Name: _____

- **Please hand in the lab as ONE PDF document on Moodle.**
- **Please make sure the pages are in order**
- **Please make sure it's legible (open your PDF file to double check 😊)**
- **Thank you.**

CRANDALL 1023
GEOGRAPHY 1023
Lab 3: Global Temperatures

Reference: *Chapter 5, text and notes*

This lab looks at global temperature patterns and the various factors that influence them.

I. Spatial Distributions of Temperature

A. Latitude

One of the major influences on global temperatures is latitude. *For this section you will need to refer to**, "Global mean temperatures for JULY," 4CE, Figure 5.13, p.131 (3CE Figure 5.16, p.125).***

- *On this map the* **isotherms***, the lines joining points of equal temperature, are spaced* ***3°C*** *apart.*
- *The red isotherms are above 0°C. The blue isotherms are 0°C and below.*

1. Look at the isotherms in the Pacific Ocean, at the very ***left-hand*** edge of the map.

   a. What is the temperature at the Equator? _____°C

   b. As you move from the Equator, does the temperature increase or decrease? _____

   c. What is the temperature at 60°S latitude (the line just below 60 will do)? _____°C

   at 90°S (the South Pole) – see the circle map of the South Pole 4CE p. 133 (3CE, p. 128) _____°C

   d. What is the temperature between 60° and 70°N? _____°C

   at 90°N (the North Pole) – see the circle map of the North Pole 4CE p. 133 (3CE, p. 128) _____°C

   e. Why is it much warmer at 60°N and 90°N than at 60°S and 90°S?

   ____ in July the sun is over the Tropic of Cancer
   ____ in July the sun is over the Tropic of Capricorn
   ____ in July the sun is closer to the Earth
   ____ in July the sun has more intense solar energy

   d. At what ***rate*** (°C/10° of latitude) is the temperature changing as you move south? That is, if you were to move 10° latitude further south, how much change in temperature would you expect?

   The temperature *difference* from the Equator (0° latitude) and 90°S latitude is _____°C

   This difference you just calculated / 9 = ***rate:*** _____°C/10° of latitude

   The point? This cooling is almost entirely due to the effect of latitude. Latitude matters!

B. Altitude

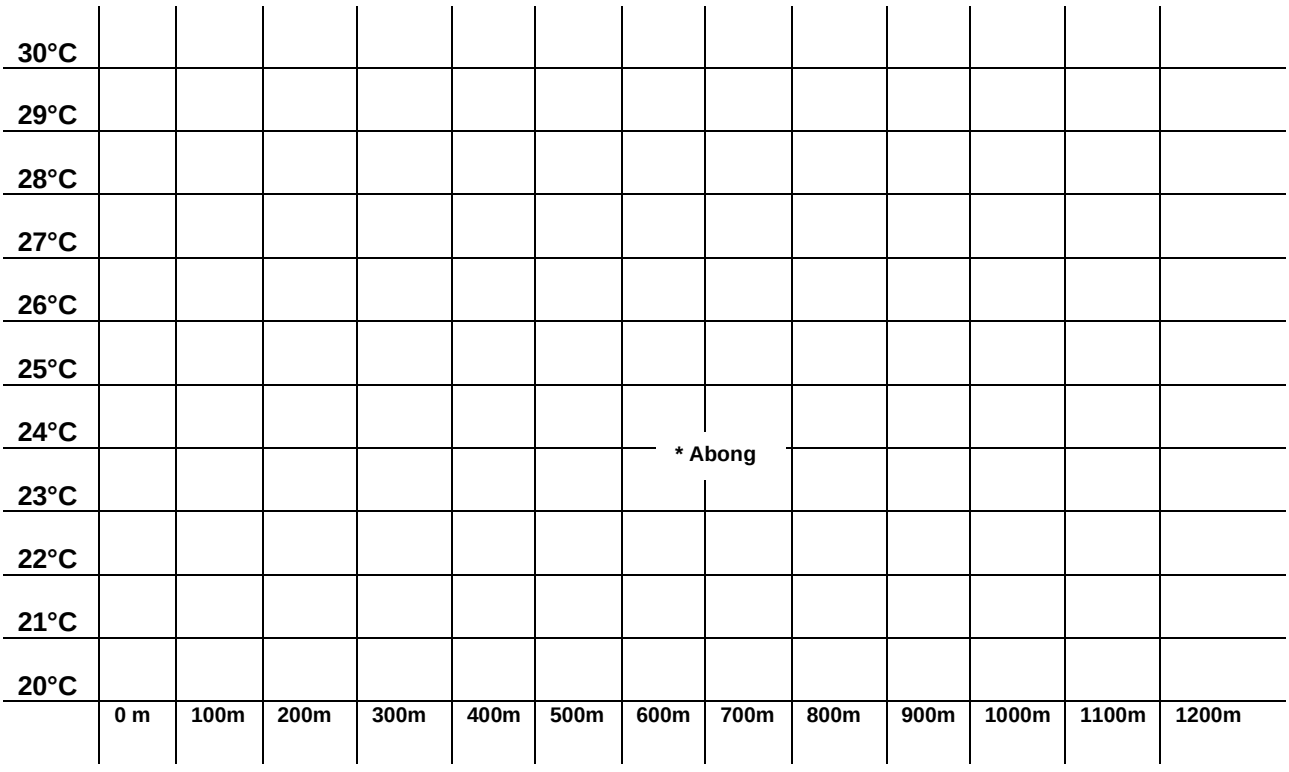
Another major influence on global temperatures is altitude. Because the air gets thinner as you move to higher elevations, the air gets cooler.

