Outline

1 Lessons Learned Last Year
   - Fall 2014 and Spring 2015

2 Course Organization
   - Before Class
   - During Class
   - After Class

3 Video Lectures
   - Lectures
   - Examples
   - Explorations
Lessons Learned Last Year

Challenges
- Class time goes by quickly
- Students do not like being “forced” to comment
- Problem solving confidence can suffer

Surprises
- Immediate video comments are far richer than “muddiest point” comments
- 50% of students use Khan Academy (even in traditional sections)
- Textbook usage is significantly reduced in flipped sections
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Before Class

- Read assigned sections from textbook?
- Watch video lectures (~2 hr per week)
- Take a short concept quiz
In Class

- Review material based on results of comments on *Classroom Salon*
- Use demonstrations and clicker questions to reinforce concepts
- Practice problem solving
After Class

- Read assigned material from the textbook?
- Re-watch portions of video lectures?
- Complete a concept-rich group problem and follow-up group quiz in recitation
- Complete weekly homework
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Lectures

- Annotated PowerPoint with voice-over
- All figures hand-drawn
- Most videos ~5 minutes long (15 min max)

All Videos

- Recorded using Active Presenter (free version)
- Hosted on YouTube (free)
- Presented using Classroom Salon (free)
Charge is Quantized

Charge always comes in multiples of $e$, the quantum of charge.

$e = 1.60 \times 10^{-19} \text{C}$

<table>
<thead>
<tr>
<th>Particle</th>
<th>Symbol</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>proton</td>
<td>$p$</td>
<td>$+e$</td>
</tr>
<tr>
<td>neutron</td>
<td>$n$</td>
<td>$0$</td>
</tr>
<tr>
<td>electron</td>
<td>$e^-$</td>
<td>$-e$</td>
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</tbody>
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- Negative net charge caused by extra electrons
- Positive net charge caused by missing electrons
Examples

- Same style as lectures
- Length widely variable depending on difficulty of problem (~minutes long)
- Questions from the textbook
- Quantity and difficulty similar to assigned homework
Interactive simulations
Video demonstrates usage, file posted for students to play with
Created using GeoGebra (free)
Annotated with Ink2Go ($20)
Sample Videos