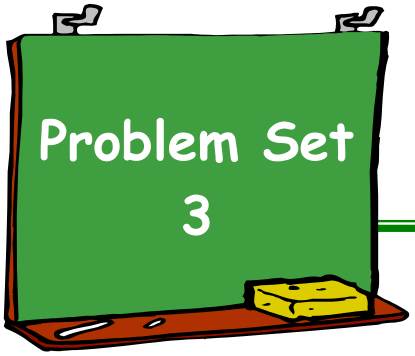
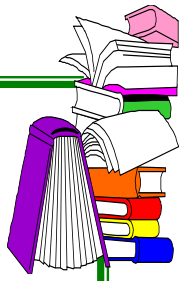


## 🕮 Question 1

**A-** Show that the conductivity in FE model is an especial case of that in NFE model.

**B-** Show that for the FE model, the effective mass is equal to the free electron mass.

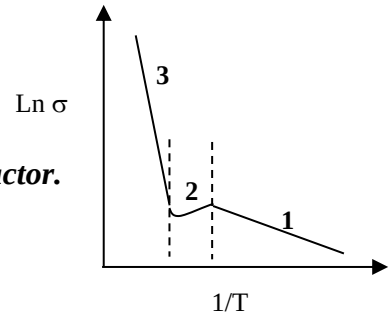
## 🕮 Question 2

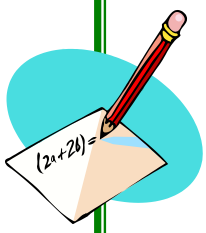
Given the following data for the variation of the conductivity of ***intrinsic silicon*** with temperature, evaluate the energy gap of silicon, and estimate the wavelength that will be absorbed if we shine a light on the sample.

| T ($^oC$) | -23 | 2 | 17 | 42 | 67 |
|---|---|---|---|---|---|
| $\sigma$ ($\Omega^{-1}m^{-1}$) | 26.7 | 295 | 2050 | 10800 | 45032 |

## 🕮 Question 3

The following figure represents the variation of the conductivity with temperature for an ***extrinsic semiconductor.*** What does each of the three shown regions refer to ?

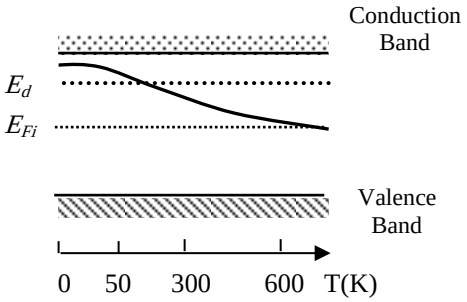


## 🕮 Question 4

It is well known that **Fermi level** in metals is temperature independent. In extrinsic semiconductors the situation is totally different.

The following diagram shows the variation of **Fermi level** with temperature in ***n-type*** semiconductors. Explain this phenomenon based on the definition of **Fermi level** in semiconductors.




## 🕮 Question 5

Starting with the relation:

$$R = \frac{R_e\sigma_e^2 + R_h\sigma_h^2}{(\sigma_e + \sigma_h)^2}$$

for Hall constant of a semiconductor contains both holes and electrons, show that this relation may rewritten as :

$$R = \frac{p\mu_h^2 - n\mu_e^2}{e(n\mu_e + p\mu_h)^2}$$

where $n$, $p$ and $\mu_e$, $\mu_h$ are the number and mobility of electrons and holes respectively.