Physical Quantities: Dimensions and Units

Quantities	Dimensions	MKS and CGS Units
mass	mass	<u>MKS</u>: kilograms (kg) <u>CGS</u>: grams (gm or g)
distance, depth, length, height, width	distance	<u>MKS</u>: meters (m) <u>CGS</u>: centimeters (cm)
time	time	seconds (sec or s)
temperature	temperature	Kelvin (K) and Centigrade (degrees C)
area	distance × distance	<u>MKS</u>: m^2 <u>CGS</u>: cm^2
volume	distance × distance × distance (*i.e.*, distance^3)	<u>MKS</u>: m^3 <u>CGS</u>: cm^3
density	mass/volume (*i.e.*, mass/distance^3)	<u>MKS</u>: kg/m^3 <u>CGS</u>: gm/cm^3
speed; velocity (motion) (rate of change of position)	distance/time	<u>MKS</u>: m/s <u>CGS</u>: cm/s
acceleration (rate of change of an object's velocity with respect to time)	(distance/time)/time (*i.e.*, distance/time^2)	<u>MKS</u>: m/s^2 <u>CGS</u>: cm/s^2
force ("push" or "pull" that can change an object's motion) (Note that <u>weight</u> is just a special case of a force—the force of gravity)	mass × acceleration *or* mass × distance/time^2	<u>MKS</u>: kg × m/s^2 (**Newton**) <u>CGS</u>: gm × cm/s^2 (**dyne**)

Quantities (cont'd)	Dimensions	MKS and CGS Units
pressure (collective force exerted by random molecular collisions against each unit of area of an object's surroundings)	force/area *or* (mass × distance/time^2)/area *or* energy/volume	MKS: N/ m^2 *or* (kg × m/s^2)/m^2 **(Pascal)** CGS: dyne/cm^2
work (force times distance over which the force is applied to an object as the object moves under the influence of the force); **energy** (the capacity to do work)	force × distance *or* mass × acceleration × distance *or* pressure × volume	MKS: Newton x m *or* kg × m^2/s^2 *or* Pa × m^3 **(Joule)** CGS: dyne × cm or gm × cm^2/s^2 **(erg)**
power (energy transferred or gained or lost per unit time)	energy/time *or* force × distance/time *or* force × velocity *etc.*	MKS: J/s *or* N × m/s *or* kg × (m/s^2) x m/s **(Watt)** CGS: erg/s
energy flux (rate at which energy is transferred, absorbed, or lost per unit time per unit surface area)	(energy/time)/area *or* force × (distance/time)/area *etc.*	MKS: (J/s)/m^2 *or* W/m^2 CGS: (erg/s)/cm^2