Regional Science Olympiad

Meteorology 2005

1) Which of these factors help a tropical wave develop into a hurricane? Write "yes" or "no" next to each factor.

_____ sea-surface temperatures above 80°F
_____ intense wind shear
_____ small (but present) Coriolis force
_____ moving over a land surface

2) A FLASH FLOOD WARNING is issued for your area. Your bus route goes under a bridge that is notorious for flooding. Sure enough, when you get to the bridge, some standing water is underneath it. You have no idea how deep it is. What should you tell your bus driver to do?

a. "Get out and see how deep the water is. If it's shallow, we can cross."
b. "We better just cross now, before it gets any deeper. If we wait, we will never get home."
c. "Let's go home a different way."
d. "Buses are way too big to get stuck in standing water. There's nothing to worry about."

3) At home, you tune into your local news channel. The weatherman tells you that the following places have warnings in effect:

International Falls, MN, has a BLIZZARD WARNING.
Oklahoma City, OK, has a SEVERE THUNDERSTORM WARNING.
Miami, FL, has a TROPICAL STORM WARNING.

Below is a list of weather events that are currently happening. In the space to the left of each statement, match the event with the correct state based only on what you know from the warnings listed above. Write "MN" if the event is occurring in Minnesota, "OK" for Oklahoma, "FL" for Florida, or NONE if it applies to none of the states above. Choose the best answer.

_____ Winds are 58 mph or higher OR there is hail ¾ of an inch in diameter (or larger)
_____ 3 inches of rain are expected in the next 6 hours.
_____ Snow and/or blowing snow is reducing visibility to ¼ mile or less for 3 hours or longer.
_____ Winds between 39 mph and 73 mph are occurring now.
_____ Severe thunderstorms are occurring now or will be in the next few minutes.
_____ Temperatures are well below freezing at the surface.
_____ Frequent gusts of wind to 35 mph or greater, or sustained winds of 35 mph or greater, are expected to occur within the next few hours.
_____ A tornado has been spotted in the city.

4) The National Weather Service (NWS) is calling for an ice storm for Chicago. Your friend, Jessica, who lives in Chicago, calls you on the phone asking what the NWS means by "ice storm". You tell her an ice storm is…

a) any accumulation of ice from freezing rain or drizzle that makes roads slippery.
b) any accumulation of more than 1/4" of ice from freezing rain or drizzle.
c) a hazardous situation where rain, sleet, and freezing rain are expected to be mixed together.
d) a situation in which rain falls, creating wet surfaces and puddles which are expected to freeze later.

5) Match the following weather symbols to their definitions:

 _____

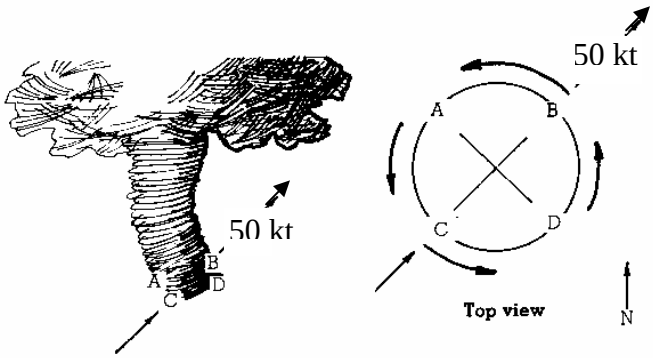
 _____

 _____

 _____

A) Strong thunderstorm in area
B) Blowing snow; blizzard
C) Tornado or funnel cloud
D) Hail or ice pellet shower

6) If faced with the following tornado, where will the strongest winds be?



Select one: A B C D

7) If a tornado travels for 500 meters through only a cornfield, what is the maximum rating it could be assigned on the Fujita Scale?

