Test Form: A Key **Final Exam: Spring 2011**

Instructions:

- Write your name (last name and first name) on your bubble sheet.
- Write your student identification number on the bubble sheet, and ***carefully and completely*** **fill in the bubbles corresponding to your student id number** (starting from the left box and leaving the last box blank)
- **Fill in the bubble that corresponds to the Test Form letter listed at the top of this page.**
- When answering the questions, select the one letter that **BEST** completes the statement or answers the question and mark this letter on your bubble sheet.
- Each question is worth equal points (2 pts each for 100 total pts).

Remember to read each question and all of the answers carefully before answering the question.

Good Luck!!!

1. True or false: Mean annual snowfall in the western United States always increases from south to north.
a) true
b) false

2. Due to the differences in the elevation of the Coast Range and the Sierra Nevada you would expect _____ of the precipitation to fall as snow in the Sierra Nevada compared to the Coast Range.
a) a larger fraction
b) about the same fraction
c) a smaller fraction

3. An upslope storm refers to a winter storm along the eastern slope of the Rocky Mountains when the winds are from the _____.
a) north
b) south
c) east
d) west

4. The National Weather Service in Boulder, CO is forecasting a winter storm for the Front Range of Colorado with southeasterly surface winds. You would expect the heaviest precipitation to fall in _____.
a) Fort Collins
b) Boulder
c) southwestern Denver
d) Grand Junction

5. A typical value for snow water equivalent would be _____ inches of snow per one inch of water.
a) 4
b) 12
c) 25
d) 75

6. For west winds across the Rocky Mountains, Boulder would be located on the _____ side of the mountains and you would expect _____ skies in Boulder.
a) windward, mostly sunny
b) leeward, mostly sunny
c) windward, mostly cloudy
d) leeward, mostly cloudy

7. For west winds across the Rocky Mountains you would expect lee waves to form on the _____ side of the Rocky Mountains.
a) north
b) south
c) east
d) west

8. A hydraulic jump may form downstream of a mountain range if _____.
a) an inversion is present just above the top of the mountain
b) an inversion is present below the top of the mountain
c) winds are strong upstream of the mountain
d) both a) and c)
e) both b) and c)

9. As air descends dry adiabatically from 3,000 m near the crest of the Rocky Mountains to 1,500 m near Boulder, CO you would expect the air to warm approximately _____ degrees C.
a) 1.5
b) 10
c) 15
d) 20

10. Which of the following is a cold downslope wind?
a) Chinook
b) Bora
c) Foehn
d) both a) and c)
e) none of the above

11. A lee trough is an area of _____ pressure on the lee side of the mountains that is a condition that promotes _____ winds.
a) high, Chinook
b) high, Santa Ana
c) low, Chinook
d) low, Santa Ana

12. Santa Ana winds are _____ in direction and typically occur _____.
a) westerly, April to September
b) westerly, September to April
c) easterly, April to September
d) easterly, September to April

13. True or false: A thunderstorm that produces a wind gust of 80 knots would be classified as a severe thunderstorm by the National Weather Service.
a) true
b) false

14. Which of the following is required in order for a severe thunderstorm to form, but is not required for a non-severe thunderstorm to form?
a) A source of moisture
b) Vertical wind shear
c) A mechanism to trigger the thunderstorm updraft
d) A conditionally unstable atmosphere

15. The dissipation stage of an airmass thunderstorm is characterized by _____.
a) a warm, buoyant plume of rising air
b) precipitation beginning to fall from the thunderstorm
c) a downdraft that dominates the storm
d) none of the above

16. A downdraft forms in a thunderstorm due to _____.
a) the drag from falling precipitation
b) the presence of warm, moist air
c) evaporative cooling as precipitation and cloud particles evaporate
d) both a) and b)
e) both a) and c)

17. What important feature of a Mesoscale Convective System (MCS) provides the storm lifting mechanism and tilts the updraft leading to the formation of the trailing stratiform region?
a) bow echo
b) squall line
c) cold pool
d) bright band

18. Which of the following answers lists the storm types in order of shortest to longest-lived?
a) mesoscale convective system, frontal squall line, air mass thunderstorm
b) air mass thunderstorm, frontal squall line, mesoscale convective system
c) frontal squall line, mesoscale convective system, air mass thunderstorm
d) air mass thunderstorm, mesoscale convective system, frontal squall line

19. An area of less intense precipitation on the rear side of a squall line is known as _____.
a) an airmass thunderstorm
b) a gust front
c) a bow echo
d) a trailing stratiform region

20. A supercell is _____.
a) an individual non-rotating thunderstorm cell
b) a long line of thunderstorms in which heavy precipitation falls in a long continuous line
c) a cluster of thunderstorms that forms in a sheared environment
d) a rotating thunderstorm

21. A frontal squall line often forms the _____ of a mid-latitude cyclone comma cloud as viewed from a satellite.
a) head
b) tail
c) both a) and b)
d) none of the above

22. Where does precipitation fall in a supercell?
a) Below the base of the updraft
b) Below the forward flank downdraft
c) Below the rear flank downdraft
d) Both b) and c)
e) All of the above

23. A shelf cloud forms _____ of a thunderstorm.
a) along the rear flanking line
b) under the anvil
c) along the gust front
d) due to the overshooting top

24. The sounding at Topeka, Kansas indicates the CAPE is 1500 J/kg, while at Dallas, Texas the CAPE is observed to be 2500 J/kg. Which location, if any, is likely to get the strongest, most severe thunderstorms?
a) Topeka would have the strongest storms
b) Dallas would have the strongest storms
c) Both will have thunderstorms of equal intensity
d) Neither would have thunderstorms

