Instructor(s): *Prof. Whiting*

PHYSICS DEPARTMENT

MET 1010 2nd Midterm Exam March 11, 2005

Name (print, last first): _____ Signature: _____

On my honor, I have neither given nor received unauthorized aid on this examination.

YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.

(1) **Code your test number on your answer sheet (use 76–80 for the 5-digit number)**. Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY**. Code your UFID number on your answer sheet.
(2) Print your name on this sheet and sign it also.
(3) Do all scratch work anywhere on this exam that you like. **Circle your answers on the test form.** At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout with scratch work most questions demand.
(4) **Blacken the circle of your intended answer completely, using a #2 pencil or blue or black ink**. Do not make any stray marks or some answers may be counted as incorrect.
(5) The answers are rounded off. Choose the closest to exact. There is no penalty for guessing.
(6) **Hand in the answer sheet separately.**

There are 40 multiple choice questions. Clearly mark the one best answer for each question. If more than one answer is marked, no credit will be given for that question, even if one of the marked answers is correct. Guessing an answer is better than leaving it blank. All questions are worth 0.5 percentage points. Good Luck!

1. A Chinook wind is:

   (1) a warm, dry wind (2) an easterly wind (3) a cool, moist wind (4) an upslope wind (5) a haboob

2. A cloud droplet in a cloud at 10°C below freezing (−10°C), will most likely:

   (1) be supercooled
   (2) homogeneously freeze
   (3) contain numerous ice embryos
   (4) grow due to condensation of water vapor
   (5) freeze to form a snow pellet

3. Which of the following conditions would most likely lead to an *unstable* atmosphere?

   (1) daytime solar heating of the surface
   (2) a radiation inversion
   (3) a subsidence inversion
   (4) warm air moving in aloft
   (5) an influx of cold air near the surface

4. What is NOT true about the jet streams in the vicinity of the United States?

   (1) the polar jet is westerly, and the subtropical jet is easterly
   (2) the subtropical jet is higher in altitude than the polar jet
   (3) the position of the jets usually changes with the seasons
   (4) both jets are located in the tropopause gaps
   (5) wind speed in the jets is often over 100 knots

5. A monsoon wind system is:

   (1) one that changes direction seasonally
   (2) one associated with heavy rain almost all year
   (3) only found in India
   (4) the opposite of a sea breeze system
   (5) one associated with heavy rains in winter

6. In the Northern Hemisphere, how does the wind blow around a SURFACE high pressure area?

   (1) clockwise and outward
   (2) counter clockwise and outward
   (3) counter clockwise and inward
   (4) clockwise and inward
   (5) clockwise and parallel to the isobars

7. During La Niña conditions, winters in north Florida are:

   (1) warm and dry
   (2) cool and moist
   (3) very rainy
   (4) winters in Florida are not affected by La Nina
   (5) cloudy and breezy

8. In the Three-Cell Model of general circulation of the atmosphere, a surface low pressure area occurs:

   (1) near the equator
   (2) near 30° north or south latitude
   (3) near the poles
   (4) near large land masses in January
   (5) throughout the mid-latitudes

9. During El Nino conditions:

   (1) the trade winds can reverse direction in the Pacific
   (2) it is rainy in Indonesia
   (3) there is a surface high near Peru
   (4) the trade winds in the Pacific are strong
   (5) water is cool off the coast of Peru

10. In the stratosphere, the atmosphere is generally:

    (1) absolutely stable (2) absolutely unstable (3) neutrally stable (4) conditionally unstable (5) metastable

11. The reversal of the positions of surface high and low pressure at opposite ends of the Pacific Ocean is called:

    (1) the Southern Oscillation (2) the Ekman Spiral (3) upwelling (4) La Niña (5) El Niño

12. The wind's speed generally increases with height above the earth's surface because:

(1) friction with the earth's surface slows the air near the ground
(2) only the highest layer of air rotates with the earth
(3) air temperature normally decreases with height
(4) wind instruments are not accurate at the earth's surface
(5) air parcels expand and become less dense as they rise above the surface

13. Why are clouds generally confined to the troposphere?

(1) there is an inversion in the stratosphere
(2) gravity is too weak above the tropopause
(3) ozone in the stratosphere charges the cloud droplets
(4) mountains don't extend up into the stratosphere
(5) clouds are not usually confined to the troposphere

14. During the summer, ocean water is colder near the northern California coast than it is further north along the coast near Seattle mainly because of:

(1) upwelling (2) the California current (3) oceanic fronts (4) cold air moving over the water (5) evaporation

15. A small crystal of pure ice and a small droplet of pure water are both suspended in a cloud maintained at a temperature of $-10°$C. What is likely to happen?

(1) the ice will grow and the water droplet will shrink
(2) the water droplet will grow and the ice crystal will shrink
(3) neither the ice crystal nor the water droplet will change size
(4) the water droplet will freeze and the ice crystal will not change
(5) both the ice crystal and the water droplet will grow by accretion

16. In the Northern Hemisphere, ocean currents in the Atlantic and the Pacific move in a generally circular pattern. The direction of this motion is _____ in the Atlantic and _____ in the Pacific.

(1) clockwise, clockwise
(2) neither; the direction of the ocean currents depends on the season
(3) counterclockwise, counterclockwise
(4) counterclockwise, clockwise
(5) clockwise, counterclockwise

17. If in the Northern Hemisphere the clouds high above you are blowing from south to north, then it is a good bet that an upper-level trough of low pressure is to the _____ of you.

