Meteorology 2008

Instructions:

Remember, you have **50 minutes**, so use your time wisely. If you don't know the answer to a question, you may wish to skip it and go on. An announcement will go out when 30 minutes, 15 minutes, and 5 minutes remain. If you finish early, you may wish to check over your answers.

You may use one 8.5 X 11" page of notes, front and back. If you have any questions, or are concerned about anything, please ask one of the event supervisors for help. Good luck and have fun!

Remember to write your names and school in the blanks below.

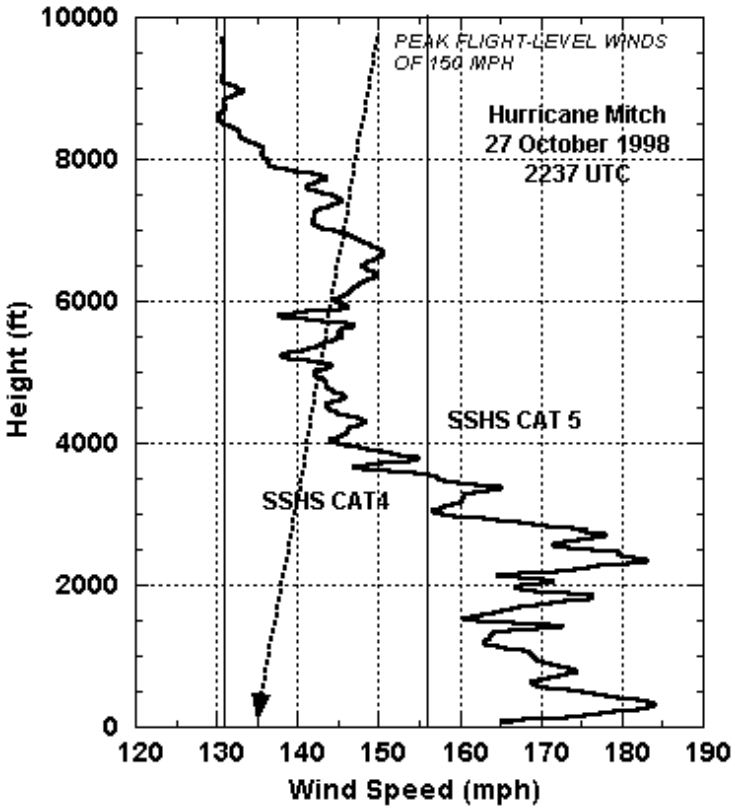
Name: _____

Name: _____

School Name: _____

School Number: _____

1. Look at the graph below, which shows wind speed along the x-axis and height along the y-axis taken from an actual hurricane. Use this graph to answer the questions below. (3 Points)



http://www.nhc.noaa.gov/aboutwindprofile.shtml

A. What are the highest wind speeds that you can see on the graph?

Answer: 184 mph

B. Are the strongest winds near top, bottom, or middle of the graph?

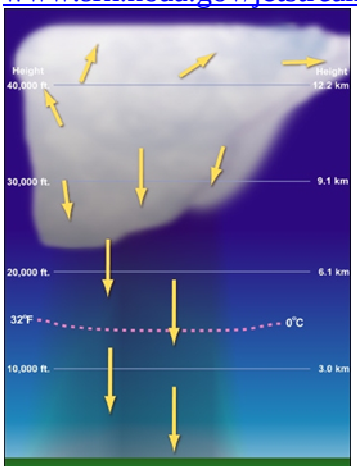
Answer: Bottom

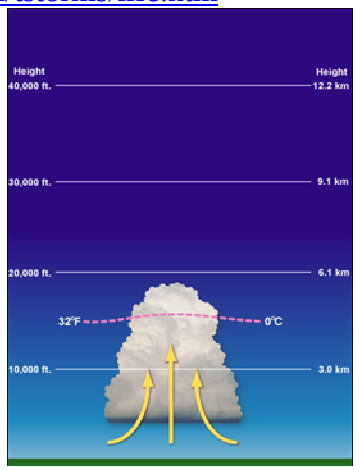
C. If you had to fly a plane into a hurricane, would you rather fly at 2,000 or 10,000 feet above the surface?

