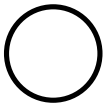
ATSC 201 **Final Exam** Name: _____
Prof. Stull (open book)
Fall 2010 (100 points) Student Number: _____

1. (2 points) For the clouds you observed outside at the start of this exam, the dominant cloud type that you could see is _____
... and the weather map symbol for the **coverage** of that type of cloud is:



2. Analyze the attached weather maps. These data are from the USA, so the units are weird. (Recall, 32°F = 0°C = freezing.) But you use the same analysis methods as you already learned.

a) On the Pressure map,
• (16 pts) **Draw isobars** every 4 hPa. For example: 996, 1000, 1004, 1008, 1012, 1016, 1020, 1024, 1028, 1032 hPa. [Hint, lightly sketch your isopleths at first. Erase as needed. Finally, darken the lines.]
• (2 pts) Also, **label** high-pressure centers with "H", and low-pressure centers with "L".
• (1 pt) At the weather station labeled "P" in western Pennsylvania, **draw a vector** indicating the likely **near-surface wind direction**.
• (1 pt) At the weather station labeled "I" in southern Illinois, **draw a vector** indicating the likely **near-surface wind direction**.

b) The Temperature map is already analyzed with isotherms in deg F, and this map corresponds to the same weather situation as was on the pressure map of part (a). On this temperature map:
• (1 pt) Find any **Warm** centers and label them with "Warm". Find any **Cold** centers and label as "Cold".
• (2 pts) Under the Warm and Cold words that you just wrote, give the **airmass** abbreviation.
• (4 pts) Using a colour that is easy to see, draw parallel lines indicating the **frontal zones**.
• (6 pts) Next, based on the pressure map info, determine which way the airmasses are moving (if at all) to determine what type the front is (warm, cold, occluded, stationary). Indicate that front with appropriate **frontal symbols on the appropriate part of the frontal zone**.

c) For western Quebec (for the weather station labeled as "Q"),
• (5 pts) In the box below, write what you expect the **current weather** is [cloud type (if any), precipitation type (rain or snow, if any), wind direction, wind speed (light, moderate, fast), temperature, pressure].
• (7 pts) In the box below, write your **weather forecast for 6 hours into the future** [cloud type, precipitation type (rain or snow, if any), wind direction, wind speed (light, moderate, fast), temperature, pressure].

Current weather:
Forecast:

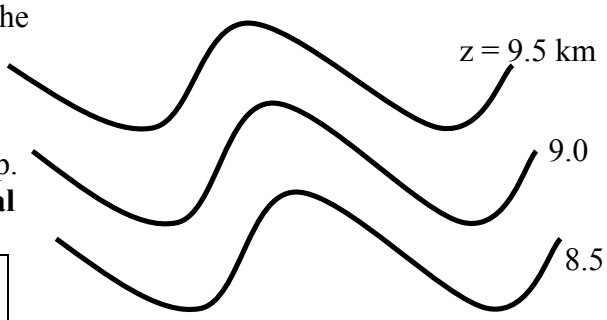
d) For eastern Kentucky (for the weather station labeled as "K"),
• (5 pts) In the box below, write what you expect the **current weather** is [cloud type (if any), precipitation type (rain or snow, if any), wind direction, wind speed (light, moderate, fast), temperature, pressure].
• (7 pts) In the box below, write your **weather forecast for 6 hours into the future** [cloud type, precipitation type (rain or snow, if any), wind direction, wind speed (light, moderate, fast), temperature, pressure].

Current weather:
Forecast:

Name: _____

3. (14 pts) Given a Northern Hemisphere region with cold air to the north and warm air to the south. The temperature change is 20K across a distance of 1000 km across this region, and this temperature gradient exists at all heights. If the wind is zero at the ground, find the **wind speed** and **direction** at 10 km above ground. Assume $f_c = 10^{-4}$, and $T_v = -10°C$. Show your calculations, and put a box around each answer.

4. Given the map at right, showing geopotential height contours for the 30 kPa isobaric surface over Southern Hemisphere midlatitudes.



a) (2 pts) Using the appropriate symbols, indentify the **troughs** and **ridges** on this map.

b) (2 pts) Draw some vectors showing **wind direction** on this map.

c) (5 pts)Outline why **Coriolis force** and conservation of **potential vorticity** are important in causing the shape of these contours.

d) (1 pt) Write the letter "D" where you expect to find the greatest horizontal **Divergence** on this map.

e) (3 pts) Outline why would you expect a **surface low-pressure center** to form under that "D"?

f) (2 pts) On the map at above right, use a different colour pencil or pen to draw wind vectors showing how **near-surface air** would move around this low center.

