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TRAINING FOR MARINERS

Navigation General

Meteorology

This Study Guide Generated For

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A gale is characterized by a wind speed of _____.
***34 to 47 knots***

**Illustrations**: COASTALWARNING
See REF1077

A tropical storm is a tropical cyclone that generates winds of _____.
***between 34 and 63 knots***

**Illustrations**: COASTALWARNING
See REF1077

A hurricane is characterized by winds of _____.
***64 knots or greater***

**Illustrations**: COASTALWARNING
See REF1077

In the doldrums you will NOT have _____.
***steep pressure gradients***

**Illustrations**: DOLDRUMSMAP
See REF1075

In the doldrums you can expect _____.
***frequent rain showers and thunderstorms***

**Illustrations**: DOLDRUMSMAP
See REF1075

Where are the prevailing westerlies of the Southern Hemisphere located?
***Between 30° and 60° latitude***

**Illustrations**: CURRENT CHART

In illustration D009NG below, your position X is at LAT 35°S. Which winds are you experiencing?
***Northeasterly***

**Illustrations**: D009NG_WM_012914

A sling psychrometer is a(n) _____.
***instrument used to measure relative humidity***

**Illustrations**: SLING PSYCHROMETER
See REF1056

An instrument useful in predicting fog is the _____.
***sling psychrometer***

**Illustrations**: SLING PSYCHROMETER
See REF1056

A sling psychrometer is used to measure _____.
***dry bulb and wet bulb temperatures***

**Illustrations**: SLING PSYCHROMETER

See REF1056

Using the surface analysis in illustration D049NG below, what change in the wind direction could be expected at position "D" if the low were moving northeasterly?
***Veering to the west***

**Illustrations**: D049NG_WM_051120

Using the surface analysis in illustration D049NG below, what wind speed is reported in position C?
***30 knots***

**Illustrations**: D049NG_WM_051120

Using the surface analysis in illustration D049NG below, which wind speeds are reported at position A?
***15 knots***

**Illustrations**: D049NG_WM_051120

Using the surface analysis in illustration D049NG below, what weather conditions would you expect to find at position A?
***Winds NW-W at 15 knots, partly cloudy, and slight seas***

**Illustrations**: D049NG_WM_051120

Your vessel is participating in the Voluntary Observing Ship Program, at 1800 ZT on 31 October your position is LAT 24°50'N, LONG 92°37'W. You are preparing WS Form B-80 as seen in illustration D041NG below. How should you encode the first three groups after the call sign if you estimate the wind?
***01003, 99248, 70926***

**Illustrations**: D041NG_WM_090618
See REF1044

Your vessel is participating in the Voluntary Observing Ship Program, at 0600 ZT on 31 January your position is LAT 00°49'S, LONG 84°27'E. You are preparing WS Form B-80 as seen in illustration D041NG below. How should you encode the first three groups after the call sign if you estimate the wind?
***31003, 99008, 30844***

**Illustrations**: D041NG_WM_090618
See REF1044

Your vessel is participating in the Voluntary Observing Ship Program, you are preparing WS Form B-80 as seen in illustration D041NG below. The dry bulb thermometer reads 34°F and the wet bulb thermometer reads 31°F. How would you encode the air temperature groups in the report?
***10011, 2104/***

**Illustrations**: D041NG_WM_090618
See REF1044

Your vessel is participating in the Voluntary Observing Ship Program, you are preparing WS Form B-80 as seen in illustration D041NG below. The dry bulb thermometer reads 30°F (-1°C) and the wet bulb thermometer reads 28°F (-2°C). How would you encode the air temperature groups in the report?
***11011, 2104/***

**Illustrations**: D041NG_WM_090618
See REF1044

Your vessel is participating in the Voluntary Observing Ship Program, you are preparing WS Form B-80 as seen in illustration D041NG below. The dry bulb thermometer reads 78°F and the wet bulb thermometer reads 75°F. How would you encode the air temperature groups in the report?
***10256, 2023/***

**Illustrations**: D041NG_WM_090618
See REF1044

Your vessel is participating in the Voluntary Observing Ship Program, you are preparing WS Form B-80 as seen in illustration D041NG below. The dry bulb thermometer reads 54°F and the wet bulb thermometer reads 50°F. How would you encode the air temperature groups in the report?
***10122, 2008/***

**Illustrations**: D041NG_WM_090618
See REF1044

Your vessel is participating in the Voluntary Observing Ship Program, you are preparing WS Form B-80 as seen in illustration D041NG below. Your position is LAT 64°42'N, LONG 02°28'W. How would this be encoded?
***99647, 70025***

**Illustrations**: D041NG_WM_090618
See REF1044

Your vessel is participating in the Voluntary Observing Ship Program, you are preparing WS Form B-80 as seen in illustration D041NG below. You are hove to in a hurricane on a heading of 328°T. The wind is from 030° true at 119 knots. How should this be encoded on the weather report form?
***80399***

**Illustrations**: D041NG_WM_090618
See REF1044

Your vessel is participating in the Voluntary Observing Ship Program, at 1200 ZT on 31 July, your position is LAT 24°33'N, LONG 173°05'W. You are preparing WS Form B-80 as seen in illustration D041NG below. How should you encode the first three groups after the call sign if you estimate the wind?
***01003, 99245, 71731***

**Illustrations**: D041NG_WM_090618
See REF1044

Your vessel is participating in the Voluntary Observing Ship Program, at 1200 ZT on 31 August, your position is LAT 43°14'S, LONG 175°44'E. You are preparing WS Form B-80 as seen in illustration D041NG below. How should you encode the first three groups after the call sign if you estimate the wind?
***31003, 99432, 31757***

**Illustrations**: D041NG_WM_090618
See REF1044

Your vessel is participating in the Voluntary Observing Ship Program, you are preparing WS Form B-80 as seen in illustration D041NG below. Twenty-five percent of the sky is covered with clouds, and the anemometer indicates that the apparent wind is from 062° relative at 13 knots. You are on course 238°T at 22 knots. How should you encode group Nddff?
***20220***

**Illustrations**: D041NG_WM_090618
See REF1044

Your vessel is participating in the Voluntary Observing Ship Program, you are preparing WS Form B-80 as seen in illustration D041NG below. The sky is overcast, and the anemometer indicates that the apparent wind is from 144° relative at 8 knots. You are on course 162°T at 15 knots. How should you encode group Nddff?
***83322***

**Illustrations**: D041NG_WM_090618
See REF1044

Your vessel is participating in the Voluntary Observing Ship Program, you are preparing WS Form B-80 as seen in illustration D041NG below. One-half of the sky is covered with clouds, and the anemometer indicates that the apparent wind is from 340° relative at 14 knots. You are on course 307°T at 12.6 knots. How should you encode group Nddff?
***42205***

**Illustrations**: D041NG_WM_090618
See REF1044

Your vessel is participating in the Voluntary Observing Ship Program. You are preparing WS Form B-80 as seen in illustration D041NG below. Three-quarters of the sky is covered with clouds, and the anemometer indicates that the apparent wind is from 226° relative at 17.7 knots. You are on course 020°T at 8 knots. How should you encode group Nddff?
***62324***

**Illustrations**: D041NG_WM_090618
See REF1044

Which Beaufort force indicates a wind speed of 65 knots?
***Beaufort force 12***

**Illustrations**: BEAUFORTSCALE_WM

The Beaufort scale is used to estimate the _____.
***wind speed***

**Illustrations**: BEAUFORTSCALE_WM

Which scale is used to estimate wind speed by observing sea conditions _____.
***Beaufort scale***

**Illustrations**: BEAUFORTSCALE_WM

A hurricane moving northeast out of the Gulf passes west of your position. You could expect all of the following EXCEPT _____.
***gradual pressure gradient***

**Illustrations**: BEAUFORTSCALE_WM

Which of the symbols shown in illustration D018NG below represents a warm front?
***C***

**Illustrations**: D018NG_WM_082918

Which of the symbols shown in illustration D018NG below represents an occluded front?
***D***

**Illustrations**: D018NG_WM_082918

In the Northern Hemisphere, an observer at point II in illustration D014NG below, should experience a wind shift from what direction?
***southwest, clockwise to northwest***

**Illustrations**: D014NG_WM_012914

Your vessel is enroute from Japan to Seattle and is located at position I on the weather map in illustration D013NG below. You should experience which weather condition?
***Thundershowers***

**Illustrations**: D013NG_WM_082918

In illustration D039NG below, what type of cloud is indicated by the number five?
***Altocumulus***

**Illustrations**: D039NG_WM_090618
See REF950

In illustration D039NG below, what type of cloud is indicated by the number four?
***Altostratus***

**Illustrations**: D039NG_WM_090618
See REF950

In illustration D039NG below, which number indicates cirrus clouds?
***1***

**Illustrations**: D039NG_WM_090618
See REF950

In illustration D039NG below, what type of cloud is indicated by the number one?
***Cirrus***

**Illustrations**: D039NG_WM_090618
See REF950

According to Buys Ballot's law, when an observer in the Northern Hemisphere experiences a northeast wind the center of low pressure is located to the _____.
***south-southeast***

**Illustrations**: BUYSBALLOT
See REF889

If an observer in the Northern Hemisphere faces the surface wind, the center of low pressure is to his _____.
***right, slightly behind him***

**Illustrations**: BUYSBALLOT
See REF889

If your weather bulletin shows the center of a low pressure area to be 100 miles due east of your position, what winds can you expect in the Northern Hemisphere?
***North to northwest***

**Illustrations**: BUYSBALLOT
See REF889

You are steaming eastward in the North Atlantic in an extratropical cyclonic storm and the wind is dead ahead. According to the law of Buys Ballot, where does the center of the low pressure lie?
***to the south***

**Illustrations**: BUYSBALLOT
See REF889

What enables you to estimate the bearing of a storm's center?
***Buys Ballot's Law***

**Illustrations**: BUYSBALLOT
See REF889

You are steaming west in the North Atlantic in an extratropical cyclonic storm, and the wind is dead ahead. According to the law of Buys Ballot, the center of low pressure lies to the _____.
***north***

