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.)

$$V = I * R$$
$$I = \frac{V}{R} \qquad R = \frac{V}{I}$$
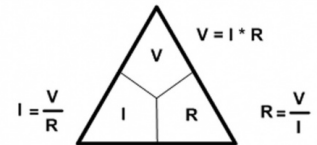
Volts _____ Amperage _____ Watts _____

Identify two reasons why the pump will not work.

1. _____

2. _____

Matching – 10 pts.

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

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

(Additional Problems on back)

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? _____ 3pts.

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	