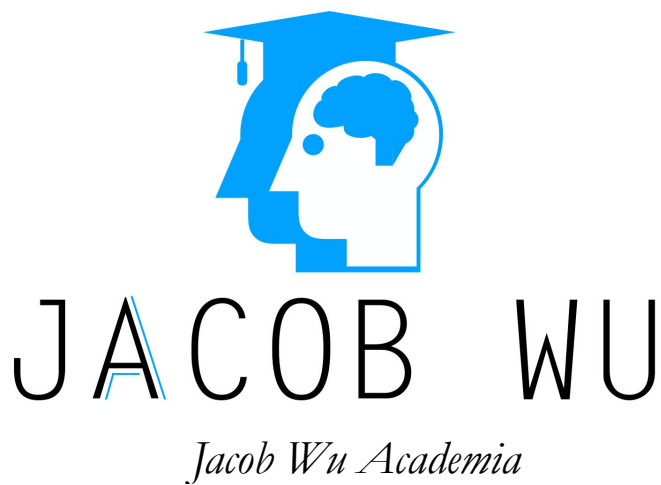
Do not point at living tissue

Store in lead-lined containers

USES OF EACH EMISSIONS

Gamma — kills bacterias (medical equipment)	Smoke Alarms
Beta — thickness of paper/metal	Tracers

PHYSICS REVISION BOOKLET



"The roots of education are bitter, but the fruit is sweet."

—Aristotle