**Illustrations**: BUYSBALLOT
See REF889

According to Buys Ballot's law, when an observer in the Northern Hemisphere experiences a northwest wind, the center of low pressure is located to the _____.
***northeast***

**Illustrations**: BUYSBALLOT
See REF889

According to Buys Ballot's Law, when an observer in the Southern Hemisphere experiences a northwest wind, the center of the low pressure is located to the _____.
***south-southwest***

**Illustrations**: BUYSBALLOT
See REF889

You are steaming west in the South Atlantic in an extratropical cyclonic storm, and the wind is dead ahead. According to the law of Buys Ballot, the center of low pressure lies _____.
***to the south of you***

**Illustrations**: BUYSBALLOT
See REF889

If a weather bulletin shows the center of a low pressure system to be 100 miles due east of you, what winds can you expect in the Southern Hemisphere?
***South-southwesterly***

**Illustrations**: BUYSBALLOT
See REF889

Warm air masses will generally have _____.
***stratiform clouds***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1026

On the pole side of the trade wind belt, there is an area of high pressure with weak pressure gradients and light, variable winds. This area is called the _____.
***horse latitudes***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF939

Temperature and moisture characteristics are modified in a warm or cold air mass due to _____.
***movement of the air mass***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1026

The region of high pressure extending around the Earth at about 35°N latitude is called the _____.
***horse latitudes***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF939

An air mass is termed "warm" if _____.
***the ground over which it moves is cooler than the air***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1026

Which of the following is associated with consistently high barometric pressure?
***The horse latitudes***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF939

Air temperature varies with _____.
***the season of the year***
***the latitude or distance from the equator***
***the altitude above sea level***
***All of the above.***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1026

A source of an air mass labeled mTw is _____.
***the Gulf of Mexico***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1026

Prevailing winds between 30°N and 60°N latitude are from the _____.
***west***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1072

On the pole side of the high pressure belt in each hemisphere, the pressure diminishes. The winds along these gradients are diverted by the Earth's rotation toward the east and are known as the _____.
***prevailing westerlies***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1072

Which wind results from a land mass cooling more quickly at night than an adjacent water area?
***Land breeze***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1079

The process by which the temperature and/or moisture characteristics of an air mass changes is called _____.
***modification***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1026

Considering the general circulation of the atmosphere, the wind system between latitudes 30°N and 60°N is commonly called the _____.
***prevailing westerlies***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1072

Which wind pattern has the most influence over the movement of frontal weather systems over the North American continent?
***Prevailing westerlies***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1072

Which statement describes the prevailing wind direction in mid-winter in the Gulf Coast area?
***30% to 40% of mid-winter winds are from a northern quadrant.***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1072

An air mass that has moved down from Canada would most likely have the symbols _____.
***cPk***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1026

Hot air can hold _____.
***more moisture than cold air***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1026

The direction of prevailing winds in the Northern hemisphere is caused by the _____.
***Earth's rotation***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1072

In North America the majority of the weather systems move from _____.
***west to east***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1026

Which of the listed properties does warm air possess?
***Atmospheric pressure drops as warm air rises.***
***Moisture in warm air condenses as the air is cooled.***
***It rises above cooler air and cools as it rises.***
***All of the above.***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1026

The pressure gradient between the horse latitudes and doldrums runs _____.
***north to south***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF939

The prevailing winds in the band of latitude from approximately 5°N to 30°N are the _____.
***northeast trade winds***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1072

Weather systems in the middle latitudes generally travel from _____.
***west to east***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1026

The prevailing westerlies of the Southern Hemisphere blow 18 - 30 knots _____.
***all year long***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1072

The winds with the greatest effect on the set, drift, and depth of the equatorial currents are the _____.
***trade winds***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH

Ascending and descending air masses with different temperatures is part of an important heat transmitting process in our atmosphere called _____.
***convection***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1026

The winds of the "roaring forties" are strongest near _____.
***50°S***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH

See REF1073

The consistent winds blowing from the horse latitudes to the doldrums are called the _____.
***trade winds***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1074

Air masses near the earth's surface _____.
***move from areas of high pressure to areas of low pressure***
***are deflected by the earth's rotation in both hemispheres***
***are deflected by the "Coriolis effect"***
***All of the above.***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1026

During the winter months, the southeast trade winds are _____.
***stronger than during the summer months***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1074

The direction of the southeast trade winds is a result of the _____.
***rotation of the earth***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1074

The southeast trade winds actually blow toward the _____.
***northwest***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1076

The belt of light and variable winds between the westerly wind belt and the northeast trade winds is called the _____.
***subtropical high pressure belt***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF939

A warm air mass is characterized by _____.
***stability***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1026

The wind flow from the horse latitudes to the doldrums is deflected due to _____.
***Coriolis force***

**Illustrations**: MAP_PREVAILING_WINDS_ON_EARTH
See REF1031

The dry-bulb temperature is 78°F and the wet-bulb temperature is 62°F. What is the relative humidity? illustration D008DG
***39 (%)***

**Illustrations**: D008DG_WM_012814
See REF1041

The dry-bulb temperature is 78°F (26°C) and the wet-bulb temperature is 68°F (20°C). What is the relative humidity? illustration D008DG
***60 (%)***

**Illustrations**: D008DG_WM_012814
See REF1041

The dry bulb temperature in 78° F (25.6°C) and the wet bulb temperature is 78°F (25.6° C). What is the relative humidity?
***1***

**Illustrations**: D008DG_WM_012814
See REF1041

Cumulonimbus clouds are formed by _____.
***vertical air movements***
See REF950

Which cloud commonly produces a halo about the Sun or Moon?
***Cirrostratus***
See REF950

Fog forms when the air _____.
***temperature is equal to, or below the dew point temperature***
See REF364

The fog produced by warm moist air passing over a cold surface is called _____.
***advection fog***
See REF364

Which of the following represents the slope of a warm front?
***1 mile vertically to 150 miles horizontally***

In the Northern Hemisphere, what do winds veering sharply to the west or northwest with increasing speed indicate?
***cold front has passed***

The first indications a mariner will have of the approach of a warm front will be _____.
***high cirrus clouds gradually changing to cirrostratus and then to altostratus***

That half of the hurricane to the right hand side of its track (as you face the same direction that the storm is moving) in the Northern Hemisphere is called the _____.
***dangerous semicircle***

Which statement is FALSE concerning the dangerous semicircle of a hurricane?
***The rain is heavier***

The dense black cumulonimbus clouds surrounding the eye of a hurricane are called _____.
***cloud walls***

In the Northern Hemisphere, the largest waves or swells created by a typhoon or hurricane will be located _____.
***forward and to the right of its course***

The hurricane season in the North Atlantic Ocean reaches its peak during the month of _____.
***September***

You are underway on course 050°T and your maximum speed is 10 knots. The eye of a hurricane bears 100°T, 90 miles from your position. The hurricane is moving towards 285°T at 19 knots. Which course should you steer at 10 knots to have the maximum CPA?
***226°***

Which meteorological feature controls the climate of the Gulf and the Gulf Coast area during late spring and summer?
***The Bermuda High***
See REF1034

If you observe a rapid fall of barometric pressure you should _____.
***prepare for the onset of stormy weather with strong winds***

The daily recurring pattern of pressure changes most noticeable in low latitudes is the _____.
***diurnal variation of pressure Center***

Most high pressure areas in the United States are accompanied by _____.
***clear, cool weather***

As the temperature of an air mass decreases, the _____.
***relative humidity increases***
See REF1041

Your vessel is on course 180°T speed 22 knots. The apparent wind is from 70° off the port bow, speed 20 knots. The true direction and speed of the wind are _____.
***51°T, 24.0 knots***
See REF1043

The speed at which an ocean wave system advances is called _____.
***group velocity***

A mercurial barometer at sea is subject to rapid variations in height ("pumping") due to the pitch and roll of the vessel. To avoid this error, measurements of atmospheric pressure at sea are usually measured with a(n) _____.
***aneroid barometer***
See REF1051

An instrument that indicates wind direction is known as a(n) _____.
***wind vane***

Which indication on the barometer is most meaningful in forecasting weather?
***The direction and rate of change of barometric pressure***
See REF1041

You are operating on the Red River Waterway, a warm front has passed and your vessel is in the warm sector. What wind conditions would you expect at your vessel?
***Generally steady winds***

When drawing a weather map and an isobar crosses a front, the isobar is drawn _____.
***kinked and pointing away from the low***
See REF1071

Weather forecast messages are usually _____.
***broadcast in plain language***

The "horse latitudes" are regions of _____.
***light airs and calms***
See REF939

A very light breeze that causes ripples on a small area of still water is a _____.
***cat's paw***

Which type of cloud is the classic "thunderhead"?
***Cumulonimbus***
See REF950

Which type of cloud is composed entirely of ice crystals and is found at very high altitudes?
***Cirrus***
See REF950

What will act to dissipate fog?
***Downslope motion of an air mass along a coast***
See REF364

Advection fog is most commonly caused by _____.
***warm moist air being blown over a colder surface***
See REF362

Which condition will occur after a cold front passes?
***Humidity decreases***

You can expect frontal activity when two air masses collide and _____.
***there are significant differences between the temperature of each air mass***

What is typical of warm front weather conditions?
***Steady precipitation***

Where is the dangerous semicircle located on a hurricane in the Southern Hemisphere?
***To the left of the storm's track***

You can determine if your vessel's position is in the dangerous or navigable semicircle of a hurricane by _____.
***Both A and B***

The strongest winds and heaviest rains in a hurricane are found in the _____.
***cloud walls***

What indicates that a tropical cyclone may be within 500 to 1,000 miles of your position?
***A pumping of the barometer up and down a few millibars***

Hurricanes may move in any direction. However, it is rare and generally of short duration when a hurricane in the Northern Hemisphere moves toward the _____.
***southeast***

You are underway on course 120°T and can make 12 knots. The eye of a hurricane bears 150°T at 120 miles. The hurricane is on course 295° at 20 knots. What course should you steer at 12 knots to have the maximum CPA?
***348°***

