

Name: _____

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**CRANDALL UNIVERSITY
GEOGRAPHY 1023
Lab 4: Atmospheric Circulation**

Reference: Chapter 6, text and notes (I know this was from before the midterm. That's OK 😊)

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

I. Wind

A. Pressure Gradient Force

One of the major influences on atmospheric circulation and air movement (wind) is the pressure gradient force.

For this section you may find Figure 6.6, "Effect of pressure gradient on wind speed," 4CE p. 149 (3CE p. 140), to be helpful.

1. On a weather map if isobars (air pressure lines) are close together would the winds be (check one)
___ strong, or ___ weak?
2. On a weather map if isobars (air pressure lines) are far apart would the winds be (check one)
___ strong, or ___ weak?

B. Coriolis Force

Another major influence on global circulation patterns is the Coriolis force. Because the Earth rotates on its axis, air appears to "deflect" in a circular pattern.

For this section refer to 4CE Figure 6.7 "The Coriolis force" p. 150 and Figure 6.8b, "Three physical forces that produce winds – Coriolis Force," p. 152. (3CE Figures 6.8 and 6.7b, pp. 141-142)

1. Assume you are in **Victoria County, N.B., Canada (Northern Hemisphere)**; would the Coriolis force cause deflection (check one)
___ clockwise, or ___ counter clockwise?
2. Assume you are in **Victoria, Australia (Southern Hemisphere)**; would the Coriolis force cause deflection (check one)
___ clockwise, or ___ counter clockwise?
3. If you were on **Lake Victoria, Africa (almost right at the Equator)**, the water in your tub will drain straight down:
___ true, or ___ false *see my notes

II. Global Circulation Patterns

A. High and Low Pressure Patterns

For this section you will need to refer to "Global barometric pressures for January and July," 4CE Figure 6.10, p. 154 (3CE Figure 6.9, p. 144).

1. Consider the global barometric pressures for January (4CE Figure 6.10a, 3CE Figure 6.9a).

- a. Is central Asia (China, northern India) relatively high or low pressure? _____
- b. Compared to that figure, is the Indian Ocean, off the coast of India, relatively high or low pressure? _____

Why do you think this is so (check one)?

- because in January the land is relatively warmer than the ocean
 because in January the ocean is relatively warmer than the land
 because in January, both the land and ocean are relatively the same temperature

- c. Would you anticipate that winds in January would blow (check one)

from the Indian Ocean into central Asia, or from central Asia to the Indian Ocean
because (check one)

winds blow from high to low pressure, or winds blow from low to high pressure

- d. What would you expect the weather to be like in India in January?

relatively cool and dry relatively cool and wet
 relatively hot and dry relatively hot and wet

2. Consider the global barometric pressures for July (4CE Figure 6.10b, 3CE Figure 6.9b).

- a. Is central Asia (China, northern India) relatively high or low pressure? _____
- b. Compared to that figure, is the Indian Ocean, off the coast of India, relatively high or low pressure? _____

Why do you think this is so (check one)?

- because in July the land is relatively warmer than the ocean
 because in July the ocean is relatively warmer than the land
 because in July the ocean and land are relatively the same temperature

- c. Would you anticipate that winds in July would blow (check one)

from the Indian Ocean into central Asia, or from central Asia to the Indian Ocean
because (check one)

winds blow from high to low pressure, or winds blow from low to high pressure

d. What would you expect the weather to be like in India in July?

- relatively cool and dry
- relatively cool and wet
- relatively hot and dry
- relatively hot and wet

3. What name is given to this regional weather pattern in Asia (4CE Figure 6.15, p. 161; 3CE Figure 6.19)? _____

B. Global Circulation Model

For this section, see “General atmospheric circulation model,” (4CE Geosystems in Action 6, pp. 156-157, 3CE Figure 6.11, p. 146;).

1. What are the dominant winds on the BC Coast? _____ Central America? _____
2. Consult 4CE 6.1a, p.156 (3CE Figure 6.11, p.146) “General atmospheric circulation model,” and 4CE Figure 6.10, p. 154 (3CE Figure 6.9), “Global barometric pressures”. **It’s July**. Imagine your wealthy client, the eccentric trillionaire, Jebidiah Jericho, has hired your sailboat to take him from Africa to South America.

a. At each latitude, briefly describe what you might expect to experience:

	Sailing along the Equator (0°)	Sailing at about 12°S latitude	Sailing at about 23 ½°S latitude	Sailing at about 45°S latitude
Winds (direction) None, SE, NE, or Westerly				
Approximate air pressure: high, normal[1013], low				

b. If Jeb’s goal is to make the crossing **sailing as quickly and reliably as possible from Africa to Brazil** so he can wed his heart’s only true love, Melamina Connery-Lazenby-Moore-Brosnan-Craig-Bond, at what latitude would you recommend making the passage? (check one)

- 0° (equator) 12°S 23½°S 45°S

At this latitude the winds would typically be called: _____

c. If Jeb is fleeing from creditors and wants to **spend as long as possible** at sea – becalmed in the middle of nowhere if possible – at what latitude would you recommend making the passage?

- 0° (equator) 12°S 23½°S 45°S

At this latitude the winds would typically be called: _____

3. Jeb offers you \$25,000,000 U.S. to take him around to the west coast of South America. Fair Melamina has moved the wedding from Brazil to Peru! This involves going down around Cape Horn, the southernmost tip of South America (55°S latitude). You won’t do it! Not even for \$250,000,000! You know that this is one of the stormiest places in the entire world and you will not risk your ship – let alone your life! From the figures in your text and what you have learned about atmospheric systems, why do you think Cape Horn might have such terrible storms? (Answer questions a and b on the next page)

a. are the isobars closely or widely spaced (4CE Figure 6.10 p.154 [3CE Figure 6.9, p.144]):

b. therefore, are there strong or weak winds: _____

c. take an educated guess at the weather at Cape Horn in July (consider ... is it summer or winter at this location)? (tick the best answer)

- | | |
|--|---|
| <input type="checkbox"/> windy and sunny | <input type="checkbox"/> calm and sunny |
| <input type="checkbox"/> windy and wet | <input type="checkbox"/> calm and wet |

d. Furious at your refusal, Jeb hires your cousin Ananias' private jet to fly him **from Africa to Peru** to wed his sweetheart! He demands that Ananias fly at an altitude of 10,000 m, at 55°S latitude right over Cape Horn, to snub you! Here the intrepid voyageurs have a horrible time— despite great **air** speed – they are barely making any ground progress (very poor **land** speed) on their journey to Peru.

Consider 4CE 6.1a-6.1b, p. 156-7 (3CE Figure 6.11), “*General atmospheric circulation model.*” What atmospheric condition occurs in the atmosphere at about 10,000 m, around 55°S?

4. What advice would you, as a wise student of this course, give to Jeb (other than to go fly a kite – preferably in a hurricane!). Seriously, at what latitudes (two latitudinal ranges) should he and Ananias **NOT** fly because of strong upper level winds?

a. _____

b. _____

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