FLINN SCIENTIFIC

Name____

Conductometer Worksheet

Data Table

Metal	Time to Melt Wax
Copper (C)	
Steel	
Aluminum (Al)	
Brass (B)	
Nickel-alloy steel (N)	

Post-Lab Questions

1. Describe the process of thermal conduction in metals.

2. Which metal conducted heat the fastest?

3. Which metal conducted heat the slowest?

4. Explain why some metals conduct heat slower and others conduct it fast.

5. Which metal would lose heat the fastest? Explain.

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Specific Heat Worksheet

Data Table

	Trial 1	Trial 2
Mass of Metal		
Mass of Calorimeter Cup and Lid		
Mass of Calorimeter Cup, Lid and Water		
Initial Temperature of Water in Calorimeter Cup		
Initial Temperature of Boiling Water and Metal Sample		
Maximum Temperature of Water in Calorimeter Cup		

Post-Lab Questions

1. Define specific heat.

2. Calculate the heat gained by the water using the mass of the water, the temperature change of the water in °C, and the specific heat of the water. (*Hint:* Use Equation 1.)

3. Determine the identity of the unknown metal by calculating its specific heat using Equation 3. (*Note:* Remember that the heat gained by the water equals the heat lost by the sample.) Compare the value to a list of published values given in Table 2.

Metals	Specific Heat	
	(in cal/gz°C)	(in J/gz°C)
Aluminum	0.215	0.899
Copper	0.092	0.385
Steel	0.110	0.460
Tin	0.053	0.222
Zinc	0.092	0.385

Table 2.

4. Describe any sources of error that may have affected the results of this experiment.

5. When are two objects considered to be in thermal equilibrium?

6. Calculate the amount of energy needed to heat up 240 mL (8 oz) of ice-cold water (0 °C) to body temperature (37 °C) after drinking it. 1 mL of water is 1 gram. Compare this value to the energy spent by a 75-kg person walking up five flights of stairs (or 30 meters). (PE = mgh, where m = mass, g = 9.81 m/s^2, h = height)

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Radiation Can Worksheet

Data Table 1

	Temperature (°C)	
Time (minutes)	**Silver Can**	**Black Can**
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Data Table 2

	Temperature (°C)	
Time (minutes)	**Silver Can**	**Black Can**
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Post-Lab Questions

1. Graph the temperature versus the time for the data in Data Table 1. Use a different coded line (or different color) for each can.
2. How did the temperature vary in each can over time? Explain the variation.
3. On a sunny winter day what coat—black or white—might be warmer? Why?
4. On a sunny summer day what shirt—black or white—might be cooler? Why?
5. On a separate graph, graph the temperature versus the time for the data in Data Table 2. Use a different coded line (or different color) for each can.
6. How did the temperature vary in each can over time for Experiment 2? Explain the results.
7. Do the results of this experiment affect your answers to Questions #3 and #4?
8. Would shining a heat lamp on the cans affect the results of Experiment 2? Why?

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Relative Humidity and Dew Point Worksheet

Dew Point and Relative Humidity Data Table

Dry-bulb temperature (°F)	
Wet-bulb temperature (°F)	
Wet-bulb depression (°F)	
Dry-bulb factor (see Reference Table 1)	
Wet-bulb depression × dry-bulb factor	
Dew point temperature (°F)	
Relative Humidity	

Dew Point Table

Dry-bulb Temp. (°F)	Factor	Dry-bulb Temp. (°F)	Factor	Dry-bulb Temp. (°F)	Factor
32	3.32	**53**	2.00	**74**	1.73
33	3.01	**54**	1.98	**75**	1.72
34	2.77	**55**	1.96	**76**	1.71
35	2.60	**56**	1.94	**77**	1.70
36	2.50	**57**	1.92	**78**	1.69
37	2.42	**58**	1.90	**79**	1.69
38	2.38	**59**	1.89	**80**	1.68
39	2.32	**60**	1.88	**81**	1.68
40	2.29	**61**	1.87	**82**	1.67
41	2.26	**62**	1.86	**83**	1.67
42	2.23	**63**	1.85	**84**	1.66
43	2.20	**64**	1.83	**85**	1.65
44	2.18	**65**	1.82	**86**	1.65
45	2.16	**66**	1.81	**87**	1.64
46	2.14	**67**	1.80	**88**	1.64
47	2.12	**68**	1.79	**89**	1.63
48	2.10	**69**	1.78	**90**	1.63
49	2.08	**70**	1.77	**91**	1.62
50	2.06	**71**	1.76	**92**	1.62
51	2.04	**72**	1.75	**93**	1.61
52	2.02	**73**	1.74	**94**	1.61

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Relative Humidity and Dew Point Worksheet continued