Table 1 gives average annual temperatures and elevations for weather stations in Cameroon, a small African country near the equator.

Table 1

STATION	ELEVATION (m)	AVERAGE TEMP. (°C)
Abong	685	23.9
Bafia	495	25.3
Banyo	1103	22.5
Campo	27	25.7
Douala	13	26.5
Edea	52	26.6
Kribi	13	26.4
Lomie	636	24.1
Meiganga	994	23.0
Nkongsamba	872	22.3
Poli	433	25.6
Yaounde	755	23.4
Yoko	1025	22.2

On the graph below plot the temperature as a function of elevation for each location.



Using a ruler, draw ***the best straight line*** you can through the dots. Not all dots will be exactly on your line. Some will be above it. Some below it. But your straight line should the "best fit" you can do.

a. What ***general*** relationship is evident from these data (what ***overall trend*** seems to appear)? (check one)

___ temperature generally increases with altitude
___ temperature generally decreases with altitude
___ altitude has no apparent influence on temperature

b. Using your notes and the text, try to explain this relationship:

____ temperature decreases as the air gets more dense
____ temperature decreases as the air gets less dense
____ temperature increases as the air gets less dense
____ temperature changes due to vegetation changes

The point? Altitude also matters!

C. ***Continentality*** *(land-water heating differences)*

Continentality – which refers to a location's position relative to oceans – is another important factor in global temperatures.

Briefly look over the two examples of maritime and continental cities – Vancouver/Winnipeg and Trondheim/Verkhoyansk in your text: 4CE p.128-129 (3CE, pp. 120 & 124).

1. Which of these four cities has the warmest average summer temperature (*look at the July/August values on the red lines)*? _____

   Why do you think this is so

   … is the location ___ inland continental, or ___ coastal maritime?

   … is the location ___ closer to the equator, or ___ further from the equator?

2. Which of these four cities has the coldest average winter temperatures (*look at the January values on the red lines*)? _____

   Why do you think this is so

   … is the location ___ inland continental, or ___ coastal maritime?

   … is the location ___ closer to the equator, or ___ further from the equator?

3. Which of these four cities has the greatest annual temperature range (difference between warmest month and coldest month) – *the last figure in the data provided below each graph.*

   _____

   Why do you think this is so

   … is the location ___ inland continental, or ___ coastal maritime?

   … is the location ___ closer to the equator, or ___ further from the equator?

