

Name: _____

Water and Climate

Date: _____ Period: _____

Earth Science

Lab Activity: Climate Variables

INTRODUCTION:

The state of the atmosphere continually changes over time in response to the uneven distribution of energy in the atmosphere. The short-term changes in temperature and precipitation are fundamental controls of weather, and their long-term averages are called climate. Since climate is averaged weather, we must take a look at the average temperature and average precipitation in a particular region to determine the climate.

We know that there are many different climates on Earth. From tropical regions near the equator to the frozen deserts at the poles, each climate varies tremendously and is characterized by its long term weather conditions.

OBJECTIVE:

You will determine particular climate variables that control a region's average temperature and precipitation and be able to recognize trends in data that help establish a regions climate.

VOCABULARY:

Climate -

Greenhouse Effect -

Insolation -

Radiative Balance -

Intensity -

Lab Activity: Climate Variables

ANGLE OF INSOLATION:

There are variations in the angle at which the sun's rays strike Earth's surface. You have observed the changing altitude during the day and annual variations of the noon Sun, but there is also a change with your latitude. This change produces differences in intensity of insolation at Earth's surface.

Data was obtained from an experiment that is used to show how angle of insolation can effect the temperature over a period of time.

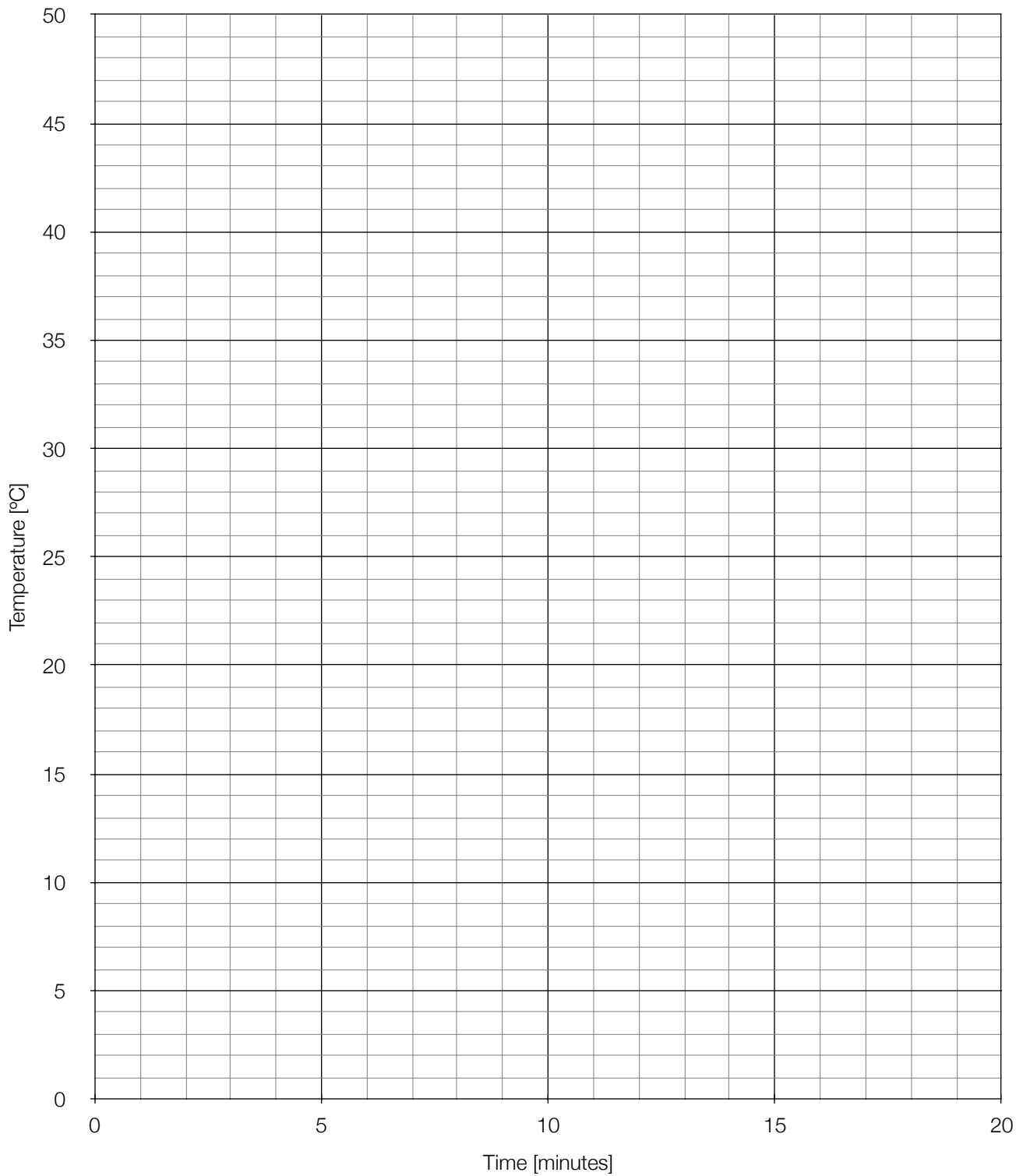
PROCEDURE A:

