9.26) E_F for Gold is 5.51 eV at 293 K.

a) Find ⟨Conduction e^-⟩ at 293 K $= \bar{E}_{ce^-}$

And find ⟨Excited e^-⟩

b) Find T for which $\frac{1}{2}m\overline{v^2_{MB}} = \frac{3}{2}kT = \bar{E}_{ce^-}$

c) Comment ______"______

a) The average energy of the conduction (valence) e^- is

$$\langle E_{ce^-}\rangle = \bar{E}_F = \frac{3}{5}E_F = \frac{3}{5}(5.51) \qquad (9.45)$$

$$\boxed{\langle E_{ce^-}\rangle = 3.306\ eV}$$

Conduction Electron Average Energy

The excited e^- are those that migrate up above the Fermi energy.

$$E_{EXCITED} = E_F + 2\left(\frac{\pi}{3}kT\right) = 5.51 + \frac{2\pi}{3}(8.26\times10^{-5})(393)$$

$$= 5.51 + 0.0529$$

$$\boxed{\langle E_{EXCITED}\rangle = 5.56\ eV}$$

Excited Electron Average Energy

b) Find T from $\vec{K}_{MB} = \frac{3}{2}kT$

$$T = \frac{2}{3}\frac{\bar{K}_{MB}}{k} = \frac{2(3.306)}{3(8.62\times10^{-5})}$$

$$\boxed{T_{Au} = 2.556\times10^4\ K}$$

c) Since T_{Au} is so much higher than room temperature, we can work as though $T_{ROOM} = 0K$.