4. Which of these cities has the least annual temperature range? _____

Why do you think this is so

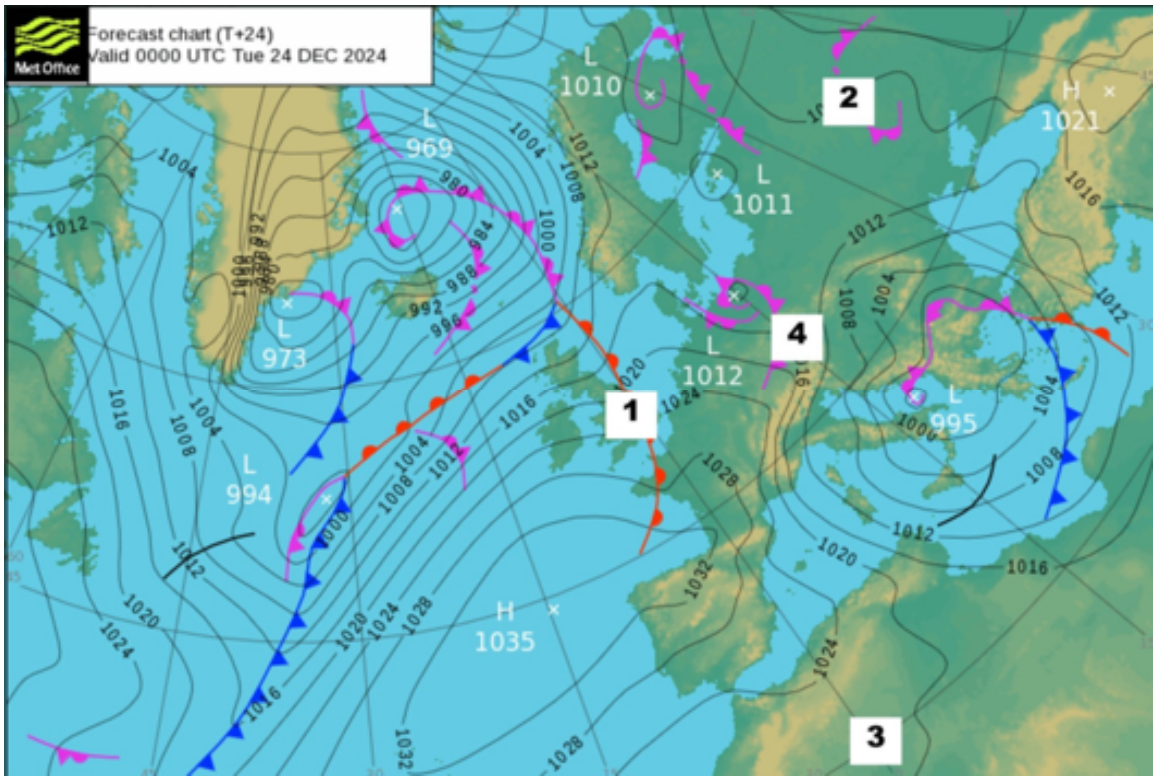
… is the location ___ inland continental, or ___ coastal maritime?

… is the location ___ closer to the equator, or ___ further from the equator?

The point? Where you are, relative to a large body of water (like the ocean) matters, too.

Look back over these four examples … understand the effect latitude (distance from the equator), altitude, and continentality (inland continental vs. coastal maritime location) have on temperatures.

5. Let's look at an example. Here is a weather map from Christmas 2024:



City **1**, London UK, is on the coast, at sea level, approximately 51°N latitude
City **2**, Moscow, Russia, is inland, 300 m above sea level, also at approximately 51°N latitude
City **3**, Béchar, Algeria, in inland, a low elevation, but at 31°N latitude
City **4**, Salzburg, Austria, is inland a bit, but also at 500 m elevation, and approximately 51°N latitude

a. Given it's December 25, would you expect London or Moscow to be colder?

