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 #5

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

Constants:

$\varepsilon_o = 8.85\times10^{-12}\,\mathrm{Fm^{-1}}$

Charge of electron $(q) = 1.6\times10^{-19}\,\mathrm{C}$

Mass of electron $(m_e) = 9.1\times10^{-31}\,\mathrm{kg}$

Plank's Constant $(h) = 6.63\times10^{-34}\,\mathrm{Js}$

Solve the following problems

[1] Consider an electron in an infinite potential well of size 0.1nm (typical size of an atom).
   a. What is the ground energy of the electron?
   b. What is the energy required to put the electron at the third energy level?
   c. How can this energy be provided?
   d. Plot the corresponding E-k diagram.
   e. Find the expression for the wavefunction of the first and second energy level, with all constants replaced with values.

[2] Write Schrodinger Equation and wave equation for both regions if:
   a. An electron with energy of 3eV is incident on a semi-infinite rectangular potential barrier of height 2eV.
   b. An electron with energy of 1eV is incident on a semi-infinite rectangular potential barrier of height 2eV.