5. (4 pts) List characteristics that are similar for **sea-breezes** and **anabatic winds**.

6. a) (3 pts) Why would **hurricanes die** if they try to cross the equator? (very short answer)

b) (5 pts) What is the "**warm core**", and why is it important for allowing hurricanes to have long lifespans?

-end-

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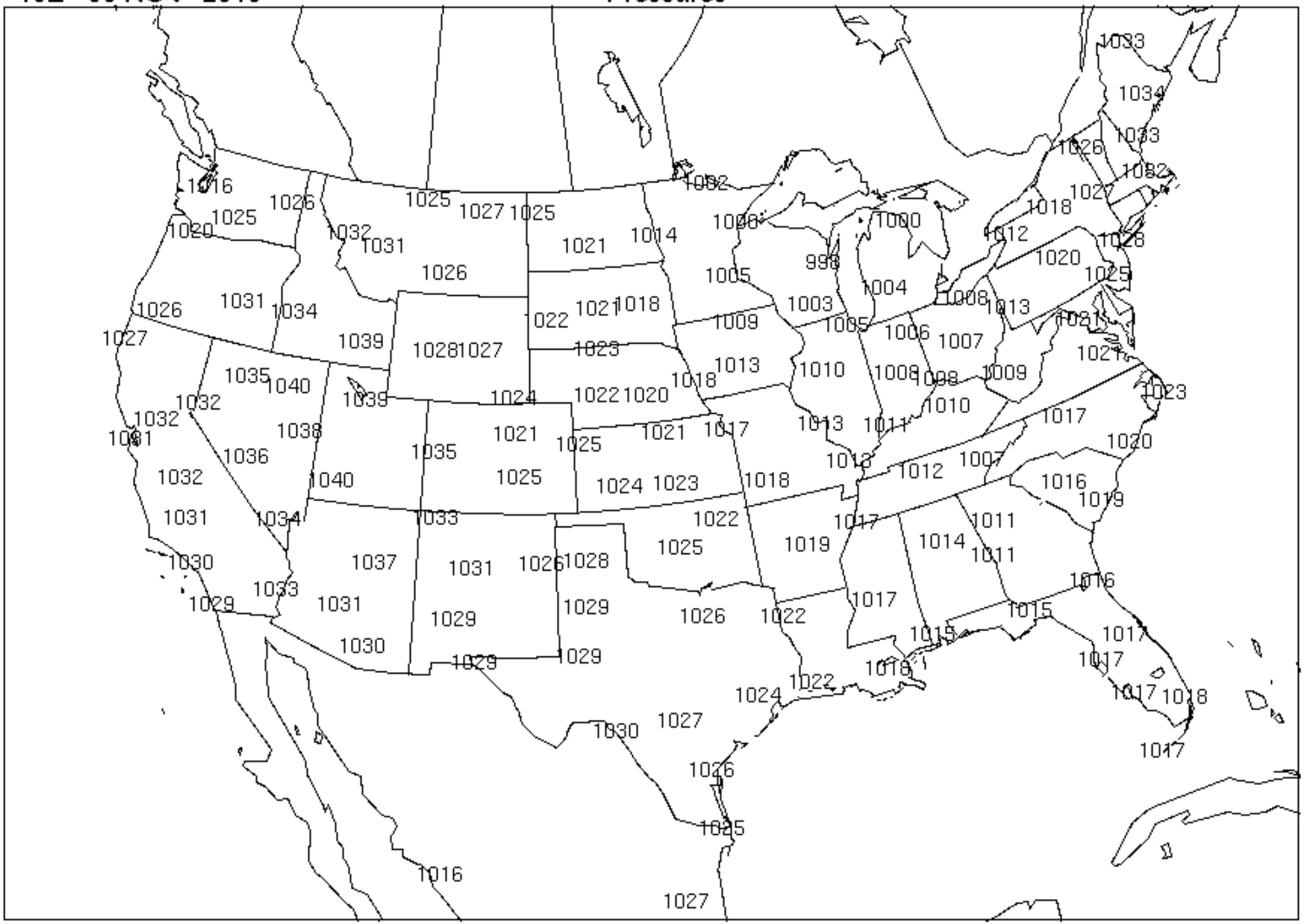
Pressures