A type of precipitation that occurs only in thunderstorms with strong convection currents that convey raindrops above and below the freezing level is known as _____.
***hail***

As a high pressure system approaches, the barometer reading _____.
***rises***

In low latitudes the range of the diurnal variation of pressure is up to _____.
***3.0 millibars***

The atmosphere in the vicinity of a high pressure area is called a(n) _____.
***anticyclone***
See REF1038

Relative humidity is defined as _____.
***the ratio of the actual vapor content at the current temperature to the air's vapor holding capability***
See REF1041

The velocity of the wind, its steady direction, and the amount of time it has blown determines a wind driven current's _____.
***speed***

An instrument that maintains a continuous record of humidity changes is called a _____.
***hygrograph***
See REF1052

If your mercurial barometer reads 30.50 inches (1033 millibars) and the temperature is 56°F (13°C), what is the correct reading at 55°N, 150°W?
***30.45 inches (1031 millibars)***

The most important information to be obtained from a barometer is the _____.
***present reading of the pressure, combined with the changes in pressure observed in the recent past***

The wind speed and direction observed from a moving vessel is known as _____.
***apparent wind***

On a weather map, a large letter "H" means _____.
***a high pressure area with cool, dry air, and fair weather***

Weather observations provided by each weather station include all of the following except _____.
***predicted weather for the next twelve hours***

In regions near the poles, the winds are generally described as _____.
***easterlies***

What will a veering wind do?
***Change direction in a clockwise manner in the Northern Hemisphere***

A sign of thunderstorm development is a cumulus cloud _____.
***creating cold downdrafts that are felt on the ground***
***darkening, growing in size and forming an anvil top***
***that shows extensive vertical development***
***All of the above.***
See REF950

The bases of middle clouds are located at altitudes of between _____.
***6,500 to 20,000 feet (1981 to 6096 meters)***
See REF950

Fog is formed when _____.
***the moisture in the air is condensed into small droplets***
***air is cooled to its dew point***
***the base of a cloud is on the ground***
***All of the above.***
See REF364

How is an occluded front represented on a weather map?
***purple line***

Which of the following typically happens to the barometric pressure after a cold front passes?
***rises, often quite rapidly, with clearing skies***

Cumulonimbus clouds are most likely to accompany a(n) _____.
***cold front***
See REF950

The first indications a mariner will have of the approach of a warm front will be _____.
***high clouds gradually followed by lower thicker clouds***

The navigable semicircle of a tropical storm in the South Indian Ocean is located on which side of the storm's track?
***Right***

In the Northern Hemisphere, the right half of the storm is known as the dangerous semicircle because _____.
***the seas are higher because of greater wind speed***
***The wind speed is greater here since the wind is traveling in the same general direction as the storm's track***
***the direction of the wind and seas might carry a vessel into the path of the storm***
***All of the above.***

Which kind of conditions would you observe as the eye of a storm passes over your vessel's position?
***Huge waves approaching from all directions, clearing skies, light winds, and an extremely low barometer***

What kind of pressure systems travel in tropical waves?
***Low pressure***

The intensity of a hurricane as it reaches higher latitudes and cooler waters _____.
***decreases***

You are underway on course 120°T and your maximum speed is 12 knots. The eye of a hurricane bears 150°T, 120 miles from your position. The hurricane is moving towards 295°T at 20 knots. If you maneuver at 12 knots to avoid the hurricane, what could be the maximum CPA?
***117 miles***

A light, feathery deposit of ice caused by the sublimation of water vapor directly into the crystalline form, on objects whose temperatures are below freezing, is called _____.
***frost***

In the Southern Hemisphere winds in a low pressure system rotate in a _____.
***clockwise direction***

In low latitudes, the high(s) of the diurnal variation of pressure occur(s) at _____.
***1000 and 2200***

A phenomenon where the atmospheric pressure is higher than that of other surrounding regions is called _____.
***a high pressure area; an anticyclone; or a "high"***
See REF1038

On the Mississippi and Ohio Rivers, there is a special type of fog known as steam fog. It is caused by _____.
***cold air passing over much warmer water***
See REF1042

Swells that have outrun the storm are produced in the _____.
***right front quadrant***

An instrument which maintains a continuous record of temperature changes is called a _____.
***thermograph***
See REF1052

The correction(s) which must be applied to an aneroid barometer reading include(s) _____.
***height error***

Which instrument is used to predict the approach of a low pressure system?
***Barometer***
See REF1062

The apparent wind's speed can be zero, but only when two conditions are present. One condition is that the true _____.
***wind's speed equals the ship's speed***
See REF1067

You can follow the approach of a dangerous cyclonic storm by inspecting _____.
***a newspaper, a weather map, a weather fax, or a weather forecast***

Plain language is usually used on marine weather _____.
***forecasts***

The greater the pressure difference between a high and a low pressure center, the _____.
***greater the force of the wind will be***

In the Northern Hemisphere, a wind that shifts counterclockwise is a _____.
***backing wind***

From which type of cloud can a tornado or waterspout develop?
***Cumulonimbus***
See REF950

Which list of clouds is in sequence, from highest to lowest in the sky?
***Cirrostratus, altostratus, stratus***
See REF950

Radiation fog _____.
***is formed by a temperature inversion***
See REF364

Which of the following statements concerning frontal movements is TRUE?
***A cold front generally passes faster than a warm front.***

When a cold air mass and a warm air mass meet, and there is no horizontal motion of either air mass, it is called a(n) _____.
***stationary front***

Steady precipitation is typical of _____.
***a warm front weather condition***

The navigable semicircle of a typhoon in the Southern Hemisphere is the area _____.
***to the right of the storm's track***

When navigating coastwise and hurricane warnings are received, you should _____.
***have battened down and be heading for the nearest port of refuge***

The eye of a hurricane is surrounded by dense black cumulonimbus clouds which are called the _____.
***wall cloud***

Low pressure disturbances, which travel along the intertropical convergence zone, are called _____.
***tropical waves***

Recurvature of a hurricane's track usually results in the forward speed _____.
***increasing***

You are underway on course 050°T and your maximum speed is 11 knots. The eye of a hurricane bears 070°T, 80 miles from your position. The hurricane is moving towards 270°T at 19 knots. What course should you steer at 11 knots to have the maximum CPA?
***215°***

Which type of precipitation is a product of the violent convection found in thunderstorms?
***Hail***

The standard atmospheric pressure measured in inches of mercury is _____.
***29.92***

In low latitudes, the low(s) of the diurnal variation of pressure occur(s) at _____.
***0400 and 1600***

In the Southern Hemisphere the wind circulation in a high pressure system rotates _____.
***counterclockwise and outward***

Steam fog is most likely to occur on the Mississippi and Ohio Rivers in _____.
***summer, around early morning***

Above-normal tides near the center of a hurricane may be caused by the _____.
***storm surge***
See REF1045

The largest waves (heaviest chop) will usually develop where the wind blows _____.
***against the flow of the current***

An anemometer on a moving vessel measures _____.
***apparent wind speed only***
See REF1053

Barometers are calibrated at a standard temperature of _____.
***32°F***

The passing of a low pressure system can be determined by periodically checking the _____.
***barometer***

In most cases, the direction of the apparent wind lies between the bow and _____.
***the direction of the true wind***
See REF1068

While in port, you can follow the approach of a dangerous cyclonic storm by inspecting _____.
***a weather map***

Wind velocity varies _____.
***directly with the pressure gradient***

Air circulation is caused or affected by _____.
***the rotation of the earth on its axis***
***mountain ranges***
***convection currents caused by differences in radiant heating between equatorial and polar regions***
***All of the above.***

In the Northern Hemisphere a wind is said to veer when the wind _____.
***changes direction clockwise, as from north to east, etc.***

Small, visible mound-like protuberances on the bottom of cumulonimbus clouds, that are potential breeding grounds for waterspouts and tornadoes, are called _____.
***mamma***
See REF950

A low, uniform layer of cloud resembling fog, but not resting on the ground, is called _____.
***stratus***
See REF950

Fog forms when the air temperature is at or below _____.
***the dew point***
See REF364

Which statement is TRUE when comparing cold and warm fronts?
***Cold fronts are more violent and of shorter duration.***

When a warm air mass is adjacent to a cold air mass, the separation line between the two is called a(n) _____.
***front***

The approximate distance to a storm center can be determined by noting the hourly rate of fall of the barometer. If the rate of fall is 0.08 - 0.12 inches, what is the approximate distance to the storm center?
***80 to 100 miles***

The safest and most prudent procedure to follow while navigating in the vicinity of a tropical cyclone is to _____.
***take positive steps to avoid it if possible***

A vessel entering the eye of a hurricane should expect _____.
***the barometer to reach the lowest point***
***moderating winds and heavy confused seas to strike his vessel from all directions***
***the winds to increase to hurricane force and strike from a different direction as the eye passes***
***All of the above.***

A easterly wave is located 200 miles due west of your position, which is north of the equator. Where will the wave be in 24 hours?
***Farther away to the west***

What is the average speed of movement of a hurricane prior to recurvature?
***10 to 12 knots***

You are underway on course 050°T and your maximum speed is 11 knots. The eye of a hurricane bears 070°T, 80 miles from your position. The hurricane is moving towards 270°T at 19 knots. If you maneuver at 11 knots to avoid the hurricane, what could be the maximum CPA?
***66 miles***

Which of the following is NOT a form of precipitation?
***frost***

A generally circular low pressure area is called a(n) _____.
***cyclone***
See REF1038

The diurnal variation of pressure is most noticeable _____.
***in the doldrums***
See REF1040

Compared to a low pressure system, generally the air in a high is _____.
***cool, more dense, and drier***

While upbound through Memphis, the weather report on the TV news indicates that a cold front will cross western Kentucky and Tennessee the next morning. What weather should accompany this front?
***Gusting winds shifting to the northwest with thunderstorms***

A tsunami is caused by a(n) _____.
***earthquake on the ocean's floor***
See REF1046

