Instructor(s): *Prof. Whiting*

PHYSICS DEPARTMENT

MET 1010 3rd Midterm Exam April 18, 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. The higher the ratio of oxygen 18 to oxygen 16 in ancient glacier cores, the _____ the climate at that time.

   (1) warmer (2) colder (3) wetter (4) drier (5) more humid

2. An example of ensemble forecasting is:

   (1) running several forecast models, each beginning with slightly different weather information
   (2) asking several different meteorologists what the forecast will be
   (3) comparing present conditions with similar conditions in the past
   (4) predicting the same weather today as occurred yesterday
   (5) making a forecast based on the climate of several adjacent regions

3. A *major* hurricane is one that:

   (1) is category 3 or higher on the Saffir-Simpson scale
   (2) has winds greater than 74 miles per hour
   (3) gets a name
   (4) inflicts heavy damage on shore
   (5) has a strong storm surge

4. Severe thunderstorms are different from ordinary (or air-mass) thunderstorms in that severe thunderstorms:

   (1) have a tilted updraft
   (2) have a strong updraft and downdraft
   (3) contain hail
   (4) contain thunder and lightning
   (5) have an anvil

5. Which is NOT true of conditions in the *eye* of a hurricane?

   (1) the strongest thunderstorms occur
   (2) air is falling
   (3) pressure is lowest
   (4) skies are partly cloudy
   (5) air is warm

6. The piling up of air above a region is called:

   (1) convergence (2) divergence (3) cyclogenesis (4) cold advection (5) thickening

7. If a closed low (a low with at least one contour encircling it) occurs at the 500 mb level directly above a surface low:

   (1) the surface low will fill
   (2) the surface low will intensify
   (3) upper level divergence will occur
   (4) a shortwave has passed through the upper-level low
   (5) cold advection will add to the developing storm

8. If conditions are *Barotropic* on an upper-level chart:

   (1) isotherms parallel contours
   (2) cold advection occurs
   (3) winds are not geostrophic
   (4) rising and descending air motions exist
   (5) a lee side low has formed

9. What weather would be forecast based on the following observations? Surface winds from the SE, cool conditions, high clouds thickening and lowering.

   (1) steady, light rain beginning within 24 hours, turning warmer
   (2) showers likely to develop, turning colder
   (3) thunderstorms building in the next few hours, continued cool
   (4) clearing and continued cool
   (5) steady, light rain beginning within 24 hours, turning cold

10. The average temperature of the earth's surface 20,000 years ago was:

    (1) colder than present
    (2) warmer than present
    (3) about the same as present
    (4) much more variable from year to year than present
    (5) much less variable from year to year than present

11. An occluded front occurs when:

(1) a cold front overtakes a warm front
(2) a strong low pressure system fills
(3) a cold front becomes a stationary front
(4) a cold front weakens and dissipates
(5) a warm front becomes a stationary front

12. For a surface storm system to intensify, the upper-level low (or trough) should be located _____ the surface low.

(1) to the west of (2) directly above (3) to the north of (4) to the east of (5) to the south of

13. Which of the following is NOT proposed as a factor influencing climate change in the Milankovitch theory?

(1) periodic reversals of the earth's magnetic field
(2) changes in the shape of the earth's orbit
(3) eccentricity of the earth's orbit
(4) precession of the earth's axis
(5) changes in the tilt of the earth's axis

14. In the last 50 years, carbon dioxide (CO_2) levels in the atmosphere have risen by about:

(1) 20% (2) 2% (3) 100% (4) 200% (5) 0%

15. A *sounding* is:

(1) a vertical profile of weather elements
(2) measuring the gravitational constant using sound waves
(3) measuring cloud heights using sonar
(4) determining wind speed using Doppler radar
(5) measuring the distance to a lightning strike using the time lapse for thunder to occur

16. The downdraft in an ordinary thunderstorm is intensified by:

(1) evaporating raindrops that make the air cold and heavy
(2) electrical attraction between the cloud and ground
(3) the release of latent heat as water in the cloud freezes
(4) the melting of snow in the anvil
(5) upper level wind motions

17. The strongest winds in a hurricane are found:

(1) in the eye wall
(2) at the center of the storm
(3) in the rain bands
(4) at upper levels, above the center of the hurricane
(5) near the periphery of the hurricane

18. Atmospheric shortwaves usually move _____ than longwaves, and _____ when they move through a longwave trough.

(1) faster, strengthen (2) faster, weaken (3) slower, weaken (4) slower, strengthen (5) slower, they are not affected