Post-Lab Questions

1. Convert the dry-bulb temperature and the dew point temperature from the Data Table from Fahrenheit to Celsius using Equation 1. Record these values in the Results Table.

$$\text{Temperature °C} = 5/9 \times (\text{Temperature °F} - 32) \qquad \textit{Equation 1}$$

2. Calculate the saturation vapor pressure by using Equation 2 (assuming standard atmospheric pressure). Record this value in the Results Table.

$$\text{Saturation vapor pressure} = 6.11 \times 10^{[(7.5 \times \text{dry-bulb temperature °C})/(237.7 + \text{dry bulb temperature °C})]} \qquad \textit{Equation 2}$$

3. Calculate the actual vapor pressures using Equation 3 (assuming standard atmospheric pressure). Record these values in the results table.

$$\text{Actual vapor pressure} = 6.11 \times 10^{[(7.5 \times \text{dew point temperature °C})/(237.7 + \text{dew point temperature °C})]} \qquad \textit{Equation 3}$$

4. The relative humidity values can then be calculated using Equation 4. Record this value in the Results Table.

$$\text{Relative humidity (\%)} = (\text{actual vapor pressure}/\text{saturation vapor pressure}) \times 100 \qquad \textit{Equation 4}$$

Results Table: Relative Humidity Calculation

Dry-bulb temperature (°C)	
Dew point temperature (°C)	
Saturation vapor pressure (millibars)	
Actual vapor pressure (millibars)	
Relative Humidity Value	%

5. Define *dew point*.

6. Define *relative humidity*.

7. Compare the relative humidity calculation to the measured relative humidity found using the sling psychrometer.

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Relative Humidity Table

Dry Bulb Temp. (°F)	Difference between Dry Bulb and Wet Bulb (measured in degrees Fahrenheit) 1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°
32	90	79	70	60	50	40	31	22	13	4	—	—	—	—	—
34	91	81	72	62	53	44	35	26	18	9	1	—	—	—	—
36	91	82	74	65	56	48	39	31	22	14	6	—	—	—	—
38	92	83	75	67	59	51	43	35	27	19	11	4	—	—	—
40	92	84	76	68	61	53	46	38	31	23	16	9	2	—	—
42	92	85	77	70	62	55	48	41	34	28	21	14	7	—	—
44	93	85	78	71	64	57	50	44	37	31	24	18	12	5	—
46	93	86	79	72	65	59	52	46	40	34	28	22	16	10	4
48	93	86	80	73	67	61	54	48	42	36	31	25	19	14	8
50	93	87	81	74	68	62	56	50	45	39	33	28	22	17	12
52	94	87	81	75	69	63	58	52	47	41	36	31	25	20	15
54	94	88	82	76	70	65	59	54	49	43	38	33	28	23	20
56	94	88	83	77	71	66	61	56	51	45	40	36	31	26	22
58	94	89	83	78	72	67	62	57	52	47	42	38	33	29	24
60	94	89	84	78	73	68	63	58	54	49	44	40	35	34	27
62	95	89	84	79	74	69	64	60	55	51	46	42	38	33	29
64	95	90	84	79	74	70	65	60	56	51	47	43	38	34	30
66	95	90	85	80	75	71	66	61	57	53	48	44	40	36	32
68	95	90	85	80	76	71	67	62	58	54	50	46	42	38	34
70	95	90	86	81	77	72	68	64	59	55	51	48	44	40	36
72	95	91	86	82	77	73	69	65	61	57	53	49	45	42	38
74	95	91	86	82	78	74	69	65	61	58	54	50	47	43	39
76	96	91	87	82	78	74	70	66	62	59	55	51	48	44	41
78	96	91	87	83	79	75	71	67	63	60	56	53	49	46	43
80	96	91	87	83	79	75	72	68	64	61	57	54	50	47	44
82	96	92	88	84	80	76	72	69	65	61	58	55	51	48	45
84	96	92	88	84	80	76	73	69	66	62	59	56	52	49	46
86	96	92	88	84	81	77	73	70	66	63	60	57	53	50	47
88	96	92	88	85	81	77	74	70	67	64	61	57	54	51	48
90	96	92	89	85	81	78	74	71	68	65	61	58	55	52	49
92	96	92	89	85	82	78	75	72	68	65	62	59	56	53	50
94	96	93	89	85	82	79	75	72	69	66	63	60	57	54	51

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Ball and Ring Worksheet

Observations

Room Temperature Ball and Ring

Heated Ball

Heated Ball and Ring

Post-Demonstration Questions

1. Which object had the greatest change in size, the ball or the ring?

2. A long, narrow iron bar is heated uniformly. Which dimension, the length or the width, will expand the most? Explain.

