FORMULARIO

DI FISICA

Sommario

GRANDEZZE E MISURA

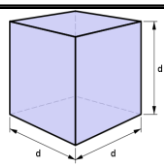
PREFISSI

Nome	Simbolo	Moltiplica
giga	G	$1\,000\,000\,000 = 10^9$
mega	M	$1\,000\,000 = 10^6$
kilo	k	$1000 = 10^3$
etto	h	$100 = 10^2$
deca	da	$10 = 10^1$
deci	d	$\frac{1}{10} = 10^{-1}$
centi	c	$\frac{1}{100} = 10^{-2}$
milli	m	$\frac{1}{1000} = 10^{-3}$
micro	μ	$\frac{1}{1\,000\,000} = 10^{-6}$
nano	n	$\frac{1}{1\,000\,000\,000} = 10^{-9}$

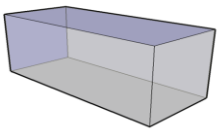
UNITA' DI VOLUME

Nome	Simbolo	Valore in m^3
decimetro cubo (litro)	dm^3 (L)	$\frac{1}{1000} = 10^{-3}$
centimetro cubo (millilitro)	cm^3 (mL)	$\frac{1}{1\,000\,000} = 10^{-6}$

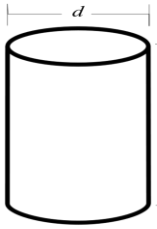
CALCOLO DEI VOLUMI



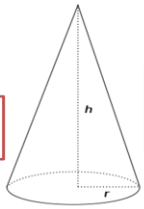
$V = L^3$



$V = L_1 \cdot L_2 \cdot L_3$



$V = \pi r^2 h$



$V = \frac{1}{3}\pi r^2 h$

$V = \frac{4}{3}\pi r^3$

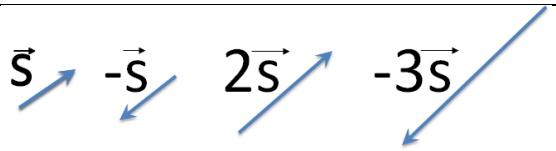
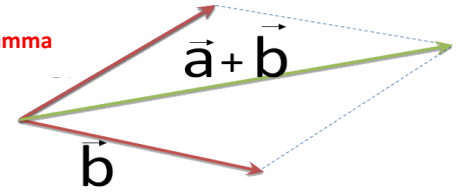
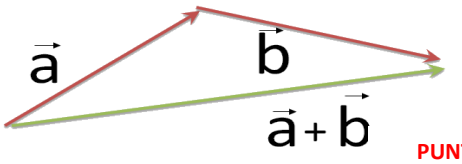
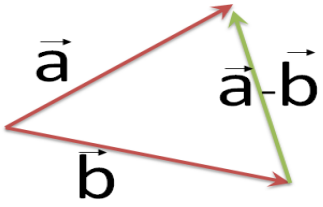
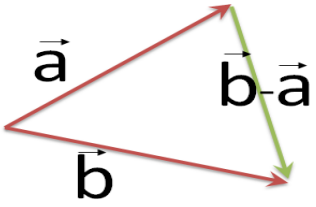
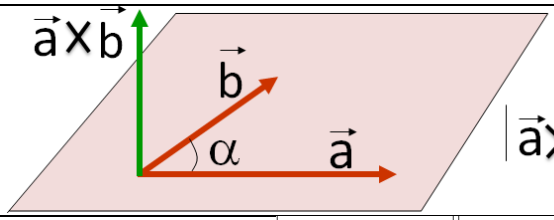
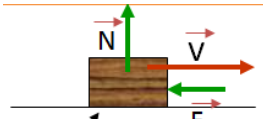
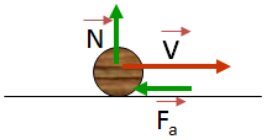
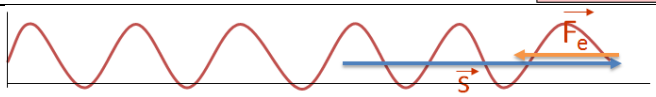
DENSITA' E PESO SPECIFICO

