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Physics Cheat Sheet by patrick via cheatography.com/21815/cs/4304/

Isotopes

Isotope - An atom with the same number of protons but a different number of neutrons.

Radioisotope - An isotope that is radioactive and sometimes unstable. They

decay.

Formulas

W1= q Δ V1 (J)..(.c)..(v) Power - rate of doing work P= w/t (joules/seconds) Power w/t = q Δ v/t P=i Δ v Unit of energy W=pt (joules) = Watt*Sec New energy unit = kWh Electrical Energy 1kWh = 1000*3600 1kWh = 3.6*10^6J

resistance

$R_{T} + \text{total resistance}_{I_{T} + \text{total current}} R_{T} = \frac{V_{T}}{I_{T}}$ $R_{T} + \text{total voltage}_{P_{T} + \text{total power}} R_{T} = \frac{V_{T}}{I_{T}}$ $R_{T} = \frac{V_{T}^{2}}{P_{T}} R_{T} = \frac{P_{T}}{I_{T}^{2}}$

1/Rt = 1/R1 + 1/R2 + ...+1/Rn if in parallel.



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Electrical energy and power

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tElectrical energy (Joules) = potential drop (volts) x current (amps) xtimes (seconds) E=VItP=E/t were one watt = 1 joule per secondE/t = VIT/t or P= VIPower (watts) = voltage (volts) x current (amps)P=VIHow much energy does a 100W light bulb use in half an hour?P=100W and t=0.5hSo E=100W x 0.5h = 50Wh or 0.05kWhTo find power used Volts times Amps
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Resistance

$$R = \frac{pL}{A}$$

p = resistivity of a material

- L = length of the wire
- $A = cross \ sectional \ area \ of \ wire$

Ohm's law: ∆V=iR or V=Amps*Ohms

A charge q moving through a potential difference ΔV will lose potential energy: ΔU =qV

Electric field

The electric field in any region of space is defined as the electric force per unit charge: E = F/q

the force on a charge of q in an electric field is given by F= qE

Neutron Bombardment

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Decay

 $\label{eq:resolution} \begin{array}{c} \mbox{Radioactive Decay} \\ \mbox{Alpha Decay} & \mbox{Alpha Decay} & \mbox{Alpha decay by emi} \\ \mbox{an α particle, which is identical to a hermal setup of the setup o$

Radiaiton

Alpha radiation - Helium nucleus (2 protons and 2 neutrons), highly ionising, charge of 2+, heavy.

Beta radiation - fast moving electron, negatively charged electron, not as high ionising capabilities, charge of -1.

Gamma radiation - electromagnetic radiation, less ionising then alpha or beta.

Detecting radiation - Geiger-Muller tube counts ions that are produced inside it, these create an electrical signal.

Radiation in the body - Ionising radiation can damage or kill the cells, dna can replicate in the damaged form, cancers can form.

Ionising Radiation

lonising means that the radiation rips off electrons from nearby atoms that it passes.

Three types of radiation: Alpha, Beta and Gamma

Alpha passes through paper.

Beta passes through thin metal.

Gamma passes through thick metal.

Alpha radiation is most ionising, so it loses it's energy very quickly.

Atomic Notation



Half life

Half-life - the time taken for the radioactivity of a specified isotope to fall to half its original value.

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Nuclear fission/fusion

Fission- When a nucleus splits into two or more pieces usually after bombardment by neutrons.

Fusion- A process taking place inside stars in which small nuclei are forced together to make larger nuclei. Energy is released in the process.

Chain reaction - A series of nuclear fissions that may or may not be controlled. The neutrons that are released cause the reaction.

Nuclear Fission Reactors

Used to harness energy from Fission reactions.

Neutrons released from Uranium-235 when it undergoes fission are travelling at high speeds, this leads to a chain reaction which causes an explosion.

The heat generated from the fission process is used to make steam which drives the turbine.

Fuel rods- long, thin rods containing pellets of enriched uranium moderator- material that slows neutrons.

control rods- rods made of a material that absorbs neutrons coolant- a liquid or gas to absorb the heat energy

Nuclear Reactor



Electric charge

Conductors: All metals, especially silver, gold, copper aluminium and any ionic solution.

Moderate conductors: Water and earth.

Semi-conductors: Silicon, Germanium and skin.

Insulators: Plastics, polystyrene, dry air, glass, porcelain, cloth (dry) Moderate insulators: wood, paper, damp air, ice and snow.

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Electrical forces and fields

 $F = \frac{kq_1q_2}{r^2}$

For the forces between two charges q1 and q2 at a distance of r k= 9.0 x 10^9 N m² x C²

Electric Current

Electric current is the rate of transfer of charge: I=q/twhere q is the charge transferred and t is the time taken. 1 ampere (A) = 1 coulomb per second (C*s⁻¹) So 1 coulomb (C) = 1 ampere second (A*s) 1 volt = 1 joule per coulomb (1V = 1JC⁻¹) 1 ohm = 1 volt per ampere (1ohm = 1VA⁻¹)

Resistance

 Δ VBattery=i Rtotal Δ vBattery= Δ V1+ Δ V2 Therefore i*Rtotal = Δ V1+ Δ V2=iR1+iR2 Rtotal = R1 + R2 R= V/I or V = IR

ormulas

Two loops
Junction law
Current in = current out
at(a) itotal = i1 +i2
Parallel arrangement
$\Delta V1 = \Delta V2$
iTotal = ∆VBattery/Rtotal
iTotal = i1 +i2
∆VBattery/Rtotal=∆V1/R1+∆V2/R2
1/Rtotal = 1/R1 + 1/R2
Rtotal = (1/R1 +1/R2)
R1=R2 =100hms
1/Rt = 1/10 + 1/10
= 2/10 = 1/5
RT= 5 ohms
Voltage loop law
One loop
\triangle Vbattery = \triangle 1+ \triangle 2
Voltage drop of battery must equal
Sum of voltage drops around one loop.

Electric Circuits

In any electric circuit the sum of all currents flowing into any point is equal to the sum flowing out of it.

The total potential drop around a closed circuit must be equal to the total EMF (electromotive force, the energy provided by the cell)

Symbols and devices



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