In[58]:=
```
MR = -19.50;
Δmbol = 0;
Mbolsun = 4.74;
mvega = 0;
fvega = 217.7 * 10^-11; (*fluxλ in R band for vega in erg cm^-2 s^-1 A^-1*)
Mbol = MR + Δmbol;
L = 10^((Mbolsun-Mbol)/2.5)
```

Out[63]= 4.96592×10^{9}

In[64]:=
```
Lsun = 3.828 * 10^33;
kmtocm = 10^5;
v_int = 3500 kmtocm;(*estimate of shell velocity in cm s^-1*)
pctocm = 3.086 * 10^18;
w = (2 L * Lsun)/v_int^3 (*wind-density parameter in erg s^2 cm^-3 or g cm^-1*)
```

Out[68]= 8.86743×10^{17}

In[71]:=
```
vwind = 100 kmtocm;(*Assuming some wind velocity of 100 km s^-1*)
Msun = 1.989 * 10^33;
secondsinayear = 365.25 * 24 * 60 * 60;
Mdot= (w*vwind)/Msun secondsinayear (*Mass loss rate in solar masses per year*)
```

Out[73]= 0.140691

In[56]:=
```
w * vwind
(w * vwind)/Msun
```

Out[56]= 8.86743×10^{24}

Out[57]= 4.45824×10^{-9}

In[101]:=
```
Maverage = -19.25;
Lrad = 10^((Mbolsun-Maverage)/2.5)
Mextra = -18;
Lextra = 10^((Mbolsun-Mextra)/2.5);
secondsinaday = 60 * 60 * 24;
(Lrad * Lsun * 55 * secondsinaday) + (Lextra * Lsun * 100 * secondsinaday)
```

Out[102]= 3.94457×10^{9}

Out[106]= 1.1301×10^{50}

```
f = fvega 10^((m-mvega)/-2.5) (*flux of SN2012ab at peak magnitude in erg cm^-2 s^-1 A^-1*)
```

In[141]:=
```
Fspec = 8.6607 * 10^-12;
mref = 0.186;
Rbandwidth = 1380;
FvegaR = 217.7 * 10^-11;
mest = mref - 2.5 * Log10[Fspec / (Rbandwidth * FvegaR)]
modulusred = -34.8146;
Mest = mest + modulusred
```

Out[145]= 14.0365

Out[147]= -20.7781