Use the data table below to construct a graph on the following page for the different angles of insolation and the temperatures they received over a 15 minute period. Be sure to construct three separate line with different colors and to label them appropriately.

30°		60°		90°	
Time [min]	Temp. [°C]	Time [min]	Temp. [°C]	Time [min]	Temp. [°C]
0	20	0	20	0	20
1	22	1	23	1	24
2	22.5	2	24	2	26
3	23.5	3	26	3	28
4	24	4	27	4	30.5
5	25	5	28.5	5	32.5
6	25.5	6	29.5	6	34
7	26	7	30.5	7	35.5
8	26.5	8	31.5	8	37
9	27	9	32.5	9	38
10	27.5	10	33	10	38.5
11	28	11	33.5	11	39.5
12	28.5	12	34	12	40
13	29	13	34.5	13	40.5
14	29.5	14	35	14	41
15	30	15	35.5	15	41.5

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GRAPH A: ANGLE OF INSOLATION



Lab Activity: Climate Variables

ABSORPTION AND RADIATION BY LAND AND WATER:

Approximately 70 percent of Earth's surface is covered by water. The unequal rates of heating of land and water cause temperature conditions that impact local and world-wide weather patterns.

Data was obtained from an experiment that compares the rates at which water and land heat up over a period of time. During the first 10 minutes the materials were allowed to heat up, then the heat source was then removed and allowed to cool for the next the ten minutes.

PROCEDURE B:

