

VIOLENT WEATHER

Name: _____

Date: _____

EARTH SCIENCE

1. _____

2. _____

3.

a. Thunderstorm	
b. Tornado	
c. Hurricane	

4. _____

5. _____

6.

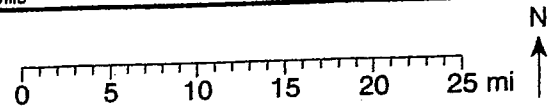
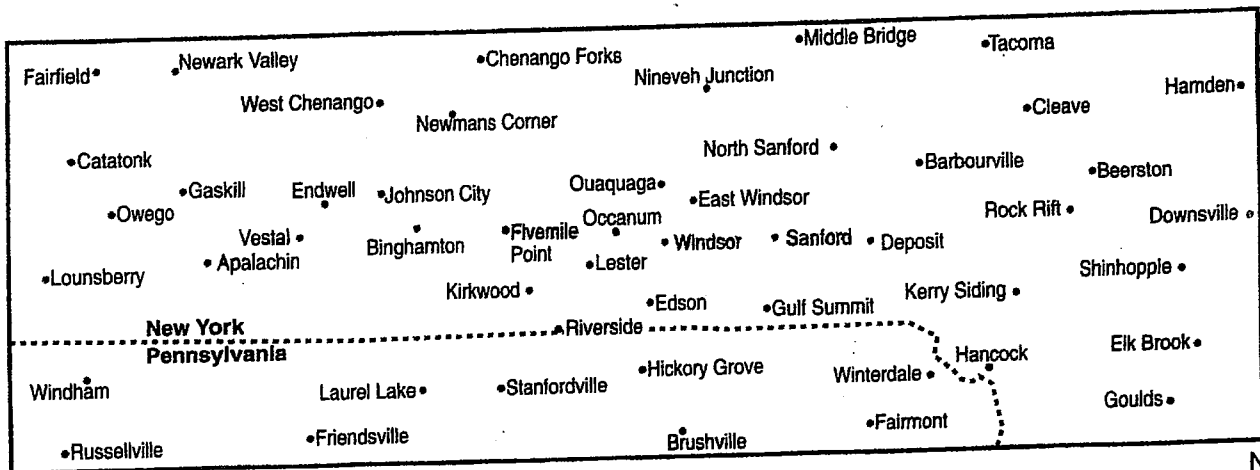
$\text{Tornado's rate of travel} = \frac{\text{distance between Vestal and Windsor (miles)}}{\text{Time (minutes)}}$
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7.

Town	F-Scale Number
Vestal	
Windsor	
Sanford	
Deposit	

8. _____

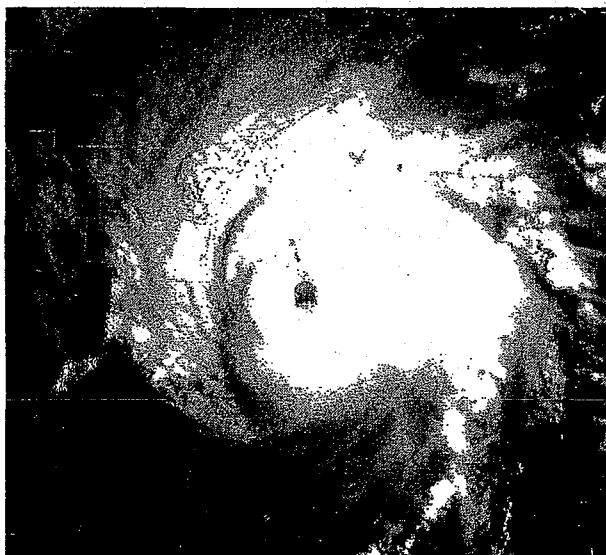
9.



