Card Sorting Review - Circuits (For the Instructor)

Introduction

This is a card-sorting review activity for NYB focusing on RC, LR, and LC circuits. Students analyze different circuits by grouping the appropriate representations (graphs, words, equations, etc). You can expect the activity to take about 45 minutes.

There are a lot of cards here, so some organization and clear instructions will help the activity run smoothly. My instructions for the students are in the file **reviewInstructions.pdf**

Before Class:

See the attached sheets for the cards.

Cut out the cards (this takes a while!). I organized them into 3 subsets to make it easier for the students:

1 (the setup): Circuit, current direction, storing/releasing energy & oscillating.
2: The graphs.
3: All of the other cards.

The Activity (In Class)

1. Organize the students in groups of ~4.

1. **(~5-10 minutes)**

   Before giving the students any cards, take them through an example of what to do by starting the charging RC circuit using subset 1 (see reviewInstructions.pdf for visuals).

   For **each** circuit setup, the students will:
   a. Determine the direction of the current in the resistor.
   b. Determine whether the circuit is storing/releasing energy or oscillating.

   Once you've gone through one example, pass subset 1 out to the students and have them set up each circuit.

2. **(~20-25 minutes)**

   Give the students the remaining cards.

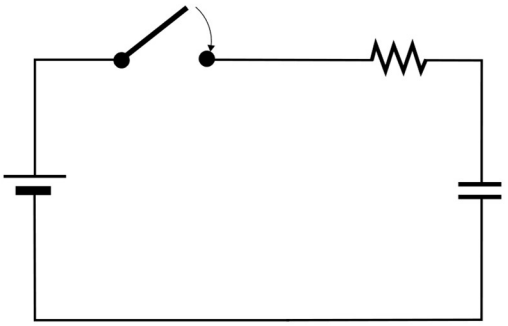
   Instructions for each group:
   a. For **each** circuit
      i. Choose the appropriate cards that represent the situation.
      ii. Choose the appropriate labels for the $\Delta V(t)$ graphs (e.g. $\Delta V(t)$ for resistor).

   As the students work on this, circulate around to see how they are doing & to answer questions.

3. **(Optional: ~10 minutes)**
   Have the students switch (exchange) places with another table.
   a. Have them come up with 3 questions for the other group.
   b. Have them discuss.

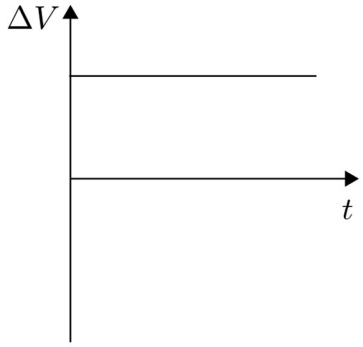
4. **(~5 minutes)**
   Wrap-up with the whole class. A few ideas:
   a. Ask the students (or call on individual groups) to give one example of what confused them. Go over these for everyone.
   b. Ask them how they can see Kirchhoff's laws in the circuit.
   c. I emphasize thinking about, say the current, by drawing a graph first, looking at the limits for $t = 0$ and $t \to \infty$, and then thinking about which equation matches this.

