Statistical Physics II.

© Daniel Alonso. IUdEA

Physical Units

- **To compute in a fast way quantities that involve physical constants you can use the package that *Mathematica* has in it.**

  - **We load the pachage**

```
<< PhysicalConstants`
```

  - **Now we have some constants to use (look at the help menu for more). Examples are:**

```
ProtonMass
```

1.67262×10^{-27} Kilogram

```
ElectronMass
```

9.10938×10^{-31} Kilogram

```
ElectronCharge
```

1.60218×10^{-19} Coulomb

```
SolarRadius
```

6.9599×10^{8} Meter

```
SolarLuminosity
```

3.84×10^{26} Watt

```
CosmicBackgroundTemperature
```

2.726 Kelvin

```
StefanConstant
```

$$\frac{5.6704 \times 10^{-8}\ \text{Watt}}{\text{Kelvin}^4\ \text{Meter}^2}$$

```
EarthMass
```

5.9742×10^{24} Kilogram

```
EarthRadius
```

$$6\,378\,140\ \text{Meter}$$

- You can use them to compute. For instance the mean Earth density

```
EarthDen = EarthMass / ((4 π / 3) (EarthRadius)^3)
```

$$\frac{5496.79\ \text{Kilogram}}{\text{Meter}^3}$$

- Another thing you can do is to change the units system. For instance you have the Earth density in the MKS system and you want it in the CGS system.

```
CGS[EarthDen]
```

$$\frac{5.49679\ \text{Gram}}{\text{Centimeter}^3}$$

- Or

```
<< Units`
```

```
Convert[EarthDen, Gram / Centimeter^3]
```

$$\frac{5.49679\ \text{Gram}}{\text{Centimeter}^3}$$

```
Convert[2.1 Kilo Meter / Hour, Inch / Minute]
```

$$\frac{1377.95\ \text{Inch}}{\text{Minute}}$$

With these packages; PhysicalConstants and Units you can work in your computations in a very efficient way. In fact there are more things available. As example (you can explore for more) is the ElementData function,

```
ElementData["H", "AtomicWeight"]
ElementData[1, "AtomicWeight", "Units"] (* gives the units *)
ElementData[1, "MolarVolume"]
```

```
1.00794
```

```
AtomicMassUnits
```

```
0.0112
```