

Physics 261

Homework # 13

Remember to show your work.

1. Do the odd-numbered problems in Ch. 8 of Faissler.
  - (a) 8-1
  - (b) 8-3
  - (c) 8-5
2. Calculate the maximum energy that can be stored, in each of the following capacitors:<sup>1</sup>
  - (a) 1.4 F, 5.5 V maximum, weighing 12 g.
  - (b) 102,000  $\mu\text{F}$ , 130 V maximum, weighing 2.02 kg.
3. Suppose an AC voltage source is connected in series with a capacitor.
  - (a) Find the phase difference between the voltage and the current.
  - (b) Plot  $v(t)$  and  $i(t)$  on the same axes, as I did for the inductor in class.
4. Use KVL and complex impedance to derive the rules for combining:
  - (a) Two capacitors in series.
  - (b) Two inductors in series.
  - (c) Two capacitors in parallel.
  - (d) Two inductors in parallel.
5. Each of the following statements is true. Justify (briefly) using complex impedance.
  - (a) In the limit  $\omega \rightarrow 0$  (the DC limit), the capacitor behaves like an open circuit and the inductor behaves like a short.
  - (b) In the limit  $\omega \rightarrow \infty$ , the capacitor behaves like a short circuit and the inductor behaves like an open.

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<sup>1</sup> Just for fun, I worked out how fast you'd have to throw each capacitor to give it a kinetic energy equivalent to the maximum it can store. I find about 59 m/s for (a) and 29 m/s for (b).