EXAM NUMBER _____

NATS 101, Section 13, Fall 2010
Midterm Examination #3
November 19, 2010

Name: KEY **SID:** _____

Instructions:

- **Write your name and student ID on ALL pages of the exam.**
- In the multiple-choice/fill in the blank section, please fill-in only **ONE** answer. **Use the multiple choice scantron answer sheet. Turn this sheet in separately when you hand in your exam. You should also record multiple choice answers next to the question, as scantron sheets will not be returned.**
- 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.
- 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:	25 / 25 points
Short Answer Section:	15 / 15 points
Bonus Questions:	6 / 6 points
Total:	46 / 40 points

VERSION A

Midterm Examination #3
NATS 101, Section 13, Fall 2010
Introduction to Weather and Climate
Multiple Choice Section

Scoring: Each question is worth 1 point in this section.

1. What area of the world experiences a clash of air masses that is conducive to tornadic thunderstorms, very similar to the central United States?
   a) Central America
   b) North Africa
   c) Eastern India
   d) Western Europe
   e) Antarctica

2. Vertically, what is the most ideal alignment of airmasses for tornadic formation, **from highest altitudes to lowest**?
   a) mT, cT, cP
   b) cP, cT, mT
   c) cP, mT, cT
   d) cT, cP, mT
   e) mT, cP, cT

3. If you are outside in the middle of an open field and a thunderstorm with lots of lightning is approaching, what is the safest course of action?
   a) Get in a parked car
   b) Seek shelter under a tree
   c) Try to lay low somewhere in the open field
   d) Jump in a nearby pond and submerge most of your body.
   e) None of the above. You would be equally likely to live or die no matter which of these you would do.

4. During a strong blizzard associated with a mid-latitude cyclone in the central or eastern United States, the surface wind direction is usually from the
   a) northwest
   b) northeast
   c) southeast
   d) southwest
   e) Any of the above

5. The surface temperature is 45°F with a dew point temperature of 44°F. There is light to moderate rain. Winds are from the southeast at 15 knots. Where is the most likely location where such an observation would be recorded?
   a) At or ahead of a warm front
   b) Behind a warm front
   c) At or ahead of a cold front
   d) Behind a cold front
   e) Any of the above

6. Approximately what time of day does Tucson typically experience thunderstorms during the monsoon?
   a) 6 am to 11 am
   b) 11 am to 3 pm
   c) 3 pm to 7 pm
   d) 7 pm to 12 am
   e) 12 am to 6 am

VERSION A

7. The surface temperature is 40° F with a dew point temperature of 20 °F. It is mostly clear. Winds are from the northwest at 30 knots gusting to 40 knots. Where is the most likely location where such an observation would be recorded?
   a) At or ahead of a warm front
   b) Behind a warm front
   c) At or ahead of a cold front
   d) Behind a cold front
   e) Any of the above

8. The atmosphere is made more conducive to thunderstorm development by _____ near the surface.
   a) Cooling and moistening
   b) Cooling and drying
   c) Warming and moistening
   d) Warming and drying
   e) Any of the above

9. The surface temperature is 70° F with a dew point temperature of 65° F. Winds are from the south at 30 knots with a squall line to the west. Where is the most likely location where such an observation would be recorded?
   a) At or ahead of a warm front
   b) Behind a warm front
   c) At or ahead of a cold front
   d) Behind a cold front
   e) Any of the above

10. Mid-latitude cyclones forming in the lee of the Rocky Mountains tend to track toward the _____ once they develop.
   a) Northeast
   b) Northwest
   c) Southeast
   d) Southwest
   e) Any of the above.

11. What is the necessary factor for a thunderstorm cloud to become electrified and produce lightning?
   a) Latent heat release
   b) Strong updrafts
   c) Wind shear
   d) Ice particles
   e) All of the above

12. What type of air mass forms over the Gulf of Mexico?
   a) mT
   b) cT
   c) mP
   d) cP
   e) None of the above

13. Derechos, or straight line winds, are associated with what type of thunderstorm?
   a) Air mass thunderstorm
   b) Squall line
   c) Mesoscale convective system
   d) Supercell
   e) All of the above