The time interval between successive wave crests is called the _____.
***period***

Apparent wind speed blowing across your vessel while underway can be measured by a(n) _____.
***anemometer***
See REF1053

The barometer is an instrument for measuring the _____.
***atmospheric pressure***

Which of the following is the most useful factor for predicting weather?
***The rate and direction of change of barometric readings***

The velocity of the apparent wind can be less than the true wind and from the same direction, if certain conditions are present. One condition is that the _____.
***true wind is from dead astern***

You can follow the approach of a dangerous cyclonic storm by inspecting _____.
***a weather fax***

The force resulting from the earth's rotation that causes winds to deflect to the right in the Northern Hemisphere and to the left in the Southern Hemisphere is called _____.
***Coriolis effect***
See REF1031

The appearance of nimbostratus clouds in the immediate vicinity of a ship at sea would be accompanied by which of the following conditions?
***Rain and poor visibility***
See REF950

Cloud formations are minimal when the _____.
***surface temperature and temperature aloft are equal***
See REF950

While on watch, you notice that the air temperature is dropping and is approaching the dew point. Which type of weather should be forecasted?
***Fog***
See REF364

When cold air displaces warm air you have a(n) _____.
***cold front***

Your facsimile prognostic chart indicates that you will cross the cold front of a low pressure system in about 24 hours. You should _____.
***prepare for gusty winds, thunderstorms, and a sudden wind shift***

How does visibility change after the passage of a cold front?
***visibility will improve rapidly***

You have determined that you are in the right semicircle of a tropical cyclone in the Northern Hemisphere. What action should you take to avoid the storm?
***Place the wind on the starboard bow and hold that course.***

When your vessel is on the storm track but behind the storm's center the _____.
***wind speed decreases***
***barometer rises***
***wind direction remains steady***
***All of the above.***

Tropical cyclones normally form within which of the following belts of latitude?
***5° to 15°***
See REF1031

You are in the Northern Hemisphere and a tropical wave is located 200 miles due west of your position. Where will the wave be located 24 hours later?
***Farther away to the west***

What is the average speed of the movement of a hurricane following the recurvature of its track?
***20 to 30 knots***

You are underway on course 050°T and your maximum speed is 12 knots. The eye of a hurricane bears 120°T, 110 miles from your position. The hurricane is moving towards 285°T at 25 knots. What course should you steer at 12 knots to have the maximum CPA?
***346°***

Which condition(s) is(are) necessary for the formation of dew?
***Earth's surface cooler than the dew point of the air***
***Clear skies***
***Calm air***
***All of the above.***
See REF1035

When observing a rapid rise in barometric pressure, you may expect _____.
***clearing weather, possibly accompanied by high winds***

The diurnal variation of pressure is not visible in the middle latitudes in winter because _____.
***it is masked by the pressure changes of moving weather systems***
See REF1040

Which weather system produces strong cold winds called "Northers" during the winter months in the Gulf of Mexico?
***A cyclone***
***An anticyclone***
***Both A and B***
See REF1038

While passing through Memphis, the weather report on the TV news indicates that a cold front is crossing western Kentucky and Tennessee. Tomorrow's weather will be dominated by a high pressure area. What weather should you expect tomorrow?
***Moderate winds from the northwest, clear visibility and cooler temperatures***

If the current and wind are in opposite directions, the sea surface represents _____.
***a higher wind speed than what really exists***

In shallow water, waves that are too steep to be stable, causing the crests to move forward faster than the rest of the wave, are called _____.
***breakers***

An aneroid barometer is an instrument _____.
***in which the pressure of the air is measured***
See REF1054

Which of the following is a standard correction applied to the reading of an aneroid barometer?
***elevation***
See REF1058

The needle of an aneroid barometer points to 30.05 on the dial. This indicates that the barometric pressure is _____.
***30.05 inches of mercury***
See REF1058

The velocity of the apparent wind can be more than the true wind, and come from the same direction, if certain conditions are present. One condition is that the _____.
***true wind must be from dead ahead***
See REF1067

Which weather element cannot be measured accurately while on board a moving vessel?
***Wave period***

What generally occurs when the land is cooler than the nearby water?
***A land breeze***
See REF1079

The low, dark, sheet-like cloud which is associated with continuous precipitation for many hours is a _____.
***nimbostratus cloud***
See REF950

Clouds form _____.
***as a mass of warm, humid air rises into the atmosphere and cools, condensing moisture into small droplets***
See REF950

When compared to air temperature, which factor is most useful in predicting fog?
***Dew point***
See REF203

On a working copy of a weather map, a cold front is represented by what color line?
***Blue***

When crossing a front how do isobars tend to change?
***change from smooth curves within the air mass to sharp bends at the front***

When a warm air mass overtakes and replaces a cold air mass, the contact surface is called a(n) _____.
***warm front***

If you count 20 seconds between seeing lightning and hearing the thunder, how far is the storm away from you?
***4 miles***

Which condition indicates that you are in a hurricane's dangerous semicircle in the Northern hemisphere?
***A veering wind***

If a hurricane several hundred miles away is moving in your general direction your barometer would _____.
***start to fall gradually***

Tropical cyclones do not form within 5° of the Equator because _____.
***of negligible Coriolis force***
See REF1031

You are in the Northern Hemisphere and a tropical wave is located 200 miles due east of your position. Where will the wave be located 12 hours later?
***Nearby to the east***

The wind velocity is higher in the dangerous semicircle of a tropical cyclone because of the _____.
***wind circulation and forward motion of the storm***

You are underway on course 050°T and your maximum speed is 12 knots. The eye of a hurricane bears 120°T, 110 miles from your position. The hurricane is moving towards 285°T at 25 knots. If you maneuver at 12 knots to avoid the hurricane, what could be the maximum CPA?
***77 miles***

A slow, gradual fall of the barometer indicates approaching _____.
***deteriorating or unsettled weather***
See REF1036

What is a common unit of measure for atmospheric pressure?
***Inches***

Generally speaking, in the Northern Hemisphere, when winds are blowing from between SE and SW the barometric reading _____.
***is somewhat lower than it would be for winds from a northern quadrant***

You are located within a stationary high pressure area. Your aneroid barometer is falling very slowly. This indicates a(n) _____.
***decrease in the pressure of the system***

While upbound through Memphis, the weather report on TV news indicates that a warm front is stationary over the Kentucky - Missouri - Tennessee areas. What weather conditions should you expect?
***Southerly winds with steady rain; fog or overcast***

If the current and wind are in the same direction, the sea surface represents a wind speed _____.
***lower than actually exists***

The rise and fall of the ocean's surface due to a distant storm is known as _____.
***swell***
See REF1049

An aneroid barometer on a boat should always be _____.
***permanently mounted***
See REF1054

In a microbarograph, the pen should be checked and the inkwell filled _____.
***each time the chart is changed***
See REF1059

Aneroid barometers are usually calibrated to indicate atmospheric pressure in _____.
***inches of mercury and millibars***
See REF1063

Which weather element cannot be measured accurately while on board a moving vessel?
***Visibility***

In a weather report, the term "visibility" expresses _____.
***the distance in miles at which prominent objects are identifiable***

The direction of the surface wind is _____.
***from high pressure toward low pressure deflected by the earth's rotation***

A katabatic wind blows _____.
***down an incline due to cooling of the air***

The probability of a sudden wind may be foretold by _____.
***a fast approaching line of dark clouds***
See REF950

How are cumulonimbus clouds formed?
***By vertical air movements***
See REF950

Clouds are classified according to their _____.
***altitude and how they were formed***
See REF950

The type of fog that occurs on clear nights with very light breezes and forms when the earth cools rapidly ?
***radiation fog***
See REF364

What type of clouds are associated with a cold front?
***Cumulus and cumulonimbus***
See REF950

A series of brief showers accompanied by strong, shifting winds may occur along or some distance ahead of a(n) _____.
***cold front***

What is true about a front?
***A front is a boundary between two air masses.***
***There are abrupt temperature differences on opposite sides of a front.***
***The pressure tendencies are different on opposite sides of a front.***
***All of the above.***

Despite weather predictions for continued good weather, a prudent mariner should be alert for all of the following, EXCEPT a sudden _____.
***drop in temperature***

The left half of the storm is called the navigable semicircle because _____.
***Both A and B***

The National Weather Service differentiates between small craft, gale, whole gale, and hurricane warnings by the _____.
***wind speed forecasted***

Severe tropical cyclones (hurricanes, typhoons) occur in all warm-water oceans except the _____.
***South Atlantic Ocean***

What kind of weather would you expect to accompany the passage of a tropical wave?
***Heavy rain and cloudiness***

How can you estimate the position of a tropical storm's center?
***With a radio weather bulletin or weather fax***
***using shipboard radar***
***observe the wind direction and apply Buys Ballot's law***
***All of the above.***

You are underway on course 050°T and your maximum speed is 12 knots. The eye of a hurricane bears 080°T, 100 miles from your position. The hurricane is moving towards 265°T at 22 knots. If you maneuver at 12 knots to avoid the hurricane, what could be the maximum CPA?
***63 miles***

In the Northern Hemisphere, when the center of a high pressure system is due east of your position, you can expect winds from the _____.
***south to east***
See REF889

The wind direction around a low pressure area in the Northern Hemisphere is _____.
***counterclockwise and inward***

A decrease in barometric pressure is associated with all of the following except _____.
***clear dry weather***

Wind direction may be determined by observing all of the following EXCEPT _____.
***swells***
See REF1043

You are anchored in the Aleutian Island chain and receive word that a tsunami is expected to strike the islands in six hours. What is the safest action?
***Get underway and be in deep, open-ocean water when the tsunami arrives.***

Swell is the rise and fall of the ocean's surface due to _____.
***distant winds***

A sylphon cell is a part of a _____.
***barograph***
See REF1054

Which correction(s) must be applied to an aneroid barometer?
***Instrument error and height error***
See REF1060

Barometer readings in weather reports are given in terms of pressure at _____.
***sea level***

An isotherm is _____.
***a line connecting points of equal temperature on a weather map***
See REF1069

