

PHY114 S09 Exam Practice 1

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These questions are only meant only as a general guide for exam preparation. The actual questions in the exam will be different possibly in both style and content. Chapters 21, 22, 23 will be covered in the exam.

- A flat square sheet of thin aluminum foil, 40 cm on a side, carries a uniformly distributed 250 nC charge. What, approximately, is the electric field 2.0 cm above the center of the sheet? What, approximately, is the electric field 20 m above the center of the sheet?
- A 15.0 cm diameter nonconducting sphere carries a total charge of $2.25 \mu\text{C}$, distributed uniformly throughout its volume. Plot the electric field as a function of the distance from the center of the sphere from $r = 0$ to $r = 30$ cm.
- The Earth is surrounded by an electric field, pointing inward at every point, of magnitude 150NC^{-1} near the surface. What is the net charge on the Earth? How many excess electrons per square meter on the Earth's surface does this correspond to?
- An electron acquires $3.30 \times 10^{-16} \text{J}$ of kinetic energy when it is accelerated by an electric field from plate A to plate B. What is the potential difference between the plates? Which plate is at the higher potential?
- In a thunderstorm, charge builds up on the water droplets or ice crystals in a cloud. Assume a spherical thunder cloud of radius 1 km. Estimate the total charge on the cloud when the breakdown of the surrounding air is reached. Take the breakdown electric field (at which lightning can form) of air to be $3 \times 10^6 \text{NC}^{-1}$.