25. A strong updraft in a supercell thunderstorm can be as strong as _____.
a) 1 mph
b) 10 mph
c) 100 mph
d) 1000 mph

26. A mesocyclone is _____.
a) a horizontally rotating column of air parallel to the ground
b) the rotating circulation in a supercell that is associated with the updraft
c) associated with an area of lower pressure
d) both a) and c)
e) both b) and c)

27. True or false: Tornadoes only occur in the United States.
a) true
b) false

28. Rotation in a supercell occurs when _____.
a) the shear associated with the low-level jet creates rotation about a vertical axis
b) the rear flank downdraft forms
c) the forward flank downdraft forms
d) the rotation created by the shear associated with the low-level jet is tilted into the vertical direction by the updraft

29. Vortex stretching _____ the rotation in a supercell.
a) weakens
b) does not change
c) strengthens

30. Vortex breakdown is a process thought to contribute to _____.
a) mesocyclone formation
b) tornadogenesis
c) tornado dissipation
d) none of the above

31. Landspout tornadoes form in _____ thunderstorms as a result of _____.
a) supercell, the dynamic pipe effect
b) non-supercell, the dynamic pipe effect
c) supercell, stretching of small vortices that form due to shear across a front
d) non-supercell, stretching of small vortices that form due to shear across a front

32. The enhanced Fujita scale of tornado intensity is based upon a tornado's _____.
a) maximum wind speed
b) average wind speed
c) damage
d) size

33. On a Doppler radar radial velocity image a small area where radial winds rapidly switch from outbound to inbound is called a _____.
a) hook echo
b) mesocyclone signature
c) tornado vortex signature
d) radar fine line

34. The Storm Prediction Center would issue a _____ when conditions are favorable for the development of thunderstorms that contain strong winds, hail, frequent lightning, heavy rain, and possible tornadoes.
a) severe thunderstorm watch
b) tornado watch
c) severe thunderstorm warning
d) tornado warning

35. True or false: Most lightning occurs over the world's oceans than over land.
a) True
b) False

36. The lower part of a thunderstorm would have a _____ charge due to the presence of _____.
a) positive, hail
b) positive, ice crystals
c) negative, hail
d) negative, ice crystals

37. The fair weather electric field is typically _____ V/m, while the electric field needed for a lightning discharge is _____ V/m.
a) 3,000; 100
b) 100; 3,000
c) 3,000,000; 1000
d) 100; 3,000,000

38. Interface (non-inductive) and induction charging mechanisms both depend on charge being transferred when _____.
a) Rimed particles collide with ice crystals
b) Charges align in rimed particles due to an ambient electric field
c) Charges align in ice crystals due to an ambient electric field
d) Charges are distributed in rimed particles differently than in ice crystals
e) None of the above

39. The first stage in a cloud-to-ground stroke is called a _____.
a) dart leader
b) stepped leader
c) return stroke
d) thunder

40. The shock wave created by the _____ of the rapidly heated air from a lightning strike will arrive at a location 1 mile away in _____.
a) explosive expansion, 1 second
b) violent contraction, 1 second
c) explosive expansion, 5 seconds
d) violent contraction, 5 seconds

41. The electrical phenomenon where a discharge extends from the top of thunderstorms up to the mesosphere is called _____.
a) heat lightning
b) sheet lightning
c) St. Elmo's fire
d) a sprite

42. A cluster of thunderstorms in the tropics with an identifiable surface pressure drop and wind speed of 30 knots would be classified as a _____.
a) tropical disturbance
b) tropical depression
c) tropical storm
d) hurricane

43. Average sea level pressure has a value of _____.
a) 913 mb
b) 980 mb
c) 1013 mb
d) 1050 mb

44. The largest horizontal pressure gradient in a hurricane is found _____.
a) on the edge of the hurricane
b) in the spiral rainbands
c) in the eyewall
d) in the eye

45. True or false: You would expect the wind speed to be the same on the right and left side eyewall of a hurricane.
a) true
b) false

46. _____ is a ripple in the low-level atmospheric flow in the tropics that causes convergence.
a) The ITCZ
b) The subtropical jetstream
c) An easterly wave
d) A mid-latitude front

47. The magnitude of the Coriolis force is zero at the _____ and increases as you move towards the _____.
a) equator, poles
b) poles, equator
c) South Pole, North Pole
d) North Pole, South Pole

48. A tropical cyclone will weaken when it encounters _____.
a) SST < 27 deg C
b) increased vertical wind shear
c) movement over land
d) all of the above
e) both a) and c)

49. A Saffir-Simpson rating of _____ is given to the weakest hurricanes and a rating of _____ is given to the strongest hurricanes.
a) 0, 5
b) 1, 5
c) 5, 0
d) 5, 1

50. True or false: Flooding typically causes more damage than winds in tropical cyclones.
a) true
b) false

DID YOU FILL IN THE BUBBLES CORRESPONDING TO YOUR STUDENT ID NUMBER, STARTING FROM THE LEFT BOX AND LEAVING THE LAST BOX BLANK, ON YOUR BUBBLE SHEET? **MAKE SURE YOU ENTERED YOUR STUDENT NUMBER CORRECTLY!!**

DID YOU FILL IN THE BUBBLE THAT CORRESPONDS TO THE TEST FORM LETTER ON THE FIRST PAGE OF THIS EXAM? **IF NOT YOUR EXAM WILL NOT BE GRADED AND YOU WILL RECEIVE A GRADE OF ZERO**