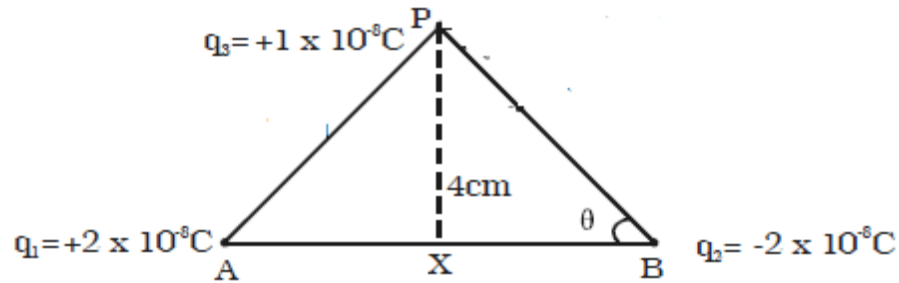# Home Assignment II
## Date of Submission September 11, 2023

1. Two small equal and unlike charges 2×10^{-8}C are placed at A and B at a distance of 6 cm is shown in fig. below. Calculate the magnitude and direction of force on the charge 1×10^{-8}C placed at P, where P is 4cm on the perpendicular bisector of AB.


2. The sum of two point charges is 6 µC. They attract each other with a force of 0.9 N, when kept 40 cm apart in vacuum. Calculate the charges.

3. Compare the magnitude of the electrostatic and gravitational force between an electron and a proton at a distance r apart in hydrogen atom. (Given : me = 9.11 × 10−31 kg ; mP = 1.67 × 10−27 kg ; G = 6.67 × 10−11 Nm2 kg−2; e = 1.6 × 10−19 C) [2.27 × 10^{39}

4. Two point charges +9e and +1e are kept at a distance of 16 cm from each other. At what point between these charges, should a third charge q to be placed so that it remains in equilibrium?

5. Two small charged spheres repel each other with a force of 2×10^{-3} N. The charge on one sphere is twice that on the other. When one of the charges is moved 10 cm away from the other, the force is 5×10^{-4} N. Calculate the charges and the initial distance between them.

6. Two point charges +4q and +q are placed 30 cm apart. At what point on the line joining them the electric field is zero?
7. A dipole is placed in a uniform electric field with its axis parallel to the field. What is Torque on it?
8. Two charges 10×10^{-9} C and 20×10^{-9}C are placed at the two corners of a equilateral triangles. The length of the arms is 0.03 m. calculate the electric field out the third corner of the triangles.

9. Two equal charges of 10×10^{-5} C are shown in fig below; each produces an electric field at point P on Y axis. (a) What are the magnitudes of the fields at P? (b) what is direction of field? (c) Find the X and Y components of the field vector.(d) What is the direction of the net field?

P

10cm

|-------20cm-------|
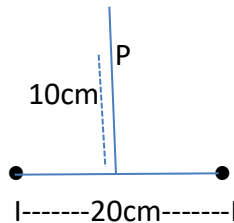
10. An electric dipole consists of charges +2e and -2e separated by 0.78 nm. It is in an electric field of strength 3.4×10^6 N/C. Calculate the magnitude of the torque on the dipole when the dipole moment is (a) parallel to, (b) perpendicular to, and (c) antiparallel to the electric field.

11. An electric dipole consisting of charges of magnitude 1.50 nC separated by 6.20 μm is in an electric field of strength 1100 N/C. What are (a) the magnitude of the electric dipole moment and (b) the difference between the potential energies for dipole orientations parallel and antiparallel to E?

12. How much work is required to turn an electric dipole 180° in a uniform electric field of magnitude E =46.0 N/C if the dipole moment has a magnitude of p =3.02× 10^{-25} C.m and the initial angle is 64°?

13. Calculate (i) the potential at a point due a charge of 4×10^{-7}C located at 0.09m away (ii) work done in bringing a charge of 2×10^{-9} C from infinity to the point.

14. Calculate the electric potential at a point P, located at the centre of the square of point charges shown in the figure.

q_1 +12nc   d q_2 -24nc

P

d   d

+31nc q_3 d=1.3m q_4 +17nc
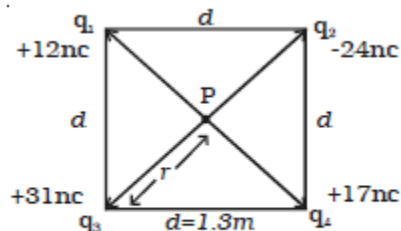
15. If a point lies at a distance x from the midpoint of the dipole, calculate the electric potential at this point.

16. The electric potential difference between the ground and a cloud in a particular thunderstorm is 1.2×10^9 V. In the unit electron-volts, what is the magnitude of the change in the electric potential energy of an electr