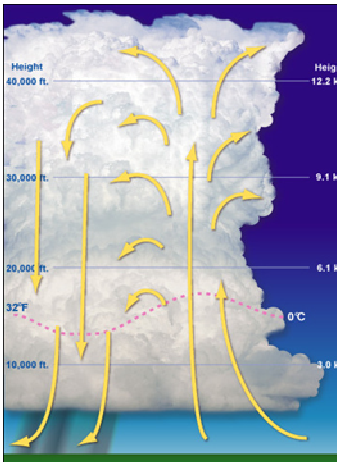
Answer: 10,000 feet

2. The following series of images show the life cycle of an “ordinary cell” thunderstorm. Put them in order from earliest to latest. (3 Points)

www.srh.noaa.gov/jetstream/tstorms/life.htm







Picture A Picture B Picture C

Earliest: Picture B

Middle: Picture C

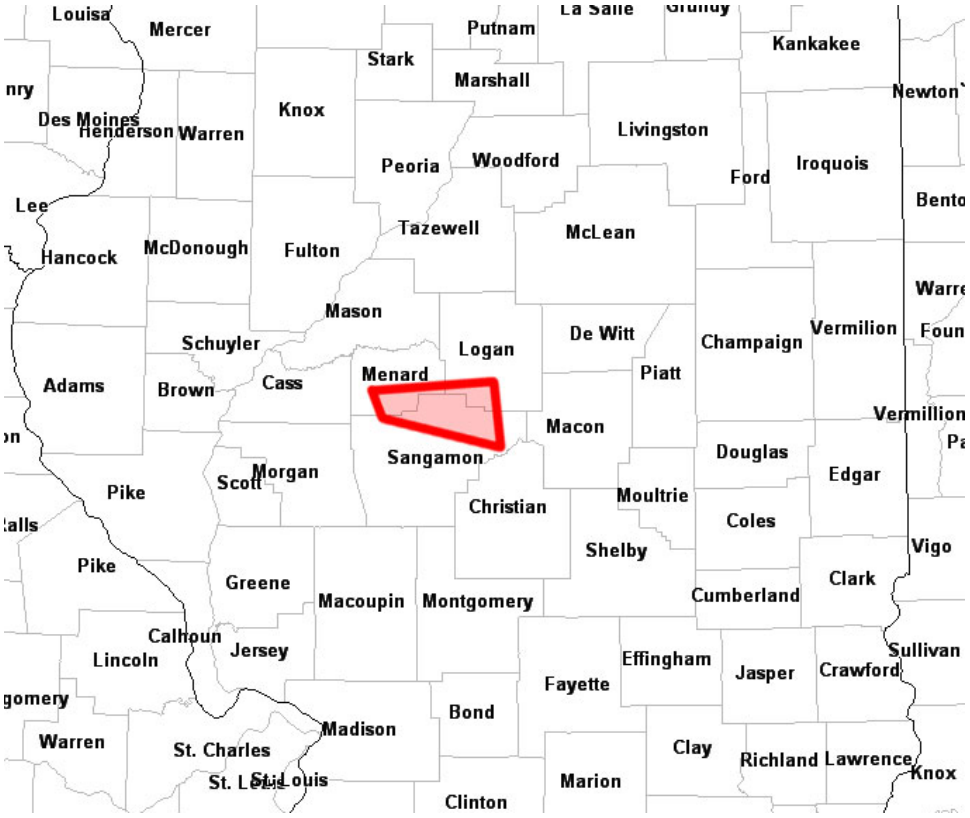
Latest: Picture A

3. Which of the following ingredients are helpful for getting severe thunderstorms? Note: There may be more than one correct answer. (1 point per correct answer)

a) Cold, dry air
b) Warm, moist air
c) Strong winds moving in different directions at different heights
d) High pressure overhead
e) Weak winds moving in the same direction
f) Very strong solar flares

Answer: B, C

4. In 2007, the National Weather Service began issuing warnings by shape, rather than by county. Using the following map, write which of the following counties are having tornado warnings. Note: State borders are in dark gray and county borders are in light gray. The tornado warning is in the area enclosed by the gray-shaded shape near the center of the map. (1 point per county)



Answer: Menard, Logan, and Sangamon Counties

5. Lake Effect Snow occurs when cold air travels over warmer water. It picks up heat and moisture as it travels over the lake. This moisture then falls as snow as it reaches the shore. Considering the three different paths over Lake Michigan (above) and assuming the factors other than the travel path are equal for each situation, which city should expect the most snow? (1 point)

