Quiz1: Refreshers

- **SI units**: in your calculations, ensure that the values of the parameters are on matching units. For example, in the Electric Force equation:

$$\vec{\mathbf{F}}_{12} = k_e \frac{q_1 q_2}{r^2} \hat{\mathbf{r}}_{12}$$

Ke= 8.9876 x 10^9 $N{\cdot}m^2/C^2$. To calculate the value of the force in Newton(N) using the given value of Ke, ensure that the values of qi are in Coulombs and those of *r* in meters. For instance, if in the question, the value of *r* is given in centimeter, convert it to meter in Eq.(1) calculation. For the values of the meter prefixes, e.g., nano, please refer to https://abacus.bates.edu/acad/depts/biobook/Metric.htm

- **Continuous Charge distribution** (reference pp 52-56 of Chapter 23): for uniform/even charged distribution, the charge densities are constant and can be calculated as given in slide 54.
For non-unform charge distribution, the charge densities are NOT constant. Then (see slide 55), **the amount of particle charge, *dq* is given by:**
  - For the volume charge distribution: $dq = \rho\, dV$
  - For the surface charge distribution: $dq = \sigma\, dA$
  - For the length element: $dq = \lambda\, d\ell$

  To calculate the total charge of the material, you need to calculate the integral of *dq* over the surface of the material; in this regard, the symbolic expression of the charge density is often given in the question.
  The choice of the material section containing *dq* should be wisely chosen. It is obvious for a 1 D shape; for 2D and 3D shapes, please refer to the examples given chapter 23 slides 59-62; for instance, in slide 62, dA=2.PI.r.dr, i.e. the perimeter of a ring times its thickness which is assumed to be infinitesimal.

- As indicated in slide 15 of Chapter 24, The **net flux through <u>any closed</u> surface surrounding a point charge, *q*, is given by q/ε_o and <u>is independent of the shape of that surface or its dimensions. What matters is the aggregate (signed sum) of the enclosed chargeS including those on the surface, not the shape or dimensions of the closed surface.</u>**

- As explained in slide 23 of chapter 25; if the electric field is constant through the surface of the integration, we can remove it from the closed integral expression while calculating the net flux. Recall that the Electric field depends solely on the source charge and its distance to the point of interest(P)

- As indicated in slide 67 of chapter 23, t**he number of lines drawn leaving a positive charge or approaching a negative charge is proportional to the magnitude of the charge.**