

Name: _____

Engineering in the Kitchen Quiz 1

Due Monday October 12, in class

Problem 1: Food processor

A food processor is advertised as having a “powerful 4 Amp motor.” Is this a meaningful specification, or just a marketing bluff? Specifically:

1. What does this specification actually measure? *Hint: It's not power!*
2. Can you infer anything about the power from the specification?
3. What does this specification not tell you? That is, if there were another model with a 3 A motor and otherwise identical features, what information would you want before deciding which one to buy?

Problem 2: Phone chargers

You might have heard the recommendation to unplug your phone charger from the outlet when you're not using it to save energy, because it consumes power even when it's not charging a phone. To measure exactly how much, I put a $10\text{ k}\Omega$ resistor in the circuit between my “TurboPower” phone charger and the wall outlet. With my multimeter, I measured 2.9 V across the resistor.

1. How much current is flowing into the charger?
2. How much power does the charger consume? *Hint: Don't accidentally calculate the power consumed by the resistor!*

3. Based on what you've learned so far in this course, is unplugging the charger a good way to save energy?

Problem 3: Designing a toaster oven

Bottom Line Electronics, Inc. has hired you to design a dirt-cheap toaster oven. It should have two heating modes: "Bake" turns on the bottom 600 W heating element, and "broil" turns on the top 720 W heating element. Draw a schematic for this oven, labeling resistances as appropriate.

Bonus: Add a lamp which turns on when either of the heating elements is on. You can use additional components if you need to, but remember that this is supposed to be a dirt-cheap toaster oven. *Note: This is actually pretty tricky, so don't waste time on it if you're stuck.*