

Formula sheet: Physics - v2021.1

Mechanics

Gravitational force:

$$F_g = mg \quad (1)$$

$$F_g = \frac{Gm_1m_2}{r^2} \quad (2)$$

Kinetic energy:

$$E_k = \frac{1}{2}mV^2 \quad (3)$$

Potential energy:

$$E_p = mgh \quad (4)$$

Work:

$$W = Fscos(\alpha) \quad (5)$$

Dynamic friction:

$$F_f = fF_N \quad (6)$$

Spring force and energy:

$$F_s = Cu \quad (7)$$

$$E_s = \frac{1}{2}Cu^2 \quad (8)$$

Centripetal force

$$F_{cp} = \frac{mV^2}{r} \quad (9)$$

Electricity and Magnetic Fields

Basics:

$$P = UI \quad (10)$$

$$U = IR \quad (11)$$

Parallel circuit:

$$\frac{1}{R_v} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots \quad (12)$$

Series circuit:

$$R_v = R_1 + R_2 + R_3 + \dots \quad (13)$$

Coulomb's law:

$$F = k_e \frac{q_1q_2}{r^2} \quad (14)$$

Magnetic flux:

$$\Phi = \mathbf{B} \cdot \mathbf{A} \quad (15)$$

Lorentz force:

$$F_L = BIl = Bqv \quad (16)$$

Properties of Fluids and Solids

Ideal gas law:

$$\frac{pV}{T} = n\mathcal{R} \quad (17)$$

$$p = \rho RT \quad (18)$$

Heat energy:

$$Q = cm\Delta T \quad (19)$$

$$Q = C\Delta T \quad (20)$$

Pressure in a fluid:

$$p = \rho gh \quad (21)$$

Vibrations and Waves

Wavelength:

$$\lambda = vT \quad (22)$$

Period of a mass-spring system:

$$T = 2\pi\sqrt{\frac{m}{C}} \quad (23)$$

Maximal velocity harmonic motion:

$$v_{\max} = \frac{2\pi A}{T} \quad (24)$$

Notes:

- **Temperatures are in Kelvin (-273.15°C equals 0K).**
- **The Coulomb's constant equals $k_e = 8.99 \times 10^9 \text{ Nm}^2/\text{C}^2$.**
- **The gravitational constant equals $G = 6.674 \times 10^{-11} \text{ m}^3/\text{kg s}^2$. Acceleration due to the Earth's gravity can be assumed to equal $g = 9.81 \text{ m/s}^2$.**
- **If other constants are required, they will be provided in the question.**