MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) The general term applied to warm air moving up over a colder air mass is:
   A) cold front.  
   B) orographic lifting.  
   C) overrunning.  
   D) warm front.

2) If a warm front is approaching, you can expect
   A) rising temperatures.  
   B) falling temperatures.  
   C) clearing skies.  
   D) calm winds.

3) In 1918, J. Bjerknes published what came to be known as the polar front theory. Which one of the following statements is correct regarding this theory?
   A) It was shown to be applicable only to winter storms in the Southern Hemisphere.  
   B) Although it was useful at the time, it is no longer a useful model.  
   C) The polar front theory was largely incorrect from the very beginning.  
   D) The main features of the theory remain an important part of present-day meteorological thought.

4) Another common term for the wave cyclone is:
   A) polar-front cyclone.  
   B) intertropical convergence zone.  
   C) midlatitude cyclone.  
   D) tropical cyclone.

5) When the center of a mature wave cyclone passes to the south, you should expect:
   A) to be influenced by an occluded front.  
   B) absolutely nothing.  
   C) to experience a veering wind shift.  
   D) generally fair weather.

6) A wind shift in a counterclockwise direction, as from east to north, is termed ______ wind shift.
   A) frontal  
   B) backing  
   C) veering  
   D) anticyclonic

7) A wind shift in a clockwise direction, as from south to west, is termed ______ wind shift.
   A) frontal  
   B) backing  
   C) cyclonic  
   D) veering

8) Middle-latitude cyclones
   A) rotate counterclockwise.  
   B) travel from east to west.  
   C) have cold fronts but not warm fronts.  
   D) are large high-pressure systems.

9) Middle-latitude anticyclones
   A) have cold fronts but not warm fronts.  
   B) travel from east to west.  
   C) rotate clockwise.  
   D) are large low-pressure systems.

10) An area on the north side of the low-pressure center of a middle-latitude cyclone usually has this type of front for the longest period of time.
    A) warm  
    B) cold  
    C) occluded  
    D) All three front types stay about the same amount of time.
11) The strongest winds during the 1993 "Storm of the Century" occurred where?
   A) Mt. Washington, NH
   B) New York, NY
   C) Flattop Mountain, NC
   D) Boston, MA
   E) Myrtle Beach, SC

12) The type of front shown on the diagram above is:
   A) an occluded front.
   B) a cold front.
   C) a stationary front.
   D) a warm front.

13) The type of weather most frequently associated with the front shown on the diagram above is:
   A) clear skies.
   B) blizzards.
   C) thunderstorms and other severe weather.
   D) steady, gentle rainfall.

14) The type of front represented in the diagram above is a:
   A) cold-type occluded front.
   B) warm front.
   C) warm-type occluded front.
   D) cold front.

15) Thunderstorms can be generated when a cT air mass meets an mT air mass and creates a frontal boundary called a:
   A) cold front.
   B) humidity front.
   C) dryline.
   D) warm front.
16) A *dryline* causes uplift to occur because:
   A) the lifted air mass is dryer than the intruding air mass.
   B) the intruding air mass is colder and more humid than the lifted air mass.
   C) the lifted air mass is moister than the intruding air mass.
   D) the intruding air mass has the same low humidity as the lifted air mass.

17) As a warm front approaches, which progression of clouds are you most likely to see?
   A) cirrocumulus, cirrus, nimbostratus, stratus
   B) cirrus, cirrostratus, altostratus, nimbostratus
   C) cumulus, cumulonimbus
   D) altostratus, cirrostratus, stratus, cumulonimbus

18) A ridge aloft is generally associated with
   A) anticyclonic flow at the surface.
   B) divergence of the jet stream.
   C) cyclonic flow at the surface.
   D) stormy weather.

19) Tornadoes are generally associated with which type of front?
   A) occluded front
   B) stationary front
   C) cold front
   D) warm front

20) A trough aloft is generally associated with:
   A) anticyclonic flow at the surface.
   B) clear skies.
   C) cyclonic flow at the surface.
   D) convergence of the jet stream.

21) Which air mass type is generally found on the poleward side of a midlatitude cyclone?
   A) mA
   B) cP
   C) cT
   D) mP
   E) mT

22) The cloud type most frequently associated with a cold front is:
   A) cirrocumulus.
   B) altocumulus.
   C) cumulonimbus.
   D) status.
   E) cirrus.

