Prof. Anchordoqui

Problems set # 6 **Physics 131** November 6, 2018

1. *(i)* Compare the electric force holding the electron in orbit ($r = 0.53 \times 10^{-10}$ m) around the proton nucleus of the hydrogen atom, with the gravitational force between the same electron and proton. What is the ratio of these two forces? *(ii)* Would life be different if the electron were positively charged and the proton were negatively charged? Does the choice of signs have any bearing on physical and chemical interactions?

2. A typical 1.5 volt flashlight battery can deliver a current of 1 ampere for 1 hour. *(i)* What is the power (in watts) when the current is 1 ampere? *(ii)* What is the total energy (in kwh) delivered by the battery in 1 hour. *(ii)* If the cell costs 50¢, what is the cost for 1 kwh of this form of chemical energy?

3. Kerosene has a fuel value of $1,400$ Btu/oz. At what rate (i.e., how many oz/hr) must it be burned in order to give off as much heat as a $1,000$ watt electric heater?

4. An air conditioner operating on a 110 volt line is rated at 750 watts. *(i)* What is the current (in amperes) drawn by this appliance? *(ii)* At 15¢/kwh, what is the cost of running the air conditioner for 8 hours?

5. Calculate the power delivered to each resistor in the circuit shown in Fig. 1.

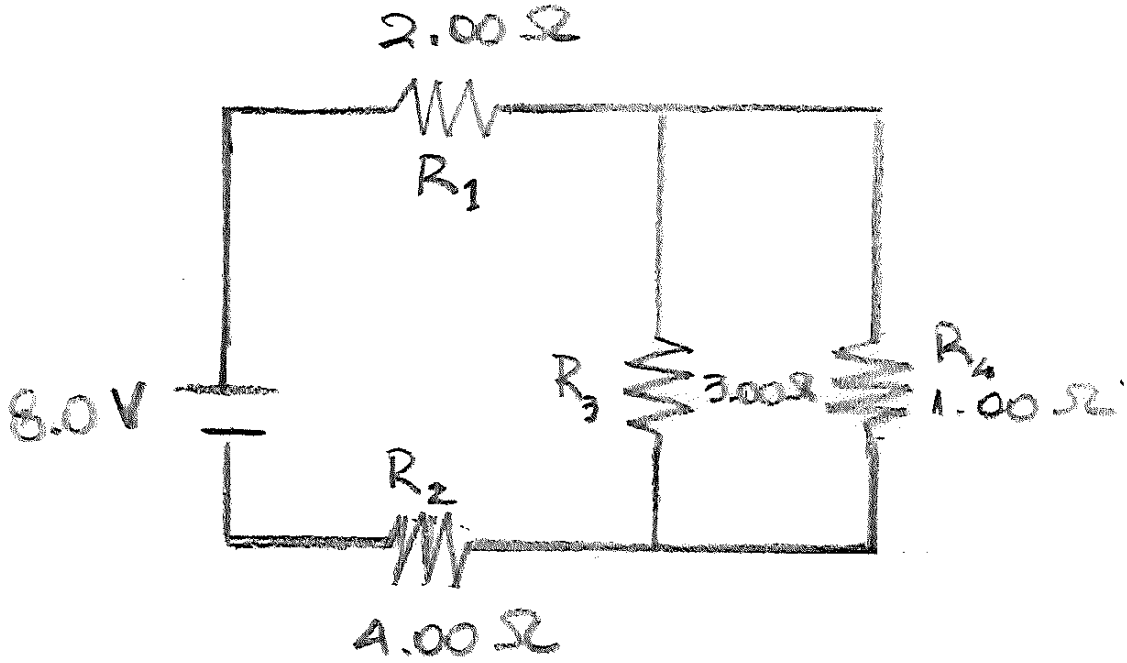

Figure 1: The situation in question 5.