VERSION A

14. Why do mid-latitude cyclones tend to "die out" after they become occluded?
    a) The storm is deprived of a source of warm and moist air
    b) Upper-level divergence ceases
    c) There is no upward motion above the surface low
    d) All of the above
    e) None of the above

15. Nimbostratus clouds are typically found _____
    a) At or ahead of a warm front
    b) Behind a warm front
    c) At or ahead of a cold front
    d) Behind a cold front
    e) Any of the above

16. With respect to the position of surface low of an intense, mature mid-latitude cyclone in the central United States, where would be the most likely location of a severe blizzard?
    a) To the southwest
    b) To the southeast
    c) To the northwest
    d) To the northeast
    e) A blizzard is equally likely to occur in all these locations

17. If you are driving along an interstate and see a large tornado approaching, what is the safest course of action?
    a) Pull over, get of the car and seek shelter in a ravine
    b) Pull over, get out of the car and seek shelter under an underpass
    c) Pull over to the shoulder and stay in your car
    d) Hit the gas and try to outrun the tornado
    e) None of the above. You would be equally likely to live or die no matter which of these you would do.

18. A tropical cyclone occurring in the western part of the North Pacific Ocean is called a _____ .
    a) Hurricane
    b) Typhoon
    c) Cyclone
    d) Any of the above
    e) None of the above

19. What is the most dangerous aspect of a landfalling hurricane?
    a) High winds
    b) Heavy rain
    c) Storm surge
    d) Tornadoes
    e) These are all equally dangerous

20. Tornadoes are associated with what type of thunderstorm?
    a) Air mass thunderstorm
    b) Squall line
    c) Mesoscale convective system
    d) Supercell
    e) All of the above

VERSION A

21. For a northward traveling hurricane in the North Atlantic, the strongest winds and storm surge would occur on which side of the storm with respect to the eye?
a) Northeast.
b) Northwest.
c) Southeast.
d) Southwest.

22. Which of the following factors is **not** favorable for hurricane development?
a) Moist air
b) Warm sea surface temperatures
c) High winds aloft
d) Conditional instability
e) All of the above are favorable for hurricane development.

23. A major hurricane is classified as being which category and above on the Saffir-Simpson scale?
a) One
b) Two
c) Three
d) Four
e) Five

24. Why is it impossible to forecast weather beyond about two weeks with a numerical weather prediction model?
a) There is a lack of meteorological data over oceans
b) Computers cannot generate a two-week forecast fast enough
c) The numerical model approximates physical processes in the atmosphere with parameterizations
d) Small errors in the initial conditions cause large changes in the forecast over time
e) All of the above

25. In a strengthening mid-latitude cyclone, the surface low is located _____of the upper-level low.
a) To the west
b) Directly above
c) To the east
d) Any of the above

VERSION A

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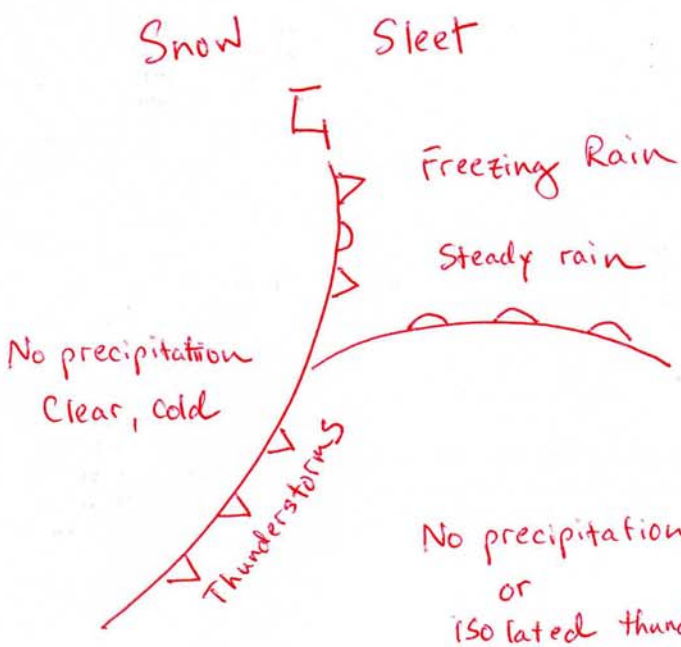
Midterm Examination #3
NATS 101, Section 13, Fall 2010
Introduction to Weather and Climate
Short Answer Section

Scoring: Each question is worth points as indicated.