$$d = \frac{m}{V} \qquad p_s = \frac{p}{V} = \frac{mg}{V} = dg$$

TABELLA UNITA' DI MISURA

GRANDEZZA	SI (MKS)	CGS	PRATICO
LUNGHEZZA	METRO (m)	CENTIMETRO (cm)	METRO (m)
AREA	$m^2 = 10^4\ cm^2$	$cm^2 = 10^{-4}\ m^2$	m^2
VOLUME	$m^3 = 10^6\ cm^3$	$cm^3 = 10^{-6}\ m^3$	m^3
MASSA	KILOGRAMMO (kg)	GRAMMO (g)	KILOGRAMMO (kg = kgp·s²/9,8 m)
TEMPO	SECONDO (s)	SECONDO (s)	SECONDO (s)
FORZA	NEWTON (N = kg·m/s²) 1 N = 10^5 dyn	DINE (dine = g·cm/s²) 1 dine = 10^{-5} N	KILOGRAMMO PESO (kgp)
DENSITA'	$kg/m^3 = 10^3\ g/cm^3$	$g/cm^3 = 10^{-3}\ kg/m^3$	kg/m^3
PESO SPECIFICO	$N/m^3 = 10^{-1}$ dine/cm^3	dine/cm^3 = 10 N/m^3	kgp/m^3 = 9,8 N/m^3

VETTORI E FORZE

Prodotto scalare-vettore	
Somma di vettori	Parallelogramma   PUNTA-CODA
Differenza di vettori	PUNTA-PUNTA  
Prodotto scalare	$\vec{a} \cdot \vec{b} = ab \cos \alpha$
Prodotto vettoriale	 $\lvert\vec{a}\times\vec{b}\rvert = ab\,\text{sen}\alpha$
Forza peso	$\vec{p} = m\vec{g}$ $g = 9{,}8\,\frac{m}{s^2}$
Forze d'attrito	 Radente $F_a = k \cdot N$    $\vec{F}_a = -k \cdot \vec{v}$ se v è grande: $F_a = -k \cdot v^2$ Viscoso $F_a = k \cdot \frac{N}{r}$ Volvente
Forza elastica	Legge di Hooke  $\vec{F}_e = -k\vec{s}$

CINEMATICA

Velocità e Accelerazione

Velocità media

$$v_m = \frac{s_2 - s_1}{\Delta t} = \frac{\Delta s}{\Delta t}$$

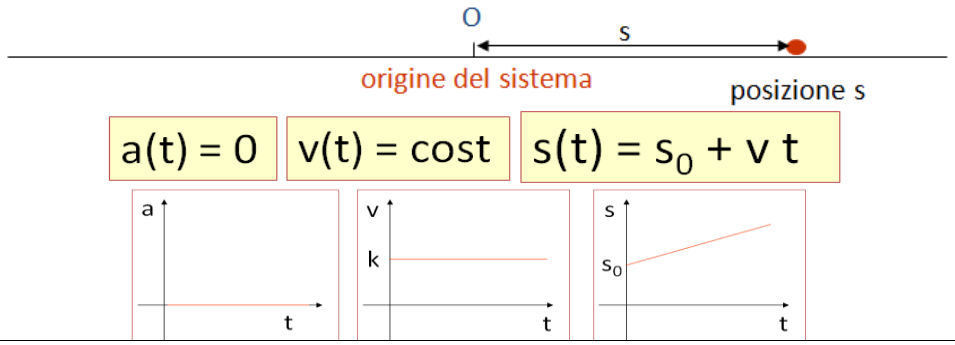
Velocità istantanea $\Delta t \longrightarrow 0$