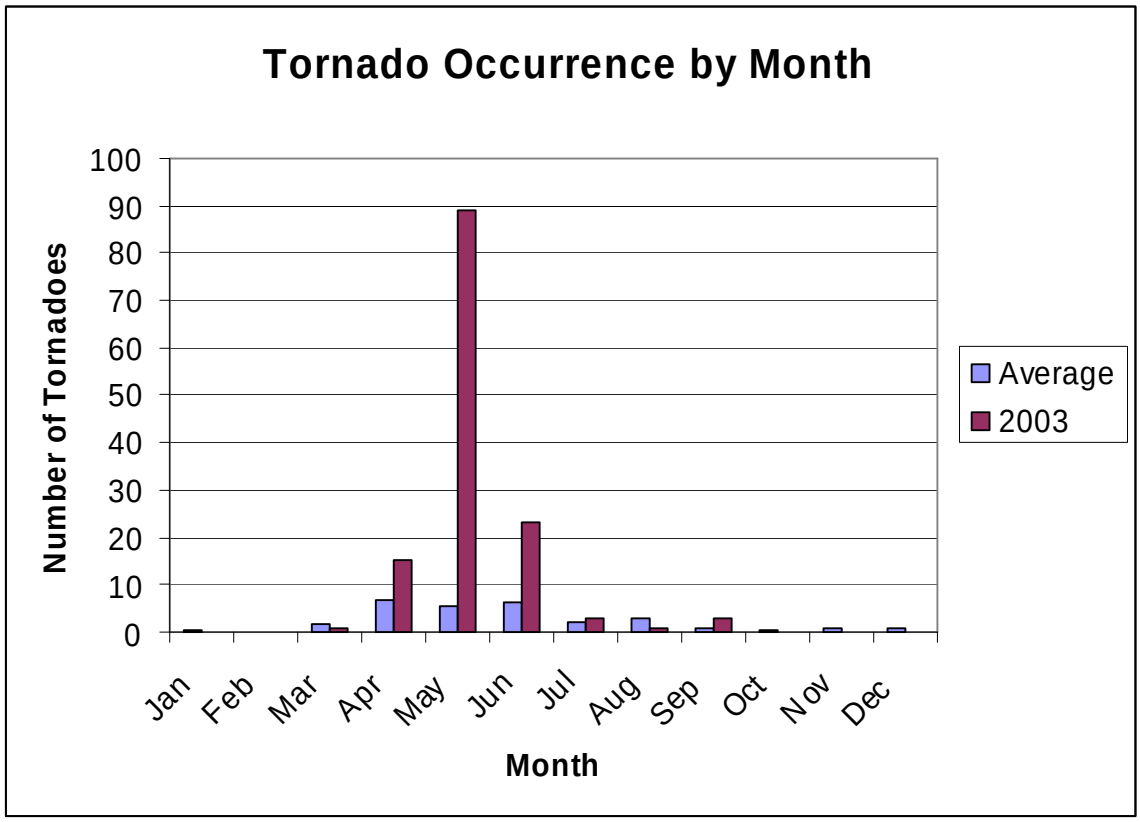
a) F1
b) F3
c) F5

8) The graph below shows the number of tornadoes that occur *on average* each month in Illinois along with the number that actually occurred in 2003. Given that information, answer the following questions:

Which month *on average* has the least number of tornadoes?

Which month in 2003 had the greatest number of tornadoes?

How many more tornadoes occurred in May 2003 than average?

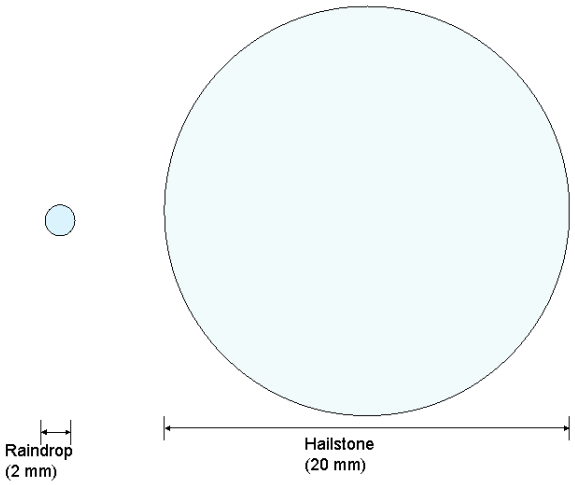


9) Which of the following is the leading cause of death from thunderstorms in the United States?

a) Lightning
b) Flash Flooding
c) Tornadoes
d) High winds

10) Below are side views of a raindrop and a hailstone. A radar “sees” both of these by bouncing radio waves off of them. If the strength of a radar signal echo is proportional to the diameter of the particle, which will show up better to it?

a) Hailstone
b) Raindrop
c) Both will show up equally well.



