**Introduction to Meteorology**

**Homework #1 (Chapters 1 and 2)**

**Due: Wednesday, September 24**

1. What is meteorology?

2. What is a meteorologist?

3. What percentage of meteorologists do forecasts for radio and television stations

 (broadcast meteorologists)?

4. Earth’s atmosphere is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

5. a) 99% of dry air is composed of what two gases?

 b) Are these gases active ingredients for weather and climate?

6. What are three reasons that water vapor is such a critical component of the

 atmosphere in regard to weather and climate?

7. How have humans upset the balance in the atmosphere created by the carbon

 dioxide cycle?

8. a) Where is most of the ozone in our atmosphere located?

 b) Why is it critical to maintaining life on earth?

9. a) What atmospheric gas is responsible for the “ozone hole”?

 b) Where did this gas come from?

 c) Did this gas really create a “hole” in the ozone layer”?

10. What is the definition of atmospheric (air) pressure?

11. Air density and pressure ***always*** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

12. The atmosphere is divided into different **“layers”** based upon \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

13. a) What is the lowest layer of the atmosphere, where all weather occurs?

 b) What is the vertical temperature profile of this layer?

14. a) What is the layer above the “weather” layer?

 b) What is its temperature profile?

 c) Why does it have this temperature profile?

15. What is the transition zone between these two layers called?

16. a) What is the definition of weather?

 b) What is the definition of climate?

17. What is the definition of temperature?

18. Which is heavier (more dense) warm air or cold air?

19. Energy from the sun is utilized to evaporate water from earth’s surface. This

solar energy is then transferred to the atmosphere when this water vapor condenses to form clouds as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a form of energy which is responsible for generating thunderstorms and hurricanes.

20. a) What are the other three methods of heat transfer in the atmosphere and

 what is their definition?

 b) Which method is utilized to transfer heat from the sun to the earth?

21. In regard to the temperature of vertically moving air parcels (convection), rising

 air \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and sinking air \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

22. What are the three important rules regarding radiation?

23. The sun emits a maximum of radiation as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 and the earth, which is much cooler, emits almost all of its radiation as

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

24. The temperature of a substance \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_when it absorbs radiation?

25. The “greenhouse effect” occurs because certain gases in the atmosphere are

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, transmitting \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 so that it can heat the earth but then absorbing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,

 emitted by the earth, as it tries to escape into outer space.

26. The “greenhouse effect” is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ thing because, without it, the

 temperature of earth’s surface would average \_\_\_\_\_\_\_\_\_\_\_\_ instead of 59°F.

27. What are the two most important greenhouse gases (strongest selective

 absorbers) in the atmosphere?

28. The troposphere is heated \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_by the sun as it is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(which was directly heated by the sun), by

 the mechanisms of heat transfer previously discussed.

29. What is scattering?

30. a) What is albedo?

 b) What type of earth surface has the highest albedo?

31. Low latitudes (tropics) tend to gain more energy than they lose (heat surplus)

 since they receive more direct sunlight and high latitudes lose more energy to

 space than they gain (deficit). So that the temperature imbalance does not

 become extreme (unstable), \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 circulations and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ redistribute heat by moving warm air and

 water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and cold air and water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

32. Why do we have seasons?

33. Our seasons are regulated by how much solar energy is received at earth’s

 surface. This is determined by what two things?

34. Why is direct sunlight (sun directly overhead) more intense than sunlight

 striking the surface at an angle (sun lower, toward the horizon)?

35. The Summer Solstice in the Northern Hemisphere (June 21) is the

 “astronomical” \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 On this day, the northern half of earth is tilted directly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 the sun so that places in the Northern Hemisphere receive more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than any other time of the year (sun most directly

 overhead, longest day of the year).

36. If the last question is correct why does it tend to be warmer in July and August

 than on June 21?

37. Why is the Arctic (above 66½°N) called the “land of the midnight sun”?

38. On the Autumnal (Fall) and Vernal (Spring) Equinoxes the sun is directly above

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are of equal length everywhere in the world.

39. The “meteorological” summer season is defined as the three months with

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

40. Seasons in the Southern Hemisphere are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 to those in the Northern Hemisphere.