Accelerazione media

$$a_m = \frac{v_2 - v_1}{\Delta t} = \frac{\Delta v}{\Delta t}$$

Accelerazione istantanea $\Delta t \longrightarrow 0$

Leggi orarie del Moto Rettilineo Uniforme

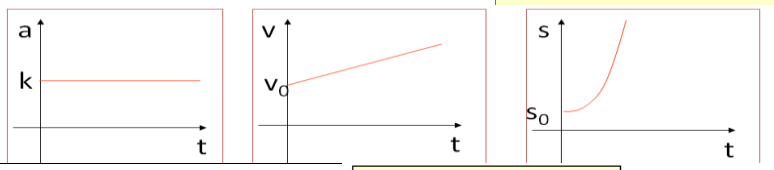


$a(t) = 0$ | $v(t) = cost$ | $s(t) = s_0 + v\,t$

Leggi orarie del Moto Uniformemente Accelerato

$a = cost$ | $v = v_0 + a\,t$ | $s = s_0 + v_0 t + \frac{1}{2} a t^2$

$v^2 - v_0^2 = 2a\Delta s$

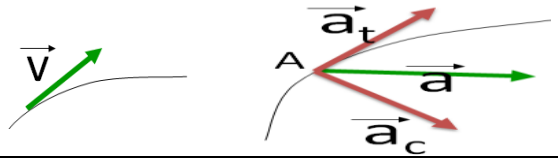


Moto verticale

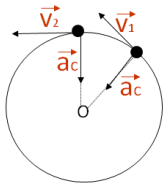
Sistema di riferimento orientato verso l'alto

$g = 9{,}81 \frac{m}{s^2}$ | $v = v_0 - gt$ | $y = y_0 + v_0 t - \frac{1}{2} g t^2$

Moto curvilineo



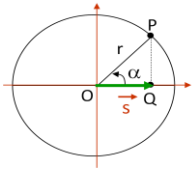
Moto circolare uniforme



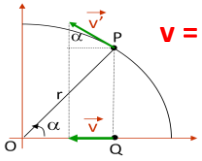
$$f = \frac{1}{T} \qquad v = \frac{2\pi r}{T} \qquad a = \frac{v^2}{r}$$

$$\omega = \frac{2\pi}{T} \qquad v = \omega r \qquad a = \omega^2 r$$

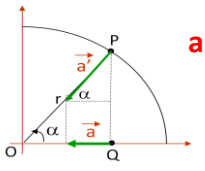
Moto Armonico Semplice



$s = r\cos(\omega t)$



$v = \omega r \,\mathrm{sen}(\omega t)$



$a = \omega^2 r\cos(\omega t)$

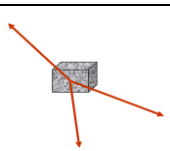
$a = -\omega^2 x$

Unità di misura

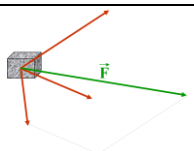
GRANDEZZA	SI (MKS)	CGS	PRATICO
VELOCITA'	m/s	cm/s	m/s
	1 m/s = (1km/h)/3,6	1 cm/s = 10^{-2} m/s	
	1 m/s = 100 cm/s		
ACCELERAZIONE	m/s^2	cm/s^2	m/s^2
	1 m/s^2 = 100 cm/s^2	1 cm/s^2 = 10^{-2} cm/s^2	
VELOCITA' ANGOLARE	rad/s	rad/s	rad/s
FREQUENZA	1 hz	1 hz	1 hz
	1hz = $1s^{-1}$	1hz = $1s^{-1}$	1hz = $1s^{-1}$

