


# Physics 231 - 1-Sep-99



- Units

- Unit Conversion

- Pre-test

# Units (SI)


time - second (s)

- Standard - atomic clock: oscillations of Cs 133
- 9,192,631,770 oscillations = 1 second

length - meter (m)

- derived from speed of light = 299,748,458 m/s
- 1 m = distance light travels in  $1/299,748,458$  s
- 1m = distance light travels in  $\sim 9 \times 10^9 / 3 \times 10^8 = 3,000$  oscillations of Cs 133

## Units (SI) - continued



- mass - kilogram (kg)
  - standard - derived from standard mass at NIST
  - physical standard based on atomic masses not (yet) as accurate

# Unit Prefixes



# Compound Units

## Areas and Volumes

- Area -  $[L] \times [L] = [L]^2$  e.g.  $m^2$

- Volume -  $[L]^3$  e.g.  $m^3$

## Others

- speed -  $[L]/[T]$  e.g.  $m/s$

- density -  $[M]/[L]^3$  e.g.  $kg/m^3$

- acceleration = speed/time =  $[L]/[T]^2$

- Force - mass x acceleration =  $[M] \times [L]/[T]^2$

# Mass and Weight



## SI Units

Time - second (s)

Length - meter (m) =  
100 cm

Mass - kilogram (kg) =  
1,000 grams (g)

- Intrinsic property of object
- Same everywhere in universe; 1 kg weighs ~2.2 lbs on earth

## British Units

■ Time - second (s)

■ Length - inch (in) =  
2.54 cm

■ Weight = pound (lb)

- Measured in force units  $[M] \times [L] / [T]^2$
- $m \times g$  (acceleration of gravity)
- Value depends on location

# Unit Conversion



Single Units - e.g. 20 km = ? m

Compound Units - e.g. 60 mi/hr = ? m/s