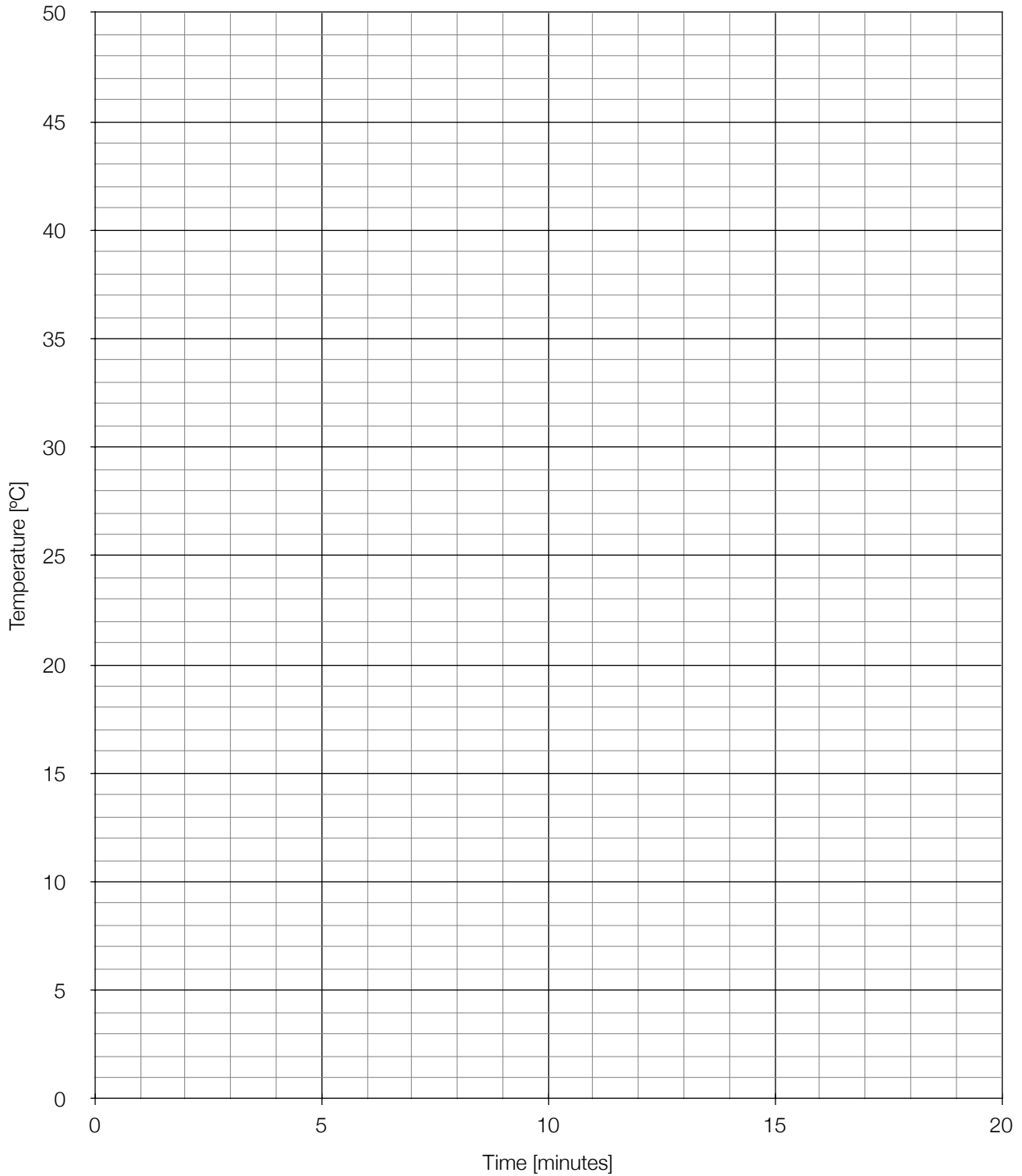
Use the data table below to construct a graph on the following page for the absorption and radiation by land and water. Be sure to construct two separate lines with different colors and to label them appropriately.

Time [min]	Soil Temp. [°C]
0	21.0
1	23.0
2	26.0
3	28.0
4	30.5
5	33.0
6	35.0
7	36.5
8	37.5
9	38.5
10	39.0
11	37.5
12	35.0
13	34.0
14	32.0
15	30.5
16	29.0
17	28.0
18	26.5
19	25.5
20	24.5

Time [min]	Water Temp. [°C]
0	21.0
1	21.5
2	22.5
3	23.0
4	23.5
5	24.0
6	25.0
7	25.5
8	25.5
9	26.0
10	26.0
11	26.0
12	26.0
13	25.5
14	25.5
15	25.0
16	24.5
17	24.5
18	24.0
19	23.5
20	23.0

Lab Activity: Climate Variables

GRAPH B: ABSORPTION AND RADIATION BY LAND AND WATER



Lab Activity: Climate Variables

COASTAL AND CONTINENTAL TEMPERATURE RANGES:

There are large variations in average monthly temperatures among cities located at the same latitude. This suggests that factors other than latitude are responsible for a region's climate. A major influence other than the angle of insolation is the location of a city relative to a large body of water.

The average monthly temperature was obtained from two different cities in the United States for the span of one year.