11)

Lightning – Myth or Fact?

People struck by lightning carry an electrical charge and should not be touched.

MYTH FACT

If it is not raining, then there is no danger from lightning.

MYTH FACT

The average flash of lightning will light a 100 watt bulb for more than three months.

MYTH FACT

Lightning never strikes the same place twice.

MYTH FACT

If you feel your hair stand on end during a storm, crouch down low to the ground – you are in danger of being struck by lightning!

MYTH FACT

If you are caught outdoors during an electrical storm, one of the safest places to be is in your car.

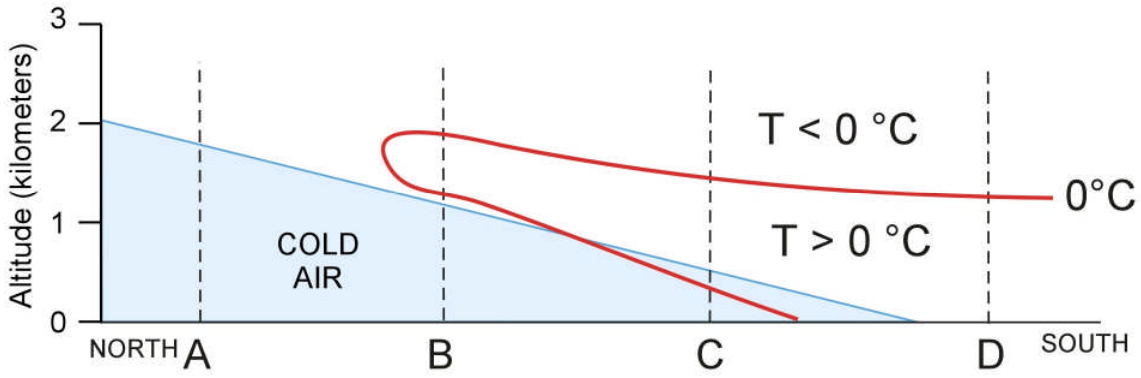
MYTH FACT

It is unsafe to be indoors near appliances or plumbing during a lightning event.

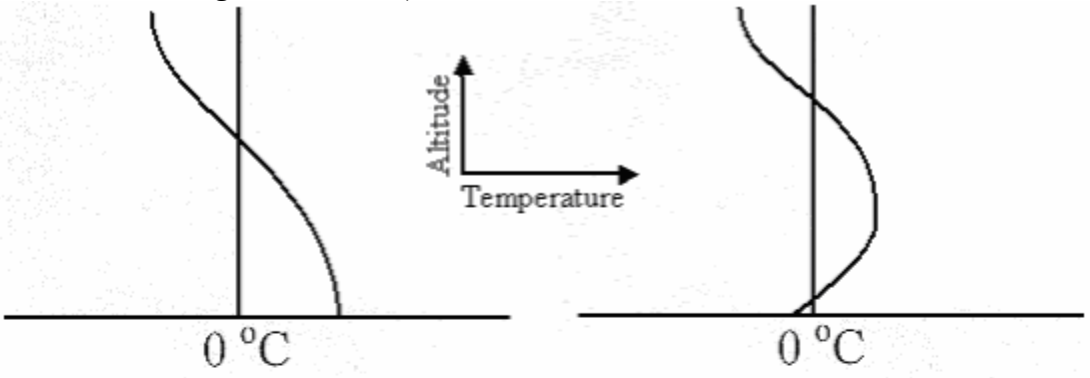
MYTH FACT

The rubber soles of your shoes will protect you from being struck by lightning.

