

Grade 12 Physical Sciences: Complete Formula Sheet

Grade 12 | Physical Sciences | Study Guide | 2024

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MECHANICS

$v = u + at$

$s = ut + \frac{1}{2}at^2$

$v^2 = u^2 + 2as$

$s = \frac{(u+v)}{2} \cdot t$

$F_{net} = ma$

$p = mv$ (momentum)

$J = F \cdot \Delta t = \Delta p$ (impulse)

$W = F \cdot d \cdot \cos(\theta)$ (work)

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

$PE = mgh$

$P = W/t = Fv$ (power)

$g = 9.8 \text{ m/s}^2$ (free fall)

WAVES, SOUND & LIGHT

$v = f \cdot \lambda$ (wave speed)

$c = 3 \times 10^8 \text{ m/s}$ (speed of light)

$E = hf = hc/\lambda$ (photon energy)

$KE_{max} = hf - W$ (photoelectric effect)

$f_0 = W/h$ (threshold frequency)

Doppler: $f_L = v \pm v_L$ $f_S \cdot \frac{v \pm v_L}{v \pm v_S}$

ELECTRICITY & MAGNETISM

$F = kQ_1Q_2/r^2$ (Coulomb's Law; $k = 9 \times 10^9$)

$E = F/q = kQ/r^2$ (electric field)

$V = W/q$ (potential difference)

$V = IR$ (Ohm's Law)

$P = VI = I^2R = V^2/R$ (power)

$E = Pt$ (energy)

$R_{series} = R_1 + R_2 + \dots$

$1/R_{parallel} = 1/R_1 + 1/R_2$

$emf = V_t + Ir$ (internal resistance)

$emf = -N \cdot \Delta \phi / \Delta t$ (Faraday's Law)

$\phi = B \cdot A \cdot \cos(\theta)$ (magnetic flux)

CHEMICAL FORMULAE

$c = n/V$	(concentration; mol/L)
$n = m/M$	(moles)
$PV = nRT$	(ideal gas law; $R = 8.314$)
$pH = -\log[H_3O^+]$	
$pH + pOH = 14$	(at 25 degC)
$K_c = \frac{\text{products}}{\text{reactants}}$	(equilibrium constant)
$E_{\text{cell}} = E_{\text{cathode}} - E_{\text{anode}}$	

CONSTANTS

g (Earth surface)	9.8 m/s^2
c (speed of light)	$3 \times 10^8 \text{ m/s}$
h (Planck)	$6.63 \times 10^{-34} \text{ J.s}$
k (Coulomb)	$9 \times 10^9 \text{ N.m}^2/\text{C}^2$
e (electron charge)	$1.6 \times 10^{-19} \text{ C}$
R (gas constant)	8.314 J/mol.K
N_A (Avogadro)	$6.022 \times 10^{23} \text{ mol}^{-1}$