   A. Leland
   B. Muskegon
   C. Saugatuck

   Answer: B

6. It's a sticky night in mid-July and you are out riding bikes with your friends. The sun hasn't quite set, but you're getting ready to head home. As you are peddling home you notice a flash in the clouds above the houses and trees on your street, but you hear no thunder. Your friend points at it and says, "Look! Heat lightning! I wonder what causes that?" (1 point)

   So, you answer:

   A. Lightning can occur without thunder in the summer because of the extreme heat of the day.
   B. It's not really lightning, just an optical illusion caused by the heat.
   C. It really is a thunderstorm. It's just too far away to hear.
   D. Heat lightning is a myth created to cover up sightings of alien spacecraft.

   Answer: C

7. Fifteen minutes later you hear a very low rumble. When you look out the window you see a flash of lightning in the distance. You remember that light travels much faster than sound. Then you count 15 seconds until you hear the next rumble of thunder. This means the thunder is _____ miles away. (1 point)

   a. 2
   b. 3
   c. 15
   d. 30

   Answer: b

8. You want to go outside and watch the thunderstorm, because you have an excellent view for miles from your backyard. You know you must wait at least _____ minutes after you hear the last thunder clap to be safe. (1 point)

   a. 5
   b. 10
   c. 30
   d. 60

   Answer: c

9. If it rains in C-U at a constant rate of .25 in/hr, how much total rain will C-U receive over six hours? (1 point)

    a. 0.25 inches
    b. 0.50 inches
    c. 1.50 inches
    d. 2.50 inches

    Answer: c

10. Tornado: Myth or Fact? Put an 'X' in the blank next to the **TRUE STATEMENTS ONLY**. (1 point for each correct "X")

    ____ Tornadoes cannot hit downtown areas because the buildings deflect the airflow.

    _X_ Tornadoes can be invisible.

    ____ Highway underpasses are a safe place to hide from tornadoes.

    ____ A tornado watch means a tornado has been sighted.

    _X_ Wind speeds in a tornado can exceed 300 miles per hour.

11. You look up and see a solid-looking, lowered area of rotating clouds above you. The clouds are firmly attached to the base of the thunderstorm. What are you most likely seeing? (1 point)

    a. A tornado
    b. A rotating wall cloud
    c. Absolutely nothing to worry about.

    Answer: b

12. In what sort of thunderstorm would you find this feature? (1 point)

    a. Heavy thunderstorm
    b. Squall line
    c. Supercell Thunderstorm

    Answer: c

13. Which is not a factor in flash flooding? (1 point)

    a. Moist Soil
    b. High Rain Rate
    c. Type of ground or soil
    d. The temperature of the rain

    Answer: d

14. Assuming all other factors are the same, which of the following will be most likely to experience flash flooding? (1 point)

    a. Forest
    b. Prairie
    c. Parking Lot
    d. Cornfield

    Answer: c

15. Rank these tropical systems from strongest to weakest: tropical storm, tropical depression, and hurricane. (3 points)

    Strongest: hurricane

    Middle: tropical storm

    Weakest: tropical depression

16. Which city is most likely to be struck by a hurricane?

    a. Nashville, TN
    b. Oklahoma City, OK
    c. Miami, FL
    d. Kalamazoo, MI

    Answer: c

17. If six tropical storms occurred in one season, would the second hurricane's name begin with B? (1 point)

    a. Yes, because hurricanes are named in alphabetical order.
    b. Not necessarily because both tropical storms and hurricanes are named.

    Answer: b

18. Which danger is **NOT** found in hurricanes? (1 point)

    a. Flooding from storm surge.
    b. Winds over 74 mph causing damage to homes.
    c. Flying debris carried in the winds.
    d. Heavy snowfall.

    Answer: d

19. Hail develops in thunderstorms with very strong updrafts (winds that go straight up inside the storm). Hail starts as a very small piece of ice that travels upward inside the storm, where it captures water that freezes on contact making it bigger and bigger with time. The longer the time it stays in the areas of updrafts the bigger it can get. The closer the fall speed (how fast something falls to the ground) of the hail is to the updraft of the storm without being stronger, the more time the hail will spend inside the thunderstorm.

