CONSTANTS

Description	Value
Acceleration of gravity on Earth (g)	9.81 m/s^2
Speed of light in a vacuum (c)	3.00×10^8 m/s
Planck's constant (h)	6.63×10^{-34} J•s = 4.14×10^{-15} eV•s
Electron rest mass	9.11×10^{-31} kg
Proton rest mass	1.67×10^{-27} kg
Charge of electron	-1.60×10^{-19} C
Coulomb's constant (k_e)	9.0×10^9 N•m^2/C^2
Boltzmann constant (k_b)	1.38×10^{-23} J/K
Gas constant (R)	8.31 J/(mol•K)
Gravitational constant (G)	6.67×10^{-11} N•m^2/kg^2
Permeability of free space (μ_0)	$4\pi \times 10^{-7}$ T•m/A
Avogadro's number	6.02×10^{23} mol^{-1}

FORMULAS

NOTES

Not all formulas necessary are listed, nor are all formulas listed used on this test.

In questions on electricity and magnetism, the term *current* refers to "conventional current" and the use of the right-hand rule is assumed.

Mathematics	Matter and Its Interactions
$C = 2\pi r$	$E = hf$
$A = \pi r^2$	$E = mc^2$
$SA = 4\pi r^2$	$\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$
$V = \frac{4}{3}\pi r^3$	$hf = \varphi + eV$
	$\Delta x \Delta p \geq h$
	$\Delta E \Delta t \geq h$
	$p = \frac{h}{\lambda}$

FORMULAS (continued)

Motion and Stability: Forces and Interactions	Motion and Stability: Forces and Interactions in Fields and Circuits
$v_f = v_i + at$	$F = \frac{Gm_1m_2}{r^2}$
$x_f = x_i + v_i t + \frac{1}{2}at^2$	$F = \frac{k_e q_1 q_2}{r^2}$
$v_f^2 - v_i^2 = 2a(x_f - x_i)$	$a_c = \frac{v^2}{r}$
$F = -kx$	$\mathbf{E} = \frac{\mathbf{F}}{q_0}$
$F \leq \mu N$	$\mathbf{E} = \left\lvert\frac{\Delta V}{\Delta r}\right\rvert$
$F\,\Delta t = \Delta p$	$V = \frac{k_e q}{r}$
$\theta_f = \theta_i + \omega_i t + \frac{1}{2}\alpha t^2$	$R = \frac{\rho \ell}{A}$
$\omega_f = \omega_i + \alpha t$	$V = IR$
$v = r\omega$	$R_s = \Sigma R_i$
$a = r\alpha$	$\frac{1}{R_p} = \sum \frac{1}{R_i}$
$r = \frac{\sum mr}{\sum m}$	$P = IV$
$I = \sum mr^2$	$C = \frac{Q}{V}$
$\boldsymbol{\tau} = \mathbf{r} \times \mathbf{F}$	$C_p = \Sigma C_i$
$\boldsymbol{\Sigma\tau} = I\boldsymbol{\alpha}$	$\frac{1}{C} = \sum \frac{1}{C_i}$
$\mathbf{L} = \mathbf{r} \times \mathbf{p}$	$\mathbf{F} = q\mathbf{v} \times \mathbf{B}$
$L = I\omega$	$\mathbf{F} = I\boldsymbol{\ell} \times \mathbf{B}$
	$\varepsilon_{ave} = -\frac{\Delta\varphi}{\Delta t}$
	$\varphi = B_\perp A$

FORMULAS (continued)

Energy	Waves and Their Applications in Technologies for Information Transfer
$W = F\Delta x$	$a = -\omega^2 x$
$KE = \frac{1}{2}mv^2$	$x = A \sin \omega t$
$KE = \frac{1}{2}I\omega^2$	$T = 2\pi\sqrt{\frac{m}{k}}$
$PE = mgh$	$T = 2\pi\sqrt{\frac{L}{g}}$
$PE = \frac{1}{2}kx^2$	$v = f\lambda$
$\Delta\ell = \alpha\ell_0\Delta T$	$v = \sqrt{\frac{T}{\mu}}$
$Q = mc\Delta T$	$2L = n\lambda$, n is an integer
$Q = mL$	$4L = n\lambda$, n is odd
$\frac{Q}{\Delta t} = \frac{kA\Delta T}{d}$	$n_1 \sin\theta_1 = n_2 \sin\theta_2$
$PV = nRT$	$n = \frac{c}{v}$
$\frac{1}{2}m\overline{v^2} = \frac{3}{2}k_bT$	$\frac{1}{f} = \frac{1}{s_i} + \frac{1}{s_0}$
$\Delta E = Q - P\Delta V$	$M = \frac{h_i}{h_0} = -\frac{s_i}{s_0}$
	$d \sin\theta = m\lambda$
	$I = I_0 \cos^2\theta$