RC charging



storing energy

releasing energy

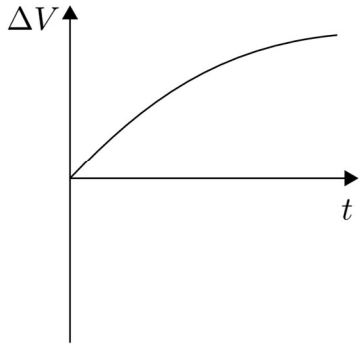


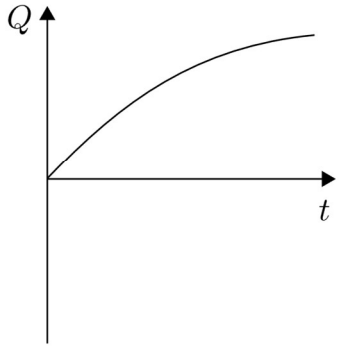
resistor

power supply

capacitor

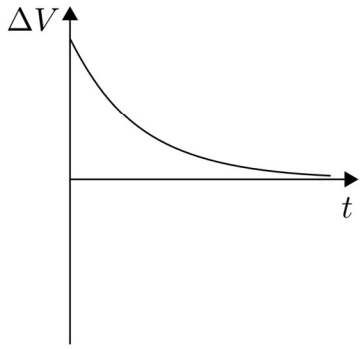
I I

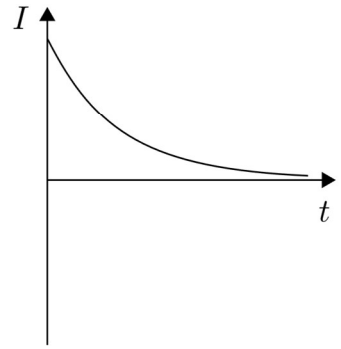




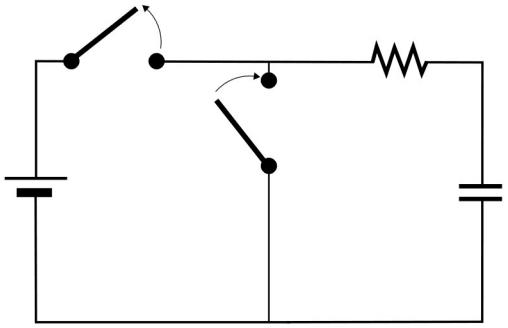
$$Q(t) = Q_{\max}\left(1 - e^{-t/\tau}\right)$$

$$I(t) = I_0 e^{-t/\tau}$$



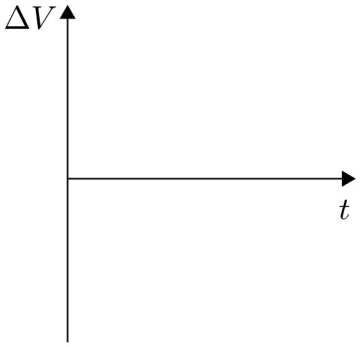


RC discharging



storing energy

releasing energy



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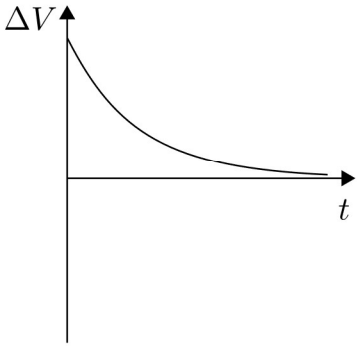

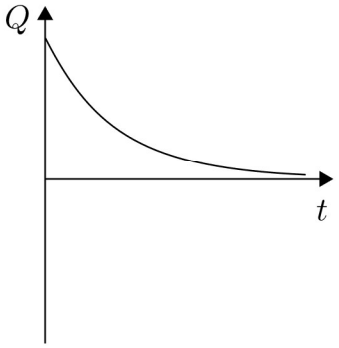

$Q(t) = Q_0 e^{-t/\tau}$

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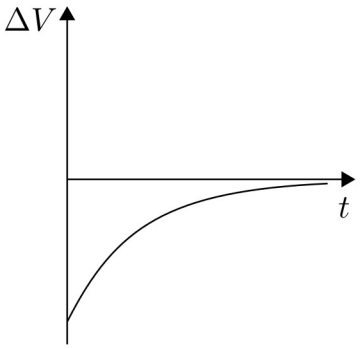
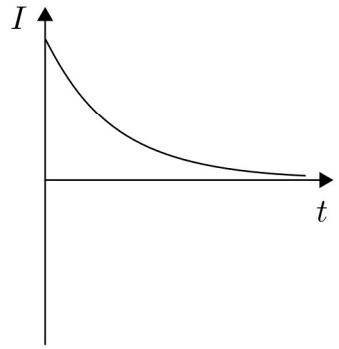
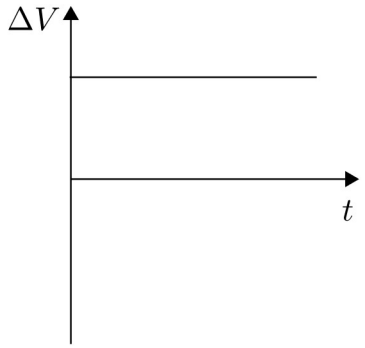
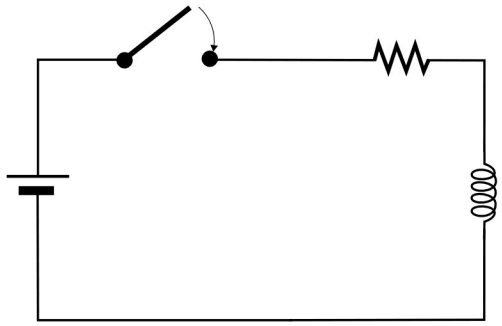




