**Earth Science 11 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Extended Weather Lab Block: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Weather is a part of our everyday lives. It shapes our landscape, affects our decisions and activities on a day to day basis, and more. In this lab you will discover the weather in your local community, collect data, and forecast the future!

**Your Role:** You are a scientist on a team of weather trackers and forecasters.

**Your Task:** In groups, you will conduct a long-term weather lab. Each group will have an “expert” in one weather instrument (thermometer, barometer, wind vane, and rain gauge) who will construct and monitor their instrument, sharing the results with their groups each day.

**Outline:**

* Step 1: Construct a weather instrument (procedure and materials provided). Track weather daily at home (5-10min max), and share their data with each other each day in class ***(Planning and Conducting****)*
* Step 2: Graph your data and identify patterns that show what is coming next ***(Processing and analyzing data and information)***
* Step 3: Use your data to predict 2-3 days of weather providing scientific reasoning for your predictions ***(Processing and analyzing data and information)***
* Step 4: Track the last 3 days of weather to determine if your predictions were correct and outline why/why not ***(Evaluating)***

**Product:** You will be evaluated on a rubric for each step of the project. You are contributing your data to your group however you are responsible for submitting individuallab reports.

Part One: *Planning and Conducting*

In your groups you must decide who will be responsible for each weather instrument. Consider each group members’ strengths and decide as a group who will be responsible for each instrument. (This must be signed off on by Ms. Abbott before proceeding.)

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| **Thermometer**  |  |
| **Barometer** |  |
| **Wind Vane** |  |
| **Rain Gauge** (including cloud observations) |  |

 Ms. Abbott initials: \_\_\_\_\_\_\_\_

Your role – You will first become an “expert” in the weather instrument that you are responsible for. You are going to meet with the other experts to build, research, and test your instruments.

You are responsible for tracking the measurements of your instrument daily. This should take no more than 5-10 minutes at home each day after school/evening.

You will be given time each day in class to exchange data with your group-mates, and record it in your Earth Science notebooks (left in class).

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|  | **0** | **1** | **2** | **3** |
| **Collaboratively and individually collect reliable data (qualitative and quantitative)** | Student did not contribute data to their team. | Student contributed *some* data to the team. | Student contributed data to the team. | Student contributed *reliable* and *accurate* data to the team. |
| **Use appropriate units to systematically and accurately collect and record data** | Student has not collected data.  | Incomplete and/or disorganised data collection methods. | Data collection was *complete* and *organised* in a table. Table contained headings | Data collection was *complete*, *accurate*, and *organised* in a table. Table contained appropriate headings |

Part Two: *Processing and Analyzing Data*

***Graphing:***Now that you have collected your data in a data chart. Graph your data. You may decide how many graphs are required to represent all your data; the following data **must** be on your graphs.

Temperature, Pressure, Rain, Clouds, Wind Direction, & Dates.

Your graphs should also have; titles, labels, **accurate and appropriate** scales, key/legend if necessary. Your graphs should be neat, clear, and organised. The type of graph you choose to use is up to you, it should **accurately** represent your data!

***Analyzing:*** Using our understanding of weather relationships from the unit. **Interpret**your graphs and **Describe** patterns and relationships in your data. Point out these relationships on your graphing/in your data in some way. You could say “On Oct 21 and 28th, the wind was \_\_\_\_\_\_\_\_\_\_\_\_\_ and the following day brought clear skies” for example.

***Use the science and language we have been learning in this unit. USE YOUR NOTES!***

Some questions to start with;

* What do you notice in your data before/during periods of rain?
* What do you notice in your data before/during periods of sun?
* Are there connections/patterns between Pressure-Temperature? Wind-Pressure? Etc
	+ Ie. If Temperature raises, does Pressure go up or down?
	+ If Wind is from the North, do we have high or low pressure? Cold or warm temperatures?

*Hint:* Our goal is to use weather data to forecast upcoming weather, so it would be most helpful to focus on observations that can help us make predictions. (Cause-and-effect relationships)

* Eg. When wind direction is (north/east/south/west), the next day will be (overcast/sunny/rainy/cold) etc.

