



*Arab Academy for Science & Technology & Maritime Transport
(AASTMT – Cairo Branch)*

College of Engineering & technology

Electronics & Communication Engineering Department

Course : Solid State Electronics

Course Code : EC210

Sheet #2

TextBook

'Principles of Electronic Materials and Devices', Third Edition, S.O. Kasap © McGraw-Hill, 2006

Constants:

$$\epsilon_0 = 8.85 \times 10^{-12} \text{ Fm}^{-1}$$

$$\text{Charge of electron } (q) = 1.6 \times 10^{-19} \text{ C}$$

$$\text{Mass of electron } (m_e) = 9.1 \times 10^{-31} \text{ kg}$$

$$\text{Plank's Constant } (h) = 6.63 \times 10^{-34} \text{ Js}$$

Solve the following problems:

[1] Example 1.3 p.17:

The potential energy E per $\text{Na}^+ - \text{Cl}^-$ pair within the NaCl crystal depends on the interionic separation as:

$$E(r) = -\frac{q^2 M}{4\pi\epsilon_0 r} + \frac{B}{r^m}$$

where $M=1.748$, $m=8$, $B = 6.972 \times 10^{-96} \text{ Jm}^8$. Find:

- i. The acting force $F(r)$.
- ii. The equilibrium separation r_0 .
- iii. The ionic bonding energy.
- iv. Plot the attractive, repulsive and net force versus the interionic separation.

[2] Example 1.4 p.23