EXAM NUMBER _____

NATS 101, Section 4, Spring 2009 Midterm Examination #3 April 22, 2009

Name:	SID: S

Instructions:

- Write your name and student ID on ALL pages of the exam.
- In the multiple-choice/fill in the blank section, please write-in only ONE answer (unless directions state otherwise). Tear off the multiple exam answer sheet at the end of the exam packet and write your answers on this sheet. Turn this sheet in separately when you hand in your exam.
- In the short answer section, please make sure to read each question carefully and show your work where it is required. Should you need more room to answer your questions, you can use the other side, and indicate it with the answer.
- You **CANNOT** use a calculator for the short calculation questions.
- You are **NOT** allowed to use your book or notes on this exam.
- You are **NOT** allowed to talk about or look at anyone else's exam. If you commit such an offense, you will be awarded a **0** and the offense will be noted in accordance to **The Code of Academic Integrity**.
- Good luck!

Score:

Multiple Choice Section:	/	30 points
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Short Answer Section: ____/ 15 points

Bonus Questions: ____/ 6 points

Total: ____/ 45 points

Midterm Examination #3 NATS 101, Section 4, Spring 2009 Introduction to Weather and Climate Multiple Choice, One Word Answer Section

Scoring: Each question is worth 1 point in this section. Some questions may require multiple answer choices to receive full credit. These questions are explicitly indicated with text in bold italics following the question.

- 1. If you attempt to cross a flooded wash or arroyo in your car during the monsoon in Arizona, you are violating the ______ law and you will be charged for the cost of your rescue. *Write the name of the law in your answer key.*
- 2. A front is the transition zone between two different
 - a) Air pressures
 - b) Air masses
 - c) Air densities
 - d) Areas of precipitation
 - e) None of the above
- 3. What type of air mass would be responsible for hot, muggy weather in the Midwest and East Coast of the United States?
 - a) mP
 - b) cP
 - c) cT
 - d) mT
 - e) None of the above
- 4. What weather conditions would not be conducive to forming high concentrations of smog over the Phoenix metropolitan area?
 - a) Monsoon thunderstorms
 - b) A strong subsidence inversion
 - c) Light surface winds.
 - d) Sunny skies
 - e) All of the above are conducive to high concentrations of smog over Phoenix
- 5. Arizona is a source region for which type of air mass?
 - a) mP
 - b) cP
 - c) cT
 - d) mT
 - e) None of the above
- 6. What primary pollutant(s) are necessary for the formation of Los Angeles type smog, or photochemical smog? *Multiple answer choices possible. List the letters for ALL correct answers on your key or you will not receive credit.*
 - a) Chloroflourocarbons (CFCs)
 - b) Nitrogen oxides (NO_x)
 - c) Particulate matter (PM)
 - d) Volatile organic compounds (VOCs)
 - e) Sulfur dioxide (SO₂)

- 7. Which primary air pollutant(s) are necessary for the formation of London-type smog? *Multiple answer choices possible. List the letters for ALL correct answers on your key or you will not receive credit.*
 - a) Chloroflourocarbons (CFCs)
 - b) Nitrogen oxides (NO_x)
 - c) Particulate matter (PM)
 - d) Volatile organic compounds (VOCs)
 - e) Sulfur dioxide (SO₂)

Use the weather map below to answer questions 8-15.



- 8. At this time, the mid-latitude cyclone is in what development stage?
 - a) Open wave
 - b) Stationary front
 - c) Occluded
 - d) Dissipating
- 9. A warm front exists between which two points?
 - a) A and B
 - b) B and C
 - c) B and E
 - d) B and D
 - e) None of the above
- 10. The surface wind at Point C is likely coming from what direction?
 - a) North
 - b) South
 - c) East
 - d) West

- 11. The temperatures at Point F are most likely _____ and amount of clouds coverage is _____ with time. a) Warming; decreasing
 - b) Cooling; decreasing
 - c) Warming; increasing
 - d) Warming; decreasing
 - e) Remaining constant; not substantially changing
- 12. At Point F, skies are likely to be _____ with _____ clouds.
 - a) Clear; virtually no
 - b) Overcast; cumulonimbus
 - c) Overcast; stratus
 - d) Overcast; nimbostratus

13. Thunderstorms are most likely to be occurring _____

- a) From A to B
- b) From B to D
- c) From B to E
- d) Along any of the weather fronts listed above

14. The winds at Point F are most likely from what direction?

- a) Northwest
- b) Northeast
- c) Southeast
- d) Southwest

15. Given that the surface low is located at Point A, the upper-level low located at 500-mb is most likely _____.

- a) To the west of Point A
- b) To the east of Point A
- c) To the north of Point A
- d) To the south of Point A
- e) Directly above Point A

16. How are thunderstorm clouds with lightning different from thunderstorm clouds with no lightning?

- a) They have stronger updrafts.
- b) They occur in an environment with wind shear.
- c) They occur in an environment with more atmospheric instability.
- d) They have ice phase processes.
- e) They have downdrafts with gust fronts.
- f) All of the above.
- 17. Over what regions on Earth are ozone holes located?
 - a) All the continents
 - b) All the oceans
 - c) The tropics
 - d) The mid-latitudes
 - e) The poles
 - f) All of the above
- 18. If a hurricane is moving northward, you will typically find the strongest winds on which side of the storm?
 - a) Northeast
 - b) Northwest
 - c) Southeast
 - d) Southwest
 - e) The winds would be constant all around.

