**Arab Academy for Science & Technology
and Maritime Transport – Cairo Branch**
College of Engineering & technology
Electronics & Communication Engineering Department

EC311 – Electronic Materials
Problem Set No.9: Introduction to Magnetism
Duration: Week# 9

h = 6.63 x 10^{-34} J-s

P1) What is the angular momentum of a particle of mass m, moving in a circle of radius r with an angular velocity ω?

P2) From the rules governing the use of quantum numbers, show that the K, L and M shells in an atom can accommodate at most 2,8 and 18 electrons, respectively.

P3) For each of the following atoms and ions, sketch the electronic structure, using a box for orbital wave functions and arrow (up or down) for an electron:
  a) Manganese, [Ar] $3d^5 4s^2$
  b) Cobalt, [Ar] $3d^7 4s^2$

P4) (a) For n = 4, what is the largest allowed value of ℓ?

(b) What is the magnitude of the corresponding orbital angular momentum for ℓ =3?

(c) Draw the possible orientations of the orbital angular momentum vector L for ℓ =3.

(d) How many different projection on the z axis may this angular momentum vector have?

(e) What is the magnitude of the largest projected component?

(f) What is the smallest angle that the angular momentum vector can make with the z axis?

P5) Show the possible orientations of the orbital angular momentum vector L for ℓ = 0, 1, 2, 3 and 4.