**Waves, DC Circuits PHYS 501 Homework 1**

NAME:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (12 points possible)

1. For each frequency, calculate the wavelength in meters. If it is a **valid** amateur frequency, put which band it's in (17m, etc), ***NOTE SIGNIFICANT DIGITS***

[***http://www.arrl.org/files/file/Regulatory/Band%20Chart/Band%20Chart%20-%2011X17%20Color.pdf***](http://www.arrl.org/files/file/Regulatory/Band%20Chart/Band%20Chart%20-%2011X17%20Color.pdf)

Frequency (MHz) wavelength(m) "band" (if relevant)

a. 49.00 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. 52.525 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. 28.50 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d. 221.15 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

e. 146.52 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

f. 444.825 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

g. 450.7125 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

h. 14.300 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. An automobile battery generally supplies 12V. Is that AC or DC? \_\_\_\_\_\_\_\_\_.

If your transceiver transmits 100W, how much current would that require from your car battery? (but of course your transmitter is not 100% efficient, so the fuse had better be larger than that…) (power (W) = I x V) ***(always show your work)***

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_A

3. If a gamma ray has a wavelength of 1 nm, what would its frequency be (Hz) (use scientific notation). c = 3 x 108 m/s

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Hz

4. If a circuit has a total resistance of 2 MΩ and a current of .5 A, what is the voltage?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ V and the power would be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_W

5. If you take the circuit of (4) and put two 2 MΩ resistors in series, what would the new current be?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ A and the total power would be \_\_\_\_\_\_\_\_\_\_\_\_\_W

6. If you take the circuit of (4) and put two 2 MΩ resistors in parallel, what would the new current be?

\_\_\_\_­\_\_\_\_\_\_\_\_\_\_\_ A and the total power would be \_\_\_\_\_\_\_\_\_\_\_\_\_W

What would be the net effective resistance? \_\_\_\_\_\_\_\_\_\_\_MΩ

7. You are going on a camping trip into the woods. Which kind of battery would you want in your handy-talkie? \_\_\_\_\_ Why?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

a. Nickel-cadmium b. iron-pyrite

c. lead-acid d. lithium-ion

8. What is the effective resistance of a circuit with 280V and current of 60A? (hybrid car)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Ω; what is the power? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

9. What is the voltage across a 50Ω resistor if a current of 2 A flows through it?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_V; what is the power? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10. Most homes use an average of 2-3 KW of power. Over the course of a day, how many kilowatt-hours would be used if the average is 3 KW? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How many KWH would be used in a 30 day month? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(a Kilowatt-hour is a unit of energy, a rate of 1 Kilowatt (1000 J/s) used steadily for one hour. So 1 KWH = 3.6E6 Joules).

11. Check your electricity bill if you pay it yourself (if you live in a dorm, ask your folks for a bill). Choose a summer month if you have one. Month/year chosen: \_\_\_\_\_\_\_\_\_\_\_\_\_

How many KWH did you use that month? \_\_\_\_\_\_\_\_\_\_\_\_\_

What was your average rate of usage (KW)? (divide by the number of hours in a month) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What was the price you paid per KWH?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

12. A solar cell that's 1 m square can deliver about 40W. Assuming its daily summer output is equivalent to 6 hours of max power, how many square meters do you need for your house? *(hint – how many KWH per day does each cell provide?)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_