19. Thunder is caused by:

(1) the rapid heating of air surrounding a lightning channel
(2) charged particles moving faster than the speed of sound
(3) the explosion that occurs when + and - charges collide
(4) turbulent wind motions inside the thunderstorm
(5) the ripping apart of air particles due to high electric fields

20. Studies reveal that during colder glacial periods, CO2 levels _____ during warmer interglacial periods.

(1) were lower than (2) were higher than (3) were about the same as (4) were more variable than (5) were less variable than

21. Which of the following is NOT true?

(1) oxygen 16 and oxygen 18 are found in roughly equal amounts in ocean water
(2) water made from oxygen 18 is heavier than water made from oxygen 16
(3) the nucleus of oxygen 18 contains two more neutrons than the nucleus of oxygen 16
(4) both oxygen 16 and oxygen 18 are found in the shells of marine organisms
(5) oxygen 16 evaporates more readily from the ocean than oxygen 18

22. By examining a surface map or upper level chart, the movement of a surface low pressure area is NOT generally predicted based upon the:

(1) dew point sounding just behind the front
(2) region of greatest pressure decrease
(3) movement of the surface low during the previous 6 hours
(4) orientation of the isobars in the warm sector
(5) wind direction at 500 mb

23. A building anticyclone means:

(1) the central pressure is increasing
(2) the anticyclone is moving toward the east coast
(3) separate anticyclones are merging
(4) the anticyclone is causing a middle latitude storm to form
(5) a region of upper-level divergence exists above the anticyclone

24. The main reason hurricanes don't develop over the eastern south Pacific Ocean adjacent to South America is because:

(1) the surface water temperatures are too cold there
(2) the pressure gradient force is too weak in that area
(3) they do form, but there is no nearby land that is impacted
(4) the air at the surface is always diverging
(5) the Coriolis force is too small there

25. If the earth were in a cooling trend, which process below would most likely act as a positive feedback mechanism?

(1) increasing the snow cover around the earth
(2) increasing the water vapor content of the air
(3) decreasing the amount of cloud cover around the globe
(4) increasing the carbon dioxide content of the air
(5) decreasing the snow cover around the earth

26. If global temperatures were to rise enough so that all of the glaciers on the earth melted, sea level would rise by approximately:

(1) 200 ft (2) 20 ft (3) 2 ft (4) 2000 ft (5) 1000 ft

27. The strongest winds in a hurricane heading westward toward Florida would most likely be found on the _____ side.

(1) northern (2) southern (3) eastern (4) western (5) southeastern

28. One would expect a cP air mass to be:

(1) cold, dry and stable (2) cold, moist and unstable (3) cold, dry and unstable (4) cold, moist and stable (5) warm, moist and unstable

29. A stationary front does not move because:

(1) the winds blow parallel to the front
(2) an occlusion blocks air flow behind the front
(3) the front is between high and low pressure
(4) the winds blow against each other and are of equal strength
(5) winds on both sides of the front are calm

30. Ordinary thunderstorms only last about one hour and begin to dissipate when:

(1) the downdraft spreads throughout the cloud and cuts off the updraft
(2) all the precipitation particles in the cloud turn to ice
(3) the thunderstorm cloud moves over a saturated ground surface
(4) solar heating at the ground begins to decrease
(5) lightning neutralizes all the electrical charge in the cloud

31. A Mesoscale Convective Complex is actually:

(1) individual thunderstorms that grow into a large, long-lasting weather system
(2) another name for a suction vortex
(3) a complex display of lightning from distant thunderstorms
(4) a family of tornadoes that do a great deal of damage
(5) a rapidly rotating tornado cyclone inside a massive thunderstorm

32. Which forecasting method assumes that weather systems will move in the same direction and at the same speed as they have been moving?

(1) steady state (trend) forecast
(2) probability forecast
(3) weather type forecast
(4) climatological forecast
(5) persistence forecast

33. In the cumulus phase of a thunderstorm:

(1) the updraft dominates
(2) the updraft and downdraft co-exist
(3) the downdraft dominates
(4) the thunderstorm breaks up into cumulus congestus clouds
(5) several cells merge to form a supercell

34. The greatest number of tornadoes occur each year in:

(1) Oklahoma (2) Illinois (3) Colorado (4) Florida (5) South Dakota

35. A single powerful volcano would be expected to cause _____ for about _____ years .

(1) global cooling, two
(2) localized cooling, ten
(3) global warming, ten
(4) localized warming, ten
(5) global cooling, twenty

36. Mammatus clouds typically occur:

(1) under the anvil (2) at the cloud base (3) where the updraft overshoots (4) on the shelf cloud (5) on the wall cloud

37. What weather system is associated with the following observations: Chilly SE winds with light rain and falling pressure, followed by much colder air, periods of heavy rain and NW winds?