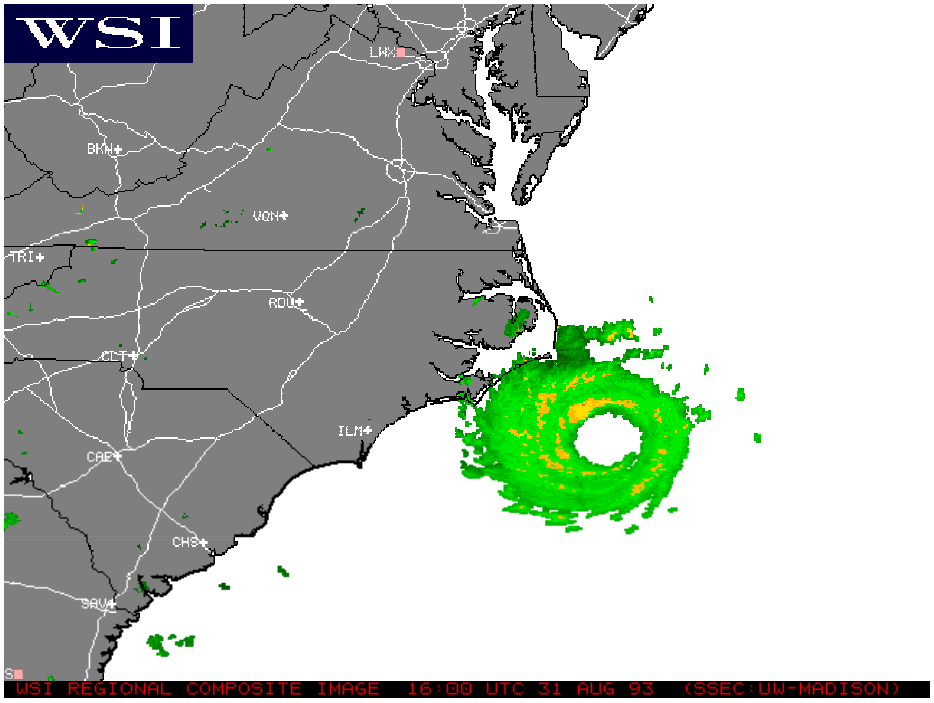
You can get a good idea of the fall speed of hail (how fast it falls to the ground) by knowing its size and using the following formula:

V = 10 X **D** where **V** is the fall speed in meters per second and **D** is the size of hail in centimeters

What is the fall speed of a hailstone with size **D** equal to 2 centimeters? (1 point)

