St John Baptist De La Salle Catholic School, Addis Ababa Homework 5 2nd Quarter

Aaron GK

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Notes, and use of other aids is allowed. Read all directions carefully and write your answers in the space provided. To receive full credit, you must show all of your work. Cheating or indications of cheating and similar answers will be punished accordingly.

Information

- The homework is due on Friday, December 30th.
- You should Work on it **individually** and consult me if you have any questions. As I have reiterated multiple times, cheating will have a serious consequence.
- For purposes of neatness and simplicity of grading, you should do the homework on an A-4 paper.

Questions

- 1. Define electric potential and describe its relationship with electric potential energy.
- 2. When a 1.5 V flashlight battery runs a single 20W headlight, how many electrons pass through it each second?
- 3. What is the difference between a car battery that is 12V and a smaller flashlight that is also 12V? Why does the latter run out faster although they have the same voltage?
- 4. A lot of electrical appliances have potential differences set at some reference point. As you may recall, potential difference is the difference in absolute potential between points. For example, a voltaic cell might have a voltage of 1.5V, what does that mean? Also, why do we have ground as a reference in multiple electric appliances?
- 5. How far apart are two conducting plates that have an electric field strength of $6.40 \times 10^3 \text{V/m}$ between them, if their potential difference is 8.0kV?

Challenge Problems

The following challenge problems are not required to be submitted, but are highly encouraged.

- 6. Find the ratio of speeds of an electron and a negative hydrogen ion (one having an extra electron) accelerated through the same voltage.
- 7. Why are equipotential lines and surfaces perpendicular to the electric field lines?
- 8. A lightning bolt strikes a tree, moving 30.0 C of charge through a potential difference of 1.00×10^2 MV.
 - What energy was dissipated?
 - What mass of water could be raised from room temperature(25⁰c) to the boiling point and then boiled by this energy?
 - Discuss the damage that could be caused to the tree by the expansion of the boiling steam.