Photon Energies

Calculate the frequency, wavelength, and photon energies for various common forms of electromagnetic radiation.

```
In[25]:= h = Quantity[1, "PlanckConstant"];
         c = Quantity[1, "SpeedOfLight"];
```

```
In[27]:= finfo[ff_] := Module[{λλ, Ep},
           λλ = UnitConvert[c/ff, "Meters"];
           Ep = UnitConvert[h ff, "Electronvolts"];
           StringForm["f = ``, λ = ``, E_photon = ``",
             UnitConvert[f, "Hertz"], λ, Ephoton];
           {f → UnitConvert[ff, "Hertz"], λ → λλ, Ephoton → Ep}]
```

```
In[28]:= λinfo[λ_] := finfo[Quantity[1, "SpeedOfLigth"]/λ]
```

Red laser pointer.

```
In[29]:= info = λinfo[Quantity[655., "Nanometers"]]
```

$$\text{Out[29]= } \left\{ f \to 4.57698 \times 10^{14}\, \text{Hz}, \lambda \to 6.55 \times 10^{-7}\, \text{m}, \text{Ephoton} \to 1.89289\, \text{eV} \right\}$$

```
In[30]:= p = Quantity[0.24, "Milliwatts"];
```

```
In[31]:= UnitConvert[p / Ephoton, 1/"Seconds"] /. info
```

$$\text{Out[31]= } 7.91363 \times 10^{14}\, \text{per second}$$

Cell phone

```
In[32]:= finfo[Quantity[1.9, "Gigahertz"]]
```

$$\text{Out[32]= } \left\{ f \to 1.9 \times 10^{9}\, \text{Hz}, \lambda \to 0.157786\, \text{m}, \text{Ephoton} \to 7.85777 \times 10^{-6}\, \text{eV} \right\}$$

Visible Light

```
In[33]:= λinfo[Quantity[400., "Nanometers"]]
```

$$\text{Out[33]= } \left\{ f \to 7.49481 \times 10^{14}\, \text{Hz}, \lambda \to 4. \times 10^{-7}\, \text{m}, \text{Ephoton} \to 3.0996\, \text{eV} \right\}$$

```
In[34]:= λinfo[Quantity[700., "Nanometers"]]
```

$$\text{Out[34]= } \left\{ f \to 4.28275 \times 10^{14}\, \text{Hz}, \lambda \to 7. \times 10^{-7}\, \text{m}, \text{Ephoton} \to 1.7712\, \text{eV} \right\}$$

X-rays

In[35]:= **λinfo[Quantity[0.3, "Nanometers"]]**

Out[35]= $\left\{ f \to 9.99308 \times 10^{17}\, \text{Hz}\,,\, \lambda \to 3. \times 10^{-10}\, \text{m}\,,\, \text{Ephoton} \to 4132.81\, \text{eV} \right\}$