Weather information provided by the National Weather Service (NWS) advisories should be used along with _____.
***weather maps and local knowledge***

The doldrums are characterized by _____.
***frequent calms***

Which cloud type is normally associated with thunderstorms?
***Cumulonimbus***
See REF950

Clouds with the prefix "nimbo" in their name _____.
***are rain clouds***
See REF950

Which type of cloud is among the most dependable for giving an indication of an approaching weather system?
***Altostratus***
See REF950

As the temperature of the air reaches the dew point, _____.
***fog may form***
See REF364

On a working copy of a weather map what color is the line that represents a stationary front?
***Alternating red and blue***

What happens to the barometric pressure after a cold front passes?
***rises, and the temperature drops***

Which of the following is a boundary between two air masses?
***front***
See REF1028

You are enroute from Puerto Rico to New York. A hurricane makes up and is approaching. If the wind veers steadily, this indicates that your vessel is _____.
***in the dangerous semicircle***

In the Northern hemisphere which semicircle of a hurricane is the navigable semicircle?
***Left***

When a hurricane passes over colder water or land and loses its tropical characteristics, the storm becomes a(n) _____.
***extratropical low-pressure system***
See REF1030

Tropical cyclones are classified by form and intensity. Which system does not have closed isobars?
***Tropical disturbance***

In the Northern Hemisphere, what type of cloud formations would you expect to see to the west of an approaching tropical wave?
***Cumulus clouds lined up in rows extending in a northeast to southwest direction***

A storm's track is characterized by all of the following except _____.
***the speed at which the storm is moving***

Mechanical lifting of air by the upslope slant of the terrain is called _____.
***topographic lifting***

A millibar is a unit of _____.
***pressure***
See REF937

In the Northern Hemisphere, an area of counterclockwise wind circulation surrounded by higher pressure is a _____.
***low***

When your barometer reading changes from 30.25 to 30.05 in a 12-hour period it indicates _____.
***little or no immediate change***

The best estimate of the wind direction at sea level can be obtained from observing the direction of the _____.
***waves***
See REF1043

What should you expect when you encounter a tsunami in the open ocean?
***No noticeable change from the existing sea state***

Three or four feet of the total height of a storm surge in a hurricane can be attributed to _____.
***the decrease in atmospheric pressure***

A wind vane on a moving vessel shows _____.
***apparent wind direction***
See REF1055

Atmospheric pressure may be measured with a(n) _____.
***mercurial barometer***
***aneroid barometer***
***barograph***
***All of the above.***

Scales on aneroid barometers are usually graduated in inches of mercury in the general range of _____.
***28 to 31 inches***

In reading a weather map, closely spaced pressure gradient lines would indicate _____.
***high winds***
See REF1039

As a Merchant Marine Officer you are expected to be able to do which of the following?
***listen to weather forecasts on the radio while enroute***
***obtain a weather forecast before setting out from port***
***understand all broadcast weather warning information***
***All of the above.***

"Surface circulation" is another term for _____.
***wind in the lower troposphere***

In many areas "atoll" clouds (clouds of vertical development) are produced over small islands. These are the result of _____.
***rising air currents produced by the warm islands***
See REF950

Uniform, grayish-white cloud sheets that cover large portions of the sky, and are responsible for a large percentage of the precipitation in the temperate latitudes, are called _____.
***altostratus***
See REF950

Which type of weather could you expect soon after seeing "hook" or "comma" shaped cirrus clouds?
***Rain with the approach of a warm front***
See REF950

Fog is likely to occur when there is little difference between the dew point and the _____.
***air temperature***
See REF364

What weather change accompanies the passage of a cold front in the Northern Hemisphere?
***A line of cumulonimbus clouds***

How does the temperature change with the passage of an occluded front?
***depends on whether warm type or cold type occlusion***

When a warm air mass overtakes a cold air mass, the contact surface is called a _____.
***warm front***

If it is impossible to avoid a hurricane in the Northern Hemisphere, the most favorable place to be when the storm passes is in _____.
***that half of the storm lying to the left of the storm's path***

In the Northern Hemisphere, if your vessel is in a hurricane's navigable semicircle it should be positioned with the wind on the _____.
***starboard quarter, hold course and make as much speed as possible***

The first cloud formations you can use to indicate the bearing of the center of a hurricane or tropical storm are _____.
***the point of convergence of the cirrus clouds***

What classification of tropical cyclone would have closed isobars, counter clockwise rotary circulation, and sustained winds between 34 and 63 knots?
***A tropical storm***

A tropical wave is usually preceded by _____.
***good weather***

Cyclones tend to move _____.
***parallel to the isobars in their warm sectors***

The region containing 3/4 of the mass of the atmosphere and the region to which are confined such phenomena as clouds, storms, precipitation and changing weather conditions is called _____.
***troposphere***
See REF1032

A rapid rise or fall of the barometer indicates _____.
***a change in the present weather conditions***
See REF1037

Two well-developed high pressure areas may be separated by a _____.
***trough of low pressure***

While taking weather observations, you determine that the wind is blowing from the northeast. You would record the wind direction in the weather log as _____.
***045°***
See REF1043

You are steaming in the open ocean of the North Pacific between the Aleutian Chain and Hawaii. A warning broadcast indicates that an earthquake has occurred in the Aleutians and has generated a tsunami that is predicted to hit Hawaii. What action is necessary for the ship's safety?
***No special action as tsunamis are inconspicuous in the open ocean***
See REF1047

The chart of a beach area shows a very steep slope to the underwater beach bottom. Which type of breakers can be expected when trying to land a boat on this beach?
***Surging***

Which of the following statements is FALSE?
***A psychrometer measures wind pressure.***

A barometric pressure reading of 29.92 inches of mercury is equivalent to _____.
***1013.25 millibars***

Isobars on a weather map are useful in predicting _____.
***wind velocity***
See REF1070

What benefit is a weather bulletin to a mariner?
***It gives the mariner time to prepare for weather changes.***

A weather forecast states that the wind will commence backing. In the Northern Hemisphere, this would indicate that it will _____.
***shift in a counterclockwise manner***
See REF1078

A cloud of marked vertical development (often anvil-shaped) would be classified as _____.
***cumulonimbus***
See REF950

Altocumulus clouds are defined as _____.
***middle clouds***
See REF950

What occurs when rising air cools to the dew point?
***Clouds form***
See REF950

Fog generally clears when the _____.
***temperature increases***
***wind direction changes***
***wind speed increases***
***All of the above.***
See REF364

A cold front moving in from the northwest can produce _____.
***thunderstorms, hail, and then rapid clearing***

As a cold front passes how do the pressure and the winds change?
***pressure rises and winds become gusty***

As it approaches, a typical warm front will bring _____.
***rising temperatures and falling barometric pressure***

The dangerous semicircle of a typhoon in the Southern Hemisphere is that area _____.
***to the left of the storm's track***

Which condition suggests that your present position lies in the navigable semicircle of a tropical storm?
***A backing wind***

When a tornado moves over the water from land it is called a _____.
***waterspout***

What level of development of a tropical cyclone has a hundred mile radius of circulation, gale force winds, less than 990 millibars of pressure and vertically formed cumulonimbus clouds?
***A tropical storm***

Ocean swells originating from a typhoon can move ahead of it at speeds near _____.
***50 knots***

In a cyclone the lowest pressure is found in the _____.
***center***

The Earth's irregular heating is caused by _____.
***the time of day***
***the seasons***
***geography***
***All of the above.***

When a high pressure system is centered north of your vessel in the Northern Hemisphere _____.
***the wind direction is generally easterly***
See REF889

When a low pressure area is approaching, the weather generally _____.
***worsens***

Generally speaking, you should expect to find low atmospheric pressure prevailing in the earth's _____.
***equatorial area***

Relative humidity is the percentage of water vapor that is in the air as compared to the maximum amount it can hold at _____.
***a specific temperature***
See REF1041

When reporting wind direction, you should give the direction in _____.
***true degrees***
See REF1043

The height of a wave is the vertical distance _____.
***from crest to trough***

The ocean bottom that extends from the shoreline out to an area where there is a marked change in slope to a greater depth is the _____.
***continental shelf***

For an accurate barometer check, you would _____.
***check it against radio or National Weather Service reports of the immediate vicinity***

A single barometric pressure reading of 28.60 indicates _____.
***a severe low pressure system***

A steep barometric gradient indicates _____.
***strong winds***

Weather information is available from _____.
***VHF-FM continuous marine weather broadcasts provided by the National Weather Service***
***commercial radio broadcasts***
***the Coast Guard on scheduled marine information broadcasts***
***All of the above.***

A weather forecast states that the wind will commence veering. In the Northern Hemisphere this indicates that the wind will _____.
***shift in a clockwise manner***
See REF1078

A "Norther" in the Gulf of Mexico is _____.
***a strong northerly wind that generally occurs between November and March***
***a forcible northerly wind of at least 20 knots***
***a wind shift to the north accompanied by a drop in temperature***
***All of the above.***

On a clear, warm day, you notice the approach of a tall cumulus cloud. The cloud top has hard well defined edges and rain is falling from the dark lower edge. Should this cloud pass directly overhead _____.
***it will be preceded by a sudden increase in wind speed***
See REF950

If the sky was clear, with the exception of a few cumulus clouds, it would indicate _____.
***fair weather***
See REF950

The presence of stratus clouds and a dying wind will usually result in _____.
***thick fog***
See REF950

Steam smoke will occur when _____.
***extremely cold air from shore passes over warmer water***
See REF364

On a working copy of a weather map what color is the line that represents a warm front?
***Red***

Which of the following causes the development of an occluded front?
***cold front overtaking a warm front***

Which of the following causes a frontal thunderstorm?
***a warm air mass rising over a cold air mass***

The dangerous semicircle of a hurricane in the Northern Hemisphere is that area of the storm _____.
***to the right of the storm's track***

In the Northern Hemisphere, your vessel is believed to be in the direct path of a hurricane, and plenty of sea room is available. The best course of action is to bring the wind on the _____.
***starboard quarter, note the course, and head in that direction***

