Name_____ Section/TA:_____

Atmospheric Sciences 101, Autumn 2004
Homework #3, Due at the beginning of lecture on Thur. October 28, 2004.

1) During the night, 10 cm of snow falls over Seattle. In the morning you shovel off part of your asphalt driveway.

   a. Give two reasons the shoveled part of the driveway will warm faster than the snow covered part. [1]

   b. The warm air over the shoveled driveway rises, and cooler air from the sides converges to take its place. Given this air flow, what can we infer about the surface air pressure difference between the shoveled driveway and the surrounding snowy ground, and why? [1]

   c. Ten feet up in the air, the rising warm air current is so diluted that it is no longer buoyant, and it spreads out sideways. What can we infer about the pressure difference between the air above the shoveled driveway and the air above surrounding snowy ground at this height?

   d. What do horizontal contrasts in air density have to do with the different answers you get for b) and c)? [1]

   e. Is the Coriolis force important for this circulation? If so, what does it do? If not, explain why. [1]

2) Name the correct size scale for the following atmospheric phenomena:[5]

   a. Jet stream

   b. A winter snow storm

   c. City wide smog

   d. Tornado

e. Plume from a smokestack

3) Circle the word that correctly completes the statement regarding what would occur because of a strong El Nino. [5]

| | | | |
|---|---|---|---|
| a. | Upwelling in the equatorial eastern tropical Pacific… | increases | decreases |
| b. | Trade winds over the Pacific… | strengthen | weaken |
| c. | Air pressure over the eastern Pacific… | rises | falls |
| d. | Air pressure over the western Pacific… | rises | falls |
| e. | Sea-surface temp. along the equator in the Pacific… | increases | decreases |
| f. | Depth of warm layer of water in the eastern Pacific… | deepens | shallows |

4) General circulation.

a. What are the two prominent surface lows in the Northern Hemisphere during the winter?[1]

b. What are the two prominent surface highs in the Northern Hemisphere summer?[1]

c. In light of you answer to (b) if you were sailing from Spain to the Eastern U.S. in the summer, would you choose a more northern or southern route? (think about the difference between surface winds around highs and lows) [1]

d. If we are looking at a constant pressure height map (e.g. 500 mb heights) of the upper tropopause over the US, how could we figure out where the jet stream is?[1]

e. How does the location and strength of the jet stream change between winter and summer and what effect does this have on the weather in the northern US? [1]

5) (Covered in Monday lecture) The following two figures show side views of two basic types of fronts. The dashed line indicates the boundary between the warm and cold air.

a. Based on the direction of motion and the profile, indicate which is a cold and which is a warm front. [1]

b. Identify which are the cold and warm airmasses in each figure. [1]
c. Circle and label the major regions of rising air. [1]
d. Identify where the strongest temperature gradient is on the surface for both situations. [1]
e. Which front has the strongest temperature gradient at the surface? [1]