Name _____ Date _____ Period _____

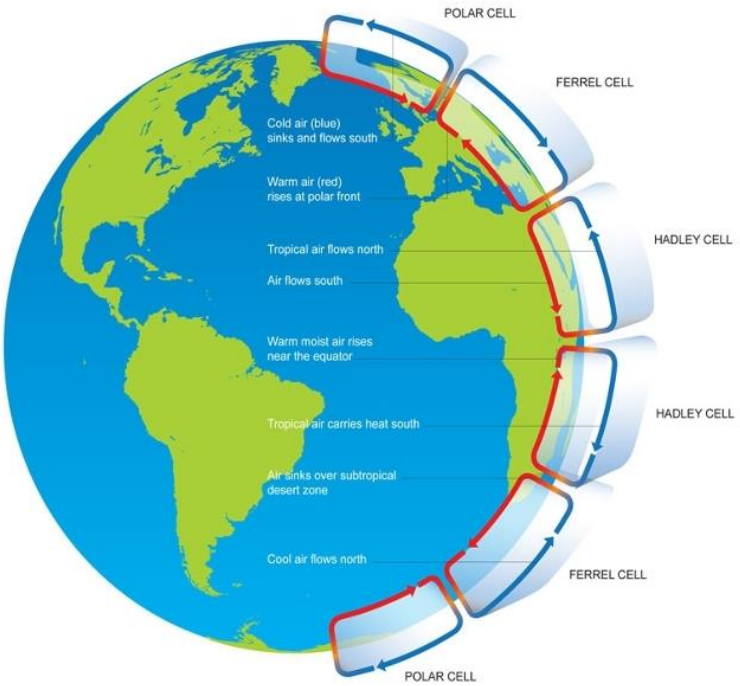
GLOBAL WIND PATTERNS

Complete the following activities to identify patterns made by global winds.

Activity 1 – Global Wind Cells

Over the major parts of the Earth's surface there are large-scale wind circulations present. The global circulation can be described as the world-wide system of winds by which the necessary transport (movement) of heat from tropical to polar latitudes is done.

In each hemisphere there are three cells (Hadley cell, Ferrel cell and Polar cell) in which air circulates through the entire depth of the troposphere. The troposphere is the name given to the vertical extent of the atmosphere from the surface, right up to between 10 and 15 km high. It is the part of the atmosphere where most of the weather takes place.



CIRCULATING CELLS
The Hadley cells have the most regular pattern of air movement, and produce extreme wet weather at the equator and extreme aridity on the deserts. The polar cells are the least well-defined.

Hadley cell

The largest cells extend from the equator to between 30 and 40 degrees north and south, and are named Hadley cells, after English meteorologist George Hadley.

Within the Hadley cells, the trade winds blow towards the equator, then rise near the equator as a broken line of thunderstorms. From the tops of these storms, the air flows towards higher latitudes, where it sinks to produce high-pressure regions over the subtropical oceans and the world's hot deserts, such as the Sahara desert in North Africa.

Ferrel cell

In the middle cells, which are known as the Ferrel cells, air converges at low altitudes to rise along the boundaries between cool polar air and the warm subtropical air that generally occurs between 60 and 70 degrees north and south. This often creates unsettled weather. The Ferrel cell moves in the opposite direction to the two other cells (Hadley cell and Polar cell) and acts rather like a gear. In this cell the surface wind would flow from a southerly direction in the northern hemisphere. However, the spin of the Earth makes an apparent motion to the right in the northern hemisphere and left in the southern hemisphere. This deflection is caused by the Coriolis effect

Polar cell

The smallest and weakest cells are the Polar cells, which extend from between 60 and 70 degrees north and south, to the poles. Air in these cells sinks over the highest latitudes and flows out towards the lower latitudes at the surface. Together, the 3 cells (Hadley, Ferrel, Polar) create one large conveyor belt to transfer energy from the equator to the poles.

Article from: https://www.metoffice.gov.uk/learning/learn-about-the-weather/how-weather-works/global-circulation-patterns

Analysis Questions

1. How many cells are in each hemisphere?

2. Which part of the atmosphere does most weather occur?

3. What is the name of the largest cell?

4. How did the Hadley cell get its name?

5. Within the _____ cells, the trade winds blow towards the _____, then rise near the equator as a broken line of _____.

6. Where are Ferrel cells located?

7. What causes Ferrel cells to act as a gear?

8. What causes the Ferrel cell to deflect to the right in the northern hemisphere and to the left in the southern hemisphere?