(1) cold-occluded front (2) cold front (3) warm front (4) squall line (5) mesoscale convective complex

38. The Thermohaline circulation refers to:

(1) an ocean current driven by variations in water density
(2) a warm ocean current in the Atlantic
(3) the Hadley cell of global air circulation
(4) a warm ocean current produced by global warming
(5) a warm ocean current that flows around the Pacific High

39. Entrainment refers to:

(1) dryer air at the edge of a cloud being drawn into the cloud
(2) new thunderstorm cells being generated by the gust front of a mature storm
(3) the formation of a squall line
(4) the updraft riding over the downdraft at the gust front
(5) the updraft overshooting into the tropopause

40. The most damage from a hurricane typically is caused by:

(1) huge waves and flooding (2) high winds (3) hurricane spawned tornadoes (4) lightning (5) flying debris

41. Which of the following would NOT tend to lead to an intensifying mid-latitude cyclone?

(1) a strong low at 500 mb directly above a surface low
(2) isotherms crossing 500 mb contours
(3) a baroclinic condition
(4) a shortwave entering a longwave trough
(5) a strong polar jet stream

42. A *major* hurricane is:

(1) category 3, 4 or 5
(2) category 1 or 2
(3) one that does over 1 billion dollars worth of damage
(4) one that makes landfall in a populous area
(5) one over 500 km in diameter

43. A forecast of an extended period of dry weather would be made for a region beneath:

(1) an upper-level ridge
(2) a cold pool of air aloft
(3) an upper-level trough
(4) the polar jet stream
(5) a shortwave trough

44. A persistence forecast could be quite accurate when:

(1) you are positioned in the middle of a large, stationary air mass
(2) a frontal system approaches your location at constant speed
(3) the weather has been unusually cold for several days
(4) upper level winds are zonal
(5) upper level winds are meridional

45. Which below is the best indication that a hurricane will likely strike your area within 24 hours?

(1) a hurricane warning is issued by the National Weather Service
(2) a hurricane watch is issued by the National Weather Service
(3) high cirrus clouds moving in from the east
(4) easterly or northeasterly winds with speeds in excess of 30 knots
(5) a rapid drop in pressure and heavy rains

46. Thunderstorms that produce tornadoes:

(1) have rotating updrafts
(2) will not produce hail
(3) have updraft velocities that exceed 100 mph
(4) have very little cloud-to-ground lightning
(5) generally move toward the southwest

47. On what timescale should variations of the climate occur associated with the reversal of the Sun's magnetic field?

(1) 22 years (2) 23,000 years (3) 41,000 years (4) 100,000 years (5) millions of years

48. In the Northern Hemisphere, hurricanes and middle latitude cyclones are similar in that both:

(1) are favored for development when upper level winds are diverging
(2) have surface weather fronts
(3) intensify with increasing height above the ground
(4) will generally move from west to east
(5) require strong vertical wind shear

49. Everything else being equal, a gradual increase in global CO_2 would most likely bring about:

(1) an increase in surface air temperature
(2) a marked decrease in plant growth
(3) a decrease in evaporation from the earth's oceans
(4) no change in global climate
(5) a decrease in surface air temperature

50. Over the past 100 years or so, it appears that average global temperatures have:

(1) increased by less than 1°C
(2) increased by as much as 6°C
(3) fluctuated widely, but shown no overall change
(4) decreased slightly
(5) remained constant

51. Hurricanes do NOT form:

(1) along the equator
(2) along the ITCZ
(3) with an easterly wave
(4) when the trade wind inversion is weak
(5) when the surface water temperature exceeds 25°C

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FOLLOWING GROUPS OF QUESTIONS WILL BE SELECTED
AS ONE GROUP FROM EACH TYPE
TYPE 1
Q# S 1
Q# S 21
TYPE 2
Q# S 2
Q# S 44
TYPE 3
Q# S 3
Q# S 42
TYPE 4
Q# S 5
Q# S 17
TYPE 5
Q# S 7
Q# S 12
TYPE 6
Q# S 9
Q# S 43
TYPE 7
Q# S 13
Q# S 47
TYPE 8
Q# S 14
Q# S 20
Q# S 49
TYPE 9
Q# S 16
Q# S 33
TYPE 10
Q# S 30
Q# S 39