19. In the eye of a hurricane, the air is _____

- a) Rising and warming.
- b) Rising and cooling.
- c) Sinking and warming.
- d) Rising and cooling.
- e) Neither rising or sinking.
- 20. If you are driving in your vehicle on the freeway and a tornado is approaching, what is the best course of action to protect your life?
 - a) Try to outrun the storm in your vehicle.
 - b) Get out of your vehicle and seek shelter under an overpass.
 - c) Get out of your vehicle and seek shelter in a low-lying ditch or ravine.
 - d) Stop where you are and remain in your vehicle.
 - e) You would be equally likely to live or die no matter which of the above actions would be taken.
- 21. The low temperature last night was 35°F, today's low temperature was 36°F, and the forecast low tonight is 37°F. This type of forecast is called.
 - a) The trend method
 - b) The persistence method
 - c) The analog method
 - d) An extended forecast
 - e) None of the above
- 22. The chaotic behavior of the atmosphere has what implication(s) for numerical weather prediction?
 - a) It is impossible to develop a set of conservation relations for the atmosphere that can be represented in a numerical model.
 - b) Numerous important physical processes in the atmosphere must be parameterized.
 - c) Small errors in the specification of the initial conditions lead to larger errors in the numerical weather forecast as time proceeds.
 - d) All of the above.
 - e) None of the above.
- 23. What is the most severe type of thunderstorm?
 - a) Multicell
 - b) Squall line
 - c) Mesoscale convective complex
 - d) Supercell
 - e) All of the above are equally severe
- 24. What time of year do tornadoes most frequently occur in the central U.S.?
 - a) Winter
 - b) Spring
 - c) Summer
 - d) Fall.
 - e) The frequency of tornado occurrence is the same in all seasons.

- 25. In a developing mid-latitude cyclone, the air is ______ above the surface low because the upper-level
 - trough is located ______ of the surface low.
 - a) Diverging; to the east
 - b) Diverging; to the west
 - c) Diverging; directly above
 - d) Converging; to the east e) Converging; to the west
 - f) Converging; directly above

26. Which of the following is the most destructive type of storm?

- a) Typhoon
- b) Hurricane
- c) Cyclone
- d) All of the above can be equally destructive
- 27. Acid rain is approximately ______ times more acidic than normal rain. An exact number or reasonable range of numbers is fine to answer this question.
- 28. What is (or are) the environmental consequence(s) of the destruction of the ozone layer in the stratosphere? Multiple answer choices possible. List the letters for ALL correct answers on your answer key.
 - a) Global warming
 - b) An increase in the amount of ultraviolent radiation
 - c) Photochemical smog
 - d) Acid rain
 - e) None of the above
- 29. An ordinary air mass thunderstorm begins to dissipate when _____
 - a) Only an updraft exists within the cumulonimbus cloud.
 - b) Precipitation and gust fronts develop.
 - c) Only a downdraft exists within a cumulonimbus cloud.
 - d) The cloud is below freezing throughout.
 - e) None of the above.

30. A strong downdraft in a thunderstorm is called a _____.

- a) Derecho
- b) Microbust
- c) Squall line
- d) Mesocyclone
- e) None of the above

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Midterm Examination #2 NATS 101, Section 4, Spring 2009 Introduction to Weather and Climate Short Answer Section

Scoring: Each question is worth points as indicated.

31. List and describe the causes of damage when a hurricane makes landfall along a coastline. Which of these is the most dangerous and why? (**4 points**)

32. Sketch a side view, vertical cross section of a typical cold front. Include in the diagram the location of any clouds, types of clouds, areas of precipitation, direction of surface winds, and the relative temperature on each side of the front. (6 points)

33. What pre-existing environmental conditions are necessary for a strong tornado (F3 or higher) to form (i.e. a 'loaded gun' sounding)? Where in the United States are such conditions most likely to occur and why? (**5 points**)

<u>BONUS QUESTION</u>: Using a series of several sketches, describe the sequence of events associated with the development of a negative cloud-to-ground lightning stoke. In class, this was shown in slow motion for actual lightning bolt using a high speed camera. (5 Points Extra Credit)

<u>BONUS QUESTION #2</u>: What is the name of woman whose recent performance of *I Dreamed a Dream* from *Les Misérables* on the TV show *Britain's Got Talent* received over 30 million hits the past two weeks on *You Tube* and catapulted her to worldwide fame? (**1 Point Extra Credit**)

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MIDTERM EXAM #3 ANSWER SHEET Mark answers <u>TO RIGHT</u> of question number.

Question	Answer	Question	Answer
1		19	
2		20	
3		21	
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