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|  | **0** | **1-2** | **3-4** | **5-6** | **7** |
| **Construct analyze, and interpret graphs, models, and/or diagrams** | Student did not meet any of the descriptors | Student constructed graphs of *some* data.  | Student constructed graphs of *most* data. | Student **accurately and appropriately** constructed *some* data | Student **accurately and appropriately** constructed graphs of **all** data collected |
| **Seek and analyze patterns, trends and connections in data including describing relationships between variables, and identifying inconsistencies** | Student did not meet any of the descriptors | Student **accurately** interprets data, identifying connections and relationships | Student **accurately** interprets and **describes** data, identifying connections and relationships  | Student **accurately** interprets and **describes** data using **scientific reasoning,** identifying connections and relationships. | Student **accurately** interprets and **analyzes** data using **correct scientific reasoning,** identifying connections and relationships. |
| **Analyze cause-and-effect relationships** | Student did not meet any of the descriptors | Student **states** cause-and-effect relationships | Student **outlines** cause-and-effect relationships  | Student **describes** cause-and-effect relationships using **scientific reasoning.** | Student **analyzes** cause-and-effect relationships using **correct scientific reasoning.** |

Part Three: *Processing and Analyzing Data*

Using your data observations and graphs, and the patterns/relationships you identified. **Predict** the weather for the next **three** days. You must **explain your reasoning.** Your prediction should include;

* Approximate Temperature
* Approximate Pressure (High, Medium, Low, etc)
* Approximate Rainfall and associated clouds
* Wind Direction

**Your prediction must be completed and signed off by Ms. Abbott before the end of class!**

Ms. Abbott initials: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Remember:* You are not graded on the success of your predictions, but on the **justifications** and **explanations** using **scientific reasoning**!

Continue to collect weather data for the three days of your prediction and include it on your data chart in another colour or highlighted to make clear that it is your final three days. You do not need to add these days to your graph unless desired.

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|  | **0** | **1-2** | **3-4** | **5-6** | **7** |
| **Formulate and predict multiple outcomes.****Communicate scientific ideas and information, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations.** | Student did not meet any of the descriptors | **State** a prediction with **limited reference** to evidence in data  | **Outline** a prediction with **reference** to evidence in data and **limited** scientific reasoning**.** | **Outline** a prediction with **reference** to evidence in data and **scientific reasoning** | **Describe** a prediction with reference to evidence in data and **correct scientific reasoning** |

Part Four: *Evaluating*

*Almost done!* You have now collected and graphed your data, analyzed it for patterns and relationships between variables, and predicted and observed the last couple of days of weather. The last step is to evaluate your predictions, experience, and findings!

1. **Discuss** the validity of your **prediction**. Consider the patterns and relationships observed in your data and what you learned about weather in the unit.
	* Was your prediction correct? Why/Why not?
	* Did the accuracy of your prediction change over time? Day 1/Day 2/Day 3?
2. **Evaluate** the methods and experiment, identify sources of error or uncertainty in your data.
	* What worked well in the lab to collect reliable data?
	* What are some sources of error or uncertainty that may have impacted your prediction?
3. **Describe** **scientific improvements** or extensions to the method that would benefit the experiment.
	* What are some improvements could be made to solve some of the problems identified above? Explain how they would improve the results.

**Hand In (Stapled together):**

* Project outline with Name and Block #
* Part 1 sheet
* Data chart including final three days (you can place the whole package in your Earth Science notebook to hand in)
* Part 2 sheet
* *All* graphs and Part 2 analysis
* Part 3 sheet
* Prediction with explanation
* Part 4 sheet (this one)
* Evaluations and explanations

**Due: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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|  | **0** | **1-2** | **3-4** | **5-6** | **7** |
| **Evaluate the validity and limitations of a model or analogy in relation to the phenomenon modelled** | Student did not meet any of the descriptors | **State the validity** of your prediction with **limited reference** to evidence in data  | **Outline the validity** of your prediction with **reference** to evidence in data and **limited** scientific reasoning**.** | **Outline the validity** of your prediction with **reference** to evidence in data and **scientific reasoning** | **Describe the validity of** your prediction with reference to evidence in data and **correct scientific reasoning** |
| **Evaluate methods, including identifying sources of error or uncertainty.**  | Student did not meet any of the descriptors | **State** the validity of the method with limited reference to investigation | **State** the validity of the method based on the outcome of the investigation | **Outline** the validity of the method based on the outcome of the investigation | **Discuss** the validity of the method based on the outcome of the investigation |
| **Describe specific ways to improve their investigation methods and the quality of their data.** | Student did not meet any of the descriptors | **State limited** improvements or extensions to the method | **State** improvements or extensions to the method that would benefit the investigation | **Outline** improvements and/or extensions to the method that would benefit the investigation | **Describe** improvements and/or extensions to the method that would benefit the investigation |