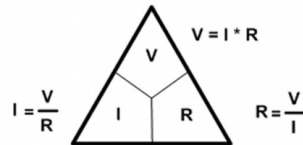


Name _____ School _____ Contestant Number _____

**2014 Cowboy Classic
Agricultural Technology and Mechanical Systems
Electrical Systems**

You are employed as a technician for a pest management company in Wyoming. In addition to your current customers, you have recently been assigned to work with rural residents in the outlying areas that in some cases live beyond the electrical service area. One such customer, Mr. Waldo Pepper has contracted you to fumigate three, grain storage bins that have been out of service for two years to prepare them for the harvest. The bins are located in an area beyond electrical service, and requires the use of solar power to provide for any electrical operations. You have selected 1,3-Dichloropropene and the directions require it to be mixed with water to dilute it to the proper strength for the fumigation process. Since the area is outside of the electrical service area, you are required to hook up a water pump to a 12V solar panel to provide your electrical needs. After confirming that you have made the proper connections, the pump does not work.

Determine the following measurements. (2 Pts. ea.)



Volts 4.89 Amperage 24.9 MA Watts 121.76

Identify two reasons why the pump will not work.

1. The solar panels are in a shady location.
2. Although there are enough volts being produced, there is not enough amperage produced to operate the pump.

Matching – 10 pts.

1. <u>G</u>	6. <u>C</u>	A	Auto Shut off timer	F	Triplex Wire
2. <u>D</u>	7. <u>A</u>	B	Duplex Receptacle	G	Hard Service Cord
3. <u>I</u>	8. <u>H</u>	C	Single Pole Switch	H	Thermoplastic Heat Resistant Wire
4. <u>E</u>	9. <u>F</u>	D	3-Way Switch	I	Underground Service Wire
5. <u>B</u>	10. <u>J</u>	E	4-Way Switch	J	Underground Feeder Wire

(Additional Problems on back)

Criterion	Points possible	Points earned
Measurement calculations and justification	10	
Questions	18	
Safety	2	
Total	30	

1) Voltage drop is a phenomenon defined as a decrease in voltage along a conductor through which current is flowing. Voltage drop of the circuit conductors can be determined by multiplying the current of the circuit by the total resistance of the circuit conductors: **VD = I x R**. "I" is equal to the load in amperes and "R" is equal to the resistance of the conductor.

120 volt Example: What is the voltage drop of two No. 12 conductors that supply a 16 ampere, 120 volt load which is located 100 feet from the power supply (200 feet of wire)?

Refer to the resistance chart show your calculations in the space provided. Circle the correct answer 5 pts.

- (a) 3.2 volts (b) **5.12 volts X** (c) 9.6 volts (d) 12.8 volts

2) What is the percentage of voltage drop for the above problem? 5.3% 3pts.

Voltage Drop = I x R
 [R is equal to 0.0016 ohms] .0016 ohms X 200 feet = 0.32 ohms
 Voltage Drop = 16 amperes x 0.32 ohms =
 Voltage Drop = 5.12 volts, (5.12 volts/120 volts = 5.3% volts drop)

Table 2: The Resistance of Various Wires

Diameter			dc Resistance	
AWG	inches	mm	Ohms/ft	Ohms/m
6	0.162	4.1	0.00040	0.00132
8	0.129	3.3	0.00064	0.00210
10	0.102	2.6	0.0010	0.0033
12	0.081	2.1	0.0016	0.0053
14	0.064	1.6	0.0026	0.0084
16	0.051	1.3	0.0041	0.0134
18	0.040	1.0	0.0065	0.0214

Criterion	Points possible	Points earned
Measurement calculations and justification	10	
Questions	18	
Safety	2	
Total	30	