

OTHER FORMULAS

KINETIC ENERGY: $KE = \frac{1}{2}mv^2$ $m = \text{mass}$ $v = \text{velocity}$

POTENTIAL ENERGY $PE = m \times v \times h$ $m = \text{mass}$ $v = \text{velocity}$ $h = \text{height}$

LINEAR MOMENTUM CONSERVATION $m_1v_1 = m_2v_2$

ANGULAR MOMENTUM CONSERVATION $m_1v_1r_1 = m_2v_2r_2$

GRAVITATIONAL FORCE $f = \frac{Gm_1m_2}{r^2}$

ELECTRICITY

a. $V = I \times R$ $V = \text{VOLTAGE}$ $I = \text{CURRENT}$ $R = \text{RESISTANCE}$

b. $P = V \times I$ $P = \text{POWER}$

WAVE EQUATIONS:

a. $v = f \times \lambda$ $v = \text{VELOCITY}$ $f = \text{FREQUENCY}$ $\lambda = \text{WAVELENGTH}$

b. $f = \frac{1}{T}$ $f = \text{FREQUENCY}$ $T = \text{PERIOD}$

GAS LAW EQUATIONS: $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

EFFICIENCY OF A HEAT ENGINE: $\text{Efficiency} = \frac{T_2 - T_1}{T_2} \times 100$

QUANTUM NUMBERS AND SYMBOLS

Symbol	Name	Description	Permitted Values
n	Principal quantum number	Main energy level	1,2,3,4
ℓ	Orbital quantum number	Sublevel	0 . . . n - 1
m_ℓ	Magnetic quantum number	Orbital	-ℓ, -$\ell+1$, -$\ell+2$ +ℓ
m_s	Electron spin quantum number	Electron spin	-1/2 or +1/2

1s
 2s 2p
 3s 3p 3d
 4s 4p 4d 4f
 5s 5p 5d 5f 5g
 6s 6p 6d 6f 6g 6h

Practice Problems

- Suppose that all you know about a certain electron in an atom is that its principal quantum number is 3. What are the possible value sets (ℓ , m_ℓ , m_s) for the other three quantum numbers?
- Is it possible for an electron in an atom to have these quantum numbers: $n=2$, $\ell=1$, $m_\ell=3$, $m_s=1/2$? Why or why not?

Practice Problems, cont'd

3. Is it possible to have two electrons in an atom with the same n , ℓ , and m_ℓ ?
4. How many subshells are there in an atom in the level with a principal quantum number $n=3$?
5. What type of orbital in an atom is designated by quantum numbers $n=4$, $\ell=3$, and $m_\ell=0$?
6. A subshell in an atom has the values, $n = 3$, $\ell = 2$. How many orbitals are there in this subshell?
7. A subshell in an atom has the values, $n = 4$, $\ell = 1$. What is the maximum number of electrons that it can hold?