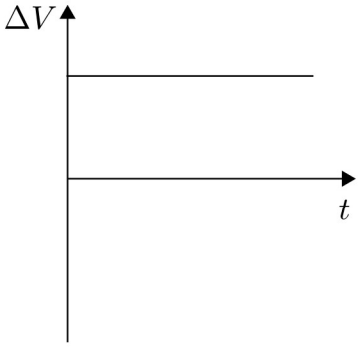


RL charging



storing energy

releasing energy



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power supply

inductor

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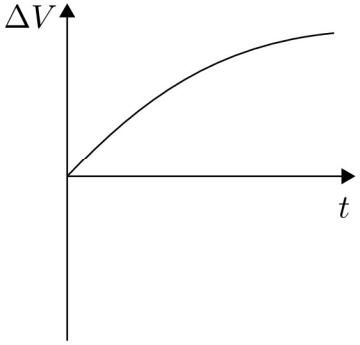
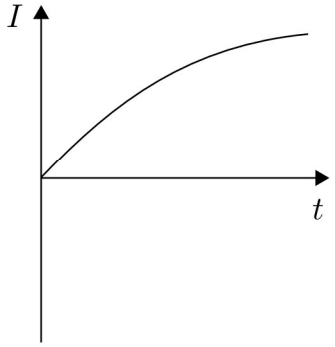
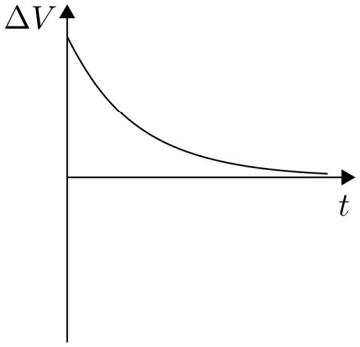
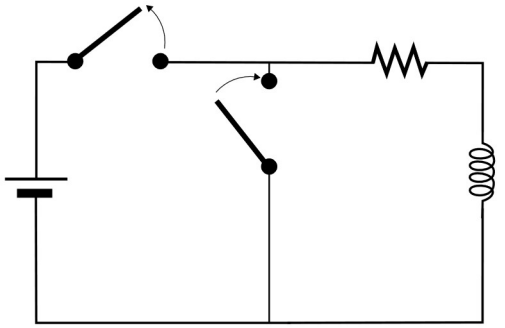