- 10. _____
- 11. _____
- 12. _____
- 13. _____
- 14. _____
- 15. _____

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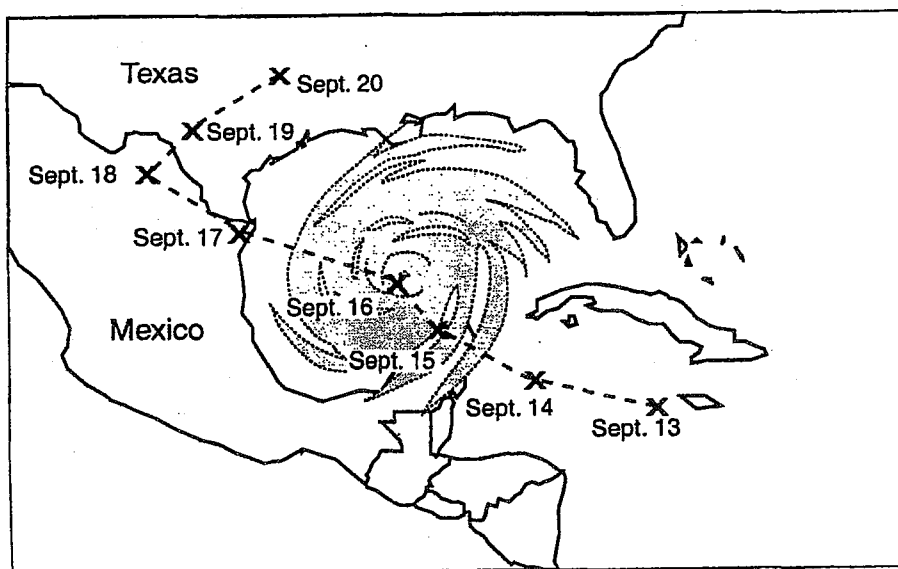
Base your answers to questions 1 and 2 on the satellite image below, which shows a Northern Hemisphere hurricane.



1. Clouds form in the hurricane because the air is
 - 1) sinking, expanding, and cooling
 - 2) sinking, compressing, and warming
 - 3) rising, expanding, and cooling
 - 4) rising, compressing, and warming
 2. Which air mass is normally associated with the formation of hurricanes?
 - 1) continental tropical
 - 2) maritime tropical
 - 3) continental polar
 - 4) maritime polar
-
3. An Earth science class is preparing a booklet on emergency preparedness. State one safety measure that should be taken to minimize danger from *each* of the following threats.

- a Thunderstorm
- b Tornado
- c Hurricane

Base your answers to questions 4 and 5 on the map below, which represents a satellite image of Hurricane Gilbert in the Gulf of Mexico. Each X represents the position of the center of the storm on the date indicated.



4. State *one* reason Hurricane Gilbert weakened between September 16 and September 18.
5. Describe *one* threat to human life and property that could have been caused by the arrival of Hurricane Gilbert along the coastline at the Texas-Mexico border.

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Base your answers to questions 6 through 10 on the passage below. The passage describes a tornado produced from a thunderstorm that moved through a portion of New York State on May 31, 1998.

New York Tornado

A small tornado formed and moved through the town of Apalachin, New York, at 5:30 p.m., producing winds between 40 and 72 miles per hour. The tops of trees were snapped off, and many large limbs fell to the ground. The path of the destruction measured up to 200 feet wide. At 5:45 p.m., the tornado next moved through the town of Vestal where winds ranged between 73 and 112 miles per hour. Many people experienced personal property damage as many homes were hit with flying material. At 6:10 p.m., the tornado moved close to Binghamton, producing winds between 113 and 157 miles per hour. A 1000-foot television tower was pushed over, and many heavy objects were tossed about by the strong winds. Then the tornado lifted off the ground for short periods of time and bounced along toward the town of Windsor. At 6:15 p.m., light damage was done to trees as limbs fell and small shallow-rooted trees were pushed over in Windsor. The tornado increased in strength again at 6:20 p.m. as it moved into Sanford. Some homes were damaged as their roof shingles and siding were ripped off. One mobile home was turned over on its side. The tornado moved through the town of Deposit at 6:30 p.m., creating a path of destruction 200 yards wide. The tornado skipped along hilltops, touching down occasionally on the valley floors. However, much damage was done to homes as the tornado's winds reached their maximum speeds of 158 to 206 miles per hour. The tornado weakened and sporadically touched down after leaving Deposit. By 7:00 p.m., the tornado had finally ended its 1-hour rampage.

