

ECT150
Homework #1 Key
Sr. Professor Wheeler

Chapter 2 review questions 1- 25

Total Points: 25

All work must be shown, and final answers boxed or underlined. No credit if work is not shown.

1. Convert 3 mV to an equivalent value in V.

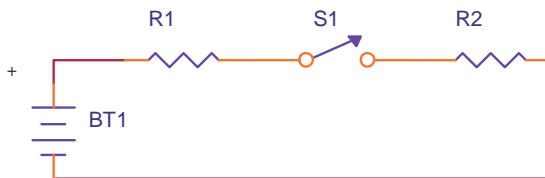
$$3 \text{ mV} = 3 \times 10^{-3} \text{ V} = \underline{0.003 \text{ V}}$$

2. $12 \mu\text{A} = \underline{12 \times 10^{-6} \text{ A}} = \underline{0.000012 \text{ A}}$

3. A micro (μ) unit is one-thousandth (0.001) of a milli unit.

4. There are 1000 $\text{k}\Omega$ in a $\text{M}\Omega$.

5. The circuit described looks like this:



6.  is the symbol for a fixed resistor.

7.  is the symbol for a variable resistor, a two-leaded device.

(Note to students: In electronics a variable resistor is not nearly as common as a three-lead device called a potentiometer, which has the symbol and appearance as shown below.)



8. The symbol shown is a voltmeter.

9. The symbol shown  is a battery.

10. Convert the following to units:

- a) 15 mA is 0.015 A.
- b) 15 mA is 15×10^{-3} A.
- c) 5,000 volts is 5 kV.
- d) 5,000 volts is 5×10^3 Volts.
- e) 0.5 megohms is 500,000 Ohms.
- f) 100,000 ohms is 0.1 M Ω .
- g) 0.5 A is 500 mA.

11. Name two or more types of resistors and discuss their physical construction.

- a) Carbon composition - made by filling an insulating body with carbon.
- b) Carbon film - made by vapor depositing carbon onto the outside of a ceramic resistor body, then laser-trimming to get the desired level of resistance.
- c) Wire wound - made by wrapping resistive wire around the resistor body, usually a ceramic insulator. Nichrome (Nickel-Chromium) wire is commonly used because it has a relatively high resistance.
- d) Chip resistors - made by vapor-depositing carbon onto a rectangular substrate of ceramic material; laser-trimmed to final value.

12. Give the resistance value and tolerance rating for the following resistors:

- a) Yellow-violet-yellow-silver = $470,000 \Omega = \underline{470 \text{ k}\Omega \text{ 10\%}}$
- b) Red-red-green-silver = $2200000 \Omega = \underline{2.2 \text{ M}\Omega \text{ 10\%}}$
- c) Orange-orange-black-gold = $\underline{33 \Omega \text{ 5\%}}$
- d) White-brown-brown-gold = $\underline{910 \Omega \text{ 5\%}}$
- e) Brown-red-gold-gold = $\underline{1.2 \Omega \text{ 5\%}}$

13. Three important factors include the resistance, the tolerance, and the power rating.

14. A fifth color band on a precision resistor indicates the reliability of the device (in % failure per 1,000 hours of service).

15. A resistor having the colors red-red-red-red-red has a value of $22200 \Omega \pm 2\%$ (22.2 k $\Omega \pm 2\%$).

16. A carbon composition resistor having only three bands (no tolerance band) has a tolerance of $\pm 20\%$. Such parts are pretty hard to find nowadays (maybe at Radio Shack!)

17. A resistor with a power rating of 25 W is a power resistor. You must replace it with another power resistor with a rating of at least 25 W.

18. A surface mount device marked "443" is really 44000 Ω or 44 k Ω .

19. The fifth color band indicates reliability. An orange band indicates a failure rate of 0.01 % per 1000 hours.

20. To prevent electric shock, turn off the power and disconnect the circuit from the power line. (Later you will learn that you must also discharge any power supply capacitors.)

21. If you must work on an energized circuit, four precautions are:

- a) Keep one hand in your pocket.
- b) Make sure you are insulated from ground (wear insulating shoes, don't lean against the equipment).
- c) Use insulated tools rated for the voltage(s) you'll likely encounter.
- d) Do not work alone. Make sure someone is close by that knows how to turn off the power.

22. Circuits with charged capacitors must be discharged using a "dummy stick" prior to working on them.

23. Metal jewelry of any kind is a hazard because it is a good conductor, and can increase the amount of current your body receives by lowering the skin resistance. You can be severely burned (or lose a finger or hand) if the jewelry shorts a high-current power supply (such as a storage battery), which can heat it up to red-hot temperatures in a fraction of a second.

24. When working with hot soldering irons:

- a) Wear safety glasses
- b) When setting the iron down, place it away from your body so that you don't accidentally contact it. Use a soldering iron holder.
- c) Do not "flick" solder off an iron. Use only the damp sponge in the iron holder.

Always treat soldering irons as if they're hot.

25. Electrical shock is the result of current flowing through one or more body parts. For example, touching points with different potentials with each hand can cause a shock if the difference in voltage is high enough. 25 V (AC) or more is generally considered dangerous, but under the wrong circumstances (wet skin), even 12 V ac is dangerous.