DINAMICA

Principi della Dinamica



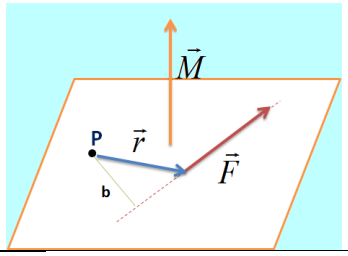
$$F = 0 \qquad a = 0$$



$$\vec{F} = m\vec{a}$$

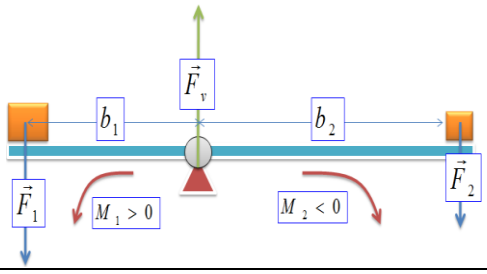
$$\vec{F}_1 = -\vec{F}$$

Momento di una forza Equilibrio di un corpo rigido



$$\vec{M} = \vec{r}x\vec{F}$$

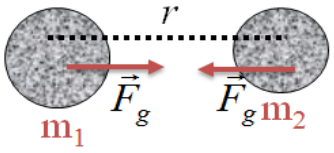
$$M = Fb$$



$$\sum F = 0$$

$$\sum M = 0$$

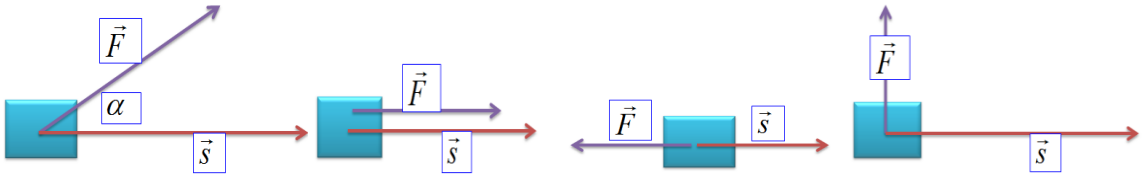
Legge di attrazione gravitazionale



$$F_g = G\frac{m_1 m_2}{r^2}$$

$$G = 6{,}67 \cdot 10^{-11}\frac{Nm^2}{kg^2}$$

Lavoro



$$L = \vec{F}\cdot\vec{s} = Fs\cos\alpha$$

$$L = F\cdot s$$

$$L = -F\cdot s$$

$$L = 0$$

Potenza

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

$$P = F\cdot v$$

Energia Cinetica

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

Teorema dell'Energia Cinetica

$$L = E_{c2} - E_{c1} = \frac{1}{2}mv_2^{\,2} - \frac{1}{2}mv_1^{\,2}$$

Energia Potenziale

FORZA CONSERVATIVA	ENERGIA POTENZIALE U
FORZA PESO	U = mgh
FORZA GRAVITAZIONALE	$U = -G\frac{Mm}{r}$
FORZA ELETTROSTATICA	$U = \frac{1}{4\pi\varepsilon}\frac{Qq}{r}$
FORZA ELASTICA	$U = \frac{1}{2}kx^2$

$$L = U_1 - U_2$$

Principio di conservazione dell'ENERGIA MECCANICA

$$U + E_c = \text{cost}$$

Impulso e Quantità di Moto

$$\vec{I} = \vec{F}\cdot\Delta t \qquad \vec{q} = m\cdot\vec{v} \qquad \vec{I} = \Delta\vec{q}$$

Principio di conservazione di q (nei sistemi isolati e negli urti)

$$\vec{q}_{tot} = \text{cost}$$

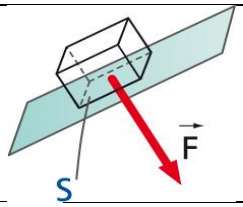
Unità di misura

GRANDEZZA	SI (MKS)	CGS	PRATICO
FORZA	N (=kg·m/s²) 1 N = 10^5 dine 1 N = 9,8 kgp	dine (=g·cm/s²) 1 dine = 10^{-5} N	kgp (fondamentale)
MOMENTO DI UNA FORZA	N·m	dine ·cm	kgp ·m
LAVORO - ENERGIA	J (=N·m) 1J = 10^7 Erg	Erg (= dine·cm) 1 Erg = 10^{-7} J	kgp ·m
POTENZA	W (= J/s)	Erg / s	kgp ·m/s
IMPULSO E QUANTITA' DI MOTO	N·s = kg·m/s	dine·s = g·cm/s	

