Name _____Class Period _____Date_____

TITLE: **Mapping a Temperature Field**

TOPIC: Measuring and plotting temperatures to make a map of isotherms in a temperature field.

GRADE LEVEL: Middle

CONTENT OBJECTIVE & SHORT DESCRIPTION: Students will measure and plot field values on a map. Students will then learn to construct isolines and interpret the resulting field map.

CONTENT STANDARD:
Content Standard D - Earth and Space Science Standards: Structure of the earth system

RESOURCE TYPE: Classroom Activity

TIME REQUIRED: 2-3 periods

MATERIALS NEEDED: Thermometers, worksheets.

DIRECTIONS FOR INSTRUCTION/ACTIVITY:
Isoline: A line on a map, chart, or graph connecting points of equal value. Also called *isogram*.

Isotherm: A line drawn on a weather map or chart linking all points of equal or constant temperature.

The room map needs to be adjusted for the room being used. Each student is assigned to a location and stays at that location to measure the temperature at floor level, desk level and 1 meter above the desk.

Each student gets their own thermometer. I use the small metal-backed Celsius thermometers. The kids can then hold them by the metal and not put their fingers on the glass. The thermometers may be off slightly but that does not really seem to affect the field map too much. The idea is to see the air temperature changes at different levels throughout the room.

I turn on an overhead projector at the front of the room to be the heat source. I also note that cool air flows in from under the doors and from an air exchange blower near the windows. You can really see the isolines get closer together at those locations.

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Before we start, we measure, in meters, locations A-B and C-D on the floor level map. We use these distances together with the temperatures at floor level to find temperature gradients at those locations.

At each level I have the kids sit quietly with their thermometers for 5 minutes so we can get accurate readings. To keep them from talking I sing silly songs or read a story.

After the data is taken we record it in the data table as a class. They all need all of the data. Then we label the temperatures at the locations on the map.

We draw the isolines together. I use the overhead projector we start with the warmest and draw an isoline for every 1 degree.

We assign colors to each degree and color in the temperature bands. This makes the map less confusing than just having many lines.

As a concluding activity, I download a US temperature map from the Datastreme site and have the kids draw isotherms and color in the field on their own.

This lab could take as much as 2-4 days but is extremely worth the time spent.

EVALUATION: Report sheet, discussion questions.

LESSON PLAN AUTHOR & CONTACT INFO:

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Lab 2-3 Mapping a Temperature Field

Introduction: A field is a region in which there is a definite physical property that can be measured at every point. There are many kinds of measurable field values that vary from place to place on or near Earth's surface. Among these measurable field values are atmospheric pressure, temperature and the elevation of Earth's surface with respect to sea level. In this lab you will be introduced to field maps by using temperature data.

Objective: You will measure and plot field values on a map. You will then learn to construct isolines and interpret the resulting field map.

Vocabulary:

Field:

Isoline:

Isotherm:

Gradient:

Procedure A:

For this procedure you will use the classroom map supplied by your instructor and the Report Sheet provided.

1. Read all thermometers to the nearest 0.5°C.
2. FLOOR LEVEL READING: On signal, read the temperature of your station at floor level. Record this value in the appropriate location on your Report Sheet.
3. Repeat Procedure 2 measuring the temperature at desk level at your station.
4. Repeat Procedure 2 measuring the temperature at 1 meter above desk level at your station.
5. Obtain and record measurements for the other stations in the room as directed by your instructor.
6. For the level indicated by your instructor, plot the station temperatures on your room map.
7. Construct isotherms on your room map using 1 degree Celsius intervals.

Procedure B:

1. On each room map, label the **energy source**. The energy source is a region of high energy potential from which energy flows.
2. On each room map, label the **energy sink**. Then energy sink is a region of low energy potential towards which energy flows.
3. **Draw an arrow** which shows the direction of energy flow between the source and the sink.

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4. **Calculate** the **temperature gradient** between points **A & B**. Show all work and circle your answer. Be sure to use proper units.

5. **Calculate** the **temperature gradient** between points **C & D.** Show all work and circle your answer. Be sure to use proper units.

