

Units and Basic Concepts.

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DATE

* International System of Units.

→ (SI) has nine base units of all other physical quantities are derived from these units.

Time (s)	length (m)	mass (kg)	Electric current (A)
Temperature (K)		amount (mol)	luminous intensity - (cd) كاسيتا

→ The system differs considerably from the more British system in which we measured:-

* length: yards, feet, inches	Mass: Pound
Power: Horse	Temp: Degree Fahrenheit

- Kilo: 10^3
- centi: 10^{-2}
- Micro: 10^{-6}
- Mega: 10^6
- Milli: 10^{-3}
- Nano: 10^{-9}
- Pico: 10^{-12}

* Electric Charge:

→ The charge of an electron is $1.6022 \times 10^{-19} \text{ C}$

→ The unit of charge is called coulomb.

$Q = n \cdot e$ \rightarrow شحنة الالكترون \rightarrow شحنة في الكون

→ The charge quantity symbol is Q or q (Q For const q For charge varies with Time)

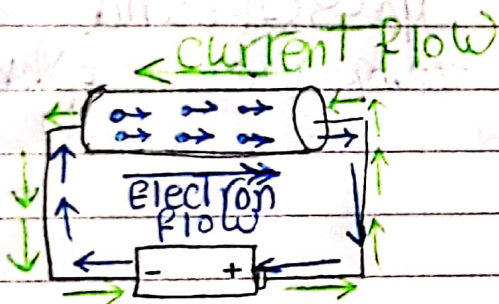
* Electric current:

→ Electric current is expressed by the rate of flow of electric charges
هو معدل سريان الشحنات الكهربائية

→ I for const charge, t for current varies with time.

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

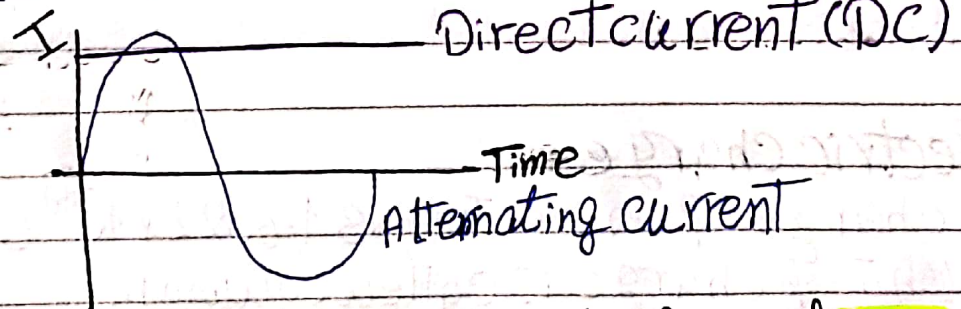
Ampere:- is defined as the flow of one coulomb of charge passes a given point in a conductor in one second.
الأمبير:- هو تدفق واحد كولوم من الشحنة يمر بنقطة معينة في موصل في الثانية الواحدة.



* التيار + ← -
* الإلكترون - ← +

→ التيار ثابت DC

→ التيار متردد AC



Ex:- what is the current from a steady flow of 100C through a wire cross section in 20s?

$$\text{A } I = \frac{Q}{t} = \frac{100}{20} = 5 \text{ A}$$

Ex:- An element in a circuit that can store charge. What is the charge stored on the element from a steady current 2A for 100 μs

$$I = \frac{Q}{t} \quad \therefore Q = \frac{Q}{100 \times 10^{-6}}$$

$$\therefore Q = 200 \mu C \quad \times$$

4. Voltage:-

→ Moving an object against a force that oppose the motion is called work.

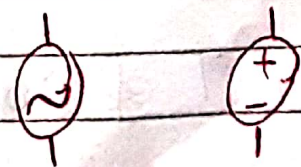
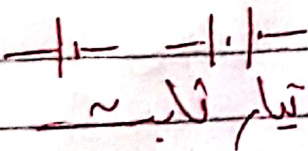
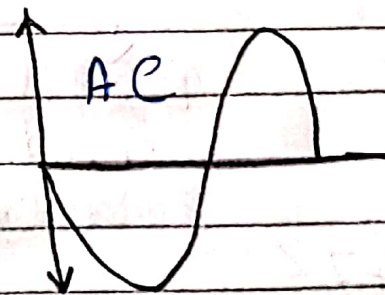
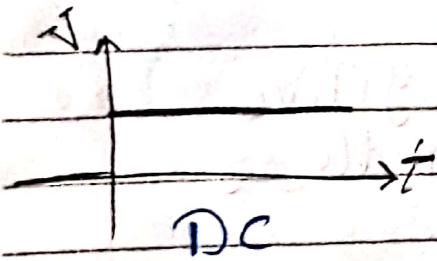
→ SI unit of work is Joule (J)

→ SI unit of force is Newton (N)

$$W = F \cdot d \rightarrow \text{"meters"}$$

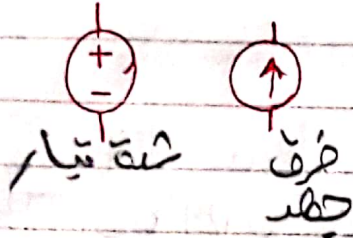
~ Newton ~

$$* V = \frac{W}{Q} = \frac{\text{work Done}}{\text{charge}}$$

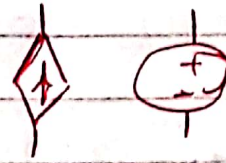


تيار متغير

* Dependent source:-
independent



dependent



* There are four types of dependent sources:-

→ voltage controlled voltage $v = b v_c$

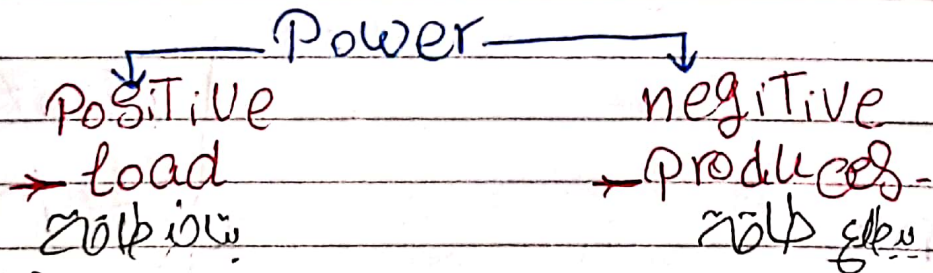
→ current controlled voltage $v = r i_c$

→ voltage controlled current $i = g v_c$

→ current controlled current $i = d i_c$

* Power:- the rate at which something either
absorbs or produces energy

$$P = \frac{W}{t}, P = V \cdot I$$



$$1 \text{ hp} = 476 \text{ W}$$

→ SI unit of power (P) is (W)

Efficiency: كفاءة

$$\eta = \frac{\text{Power output}}{\text{Power input}} \times 100\%$$