FLUIDI

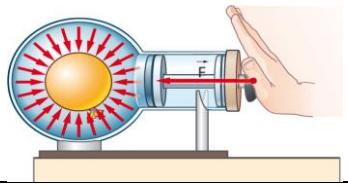
Densità Peso Specifico Pressione

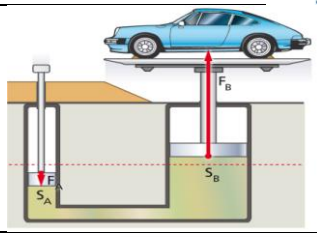
$$d = \frac{m}{V} \qquad p_s = \frac{p}{V} = \frac{mg}{V} = dg \qquad m = dV \qquad p = dgV$$



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

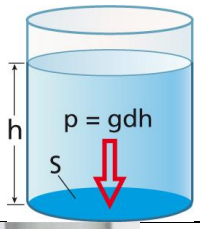
Principio di Pascal e torchio idraulico



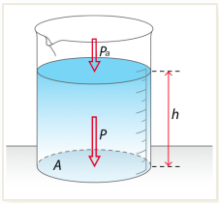


$$\frac{F_A}{S_A} = \frac{F_B}{S_B}$$

Legge di Stevino (generalizzata)



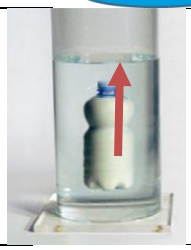
$$P = dgh$$



$$P = dgh + p_a$$

Principio di Archimede

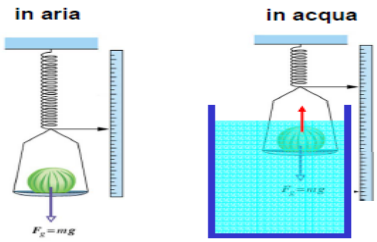
Galleggiamento



$$s_A = d_{liquido} g V_{immerso}$$

$$\frac{V_i}{V} = \frac{d_{corpo}}{d_{liquido}}$$

Peso apparente



$$p_{apparente} = p - s_A \qquad = (d_{corpo} - d_{acqua}) g V$$

Unità di misura della Pressione e conversioni

SI (MKS)	CGS	PRATICO
Pascal (Pa) [= N/m² = kg/(m·s²)]	**Baria (Ba)** [= dine/cm² = g/(cm·s²)]	**kgp / m²** [= N/m² = kg/(m·s²)]

1 **torr** = pressione di1 mm di Hg

1 **atm** = 1,01 ·10⁵ **Pa** = 760 **torr**

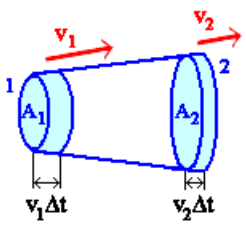
1 **bar** = 10⁵ **Pa** = 1 **MBa**

1 **mbar** = 10² **Pa** = 1 **hPa** = 1 **kBa**

1 **Pa** = 10⁻⁵ **bar** = 10 **Ba** = 0,99·10⁻⁵ **atm** = 9,8 **kg$_p$/m²**

1 **Ba** = 10⁻¹ **Pa** = 10⁻⁶ **bar**

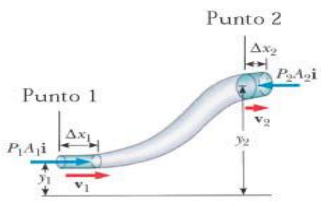
Portata ed equazione di continuità (Fluidi in moto)



$$Po = \frac{\Delta V}{t} = S \cdot v \quad \left[\frac{m^3}{s}\right]$$

$$Po_1 = Po_2 \rightarrow S_1 V_1 = S_2 V_2$$

Teorema di Bernoulli



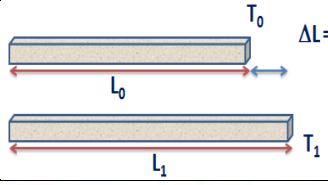
$$P + \frac{1}{2} dv^2 + dgh = \text{cost}$$