9. What is the weakest and smallest of the cells?

10. Looking at the diagram, what cell would most likely affect us here in St George?

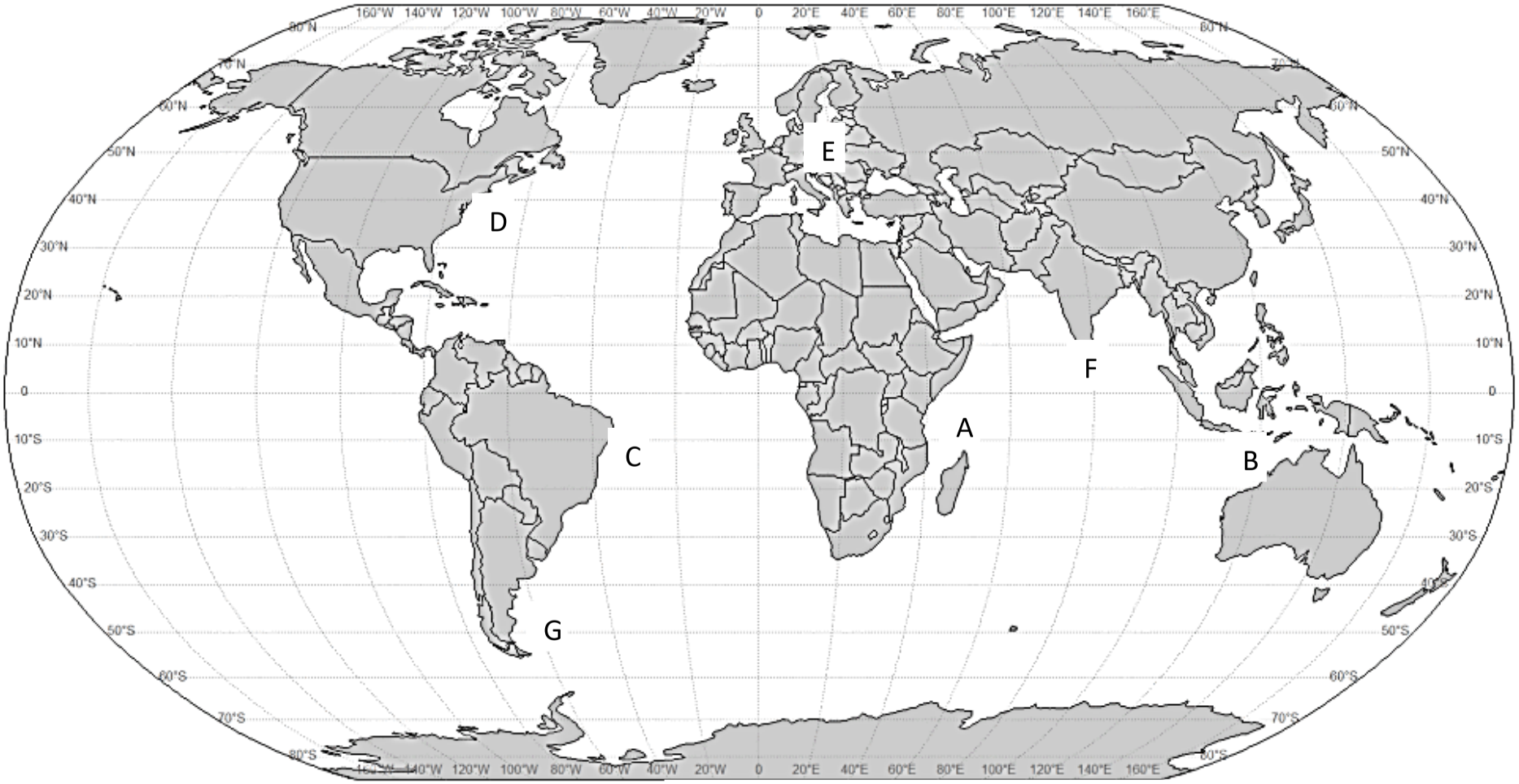
11. Looking at the diagram, what direction do polar cells flow in the northern hemisphere?

12. Looking at the diagram, what direction do the Hadley cells carry heat in the southern hemisphere?

Activity 2 – Can You Map It?

Use the following directions to label the map to show global surface wind patterns and then answer the questions that follow.

1. Use a red colored pencil to mark the equator line on the map, (0°)
2. Use the amazing textbook of knowledge page 404 to help you identify the three main surface global winds along with the location of doldrums and horse latitudes.
3. Use the key below the map to assign a color for each of the winds, then use that color to show the location of each on the map
4. Cut out the arrows and glue each in the correct spot showing the direction of trade winds, westerlies, and polar easterlies.



Key

- Trade Winds
- Doldrums
- Westerlies
- Horse Latitude
- Polar Easterlies

Analysis Questions

1. What direction do trade winds move?

2. What direction do westerlies move?

3. What direction do polar easterlies move?

4. How many doldrums are found on Earth? Why?

5. How many horse latitudes are found on the Earth? Why?

6. Could a sailor use a sailboat to sail from point A to point B? Why?

7. Could a sailor use a sailboat to sail from point D to point E? Why?

8. Could a sailor use a sailboat to sail from point F to point A? Why?

9. Could a sailor use a sailboat to sail from point G to point G? Why?

10. Explain the best route for a sailor to take to sailboat and travel to the most locations as possible on the map. Keep in mind, crossing doldrums or horse latitudes will result in a 4 to 6 week delay and possibly lead to death by starvation.