(1) west (2) south (3) east (4) north (5) right above

18. The world's deserts are found at about 30° latitude because:

(1) of the sinking air of the subtropical highs
(2) the intertropical convergence zone is located there
(3) of the sinking air of the polar front
(4) of the convergence of the prevailing westerlies and the Northeast Trades
(5) of the doldrums

19. The *net* force acting on air which is blowing parallel to straight contours at constant speed is:

(1) zero
(2) in the direction of wind motion
(3) to the right of the wind's motion in the Northern Hemisphere
(4) in a direction opposite the wind's motion
(5) in the direction of the pressure gradient

20. One day, the 500 mb surface above your city was at 5620 m. A week later, the 500 mb surface above the same city was at 5740 m. What most likely happened in your city during that week?

(1) the temperature increased
(2) a full moon occured
(3) a cold front passed through
(4) the atmosphere became more unstable
(5) the winds aloft became geostrophic

21. What supports the weight of the column of mercury in a mercury barometer (so that the mercury does not flow out of the column)?

(1) the pressure of the atmosphere
(2) capillary action
(3) the mercury in the dish below the column
(4) surface tension
(5) the gravitational force on the mercury

22. Upwelling off of the coast of Peru is caused by:

(1) a cold current flowing north on the western side of South America
(2) a warm current flowing south on the western side of South America
(3) a cold current flowing north on the eastern side of South America
(4) a cold current flowing south on the western side of South America
(5) a warm current flowing north on the western side of South America

23. On the west coast of Florida, a land breeze would be _____ .

(1) easterly (2) westerly (3) northerly (4) southerly (5) vertical

24. According to the 3-cell model of general circulation, rising air should occur at:

(1) the equator and 60° (2) the equator and 30° (3) 30°and 60° (4) the equator and the poles (5) 30°and the poles

25. *Cyclonic* wind refers to:

(1) CCW flow around a low
(2) CW flow around a high
(3) CCW flow around a high
(4) any wind over 40 knots
(5) any wind associated with a force 3 or greater storm

26. The lines of primary importance on a 500mb map are:

(1) height contours (2) isobars (3) isotherms (4) isotachs (5) isomers

27. The polar front refers to:

(1) convergence of surface air near 60°
(2) cold fronts that originate near the poles
(3) cold fronts that originate on ice fields near 80°
(4) convergence of air aloft near 30°
(5) convergence of air aloft near 60°

28. The main force responsible for surface ocean currents is:

(1) friction with the wind (2) the Ekman spiral (3) upwelling (4) the Coriolis force (5) the pressure gradient force

29. A strong La Nina condition is associated with _____ weather in winter the southeastern United States.

(1) warm and dry (2) cool and wet (3) stormy (4) bitter cold (5) normal

30. The Labrador current

(1) is a cold current that flows south
(2) is a warm current that flows south
(3) is a cold current that flows north
(4) is a warm current that flows north
(5) is a cold current that flows in a shape resembling a dog

31. For several days over a large area, the ground has grown cold through radiative cooling while warmer air has advected to the area aloft. What atmospheric conditions would be expected in this area?

(1) haze and pollution will collect in a layer near the surface
(2) air will readily mix in the unstable atmosphere
(3) air will readily mix in the stable atmosphere
(4) nimbostratus clouds will form bringing light rain and drizzle
(5) cumulonimbus clouds will form bringing thunderstorms

32. A pilot balloon is released from the ground and travels straight upward at a constant speed of 6 m/s. It disappears into the clouds after exactly 10 minutes. How high is the cloud base?

(1) 3600 m (2) 360 m (3) 600 m (4) 1000 m (5) 6000 m

33. One day, the 500 mb surface above your city was at 5740 m. A week later, the 500 mb surface above the same city was at 5620 mb. What most likely happened in your city during that week?

(1) a cold front passed through
(2) the temperature increased
(3) a full moon occurred
(4) the winds aloft became geostrophic
(5) orographic clouds formed

34. Which statement best describes why the dew point in an *unsaturated* parcel drops as the parcel rises in the atmosphere?

(1) the water vapor pressure drops because it is proportional to the atmospheric pressure
(2) the water vapor pressure drops because water vapor in the parcel condenses as it rises
(3) the dew point temperature always falls when the parcel temperature falls
(4) it doesn't—the dew point only falls in a saturated parcel
(5) the dew point temperature always falls when the parcel temperature rises

35. In a *thermal circulation*, the surface winds blow:

(1) from the cool region to the warm region
(2) from the warm region to the cool region
(3) from low to high pressure
(4) from the cloudy to the clear region
(5) from the water to the land

36. If the environmental lapse rate is 7°C/1000m:

(1) moist air is unstable and dry air is stable
(2) moist air is stable and dry air is unstable
(3) both moist and dry air are unstable
(4) both moist and dry air are stable
(5) can't be determined

37. What would you expect to fall first from a warm cumulus cloud?

(1) large raindrops (2) ice crystals (3) drizzle (4) virga (5) hail

38. Which cloud type would most likely form in absolutely stable air?

(1) stratus (2) cumulus congestus (3) cumulonimbus (4) cumulus (5) altocumulus

39. *Convective* clouds would be observed at the highest altitudes:

(1) where the relative humidity is low
(2) where the relative humidity is high
(3) in the tropics
(4) in the temperate zone
(5) in the polar region

40. Supercooled cloud droplets are:

(1) liquid droplets observed at temperatures below 0°C
(2) ice crystals at temperatures near −40°C
(3) water droplets that have had all of their latent heat removed
(4) liquid droplets that are colder than the air around them
(5) ice crystals surrounded by air warmer than 0°C