$$I(t) = I_{\max}\left(1 - e^{-t/\tau}\right)$$

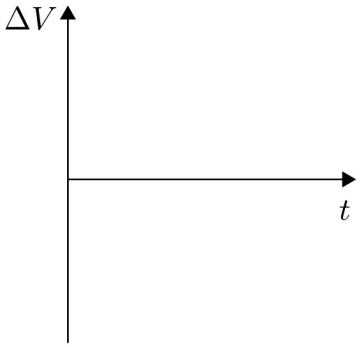


RL discharging



storing energy

releasing energy



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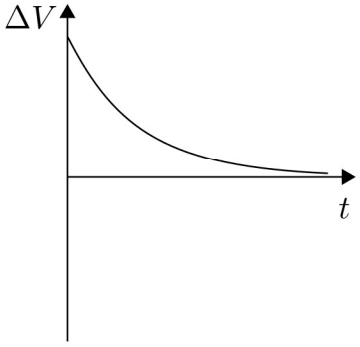
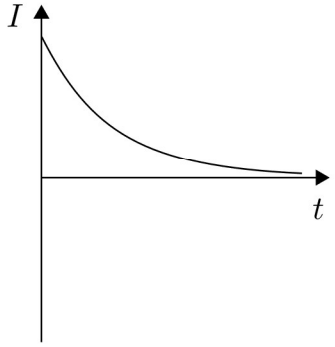
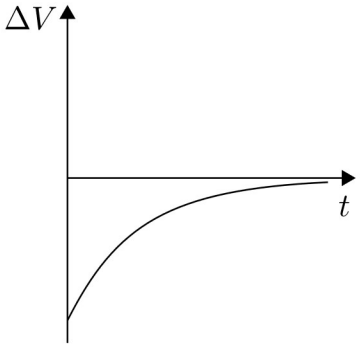
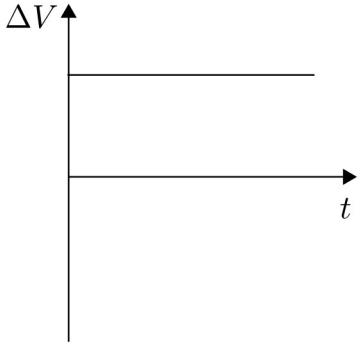


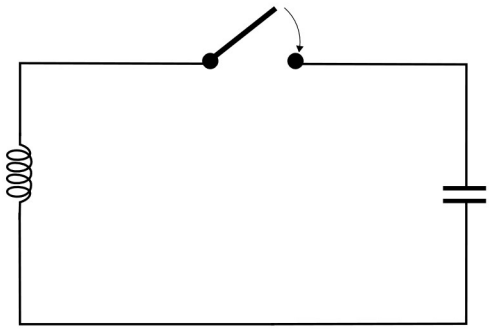


$I(t) = I_0 e^{-t/\tau}$

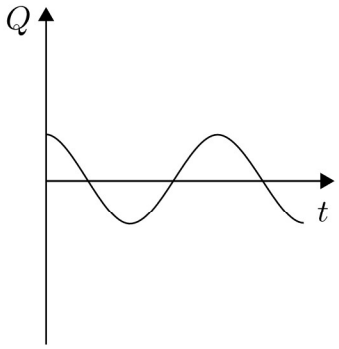


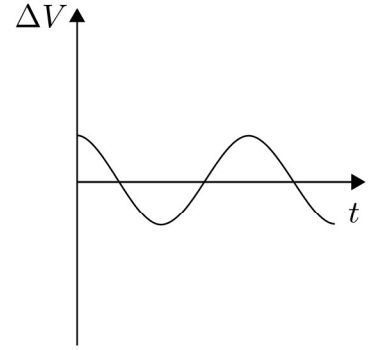


LC



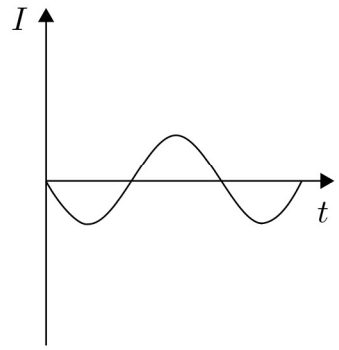
oscillating

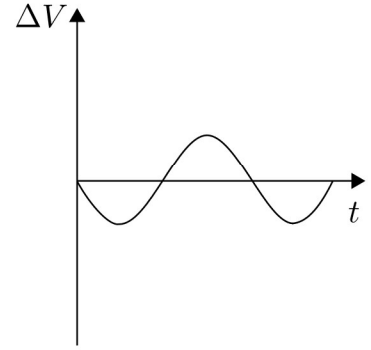




$I(t) = -I_{\max} \sin(\omega t)$

$Q(t) = Q_{\max} \cos(\omega t)$





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