26. Describe and sketch how an intense, mature mid-latitude cyclone would appear on a surface weather map with accompanying weather fronts and surface low. On your sketch, indicate the areas where precipitation is and is not occurring. Label the various precipitation types in relation to the position of the fronts and the surface low. **(5 points)**



Scoring

3 points: low position and fronts

2 points: Precip. types and location

VERSION A

27. What atmospheric conditions are necessary for the development of an ordinary air mass thunderstorm? Describe and sketch the life cycle of an ordinary air mass thunderstorm. How long does this process take? **(5 points)**

Scoring

Required conditions:
1) Conditionally unstable atmosphere
2) Triggering mechanism for updraft.

1-2 points

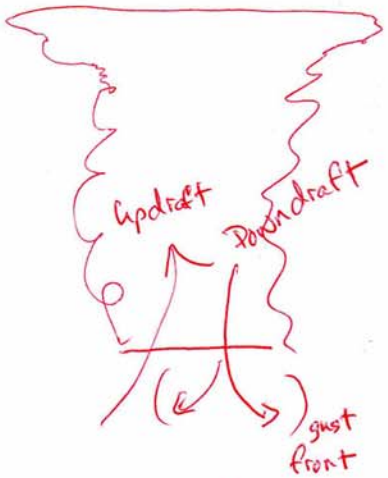
Life cycle: About a hour or less.

3points

Updraft stage

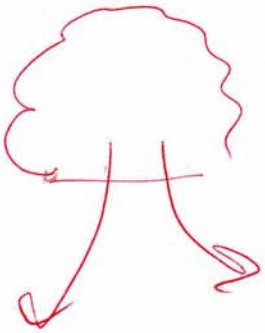
Updraft rises to lifting condensation level

Mature stage



As precipitating particles grow they fall to ground and entrain air, creating a gust front

Dissipating stage



Storm begins to dissipate when downdraft chokes updraft.

VERSION A

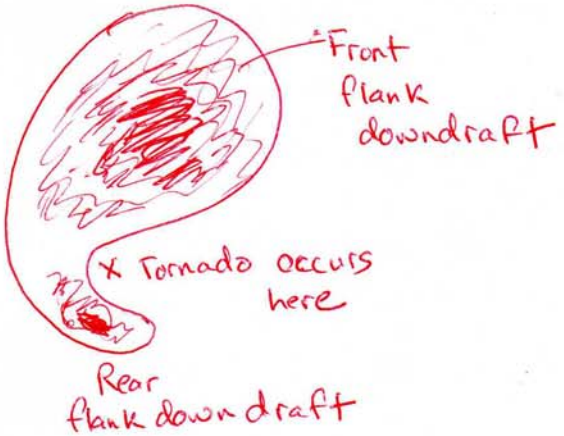
28. What would an operational meteorologist look for in real-time radar reflectivity and wind velocity products to determine whether a severe weather warning is warranted for a supercell thunderstorm? What kind of severe weather warning would you expect with this type of storm? Sketches are strongly encouraged in your answer. **(5 points)**

Scoring

Radar reflectivity

Would look for compact, isolated storm cells with high precipitation, as indicated by red and yellow colors on radar image. A severe supercell has a characteristic hook echo shape.

3 points radar image, 1 pt tornado warning.



1pt

Wind velocity: A tornadic supercell would be indicated by winds moving to and away from radar beam, indicating a tight rotation

VERSION A

BONUS QUESTION: "Why should I even believe that scientists can tell me how much it's going to rain this winter or many years from now when the guy on TV gets tomorrow's forecast wrong more than half the time?" Do you agree or disagree this statement? Substantiate your opinion with at least two supporting facts. **(4 Points Extra Credit)**

See various arguments on homework assignment key.

2-3 points per argument

Needed to discuss both weather and climate forecasting in answer.

BONUS QUESTION #2: On what television program did the *Dopplest 9000* weather forecasting system make its first debut? **(1 Point Extra Credit)**

Colbert Report

BONUS QUESTION #3: What hurricane struck Pass Christian, Mississippi, in August 1969, leveling the Richelieu Apartments where a "hurricane party" was allegedly being held? **(1 Point Extra Credit)**

Camille

VERSION A