Which condition would NOT indicate the approach of a tropical storm?
***Decrease in wind velocity***

What is the first visible indication of the presence of a tropical cyclone or hurricane?
***An exceptionally long swell***

You are underway on course 050°T and your maximum speed is 13 knots. The eye of a hurricane bears 120°T, 100 miles from your position. The hurricane is moving towards 265°T at 25 knots. What course should you steer at 13 knots to have the maximum CPA?
***324°T***

What is the primary source of the earth's weather?
***The sun***

A slow rise in the barometric pressure forecasts _____.
***improving weather conditions***

A barometer showing falling pressure indicates the approach of a _____.
***low pressure system***

Which general weather conditions should you expect to find in a low pressure system?
***Precipitation and cloudiness***

The dew point is reached when the _____.
***air becomes saturated with water vapor***
See REF940

When recording the wind direction in the weather log, you would report the _____.
***direction the wind is blowing from***
See REF1043

The length of a wave is the length _____.
***measured from crest to crest***

Swell is the rise and fall of the ocean's surface due to _____.
***distant winds***

The purpose of the "set" hand on an aneroid barometer is to _____.
***indicate any change in the reading of the barometer***

You should log all barometer readings taken at sea _____.
***regularly***
***at least once during each watch***
***more often under changeable weather conditions***
***All of the above.***

A line on a weather chart connecting places which have the same barometric pressure is called an _____.
***isobar***

Static on your AM radio may be _____.
***an indication of nearby thunderstorm activity***

A local wind which occurs during the daytime and is caused by the different rates of warming of land and water is a _____.
***sea breeze***
See REF1079

Which type of cloud formation should be of immediate concern to small craft operators?
***cumulonimbus***
See REF950

The form of cloud often known as "mackerel sky" which is generally associated with fair weather is _____.
***cirrocumulus***
See REF950

Which condition would most likely result in fog?
***Warm moist air blowing over cold water***
See REF364

A line of clouds, sharp changes in wind direction, and squalls are most frequently associated with a(n) _____.
***cold front o***

Which type of front forms when a cold front overtakes and forces a warm front upwards?
***An occluded front***

Squall lines with an almost unbroken line of threatening dark clouds and sharp changes in wind direction, generally precede a(n) _____.
***fast-moving cold front***

The navigable semicircle of a hurricane in the Northern Hemisphere is that area of the storm measured _____.
***from the direction of the storm's movement counterclockwise 180°***

If you are caught in the left semicircle of a tropical storm, in the Southern Hemisphere, you should bring the wind _____.
***on the port bow, and make as much way as possible***

What is the direction of rotation of tropical cyclones, tropical storms and hurricanes in the Northern Hemisphere?
***Counterclockwise and inward***

Early indications of the approach of a hurricane may be all of the following EXCEPT _____.
***short confused swells***

Your present weather is sunny with a steady barometer. A low swell approaches your vessel from the south with crests passing at relatively long periods of about four per minute. This usually indicates _____.
***a tropical cyclone south of your vessel***

You are underway on course 050°T and your maximum speed is 10 knots. The eye of a hurricane bears 100°T, 90 miles from your position. The hurricane is moving towards 285°T at 19 knots. If you maneuver at 10 knots to avoid the hurricane, what could be the maximum CPA?
***53 miles***

The climate of the northern Gulf coast _____.
***is a warm marine type of climate***

Atmospheric pressure may be measured with a(n) _____.
***29.92 inches of mercury***
***14.7 pounds per square inch***
***1013.25 millibars***
***All of the above.***

Stormy weather is usually associated with regions of _____.
***low barometric pressure***

Two well-developed low pressure areas may be separated by a _____.
***ridge of higher pressure***

The expression "the air is saturated" means _____.
***the relative humidity is 100%***
See REF1041

Your ship is proceeding on course 320°T at a speed of 25 knots. The apparent wind is from 30° off the starboard bow, speed 32 knots. What is the relative direction, true direction and speed of the true wind?
***Relative 80°, true 040°T, 16.2 knots***
See REF1043

What is the distance from the bottom of a wave trough to the top of a wave crest?
***Wave height***

The chart of a beach area shows a very flat slope to the underwater beach bottom. What type of breakers can be expected when trying to land a boat on this beach?
***Spilling***

A hygrometer is a device used for determining _____.
***relative humidity***
See REF1057

On what does the operation of an aneroid barometer depend?
***Thin, metal, air tight cell***
See REF1054

Which instrument is used to measure the relative humidity of the air?
***A hygrometer***
See REF1064

Lines drawn through points on the Earth having the same atmospheric pressure are known as _____.
***isobars***
See REF1071

While taking weather observations, you determine that the wind is coming from the west. In the weather log, you would record the wind direction as _____.
***270°***

The area of strong westerly winds occurring between 40°S and 60°S latitude is called the _____.
***roaring forties***

A sea breeze is a wind _____.
***that blows towards an island during the day***
See REF1079

All of the following are associated with cumulonimbus clouds EXCEPT _____.
***steady rainfall***
See REF950

High clouds, composed of small white flakes or scaly globular masses, and often banded together to form a "mackerel sky", would be classified as _____.
***cirrocumulus***
See REF950

When warm moist air blows over a colder surface and is cooled below its dew point, the result is _____.
***advection fog***

See REF364

Which type of frontal passage is associated with a relatively narrow band of precipitation?
***A cold front***

In the Northern Hemisphere, gusty winds shifting clockwise, a rapid drop in temperature, thunderstorms or rain squalls in summer (frequent rain/snow squalls in winter) then a rise in pressure followed by clearing skies, indicate the passage of a(n) _____.
***cold front***
See REF1027

A cloud sequence of cirrus, cirrostratus, and altostratus clouds followed by rain usually signifies the approach of a(n) _____.
***warm front***

In a tropical cyclone in the Northern Hemisphere, a vessel hove to with the wind shifting counterclockwise would be _____.
***in the navigable semicircle***

In the Northern Hemisphere you are caught in the dangerous semicircle of a storm with plenty of sea room available. The best course of action is to bring the wind on the _____.
***starboard bow and make as much headway as possible***

The usual sequence of directions in which a tropical cyclone moves in the Southern Hemisphere is _____.
***southwest, south, and southeast***

What indicates the arrival of a hurricane within 24 to 36 hours?
***Unusually good weather with above average pressures followed by a slow fall of 4 millibars in six hours***

The highest frequency of tropical cyclones in the North Atlantic Ocean occurs during _____.
***August, September and October***

You are underway on course 050°T and your maximum speed is 12 knots. The eye of a hurricane bears 080°T, 100 miles from your position. The hurricane is moving towards 265°T at 22 knots. What course should you steer at 12 knots to have the maximum CPA?
***208°***

The climate of the eastern Gulf coast _____.
***varies from warm to subtropical***

The flow of air around an anticyclone in the Southern Hemisphere is _____.
***counterclockwise and outward***
See REF1038

Pressure gradient is a measure of _____.
***pressure difference over horizontal distance***
See REF1039

A cyclone in its final stage of development is called a(n) _____.
***occluded cyclone or occluded front***

The temperature at which the air is saturated with water vapor and below which condensation of water vapor will occur is referred to as the _____.
***absolute humidity***
See REF1041

Your vessel is on course 270°T, speed 10 knots. The apparent wind is from 10° off the port bow, speed 30 knots. From which direction is the true wind?
***255°T***
See REF1043

On mid-ocean waters, the height of a wind-generated wave is not affected by the _____.
***water depth exceeding 100 feet***

Freezing salt water spray should be anticipated when the air temperature drops below what temperature?
***28°F (-2.2°C)***

What instrument measures wind velocity?
***Anemometer***

The pressure-sensitive element of an aneroid barometer is called a _____.
***sylphon cell***

The instrument most commonly used to gather the data for determining the relative humidity is the _____.
***psychrometer***
See REF1065

What do the numbers on isobars indicate?
***barometric pressure***
See REF1070

It is desirable that a vessel encountering hurricane or typhoon conditions sends weather reports to the closest meteorological service at least every _____.
***3 hours***

What wind reverses directions seasonally?
***Monsoon winds***
See REF1080

Cumulonimbus clouds can produce _____.
***gusty winds, thunder, rain or hail, and lightning***
See REF950

A thin, whitish, high cloud popularly known as "mares' tails" is _____.
***cirrus***
See REF950

Fog is most commonly associated with a(n) _____.
***warm front at night***
See REF364

Which weather change accompanies the passage of a cold front in the Northern Hemisphere?
***A line of cumulonimbus clouds***

Brief, violent showers frequently accompanied by thunder and lightning are usually associated with _____.
***passage of a cold front***

Which is a characteristic of the weather preceding an approaching warm front?
***Steadily falling barometric pressure***
See REF1029

You are attempting to locate your position relative to a hurricane in the Northern Hemisphere. If the wind direction remains steady, but with diminishing velocity, you are most likely _____.
***on the storm track behind the center***

The edge of a hurricane has overtaken your vessel in the Gulf of Mexico, and the northwest wind of a few hours ago has shifted to the west. This is an indication that you are located in the _____.
***navigable semicircle***

Which condition exists in the eye of a hurricane?
***An extremely low barometric pressure***

What is the FIRST sign of the existence of a well developed tropical cyclone?
***An unusually long ocean swell***

When is the peak of the hurricane season in the western North Pacific?
***July through October***

You are underway on course 050°T and your maximum speed is 13 knots. The eye of a hurricane bears 100°T, 120 miles from your position. The hurricane is moving towards 275°T at 25 knots. If you maneuver at 13 knots to avoid the hurricane, what could be the maximum CPA?
***72 miles***

Weather patterns in the Gulf area of the United States are _____.
***those of a transition zone between tropical and a temperate area***

Anticyclones are usually characterized by _____.
***dry, fair weather***
See REF1038

The diurnal pressure variation is most noticeable in the _____.
***doldrums***
See REF1040

The wind circulation around a high pressure center in the Northern Hemisphere is _____.
***clockwise and moving outward from the high***

