

Dark Matter Box

```
In[23]:= h = Quantity[7.7, "cm"];  
w = Quantity[16.5, "cm"];  
d = Quantity[12.5, "cm"];  
V = UnitConvert[w d h, "cm"]; // N  
Print["V ", V];  
Print[" ", UnitConvert[V, "quart"]];
```

V 1588.13 cm³

1.67815 qt

```
In[29]:= H = Quantity[67.3, "km/s/Mpc"];  
h = H[[1]] / 100;  
G = Quantity[1, "G"];  
rhoc = UnitConvert[3 H ^ 2 / (8 Pi G), "g/cm^3"];  
OmegaM = 0.293;  
OmegaLambda = 0.707;  
Omegabh2 = 0.02211;  
Omegach2 = 0.1162;
```

```
In[37]:= << StandardAtmosphere`  
UnitConvert[ParticleData["Electron", "Mass"], "g"]  
rhoElectrons = UnitConvert[ParticleData["Electron", "Mass"], "g"]  
UnitConvert[ChemicalData["Air", "MolarMass"] ThermodynamicData["Air",  
"MolarDensity"] / UnitConvert[Quantity[1, "AMU"], "g"], "1/cm^3"];
```

Out[38]= 9.109383×10^{-28} g

```

In[40]:= c = UnitConvert[Quantity[1, "c"], "Meter/Second"];
muonFlux = Quantity[100, "1/(Meter^2 Second)"];
mMu = UnitConvert[ParticleData["Muon", "Mass"], "g"];
rhoMuon = UnitConvert[mMu muonFlux / c, "cm"];
rhoNu = UnitConvert[Quantity[1, "eV"] Quantity[110, "1/cm^3"] 6 / c^2, "g/cm^3"];
rhoLeptons = rhoNu + rhoElectrons + rhoMuon
rhoGamma =
  UnitConvert[Quantity[1, "StefanConstant"] Quantity[2.7, "Kelvin"]^4 / c^3, "g/cm^3"]
TableForm[{"Total Mass", V[[1]] MeanDensity[0][[1]] / 1000},
  {" Dark Matter", V[[1]] Omegach2 rhoc[[1]] / h^2}, {" Dark Energy",
  V[[1]] OmegaLambda rhoc[[1]]}, {" Air", V[[1]] MeanDensity[0][[1]] / 1000},
  {" Nitrogen", 0.78 V[[1]] MeanDensity[0][[1]] / 1000},
  {" Oxygen", 0.209 V[[1]] MeanDensity[0][[1]] / 1000},
  {" Argon", 0.009 V[[1]] MeanDensity[0][[1]] / 1000},
  {" CO2", 0.0003 V[[1]] MeanDensity[0][[1]] / 1000}, {" Leptons", V rhoLeptons},
  {" Electrons", V rhoElectrons}, {" Muons", V rhoMuon},
  {" Neutrinos", V rhoNu}, {" Photons", UnitConvert[V rhoGamma, "g"]}
  ]

```

Out[44]= $6.60681 \times 10^{-7} \text{ g/cm}^3$

Out[45]= $1.11842 \times 10^{-34} \text{ g/cm}^3$

Out[46]/TableForm=

Total Mass	1.94545
Dark Matter	3.46653×10^{-27}
Dark Energy	9.55298×10^{-27}
Air	1.94545
Nitrogen	1.51745
Oxygen	0.4066
Argon	0.0175091
CO ₂	0.000583636
Leptons	0.00104924 g
Electrons	0.00104924 g
Muons	$9.97785 \times 10^{-35} \text{ g}$
Neutrinos	$1.86852 \times 10^{-27} \text{ g}$
Photons	$1.77619 \times 10^{-31} \text{ g}$

V Quantity[0.3, "GeV/cm^3"]

476.438 GeV

```

In[50]:= UnitConvert[UnitConvert[Quantity[476, "GeV"], "Joule"] / c^2, "g"]

```

Out[50]= $8.485470 \times 10^{-22} \text{ g}$