

**ALWAYS CONSERVED: NOT DESTROYED/CREATED, JUST TRANSFERRED.**

**STORES:** EM WAVES ARE WAY OF TRANSFERRING ENERGY

KINETIC  
GRAV. POTENTIAL  
ELECTRIC POT/ELECTRO-MAGNETIC  
NUCLEAR  
THERMAL  
ELASTIC POTENTIAL  
VIBRATIONAL  
CHEMICAL POTENTIAL

**EFFICIENCY: HOW MUCH OF INPUT ENERGY/POWER IS USED USEFULLY.**

input → useful  
wasted

(CAN BE REPLACED/REPLENISHED)

WORK DONE (ENERGY TRANSFERRED BY FORCE)

$$W_{or} E = Fd$$

Force x distance

$$EFF = \frac{USEFUL OUTPUT}{TOTAL INPUT} \times 100$$

If OBJECT DROPS:

GPE = KE  
at top at bottom

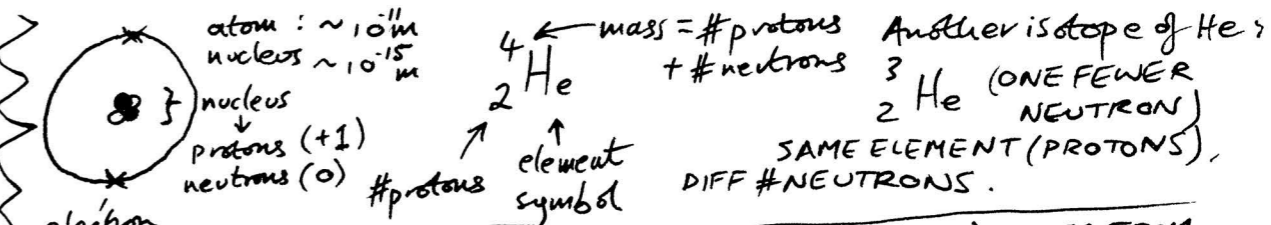
$$mgh = \frac{1}{2}mv^2$$

ENERGY SOURCES (NOT STORES!)

WIND, SOLAR, TIDAL, HYDROELECTRIC (RENEWABLE)  
COAL, OIL, GAS, NUCLEAR (NON-RENEWABLE)

**INSULATORS (TRIPLE) - REDUCE HEAT TRANSFER VIA CONDUCTION PRAC!**

- TAKE IDENTICAL CANS/BEAKERS, FILL WITH WATER FROM KETTLE
- EACH CAN WILL HAVE DIFFERENT NUMBER OF LAYERS OF INSULATION
- RECORD TEMP DROP OVER CERTAIN TIME e.g. 10 MINS.
- INDP VAR: # LAYERS. DEP VAR: TEMP DECREASE
- CONTROLS: EACH LAYER IS SAME THICKNESS, START TIME AT SAME INITIAL TEMP. SAME VOLUME OF WATER, SAME ROOM/AMBIENT TEMP.



IONISING RADIATION (ALL EM (BUT GAMMA) COMES FROM ELECTRONS)

COMES FROM UNSTABLE NUCLEUS

\*Alpha ( $\alpha$ ): Helium nucleus. Heavy. CHARGE: +2  
HIGHLY IONISING, WEAKLY PENETRATING. STOPPED BY PAPER OR FEW CM OF AIR. USED IN SMOKE DETECTORS 'IONISE': KNOCK ELECTRON OFF ATOMS BY GIVING THEM LOTS OF ENERGY.

\*Beta ( $\beta$ ): fast-moving electron. LIGHT CHARGE: -1  
MEDIUM IONISING + PENETRATING ABILITY. STOPPED BY FEW MM OF ALUMINIUM. USED TO MEASURE THICKNESS OF MATERIALS e.g. PAPER

\*Gamma ( $\gamma$ ): HIGH ENERGY EM WAVE  
DOES NOT CHANGE NUCLEUS WHEN EMITTED. WEAKLY IONISING, HIGHLY PENETRATING. REDUCED BY LEAD/CONCRETE. USED TO STERILISE, OR AS MEDICAL TRACER

**RADIOACTIVITY: HOW MANY DECAYS HAPPEN EVERY SECOND (Bq), or counts**  
USUALLY HOW MANY 'BITS' OF RADIATION ARE DETECTED EVERY SEC. (C.P.S.)

MUST MEASURE BACKGROUND COUNT AND SUBTRACT FROM READINGS!

(RADON GAS, POWER STATIONS, MEDICAL EQUIPMENT) COSMIC RAYS?  $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$  of original activity.

\*ACTIVITY HALVES EVERY HALF-LIFE. SO AFTER 3 HALF-LIVES? "HOW MANY HALF-LIVES?"

\*FISSION:  ${}^{235}_{92}U \rightarrow \dots$  CAUSE CHAIN REACTION. MORE FISSION

\*FUSION:  ${}^2_1H + {}^3_1H \rightarrow {}^4_2He$  ENERGY - HAVE NOT FUSION REACTOR YET.

