

## CONSTANT ACCELERATION FORMULAE



$v$  = final velocity (m/s)  
 $u$  = initial velocity (m/s)  
 $a$  = acceleration (m/s<sup>2</sup>)  
 $s$  = displacement (m)  
 $t$  = time (s)

$$\begin{aligned}
 v &= u + at \\
 s &= ut + 0.5at^2 \\
 s &= vt - 0.5at^2 \\
 s &= \frac{(u + v) \times t}{2} \\
 v^2 &= u^2 + 2as
 \end{aligned}$$

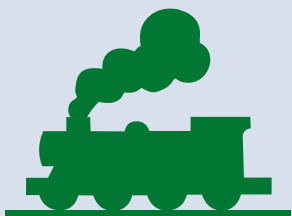
## NEWTON'S 2ND LAW OF MOTION



$\Sigma F$  = net force acting on an object (N)  
 $m$  = mass of object (kg)  
 $a$  = acceleration of object (m/s<sup>2</sup>)

$$\Sigma F = m \times a$$

## MOMENTUM



$p$  = Momentum (kg x m/s)  
 $m$  = Mass (kg)  
 $v$  = Velocity (m/s)

$$p = mv$$

## TORQUE



$$T = F \times d \times \sin(\theta)$$

$T$  = Torque (Nm)  
 $F$  = Force applied on lever (N)  
 $d$  = Distance that the force is applied from the axis of rotation (m)  
 $\theta$  = Angle between force vector and distance vector,  $\sin(\theta)$  is equal to 1 if perpendicular

## MECHANICAL ENERGY



$$ME = U_s + U_g + KE$$

$ME$  = mechanical energy (J)  
 $U_s$  = spring potential energy, a.k.a elastic potential energy (J)  
 $U_g$  = gravitational potential energy (J)  
 $KE$  = kinetic energy (J)

## GRAVITATIONAL POTENTIAL ENERGY



$$U_g = mgh$$

$U_g$  = gravitational potential energy (J)  
 $m$  = Mass of object (kg)  
 $g$  = Acceleration due to gravity = 9.8 m/s<sup>2</sup> = gravitational field strength = 9.8 N/kg  
 $h$  = Vertical height above a reference level (m)

TEMPERATURE  
CHANGE



$$Q = m \times C \times (T_{\text{final}} - T_{\text{initial}})$$

Q = heat energy applied (J)  
m = mass of object (kg)  
c = specific heat capacity of object (J/kg/K)  
T = initial and final temperatures of object (K)

FORCE ON A MOVING  
CHARGE



$$F = qvb$$

F = Magnetic Force  
q = Charge of the particle  
v = Velocity of the charged particle  
b = Magnetic Field Strength

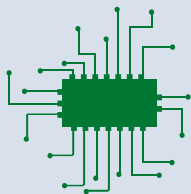
OHM'S  
LAW



$$V = IR$$

V = Voltage (volts)  
I = Current (amps)  
R = Resistance (ohms)

ELECTRICAL  
POWER



$$P = IV = I^2R = \frac{V^2}{R}$$

P = Power  
V = Voltage (volts)  
I = Current (amps)  
R = Resistance (ohms)

KINETIC  
ENERGY



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

KE = Kinetic energy of object (J)  
m = Mass of object (kg)  
v = Velocity of object (m/s)

GRAVITATIONAL  
FORCE



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

F = gravitational force of attraction from the center of mass of the two objects (N)  
G = gravitational constant  $6.674 \times 10^{-11}$  Nm kg  
m1 = mass of one of the objects (kg)  
m2 = mass of the other object (kg)  
r = distance between the center of the mass of the two objects (m)

PRESSURE



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

P = Pressure (N/m or Pascals)  
F = Force applied on a surface (N)  
A = Area of surface (m<sup>2</sup>)

ARCHIMEDES  
PRINCIPLE



$$F_b = F_{\text{g of object}} = F_{\text{g of fluid displaced}} = \rho_{\text{fluid}} \times V_{\text{g of fluid displaced}} \times g$$

F<sub>b</sub> = Force of buoyancy (N)  
F<sub>g of object</sub> = Weight of object (N)  
F<sub>g of fluid displaced</sub> = Weight of fluid displaced (N)  
ρ<sub>fluid</sub> = Density of fluid (kg/m<sup>3</sup>)  
V<sub>fluid displaced</sub> = Volume of fluid displaced by the object in the fluid (m<sup>3</sup>)  
g = gravitational field strength, a.k.a acceleration due to gravity = 9.8 N/kg = 9.8 m/s<sup>2</sup>

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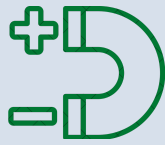
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## ELECTROSTATIC FORCE



$$F = \frac{k \times q_1 \times q_2}{r^2}$$

F = electrostatic force acting between two charged objects (N)

k = Coulomb's constant =  $9.0 \times 10 \text{ NmC}$

q1 = magnitude of one of the charged object (C)

q2 = magnitude of the other charged object (C)

r = distance between the center of the two charges (m)

## WORK



$$W = F \times d \times \cos(\theta)$$

W = Work done (J)

F = Force applied on object (N)

d = Distance object moves due to the application of the force (m)

$\theta$  = Angle between force vector and displacement vector,  $\cos(\theta)$  is equal to 1 when the force vector is in the same direction as the movement of the object

or

$$W = F \times d$$

W = Work done (J)

F = Component of the force that acts parallel to the distance only (N)

d = Distance object moves due to the application of the force (m)



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