

# 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)

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 batter? (but of course your transmitter is not 100% efficient, so the fuse had better be larger than that...) (power (W) = I V)

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3. If a gamma ray has a wavelength of 1 nm, what would its frequency be (Hz) (use scientific notation).  $c = 3 \times 10^8$  m/s

\_\_\_\_\_ Hz

4. If a circuit has a total resistance of 2 M $\Omega$  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  $2\text{ M}\Omega$  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  $2\text{ M}\Omega$  resistors in parallel, what would the new current be?

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

What would be the net effective resistance? \_\_\_\_\_  $\text{M}\Omega$

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

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- 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)

\_\_\_\_\_  $\Omega$ ; what is the power? \_\_\_\_\_

9. What is the voltage across a  $50\Omega$  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  $1\text{ KWH} = 3.6\text{E}6\text{ Joules}$ ).

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)? \_\_\_\_\_ 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?

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