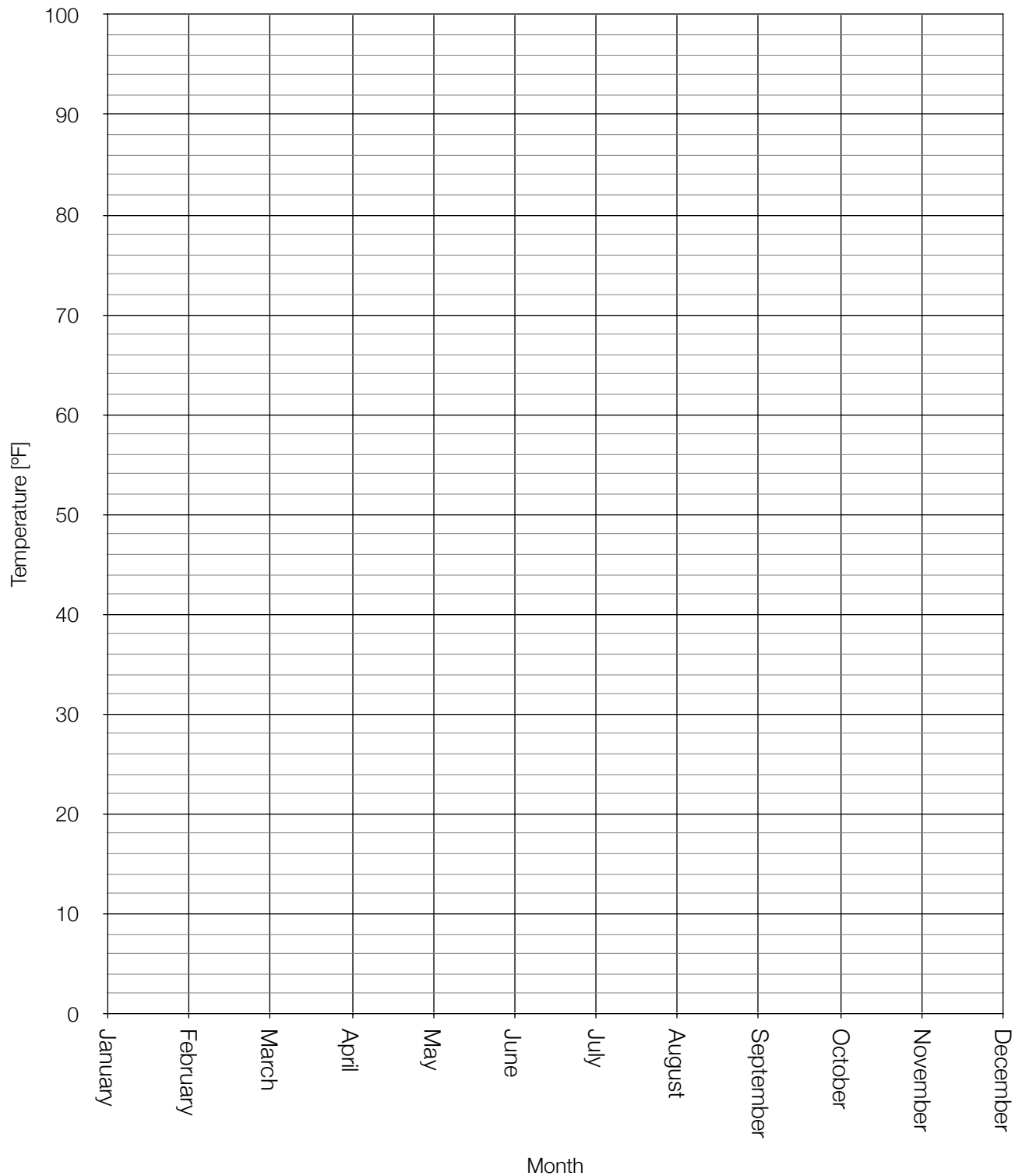
PROCEDURE C:

Use the data table below to construct a line graph of the following four cities average monthly temperature. Be sure to label each line with the appropriate city and use different colors.

Month	Temperature [°F]	
	Eureka, California	Omaha, Nebraska
January	46	20
February	48	26
March	50	36
April	52	50
May	54	60
June	56	72
July	58	76
August	60	74
September	56	66
October	54	54
November	52	38
December	50	24

Lab Activity: Climate Variables

GRAPH C: COASTAL AND CONTINENTAL TEMPERATURE RANGES



Lab Activity: Climate Variables

DISCUSSION QUESTIONS:

1. Which angle of insolation received the most direct rays and heated to the highest temperature?
2. What is the relationship between the angle of insolation and the rate of temperature changes?
3. Which was a better absorber and radiator of heat energy?
4. How could you tell from the temperature data that both cities are in the Northern Hemisphere?
5. Describe the differences in annual temperature ranges between coastal and inland regions.

CONCLUSION: Other than the variable studied in this lab, what other variable might influence climate?