The dew point temperature is _____.
***the temperature at which the air is saturated with water vapor***
See REF940

A ship is on course 195° at a speed of 15 knots. The apparent wind is from 40° on the port bow, speed 30 knots. The direction and speed of the true wind are _____.
***127°T, 21 knots***
See REF1043

Fetch is the _____.
***stretch of water over which a wave-forming wind blows***

An instrument designed to maintain a continuous record of atmospheric pressure is a(n) _____.
***barograph***
See REF1050

What is TRUE concerning an anemometer on a moving vessel?
***It measures apparent wind speed.***

Prior to reading an aneroid barometer, you should tap the face lightly with your finger to _____.
***bring the pointer to its true position***
See REF1061

A psychrometer has two thermometers that provide dry bulb and wet bulb temperatures. By comparing these two temperature readings with a set of tables you can determine the _____.
***relative humidity and dew point***
See REF1066

At what angle to the isobars do surface winds blow over the open sea?
***About 15°***

When within 300 miles of a named tropical storm or hurricane, it is standard practice to send weather reports every _____.
***3 hours***

Weather conditions in the middle latitudes generally move _____.
***eastward***

A strong, often violent, northerly wind occurring on the Pacific coast of Mexico, particularly during the colder months, is called _____.
***Tehuantepecer***

Cumulus clouds that have undergone vertical development and have become cumulonimbus in form, indicate _____.
***probable thunderstorm activity***
See REF950

Cirrus clouds are composed primarily of _____.
***ice crystals***
See REF950

The fog most commonly encountered at sea is called _____.
***advection fog***
See REF364

The steepness of a cold front depends on _____.
***its velocity***

When does a weather front exist?
***when air masses of different temperatures meet***

As a warm front approaches how does barometric pressure change?
***pressure falls***

In a tropical cyclone in the Northern Hemisphere, a vessel hove to with the wind shifting counterclockwise would be _____.
***in the navigable semicircle***

When your vessel is on or near the path of an approaching tropical storm the _____.
***barometer falls***
***wind direction remains steady***
***wind speed increases***
***All of the above.***

In the relatively calm area near the hurricane center, the seas are _____.
***mountainous and confused***

Which change in the condition of the seas could indicate the formation of a tropical storm or hurricane several hundred miles from your location?
***A long swell from an unusual direction***

Tropical storms and hurricanes are most likely to form in the Southern hemisphere during _____.
***January through March***
See REF1031

You are underway on course 050°T and your maximum speed is 13 knots. The eye of a hurricane bears 100°T, 120 miles from your position. The hurricane is moving towards 275°T at 25 knots. What course should you steer at 13 knots to have the maximum CPA?
***333°***

What natural feature is responsible for the rather even climate found on the Florida peninsula throughout the year?
***The Gulf Stream***
See REF1033

The standard atmospheric pressure in millibars is _____.
***1013.2***

Little or no change in the barometric reading over a twelve hour period indicates _____.
***that present weather conditions will continue***

Good weather is usually associated with a region of _____.
***high barometric pressure***

As the temperature for a given mass of air increases, the _____.
***relative humidity decreases***
See REF1041

Your vessel is on course 150°T, speed 17 knots. The apparent wind is from 40° off the starboard bow, speed 15 knots. What is the speed of the true wind?
***11.0 knots***
See REF1043

In mid-ocean, the characteristics of a wave are determined by three factors. What is NOT one of these factors?
***Effect of the moon's gravity***
See REF1048

A microbarograph is a precision instrument that provides a _____.
***charted record of atmospheric pressure over time***
See REF1050

What is used to measure wind velocity?
***Anemometer***

To avoid error you should read the scale of an aneroid barometer with your eye placed _____.
***directly in front of the pointer***

The apparent wind is zero when the true wind is _____.
***from astern and equal to the ship's speed***

See REF1067

Widely spaced isobars on a weather map indicate _____.
***gentle breezes***

NOAA VHF weather reports are continuously broadcast on VHF channels WX-1, WX-2 and WX-3 on a frequency of _____.
***162.55, 162.40, 162.475 MHz***

The horse latitudes are characterized by _____.
***weak pressure gradients and light, variable winds***
See REF939

Monsoons are characterized by _____.
***steady winds that reverse direction semiannually***

REF1026
Air mass. A term applied by meteorologists to an extensive body of air within which the conditions of temperature and moisture in a horizontal plane are essentially uniform. A large body of air that has similar horizontal temperature and moisture characteristics Air mass property. Any quality or quantity the nature or value of which can be used in a characterization of the physical state or condition of an air mass. Air Masses are designated by three things: 1. The source region of their formation, in this case m for maritime, meaning it was formed over water. 2. The geographic band of Latitude where it was formed, in this case T for tropical. 3. The temperature of the air mass relative to the ground below it, in this case w because it is warmer than the ground below it. Convection : The transfer of heat within a the air by its movement. The term is used specifically to describe vertical transport of heat and moisture, especially by updrafts and downdrafts in an unstable atmosphere. Coriolis effect: An effect whereby a mass moving in a rotating system experiences a force (the Coriolis force ) acting perpendicular to the direction of motion and to the axis of rotation. On the earth, the effect tends to deflect moving objects to the right in the northern hemisphere and to the left in the southern and is important in the formation of cyclonic weather systems. An inertial force acting on a body in motion, due to rotation of the earth, causing deflection to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. It affects air (wind), water (current), etc. and introduces an error in bubble sextant observations made from a moving craft due to the liquid in the bubble being deflected, the effect increasing with higher latitude and greater speed of the craft.

REF1027
Cold Front : A narrow transition zone separating advancing colder air from retreating warmer air. The air behind a cold front is cooler and typically drier than the air it is replacing.

REF1028
Front : The boundary or transition zone between two different air masses. The basic frontal types are cold fronts, warm fronts and occluded fronts.

REF1029
Meaning of Air Mass: An air mass may be defined as a large body of air whose physical properties, especially temperature, moisture content, and lapse rate, are more or less uniform horizontally for hundreds of kilometres. According to A.N. Strahler and A.H. Strahler (1978) “a body of air in which the upward gradients of temperature and moisture are fairly uniform over a large area is known as an air mass.” An air mass may be so extensive that it may cover a large portion of a continent and it may be so thick in vertical dimension that it may vertically extend through the troposphere.

REF1030
When cold air intrudes, the winds gradually abate as the concentrated storm disintegrates. The storm’s warm core will survive for a few more days before completing the transformation into an extra tropical low-pressure system. Reference: Bowditch; “The American Practical Navigator.”

REF1031
Coriolis effect: An effect whereby a mass moving in a rotating system experiences a force (the Coriolis force ) acting perpendicular to the direction of motion and to the axis of rotation. On the earth, the effect tends to deflect moving objects to the right in the northern hemisphere and to the left in the southern and is important in the formation of cyclonic weather systems. An inertial force acting on a body in motion, due to rotation of the earth, causing deflection to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. It affects air (wind), water (current), etc. and introduces an error in bubble sextant observations made from a moving craft due to the liquid in the bubble being deflected, the effect increasing with higher latitude and greater speed of the craft.

REF1032
troposphere: the lowest layer of the atmosphere, 6 miles (10 km) high in some areas and as much as 12 miles (20 km) high in others, within which there is a steady drop in temperature with increasing altitude and within which nearly all cloud formations occur and weather conditions manifest themselves.

REF1033
The Gulf Stream, together with its northern extension the North Atlantic Drift, is a warm and swift Atlantic ocean current that originates in the Gulf of Mexico and stretches to the tip of Florida, and follows the eastern coastlines of the United States and Newfoundland before crossing the Atlantic Ocean as the North Atlantic Current. The process of western intensification causes the Gulf Stream to be a northwards accelerating current off the east coast of North America. At about 40°0′N 30°0′W, it splits in two, with the northern stream, the North Atlantic Drift, crossing to Northern Europe and the southern stream, the Canary Current, recirculating off West Africa. The Gulf Stream influences the climate of the east

coast of North America from Florida to Newfoundland, and the west coast of Europe. Although there has been recent debate,[1] there is consensus that the climate of Western Europe and Northern Europe is warmer than other areas of similar latitude because of the North Atlantic Current. It is part of the North Atlantic Gyre. Its presence has led to the development of strong cyclones of all types, both within the atmosphere and within the ocean. The Gulf Stream is also a significant potential source of renewable power generation.

REF1034
Bermuda High A semi-permanent, subtropical area of high pressure in the North Atlantic Ocean off the East Coast of North America that migrates east and west with varying central pressure. Depending on the season, it has different names. When it is displaced westward, during the Northern Hemispheric summer and fall, the center is located in the western North Atlantic, near Bermuda. In the winter and early spring, it is primarily centered near the Azores in the eastern part of the North Atlantic. Also known as Azores High.

REF1035
Dew forms when a surface cools through loss of infrared radiation down to a temperature which is colder than the dewpoint of the air next to that surface. Dew most often forms on on evenings or nights when there are few clouds, since the greenhouse effect from clouds can keep surfaces from cooling by infrared radiation loss to outer space. Calm winds at night also contribute to dew formation because a windy night keeps the lowest layers of the atmosphere warmer, and also helps evaporate any dew that might begin to form on surfaces. Dew is made of liquid water that has condensed from some of the water vapor contained in the air. If the layer of air next to the ground also cools to the dewpoint temperature, then fog forms as well.

REF1036
1,013.25 millibars or 29.92 inches of mercury.

REF1037
or 1/1,000th of a bar. The millibar is used as a unit of measure of

REF1038
An anticyclone is a system of winds that rotates around a center of high atmospheric pressure. ... Winds in a cyclone blow counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere. A cyclone is a storm or system of winds that rotates around a center of low atmospheric pressure.