MYTH FACT

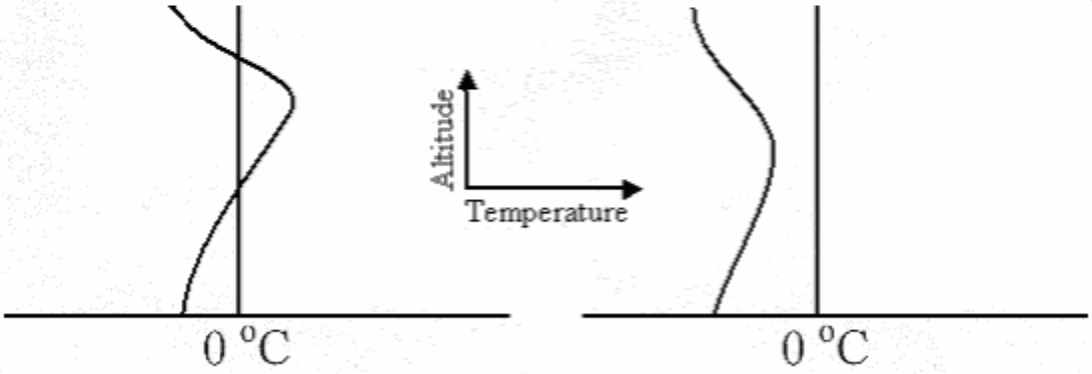


12) These vertical temperature profiles correspond to the four locations indicated at A, B, C, and D in the image above. In the spaces provided, write the letter corresponding to the location in the image that each profile represents. Use the second space for each temperature profile to indicate which type of precipitation is occurring at each location. (rain, sleet, freezing rain, or snow)



Location: _____ Location: _____

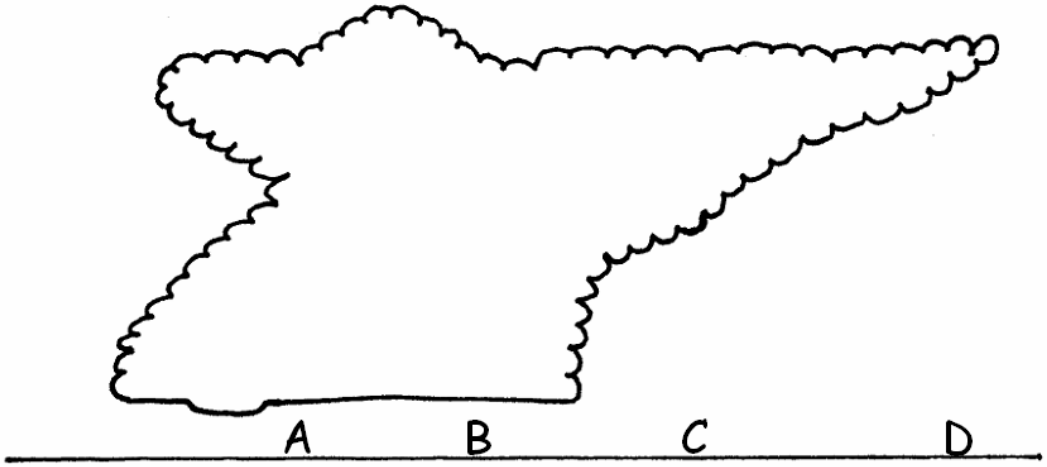
Precipitation Type: _____ Precipitation Type: _____



Location: _____ Location: _____

Precipitation Type: _____ Precipitation Type: _____

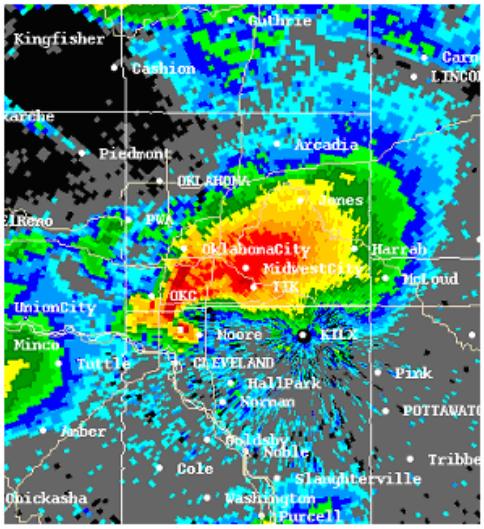
13) Use the following side view of a supercell thunderstorm to answer the question below. On this diagram, the right-hand side is toward the northeast and the left-hand side is toward the southwest. The bold horizontal line represents the ground.