TERMOLOGIA E TERMODINAMICA

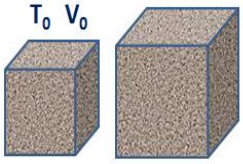
Temperatura

T = °t + 273,15 K °t = T - 273,15 °C

Dilatazione



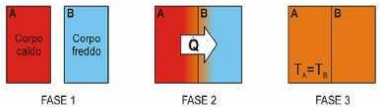
$$\Delta L = L_0 \lambda \Delta T \qquad L = L_0(1+\lambda\Delta T)$$



ΔV= V1 - V0 α = 3λ

$$\Delta V = V_0 \alpha \Delta T \qquad V = V_0(1+\alpha\Delta T)$$

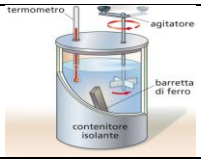
Calore



$$Q = mc(t_f - t_i) = mc\Delta t$$

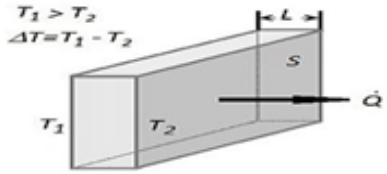
1 cal = 4,186 J

Calorimetro



$$c_2 = \frac{c_1 m_1 (T_e - T_1)}{m_2 (T_2 - T_e)} \qquad T_e = \frac{m_1 c_1 T_1 + m_2 c_2 T_2}{m_1 T_1 + m_2 T_2}$$

Conduzione



$$\frac{Q}{tempo} = \lambda \frac{S \cdot \Delta T}{L}$$

Passaggi di stato

Calore latente

$$Q = mL$$

Leggi dei Gas

P = cost $V_t = V_0(1+\alpha t)$ $\frac{V}{T} = k$

V = cost $P_t = P_0(1+\alpha t)$ $\frac{P}{T} = k$ $\alpha = \frac{1}{273}°C^{-1}$

T = cost $PV = k$

Equazione di stato $PV = nRT$ $R = 8{,}314 \frac{J}{molK}$

Teoria cinetica dei gas

$$Ec_{media\ molecola} = \frac{3}{2}kT \qquad k = 1{,}38 \cdot 10^{-23}\frac{J}{K} \qquad Ec_{media\ moli} = \frac{3}{2}nRT$$

Sistema termodinamico

PRIMO PRINCIPIO DELLA TERMODINAMICA

$$\Delta U = Q - L$$

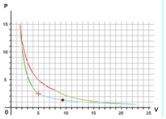
Macchina termica

RENDIMENTO

$$\eta = \frac{L}{Q_1} = \frac{Q_1 - Q_2}{Q_1} = 1 - \frac{Q_2}{Q_1}$$

Secondo principio della Termodinamica

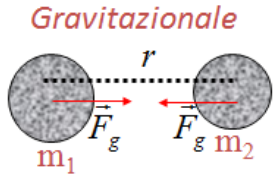
Teorema di Carnot



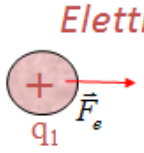
$$\eta_{rev} = 1 - \frac{T_2}{T_1}$$

ELETTROMAGNETISMO

FORZE GRAVITAZIONALE ED ELETTRICA



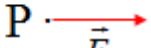
$$F_g = G\frac{m_1 m_2}{r^2}$$



$$F_e = K\frac{q_1 q_2}{r^2}$$

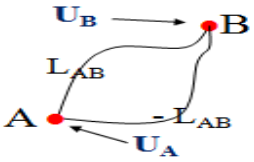
CAMPI GRAVITAZIONALE ED ELETTRICO

$$H = \frac{F_g}{m} = G\frac{M}{r^2}$$



$$E = \frac{F_e}{q} = K\frac{Q}{r^2} = \frac{1}{4\pi\varepsilon}\frac{Q}{r^2}$$

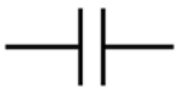
ENERGIA POTENZIALE / POTENZIALE



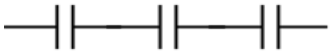
$$L_{AB} = U_A - U_B \qquad V(P) = \frac{U_P}{q} \qquad \boxed{L_{AB} = -q\Delta V_{BA}}$$