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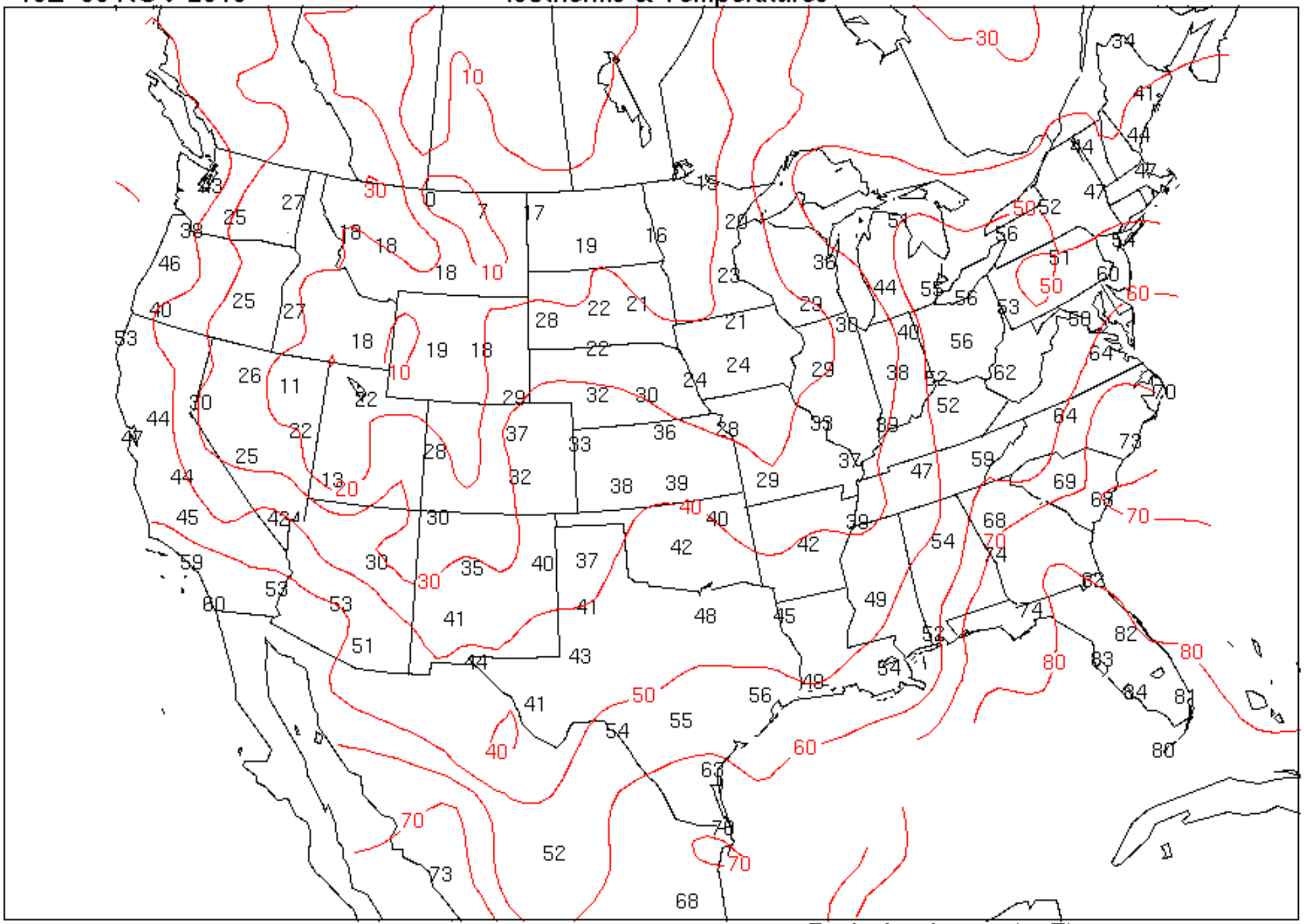
Isotherms & Temperatures



NCEP/NWS/NOAA

Red - Isotherms (10F)