6. Calculate the tornado's average rate of travel, in miles per minute, between Vestal and Windsor, by using the equation below. Express your answer to the nearest tenth.

$$\text{tornado's rate of travel} = \frac{\text{distance between Vestal and Windsor (miles)}}{\text{time (minutes)}}$$

7. Using the Fujita Scale shown below and the information in the passage, complete the table by assigning an F-Scale number for the tornado as it passed through each town given in the table.

Fujita Scale

F-Scale Number	Wind Speed (mph)	Type of Damage Done
F-0	40-72	some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards
F-1	73-112	peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed
F-2	113-157	considerable damage; roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated
F-3	158-206	roof and some walls torn off well-constructed homes; trains overturned; most trees in forest uprooted
F-4	207-260	well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated
F-5	261-318	strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile-sized missiles fly through the air in excess of 100 meters; trees debarked; steel-reinforced concrete structures badly damaged

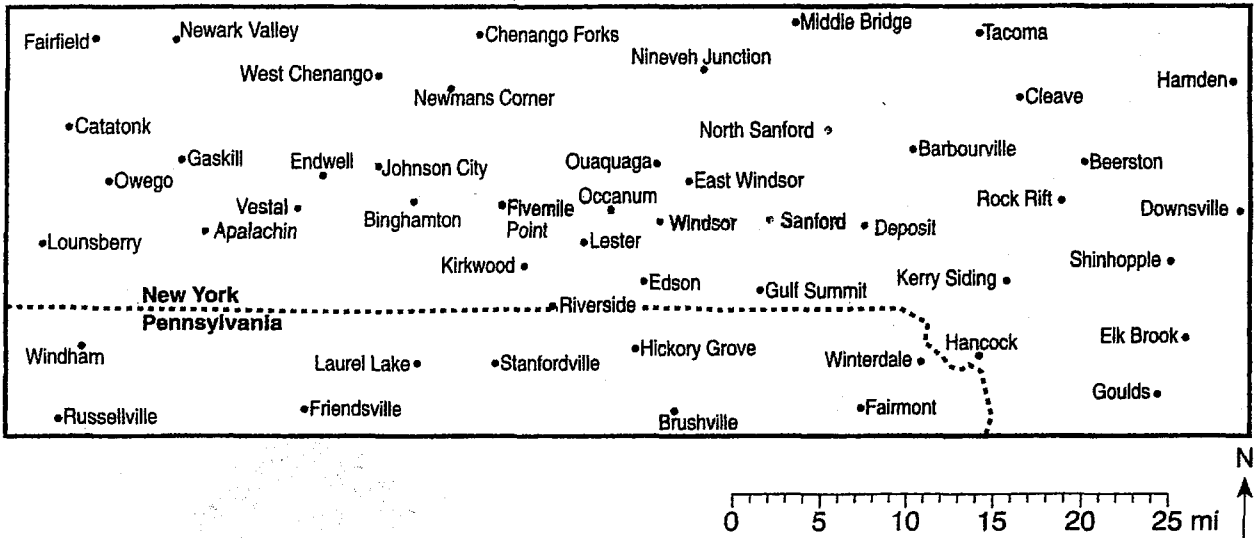
Town	F-Scale Number
Vestal	
Windsor	
Sanford	
Deposit	

8. which type of front was located at the boundary between the advancing cold, dry air mass and the warm, moist air mass?

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9. On the map, draw the path of the tornado and the direction the tornado moved, by following the directions below.

- Place an X through the point for each of the six towns mentioned in the passage.
- Connect the Xs with a line in the order that each town was mentioned in the passage.
- Place an arrow at one end of your line to show the direction of the tornado's movement.



10. The tornado mentioned in this passage was produced by cold, dry air from Canada quickly advancing into warm, moist air already in place over the northeastern United States. List the two-letter air-mass symbols that would identify each of the two air masses responsible for producing this tornado.