**POWER: RATE OF ENERGY TRANSFER.**

$$P = \frac{E}{t}$$

Unit: W (J/s)

**Hooke's Law (SPRINGS) PRAC!**

$F = ke$

stiffness / extension spring constant

LINE UP RULER (0) WITH BOTTOM OF SPRING.  
HAVE CLOSE, WITH EYE IN LINE (REDUCE PARALLAX ERROR)  
ADD 100g SLOTTED MASS, MEASURE EXTENSION.  
REPEAT TO e.g. 1000g. DRAW GRAPH  
INDP VAR: FORCE. DEP VAR: EXTENSION  
CONTROLS: SAME SPRING THROUGHOUT, DO NOT OVERSTRETCH, AS k COULD CHANGE

**DENSITY - PRAC!**

$$D = \frac{m}{V}$$

mass / Volume

\*REGULAR OBJECTS: MEASURE 3 EDGES WITH RULER OR CALLIPER, FIND VOL BY X'ing

\*IRREGULAR OBJECTS: - FILL DISPLACEMENT CAN W/ WATER TO SPOUT. - SUBMERGE OBJECT USING STRING. VOL OF WATER COLLECTED IN BEAKER = VOL OF OBS. - USE MEASURING CYLINDER (BOTTOM) MENISCUS

**INTERNAL ENERGY:** SUM OF KINETIC AND POTENTIAL ENERGY OF ALL PARTICLES IN A SUBSTANCE.

HIGHER TEMP? HIGHER KE.  
- BREAKING BONDS - HIGHER PE.

**MEASURING MASS USING TOP PAN BALANCE. TARE FIRST!**

SOLUTIONS. FILL MEASURING CYLINDER WITH SOLUTION. 100cm<sup>3</sup> of WATER = 100g. SO IF MASS of 100cm<sup>3</sup> = 104g, 4g OF SOLUTE IS DISSOLVED IN IT.

**PRESSURE:**

$$P = \frac{F}{A}$$

Force / Area

Pressure is CONSTANT IN HYDRAULIC SYSTEM (WATER PIPES etc)

**TRIPLE: IN A GAS.**

RESULT OF PARTICLES COLLIDING WITH WALLS OF CONTAINER.

INCREASE BY:  
- ADDING MORE GAS (MORE FREQUENT COLLISIONS).  
- HEAT (COLLIDE WITH GREATER VEL + MORE FREQUENTLY).  
- MAKE CONTAINER SMALLER (AGAIN, MORE FREQUENTLY).

**PHYSICS PAPER 1 (YEAR 10)**

**Ohm's Law**

$$V = IR$$

V: VOLTAGE, (P.D.) POTENTIAL DIFFERENCE!  
I: CURRENT OF CHARGE  
R: RESISTANCE: "HOW HARD IT IS FOR CURRENT TO FLOW" UNIT:  $\Omega$  (Ohms)

**ELECTRICAL POWER:**

$$P = IV$$

(=  $I^2R = \frac{V^2}{R}$ )

**CHARGE (COULOMBS)**

SERIES (Pot Divider): Same I, V is shared

PARALLEL: Same V, I is shared

**NATIONAL GRID:** USES A.C. NOT D.C.

ratio of R = ratio of V

$$\frac{V_1}{V_2} = \frac{R_1}{R_2}$$

**SOHZ TRANSFORMERS USED TO STEP UP V (STEP DOWN I) BEFORE GRID, TO REDUCE POWER LOST DUE TO HEAT. RESISTANCE OF WIRES, STEPPED DOWN AGAIN.**

SAFETY Earth wire (GREEN/YELLOW) - CONNECTED TO CASE OF APPLIANCE, SO CHARGE CAN ESCAPE THROUGH IT INSTEAD OF USER.

\* FUSE (LIVE WIRE) - DESIGNED TO MELT AT 3A, 5A, 13A.

\* RCD/TRIPSWITCH: IF CURRENT GETS TOO HIGH, MAKES ELECTROMAGNET PULL CONTACTS APART, BREAKING CIRCUIT. CAN BE RESET.

**TRIPLE: ELECTRONS REMOVED FROM STATIC OBJECT → POSITIVE. AND V.V. & FIELDS FIELD LINES SHOW DIR. OF FORCE A +ve CHARGE WOULD FEEL.**

**DIODE (ONLY LETS CURRENT IN ONE DIRECTION)**

RESISTOR: CONSTANT R = 'OHMIC'

LDR/THERMISTOR: DARK/COLD = HIGH R. LIGHT/HOT = LOW R

**ELECTRICITY**

METAL: NON-OHMIC

R INCREASES AT HIGHER V BECAUSE: METAL IS ION LATTICE SURROUNDED BY SEA OF DELOCALISED ELECTRONS. IF CURRENT INCREASES, ELECTRONS COLLIDE WITH IONS MORE FREQUENTLY. THIS MAKES THEM VIBRATE MORE (TEMP INCREASES) SO HARDER FOR ELECTRONS TO FLOW.

**\*PRAC! R of WIRE**

- Make this circuit.

- L of wire is from end to croc clip.

- Do not make too short or current will be too high, could melt/injure. CROC CLIP - don't leave on for too long.

- Calculate R from  $R = V/I$ .

- Indp: L Dep: R Controls: same ness, material. Graph: R vs L

**STRONGER FIELD**

CLOSER LINES

Video Science Shorts