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REPORT SHEET

STATION NUMBER	FLOOR TEMP °C	DESK LEVEL TEMP °C	1 METER ABOVE DESK TEMP °C
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			

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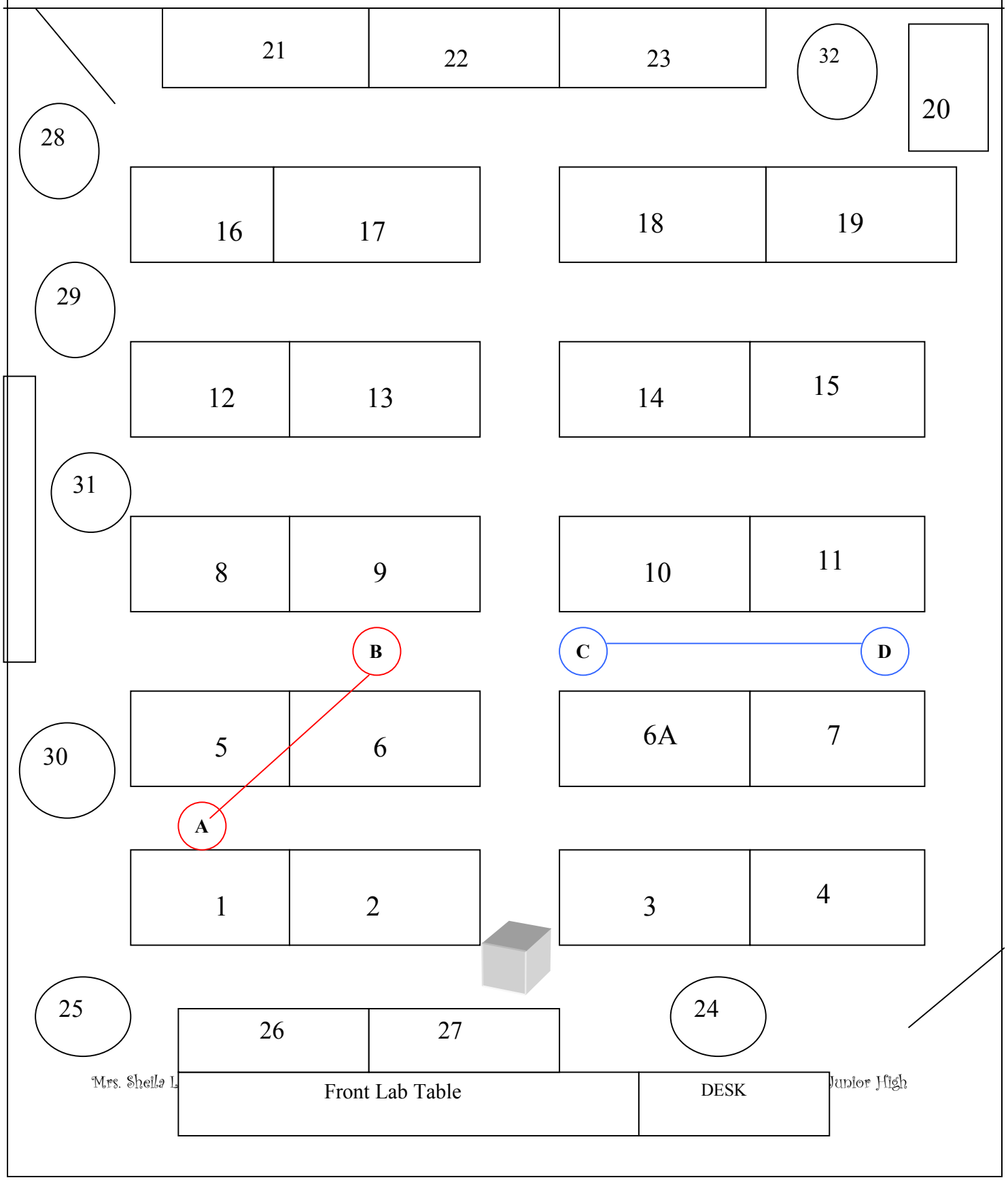
ROOM MAP



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REPORT SHEET

Part 2

STATION NUMBER	FLOOR TEMP °C	DESK LEVEL TEMP °C	1 METER ABOVE DESK TEMP °C
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

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Lab 2-3 Discussion Questions

1. Will the temperature field you measured and mapped have the same appearance tomorrow? **EXPLAIN YOUR ANSWER**.

_____
_____
_____
_____

2. Between which two letters on the floor map is the gradient the most?

_____
_____

3. Between which two letters in the floor map is the gradient the least?

_____
_____

4. As the temperature difference between two points increases, what happens to the spacing of the isotherms?

_____
_____
_____

5. What factors may have caused the temperature variations in the classroom?

_____
_____
_____

6. Other than the types of fields already mentioned in this lab, name at least two other scientific field quantities.

_____
_____

7. If the overhead projector was to be turned off, what changes would occur in the isotherm values?

_____
_____
_____