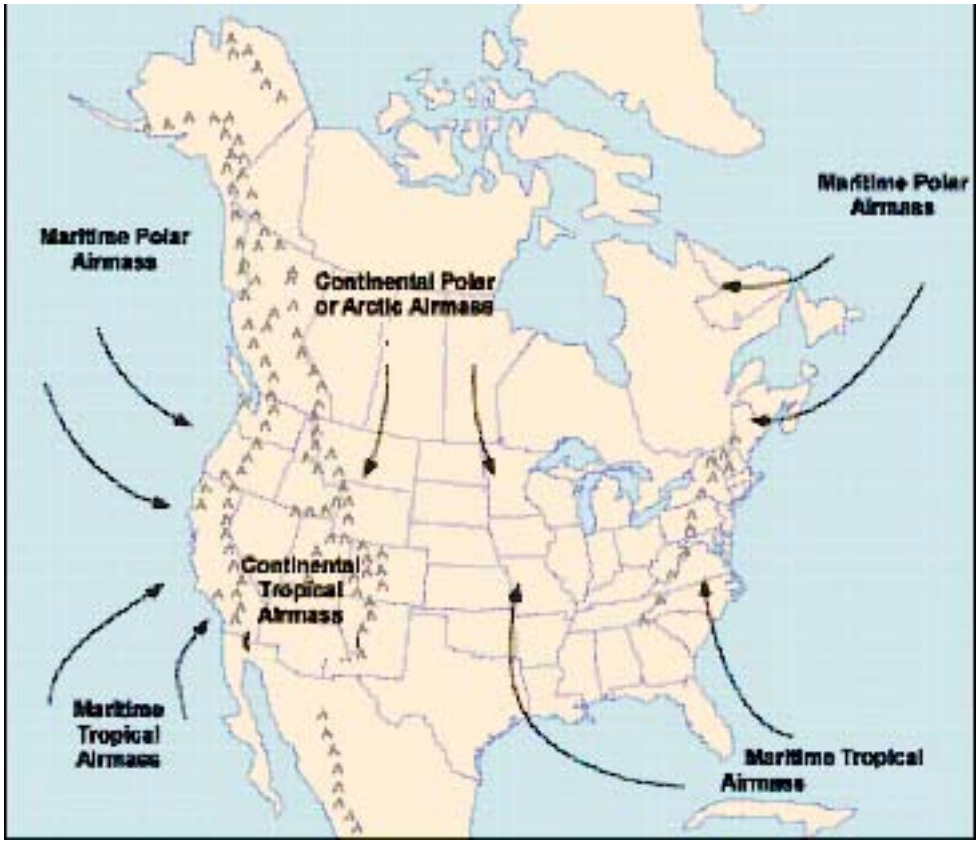
Answer: 20 meters per second

20. Using the radar image shown below, mark an "X" over the **EYE** of Hurricane Emily. (2 points)



The eye is at the center of the storm, in the center of the green ring of rain.

21. Meteorologists classify airmasses according to the general temperature and moisture of the region where they form. The terms ‘maritime’ and ‘continental’ refer to the amount of moisture in the region while the terms ‘arctic’ and ‘tropical’ refer to the general temperature of the region. The map below shows the general location of the typical airmasses we see over North America. Match the airmass name on the left with the best description of its temperature and moisture on the right. (4 points)



_C_ Maritime Polar Airmass

_A_ Continental Polar or Artic Airmass

_B_ Maritime Tropical Airmass

_D_ Continental Tropical Airmass

A) Cold and Dry

B) Warm and Moist

C) Cool and Moist

D) Warm and Dry

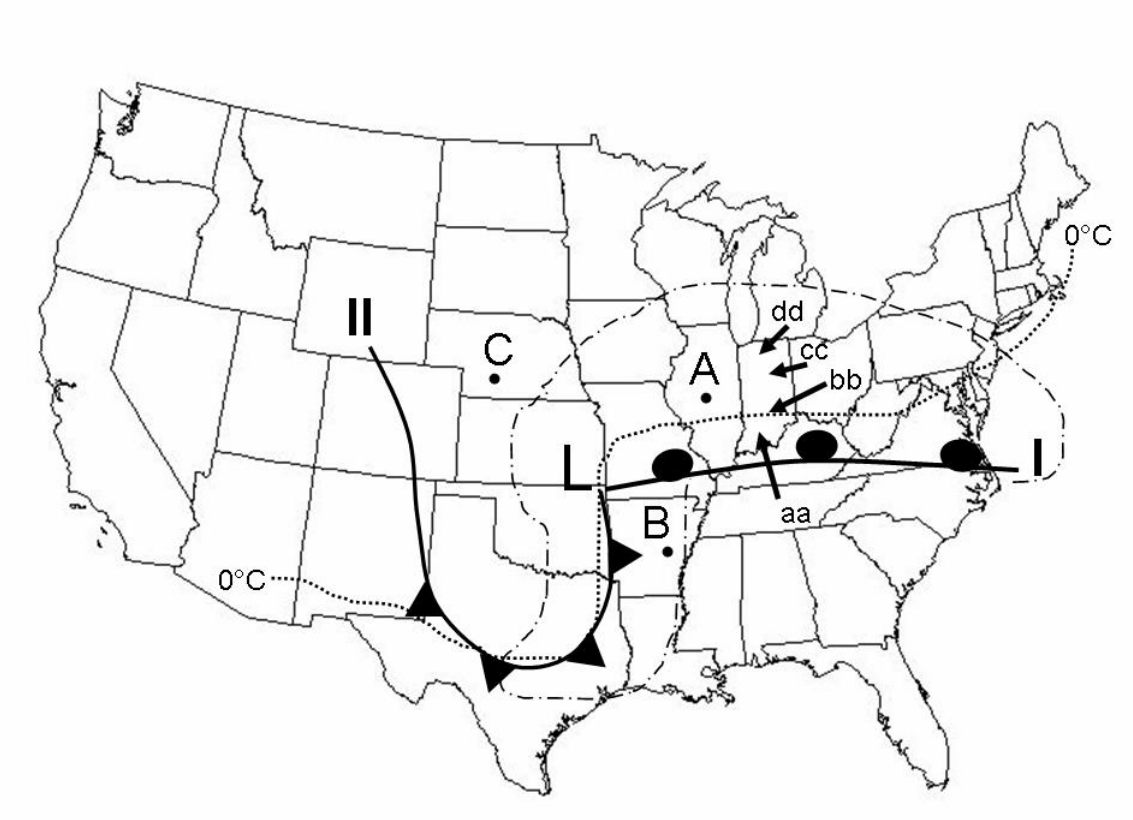
22. A thunderstorm just passed and you and your neighbor across the street find two big hail stones. You use a ruler to measure their size and find out that piece **A** was 4 centimeters and piece **B** was 6 centimeters. Using the equation above you calculate that the fall speed of hailstone **A** is **40 meters per second** and the fall speed of hailstone **B** is **60 meters per second**.