11. Base your answer to the following question on data table below, which shows the average number of days with thunderstorms that occur over land areas at different latitudes each year.

Data Table

Latitude	Average Number of Days a Thunderstorm Occurs Over Land
60° N	5
45° N	14
30° N	19
15° N	30
0° (equator)	56
15° S	44
30° S	21
45° S	8
60° S	0

State the relationship between latitude and the average number of days each year that thunderstorms occur over a land area.

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Base your answers to questions 12 through 15 on the magazine article and diagram below.

Lake-Effect Snow

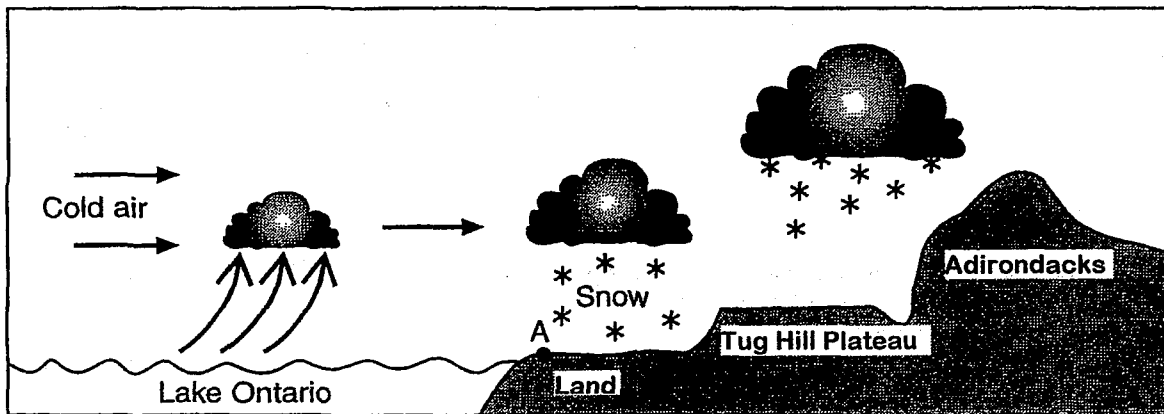
During the cold months of the year, the words "lake effect" are very much a part of the weather picture in many locations in New York State. Snow created by the lake effect may represent more than half the season's snowfall in some areas.

In order for heavy lake-effect snow to develop, the temperature of the water at the surface of the lake must be higher than the temperature of the air flowing over the water. The higher the water temperature and the lower the air temperature, the greater the potential for lake-effect snow.

A lake-effect storm begins when air flowing across the lake is warmed as it comes in close contact with the water. The warmed air rises and takes moisture along with it. This moisture, which is water vapor from the lake, is turned into clouds as it encounters much colder air above. When the clouds reach the shore of the lake, they deposit their snow on nearby land. A typical lake-effect storm is illustrated in the diagram below.

The area most likely to receive snow from a lake is called a "snowbelt." Lake Ontario's snowbelt includes the counties along the eastern and southeastern ends of the lake. Because the lake runs lengthwise from west to east, the prevailing westerly winds are able to gather the maximum amount of moisture as they flow across the entire length of the lake. There can be lake-effect snowfall anywhere around the lake, but the heaviest and most frequent snowfalls occur near the eastern shore.

In parts of the snowbelt, the lake effect combines with a phenomenon known as orographic lifting to produce some very heavy snowfalls. After cold air has streamed over the length of Lake Ontario, it moves inland and is forced to climb the slopes of the Tug Hill Plateau and the Adirondack Mountains, resulting in very heavy snowfall.



12. State why very heavy snowfall occurs in the Tug Hill Plateau region.
13. State why locations east and southeast of Lake Ontario are more likely to receive lake-effect snow than are locations west of the lake.
14. State the relationship that must exist between water temperature and air temperature for lake-effect snow to develop.
15. State the name of the New York State landscape region that includes location A shown in the diagram.