____ London OR ____ Moscow

Why? (pick as many as are relevant)

_____ it's closer to the Equator
_____ it's further from the Equator
_____ it's at a higher elevation
_____ it's at a lower elevation
_____ it's coastal
_____ it's inland continental

b. Given it's December 25, would you expect London or Salzburg to be colder?

____ London OR ____ Salzburg

Why? (pick as many as are relevant)

_____ it's closer to the Equator
_____ it's further from the Equator
_____ it's at a higher elevation
_____ it's at a lower elevation
_____ it's coastal
_____ it's inland continental

c. Given it's December 25, would you expect London or Béchar to be warmer?

____ London OR ____ Béchar

Why? (pick as many as are relevant)

_____ it's closer to the Equator
_____ it's further from the Equator
_____ it's at a higher elevation
_____ it's at a lower elevation
_____ it's coastal
_____ it's inland continental

II. Apparent Temperature

A. Wind Chill

Familiarize yourself with wind chill (4CE pp. 118-119 (3CE Focus Study 5.1, pp. 126-127)).

1. To reduce wind chill, which would you think it would be better to wear:

   ____ a cotton jacket: it allows wind to get in
   ____ a cotton jacket: it blocks all wind
   ____ a nylon jacket: it allows wind to get in
   ____ a nylon jacket: it block all wind

2. Consult ***"Wind chill temperature index" (4CE, Figure 5.2, p. 118 (3CE Figure 5.1.1, p.126))*.** Using ***the chart***, fill in the wind chill temperature for temperature and wind speed conditions (note which chart you fill in depends on which edition of the text you have – only fill in one or the other, not both!).

   If you have <u>4CE</u> or <u>3CE</u> use this chart:

AIR TEMPERATURE (°C)	WIND SPEED (km/h)	WIND CHILL TEMPERATURE (°C)
- 25	15	
0	25	
-10	30	
-40	8	
0	80 (Lethbridge Chinook!)	

   If you have <u>2CE</u> use this chart:

AIR TEMPERATURE (°C)	WIND SPEED (km/h)	WIND CHILL TEMPERATURE (°C)
- 23	16	
+4	24	
-7	32	
-40	8	
+4	80 (Lethbridge Chinook!)	

The point? The temperature you FEEL depends on BOTH how cold and how windy it is. Dress accordingly tomorrow!

B. Humidex/Heat Index

Familiarize yourself with the heat humidex/heat index (4CE, pp. 136-138 (3CE, also in Focus Study 5.1).

The humidex is a Canadian innovation.

It was devised by Canadian meteorologists to describe how hot, humid weather feels to the average person. The humidex combines the temperature and humidity into one number to reflect the perceived temperature.

Because it takes into account the two most important factors that affect summer comfort, it can be a better measure of how stifling the air feels than either temperature or humidity alone. Extremely high readings are rare except in the southern regions of Ontario, Quebec, and the Maritimes. Generally, the humidex decreases as latitude increases (the further north you go). Wind also helps reduce the humidex.

Range of humidex: Degree of comfort

- Less than 29 Celsius: No discomfort
- 30 to 39 Celsius: Some discomfort
- 40 to 45 Celsius: Great discomfort; avoid exertion
- Above 45 Celsius: Dangerous
- Above 54 Celsius: Heat stroke imminent

1. Knowing this, and considering the Table (4CE Figure 5.18, p. 138 (3CE Table 5.1.1, p.127)), in conditions with a high humidex, indicate if each statement is true or false:

    a. All unnecessary activity should be curtailed _____
    b. You should not drink extra liquids _____
    c. You should take plenty of rest breaks working outside _____
    d. You should do extra training for your upcoming marathon _____

2. In warm conditions, which would be the best colour (think albedo) to wear (pick one)

    a. Black? _____
    b. White? _____

3. In warm conditions is it best to wear (pick one):

    a. an open cotton weave shirt _____
    b. a windproof nylon top? _____

The point? Next summer when it's hot and humid (or if you go somewhere warm for winter break), take not of both the heat AND the humidity. Make wise choices!