23) The life cycle of a midlatitude cyclone generally has ________ stages.
   A) two
   B) one
   C) four
   D) ten
   E) six

24) When *speed divergence* occurs in the upper atmosphere, what effect does it have on cyclogenesis?
   A) It inhibits cyclogenesis by preventing cyclonic flow.
   B) It has no impact whatsoever on the formation of mid-latitude cyclones.
   C) It can either inhibit or enhance cyclogenesis, depending on the surface air temperature.
   D) It greatly enhances cyclogenesis by increasing convergence on the surface below.

25) Why does *occlusion* lead to the demise of a mid-latitude cyclone?
   A) Occlusion stops all precipitation from occurring within the cyclone.
   B) All warm air is displaced aloft, so the surface temperature gradient has been equalized.
   C) The cold front stops progressing during occlusion.
   D) The cold cP air mass driving the cyclone has warmed intensely.
26) A warm front is said to exist when
   A) warm and cold air meet.
   B) warm air pushes underneath cold air.
   C) invading cold air pushes underneath warmer air.
   D) moving cold air overrides warmer air.
   E) advancing warm air overrides retreating cold air.

27) The lifting of air and the resulting formation of clouds and rain is more gentle (gradual) for a
    A) cold front.
    B) mesocyclone.
    C) divergence zone.
    D) occluded front.
    E) warm front.

28) The more violent nature of weather produced by a cold front can be attributed to which two factors?
    A) the gradual slope and slow forward motion of the front
    B) the steep slope and slow forward motion of the front
    C) the steep slope and fast forward motion of the front
    D) the gradual slope and fast forward motion of the front

29) The approximate lifetime of a wave cyclone is
    A) 1 - 2 days.
    B) 10 - 14 days.
    C) a few days to a week.
    D) 10 - 24 hours.
    E) a month.

30) Why is the number and intensity of wave cyclones greatest during the late fall, winter and spring months?
    A) Temperature contrasts are greater.
    B) Meteorologists do not know.
    C) Air is drier then.
    D) Temperatures are below freezing.
    E) Density of the air is greatest.

31) After a cold front passes, which of these does not usually occur?
    A) falling barometer
    B) marked temperature drop
    C) clearing skies
    D) wind direction shift
    E) drop in relative humidity

32) Which of these best describes the reason most high pressure systems bring clear skies?
    A) cold air near the surface
    B) high temperatures aloft
    C) low temperatures aloft
    D) sinking air aloft
    E) rising air aloft
33) The width or horizontal extent of a typical mid-latitude low pressure system would be
   A) 500 - 1000 km.
   B) 50 - 100 km.
   C) 20,000 km.
   D) 5 - 10 km.
   E) 10,000 km.

34) The development of major winter storms in the midwest depends strongly on
   A) amount of snow already on the ground.
   B) rainfall amounts during the previous fall.
   C) air mass contrasts.
   D) wind speed aloft.
   E) wind speed near the surface.

35) Which of these is common to both cold and warm fronts?
   A) decreasing precipitation rates
   B) light to calm winds
   C) steady barometer readings
   D) divergence of surface winds
   E) lifting of warm air over cold

36) An approaching wave cyclone would be indicated by a ________ barometer reading.
   A) rapidly falling
   B) variable, rising then falling
   C) very low
   D) slowly rising
   E) high

37) What is the cause-and-effect relationship between the pattern of upper-level winds and surface
    low- and high-pressure systems?
   A) Upper level wind patterns strongly control the origin and development of surface systems.
   B) There is no strong or consistent relationship.
   C) Surface systems control the upper level wind patterns.
   D) Surface systems depend primarily on wind speeds at upper levels.
   E) Surface lows decrease upper level wind speeds, surface highs increase them.

38) The wind direction in a low pressure system is
   A) from the east.
   B) from the northwest.
   C) from the south.
   D) from the north.
   E) dependent on your location relative to the storm center.

39) Compared to other types of fronts, the weather associated with a cold front usually
   A) does not involve thunderstorms.
   B) is more violent but of shorter duration.
   C) involves less precipitation.
   D) is less violent but of longer duration.
   E) covers more area.
40) The energy of a mid-latitude cyclone comes mainly from
   A) Earth's interior.
   B) ocean water.
   C) sinking cold air and rising warm air.
   D) greenhouse effect.
   E) clouds.

41) If you were 200 kilometers ahead of the surface position of a warm front, you would find the
   frontal surface at a height of ________ km overhead.
   A) 1.5
   B) 1
   C) 0.5
   D) 2
   E) 2.5

42) On a weather map, ________ fronts are shown with triangular points on one side of the front and
   semicircles on the other.
   A) cold
   B) stationary
   C) warm
   D) occluded

43) Rain long foretold, long last; short notice, soon past. The FIRST FIVE words of this weather
   proverb:
   A) refer to a warm front.
   B) have no basis in fact.
   C) refer to an anticyclone.
   D) refer to a cold front.
   E) refer to the formation of cumulonimbus clouds.