A. Lets assume both hail stones are in the updraft of a thunderstorm with an updraft speed of **50 meters per second**, which hail stone will probably stay in the updraft of the thunderstorm? (1 point)

Answer: Hailstone A

B. Assuming that the stones have not melted when you and your neighbor found them, which hail stone you think spent more time inside the thunderstorm? (1 point)

Answer: Hailstone B



The figure above shows a low pressure system over the central plains. In the figure, the fronts are denoted by I and II, the areas with clouds are encircled by the dash-dot line, and the dotted line is the 0°C line.

TB 1) Identify what types of fronts are I and II (2 points)

I - Warm Front

II – Cold Front

TB 2) You, who are at point A, are talking with your good friends that live at point B and C about the weather. Choose the description that best fits what you or your friends would be experiencing by placing A, B, or C in front of the description. (3 points)

_A_1. "Well, over here it's been snowing quite a bit, very slushy. The winds seem to be coming from the East. The TV weather person says that we can expect more snow."

_B_ 2. "Over here it was sunny and warm, really nice this morning, but now there are severe weather alerts everywhere!"

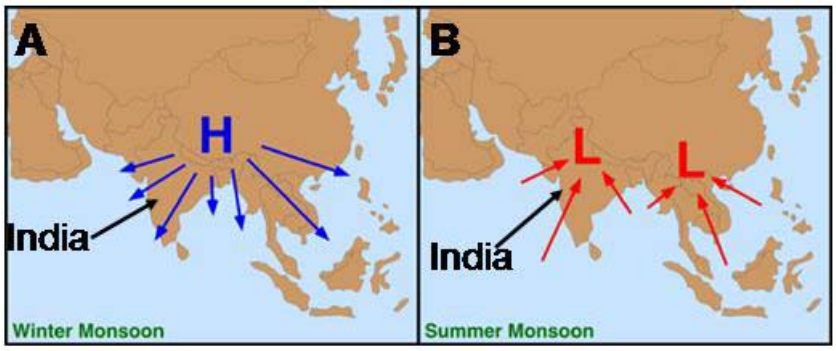
_C_3. "Nothing much out here, it's been cold and windy. I think the winds are coming from the northwest.

TB 3) Hurricanes are rated on the Saffir-Simpson Scale (1-5). Tornadoes are rated on the Enhanced Fujita Scale (EF0-EF5). How are these ratings determined? (1 point)

a. Saffir-Simpson is based on central pressure and Enhanced Fujita is based on wind speed.
b. They are both based on wind speed.
c. Saffir-Simpson is based on wind speed and Enhanced Fujita is based on damage.
d. They are both based on damage.
e. Saffir-Simpson is based on central pressure and Enhanced Fujita is based on damage.

Answer: e

TB 4) Global Circulation pattern: (1 point)



India every year has a period where they receive large amounts of rain. Meteorologists have learned that these periods, called monsoons, are related to the wind patterns over India. One of the reasons that India receives so much rain is that winds can bring a lot of moisture from the ocean and move it inland.

The wind patterns for the **winter monsoon** are shown by the **arrows** in **panel A** and the wind patterns for the **summer monsoon** are shown by the **arrows** in **panel B**. Which monsoon period has the wind pattern that you think will produce the greatest amounts of rain?

Answer: panel A

TB 5) On February 4, 2008, the Champaign-Urbana area experienced dense fog. Select all the things that might helped in the formation of the fog: (1 point)

a) snow covered ground
b) warm air
c) clear skies
d) strong or fast winds close to the ground

Answer: a, b, c