Based on the diagram above, match the letter with the event most likely to be found at each location.

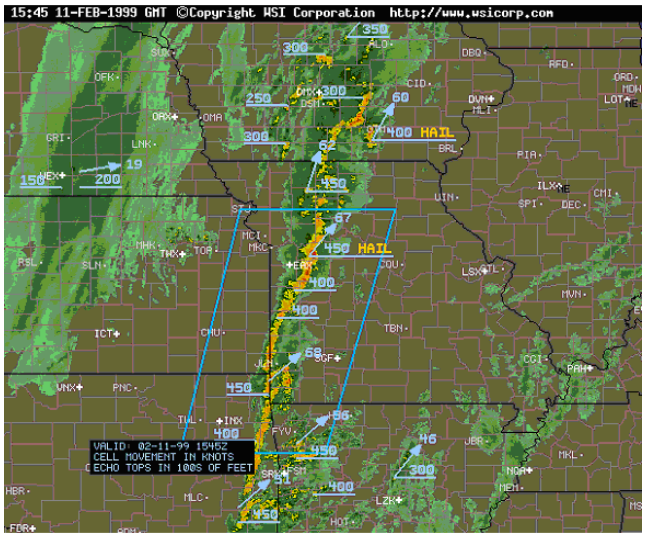
A	_____	Heavy rain
B	_____	Light rain
C	_____	Hail
D	_____	No precipitation

14) Using what you know about severe storms, classify the storm types shown in the 3 radar images below as a: squall line, supercell, multicell cluster, ordinary thunderstorm, or ice storm.

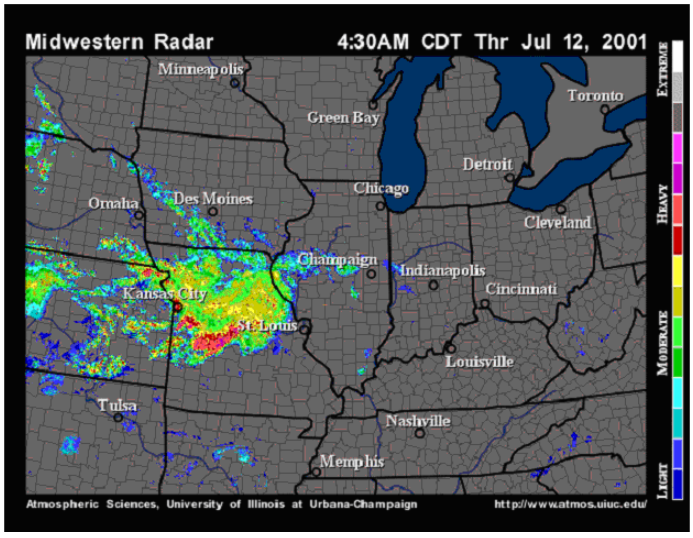


(1 cm = 20 miles in this image)

A _____



B _____



C _____

15) On the map below, the Great Lakes are traced in bold. The lakes are completely unfrozen and the air temperature is below freezing everywhere. Shade in regions where lake effect snow will likely fall inland. Be sure to take into consideration how far inland lake effect snow typically falls. The scale for this map is provided. The large arrows indicate the direction the wind is blowing.