44) The "Storm of the Century" struck in the winter of
   A) 1993.
   B) 1933.
   C) 1975.
   E) 1888.

45) The "Storm of the Century" had its origins in
   A) the Rocky Mountains.
   B) the North Atlantic.
   C) northern Canada.
   D) the Gulf of Mexico.
   E) Siberia.

46) Compared to warm fronts, cold fronts have
   A) the same gradient and the same advance rate.
   B) the same gradient and a faster advance rate.
   C) a shallower gradient and a slower advance rate.
   D) a steeper gradient and a faster advance rate.
   E) a shallower gradient and the same advance rate.

47) The arrival of a cold front brings
   A) stationary winds.
   B) gentle rains.
   C) higher temperatures.
   D) cumulonimbus clouds.
   E) mild weather.
Refer to the diagram of a mature wave cyclone.

48) Of the stations listed below, which one most likely has the least rain and cloud cover?  
A) point G  B) point A  C) point I  D) point B  E) point H

49) Line A-D probably represents:
A) a warm front.  B) an occluded front.  C) a cold front.  D) a stationary front.

50) A low-flying aircraft heading from point J to point H would most likely experience which of the following changes in wind direction?  
A) E to W to NE  B) SE to SW to NW  C) N to S to W  D) NE to N to NW  E) SW to SE to NE

51) Which of the stations listed below should have the highest temperature?  
A) point F  B) point E  C) point J  D) point H  E) point A

52) Which of the following best represents the wind direction at point H?  
A) E  B) NW  C) SE  D) SW  E) NE

53) The lowest pressure would be found at which one of the following points?  
A) point D  B) point E  C) point A  D) point B  E) point J

54) Line A-B represents:
A) a warm front.  B) an isobar.  C) an occlusion.  D) a cold front.  E) none of these
TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

55) Cyclogenesis refers to the birth of a cyclone.  
56) Cold fronts generally travel faster than warm fronts.  
57) Cyclonic winds are always counterclockwise in the northern hemisphere.  
58) Surface low-pressure systems usually develop in conjunction with a ridge aloft.  
59) The region between the warm front and cold front of a wave cyclone is the warm sector.  
60) Downstream from a ridge aloft, the wind direction is northwest.  
61) Straight west-to-east winds aloft cause maximum cyclone development.  
62) Freezing rain and/or sleet occur most often with a cold front.  
63) Ridges and troughs are features of the upper level wind pattern.  
64) Frontal systems cause clouds by adding moisture to the air.  
65) The prevailing wind direction for an anticyclone is from the east.  
66) Thunderstorms are most common along a cold front.  
67) Surface winds for an anticyclone are convergent.  
68) Much less study has been devoted to anticyclones as compared to cyclones.  
69) Thermal lows are primarily a wintertime phenomenon in the American Southwest.  
70) When surface cyclones form, they almost invariably occur just ahead of an upper air ridge.  
71) Speed divergence helps maintain surface lows.  
72) Occluded fronts characterize the beginning stages of a middle latitude cyclone.  
73) The term cyclogenesis refers to the decay of a cyclone.  
74) Warm-type occluded fronts are the most common type of occluded front to form east of the Rockies.  
75) Cold fronts are steeper than warm fronts.  
76) Middle-latitude cyclones typically develop along segments of the polar front.
77) Under certain conditions, a cold front can be forced aloft by a warm front.
78) The first sign of an approaching warm front is the appearance of cirrostratus clouds.
79) When a warm front passes, temperature rises and the wind usually shifts.
80) Middle-latitude cyclones die out once all the warm air has risen aloft.
81) Generally, a change in wind direction from southwest to northwest means bad weather will come soon.
82) Shearing of air between two air masses forms waves crucial to cyclogenesis.
83) Cyclones usually form alone, although sometimes they are associated with anticyclones.
84) Most cyclones and anticyclones are generated by upper-level air flow.
85) Typically, upper-level air flow is slower over anticyclones than over cyclones.
86) Cyclones usually move fastest in summer.
87) Cyclones usually start out moving eastward, then turn northeast.
88) Cyclones pass over Oregon more often in winter than in summer.
89) Summer thermal lows in the desert Southwest are caused by surface heating.