$$U_P = K\frac{Qq}{r_P} \qquad V(P) = K\frac{Q}{r} \qquad eV = e\cdot V$$

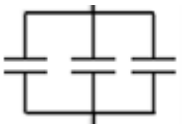
CONDENSATORI



$$C = \frac{Q}{\Delta V} = \varepsilon\frac{A}{d}$$

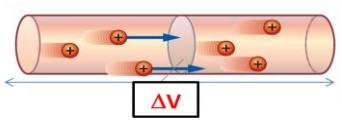


$$\frac{1}{C_{TOT}} = \frac{1}{C_1} + \frac{1}{C_2} + ..$$



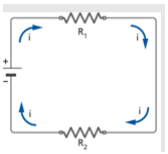
$$C_{tot} = C_1 + C_2 + ..$$

CORRENTE ELETTRICA / LEGGI DI OHM RESISTENZA

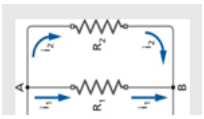


$$i = \frac{\Delta q}{\Delta t} \qquad \frac{\Delta V}{i} = R \qquad R = \rho\frac{l}{A}$$

$\rho = \rho_0(1 + \alpha t)$

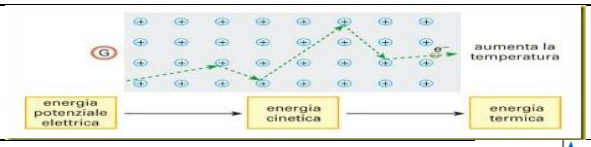


$$R_{tot} = R_1 + R_2 + \ldots$$



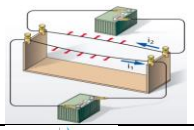
$$\frac{1}{R_{tot}} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$$

ENERGIA ELETTRICA

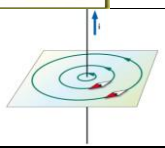


$$P = i\cdot\Delta V = i^2 R = \frac{(\Delta V)^2}{R}$$

MAGNETISMO



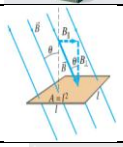
$$F = \frac{\mu_0}{2\pi}\frac{i_1 i_2}{d}l$$



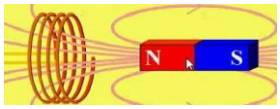
$$B = \frac{\mu_0 i}{2\pi R}$$

$$\vec{F} = q\vec{v}\wedge\vec{B} \qquad \vec{F} = i\vec{L}\wedge\vec{B}$$

FLUSSO / INDUZIONE ELETTROMAGNETICA



$$\Phi = \vec{B}\cdot\vec{A} = BA\cos\theta$$



$$fem = -\frac{\Delta\Phi}{\Delta t}$$

UNITA' DI MISURA

GRANDEZZA	SI (MKS)	CGS
INTENSITA' DI CORRENTE	AMPERE (A)	statC /s
CARICA ELETTRICA	COULOMB(C) = V·s	statC o Franklin = 3,3356 $\cdot 10^{-10}$ C
CAMPO GRAVITAZIONALE	m/s^2	cm/s^2
CAMPO ELETTRICO	N/C	dyne/statC
POTENZIALE ELETTRICO	VOLT(V) = J/C	statV ~ 300 V
CAPACITA' ELETTRICA	FARAD(F) = C/V	
RESISTENZA ELETTRICA	OHM(Ω) = V/A	
RESISTIVITA' ELETTRICA	Ω·m	
CAMPO MAGNETICO	TESLA (T) = N/(A·m)	GAUSS(G) = 10^{-4}T
FLUSSO MAGNETICO	WEBER (Wb) = T·m^2	MAXWELL (M) = G·cm^2