Scale: ▬ = 50 miles

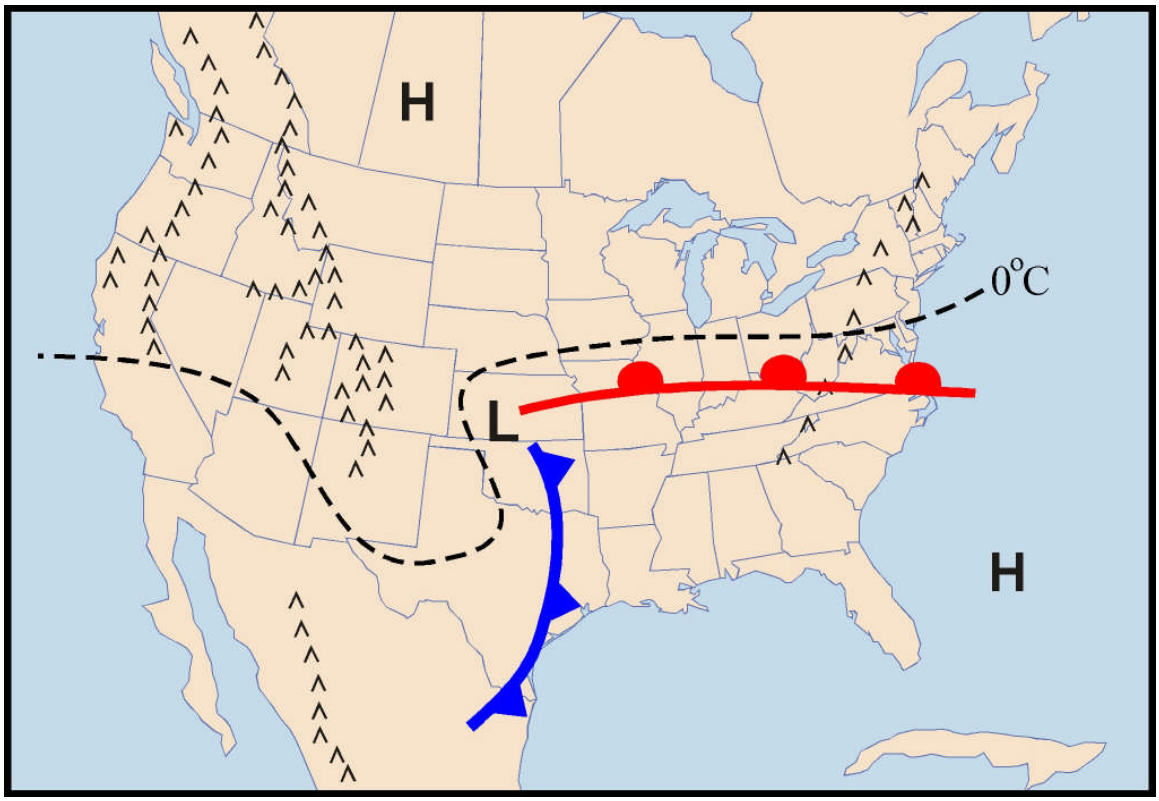
Tie Breaker Question 1

Use the US map below to answer the following question:

The types of severe weather that occur in each region of the United States vary considerably. Each different type of severe weather occurs most frequently in only one region. Write on the map where the largest number of occurrences of the following types of severe weather occur:
(A) Tornadoes
(B) Ice storms
(C) Thunderstorms

Tie Breaker Question 2

The following US map depicts a low pressure system over the central plains. On the corresponding map in your answer sheet, draw a line around the region where you would expect clouds to be in association with this system. Write in the types of precipitation you would expect to find in different parts of the cloudy region(s) you have drawn. Note: for the purposes of this exercise, you may treat the "upper-level front" as a normal cold front, with even colder and drier air behind the cold front along the Rocky Mountains.



Credits:

1. "Severe and Hazardous Weather" by Rauber, Walsh, and Charlevoix were used in creating the Myth/Fact questions, question number 12, and Tie Breaker number 2.
2. "Meteorology Today" by Aherns for question number 6.
3. Storm Prediction Center for outline maps
4. UIUC for radar and satellite images
5. Mike Wilson, Joe Brewer, Redina Herman, and Mike Spinar for writing and submitting the exam.