REF1039
Pressure gradient is a change in pressure over a change in distance. Where isobars (lines of equal pressure) are closely spaced indicates a large change in pressure over a small distance, or a steep pressure gradient. The greater the pressure gradient is, the stronger the wind speed will be. A bar is a metric unit of pressure and isobars are lines on a weather map that connect points of equal pressure. Since variations in air pressure drive the atmosphere's winds, isobars also give meteorologists an easy way to assess wind direction and speed. Closely spaced isobars indicate large pressure changes over a small area and suggest strengthening winds. Widely spaced isobars portray a "flat" or weak pressure gradient typical of light-wind situations. Isobars also determine wind direction, with winds in the Northern Hemisphere blowing clockwise around highs and counterclockwise around lows. The wind direction roughly parallels the isobars, but at ground level frictional effects cause the winds to blow across the isobars at about a 30(degree) angle toward lower pressure

REF1040
diurnal pressure variation: A variation of pressure during one 24-h period. Except when weather systems are present, there are two maximum and two minimum pressures per day, and they occur at a constant local time every day. From a maximum at 1000 h, the pressure falls to a minimum at 1600 h, rises to another maximum at 2200 h, and falls again to a second minimum at 0400 h local time.

REF1041
Relative Humidity : The amount of water vapor in the air, compared to the amount the air could hold if it was totally saturated. (Expressed as a percentage).

REF1042
Steam Fog, also known as Steaming Fog, Evaporation Fog, Frost Smoke or Arctic Sea Smoke, occurs when evaporation takes place into cold air lying over warmer water. It is usually quite shallow. It is named by analogy with the condensed vapour or steam which appears above water which is heated.

REF1043
True And Apparent Wind An observer aboard a vessel proceeding through still air experiences an apparent wind which is from dead ahead and has an apparent speed equal to the speed of the vessel. Thus, if the actual or true wind is zero and the speed of the vessel is 10 knots, the apparent wind is from dead ahead at 10 knots. If the true wind is from dead ahead at 15 knots, and the speed of the vessel is 10 knots, the apparent wind is 15 + 10 = 25 knots from dead ahead. If the vessel reverses course, the apparent wind is 15 – 10 = 5 knots, from dead astern. The apparent wind is the vector sum of the true wind and the reciprocal of the vessel's course and speed vector. Since wind vanes and anemometers measure apparent wind, the usual problem aboard a vessel equipped with an anemometer is to convert apparent wind to true wind. Wind direction is generally reported by the direction from which it originates. For example, a north or northerly wind blows from the north to the south.[1] The exceptions are onshore winds (blowing onto the shore from the water) and offshore winds (blowing off the shore to the water). Wind direction is usually reported in cardinal (or compass) direction, or in degrees. Consequently, a wind blowing from the north has a wind direction referred to as 0° (360°); a wind blowing from the east has a wind direction referred to as 90°, etc.

REF1044
Voluntary Observing Ship Program: A worldwide program under the World Meteorological Organization (WMO) to recruit ships to voluntarily observe and report marine meteorological and oceanographic conditions to ensure the safety of life at sea and reduce commercial loss.

REF1045
Storm Surge - a rise in water level on oceans and lakes caused by high winds pushing across the water's surface and thus piling water deeper and deeper as the storm moves forward. As this water approaches and moves ashore, it may be added to a high tide if the timing is bad; causing massive destruction as it moves ashore and then retreats after the storm passes; or, if the tide is out at the time the storm comes ashore, the Storm Tide would be less destructive. This timing is very difficult for the weather service to predict.

REF1046
tsunami, n. A long-period sea wave, potentially catastrophic, produced by a submarine earthquake or volcanic eruption. It may travel unnoticed across the ocean for thousands of miles from its point of origin, building up to great heights over shoal water. Also called SEISMIC SEA WAVE, TIDAL WAVE.

REF1047
Tsunamis have a small amplitude (wave height) offshore, and a very long wavelength (often hundreds of kilometers long, whereas normal ocean waves have a wavelength of only 30 or 40 meters),[22] which is why they generally pass unnoticed at sea, forming only a slight swell usually about 300 millimeters (12 in) above the normal sea surface. They grow in height when they reach shallower water, in a wave shoaling process described below. A tsunami can occur in any tidal state and even at low tide can still inundate coastal areas.

REF1048
The great majority of large breakers one observes on a beach result from distant winds. Five factors influence the formation of wind waves] Wind speed Distance of open water that the wind has blown over (called the fetch) Width of area affected by fetch Time duration the wind has blown over a given area Water depth All of these factors work together to determine the size of wind waves. The greater each of the variables, the larger the waves. Waves are characterized by: Wave height (from trough to crest) Wavelength (from crest to crest) Wave period (time interval between arrival of consecutive crests at a stationary point) Wave propagation direction Waves in a given area typically have a range of heights. For weather reporting and for scientific analysis of wind wave statistics, their characteristic height over a period of time is usually expressed as significant wave height. This figure represents an average height of the highest one-third of the waves in a given time period (usually chosen somewhere in the range from 20 minutes to twelve hours), or in a specific wave or storm system. The significant wave height is also the value a "trained observer" (e.g. from a ship's crew) would estimate from visual observation of a sea state. Given the variability of wave height, the largest individual waves are likely to be somewhat less than twice the reported significant wave height for a particular day or storm.[

REF1049
A swell, in the context of an ocean, sea or lake, is a series of surface gravity waves that is not generated by the local wind. Swell waves often have a long wavelength but this varies with the size of the water body, e.g. rarely more than 150 m in the Mediterranean, and from event to event, with swells occasionally longer than 700 m away from the most severe storms. Swells have a narrower range of frequencies and directions than the wind sea, because swell waves have

dispersed from their generation area and have been dissipated.

REF1050
A barograph is a recording aneroid barometer. A barograph is used to monitor pressure. The pointer in an aneroid barometer is replaced with a pen. It produces a paper or foil chart called a barogram that records the barometric pressure over time. Barographs use one or more aneroid cells acting through a gear or lever train to drive a recording arm that has at its extreme end either a scribe or a pen. A scribe records on smoked foil while a pen records on paper using ink, held in a knib. The recording material is mounted on a cylindrical drum which is rotated slowly by clockwork. Commonly, the drum makes one revolution per day, per week, or per month and the rotation rate can often be selected by the user.

REF1051
A barometer is a scientific instrument used in meteorology to measure atmospheric pressure. Pressure tendency can forecast short term changes in the weather. Numerous measurements of air pressure are used within surface weather analysis to help find surface troughs, high pressure systems, and frontal boundaries.

REF1052
A Thermo-Hygrograph is a chart recorder that measures and records both temperature and humidity (or dew point). Similar devices that record only one parameter are a thermograph for temperature and hygrograph for humidity. Uses a bi-metallic strip for temperature and one human hair bundle for humidity. Includes one red and blue felt –tipped pen to record the reading. A thermograph is usually configured with a pen that records temperature on a revolving cylinder. The pen is at the end of a lever that is controlled by a bi-metal strip of temperature-sensitive metal which bends as the temperature changes.

REF1053
An anemometer is a device for measuring wind speed, and is a common weather station instrument. The term is derived from the Greek word anemos, meaning wind, and is used to describe any airspeed measurement instrument used in meteorology or aerodynamics. The first known description of an anemometer was given by Leon Battista Alberti around 1450. Anemometers can be divided into two classes: those that measure the wind's speed, and those that measure the wind's pressure; but as there is a close connection between the pressure and the speed, an anemometer designed for one will give information about both.

REF1054
Aneroid barometers helps to measure the atmospheric pressure. Aneroid barometer has aneroid cell which is made of alloy of beryllium and copper. This alloy under goes expansion and contraction on the change in pressure. Thus, the mechanical levers of aneroid cell expand and contract and display the reading on the aneroid barometer by the movement of the pointer. Aneroid means without fluid and refers to the detection cell in these barometers. The cell, known as a sylphon cell is a hollow capsule made of thin corrugated metal from which the air has been removed. When the air pressure outside the cell changes, the cell surface bends inward or outward depending on how the air pressure is changing. This motion is transmitted to the scale dial of the barometer by a series of springs, levers and gears that amplify the changes in the sylphon cell so that they can be easily seen. Depending on the construction of the barometer, there will be a number of linkage points where friction can resist the mechanical movement. When we tap the barometer, we release the built- up frictional resistance, thereby allowing the indicator dial to show the air pressure change.

REF1055
Apparent Wind - the direction and velocity of the wind relative to the speed and direction of the boat which is derived from the True Wind and Wind of Motion

REF1056
Sling Psychrometer Weather observers can use a sling psychrometer to measure the amount of water vapor in the air - that is, its humidity. It consists of two glass thermometers containing a liquid, usually mercury. One thermometer measures the air temperature while the other one measures the wet-bulb temperatures. After the wick is dipped in distilled water, a weather observer whirls the sling psychrometer around, using the handle. As the instrument is whirled, water evaporates from the wick on the wet-bulb thermometer and cools the thermometer. (Related text: Latent heat) The wet-bulb thermometer cools to the lowest value possible in a few minutes. This value is known as the wet-bulb temperature. The drier the air the more the thermometer cools and hence, the lower the wet-bulb temperature.

REF1057

You can measure the specific gravity of the sulfuric acid electrolyte with a hydrometer to determine the charge of a lead-acid battery. A hydrometer will give an inaccurate reading immediately after you add water to a battery. Hydrometers should be flushed daily with fresh water to prevent inaccurate readings and to prevent the rubber bulb at the top from rotting from its exposure to sulfuric acid. Because of its contact with acid, storage battery hydrometers must not be used for any other purpose.

REF1058
The aneroid barometer measures the force exerted by atmospheric pressure on a partly evacuated, thin-metal element called a sylphon cell (aneroid capsule). A small spring is used, either internally or externally, to partly counteract the tendency of the atmospheric pressure to crush the cell. Atmospheric pressure is indicated directly by a scale and a pointer connected to the cell by a combination of levers. The linkage provides considerable magnification of the slight motion of the cell, to permit readings to higher precision than could be obtained without it. An aneroid barometer should be mounted permanently. Prior to installation, the barometer should be carefully set. U.S. ships of the Voluntary Observing Ship (VOS) program are set to sea level pressure. Other vessels may be set to station pressure and corrected for height as necessary. An adjustment screw is provided for this purpose. The error of the instrument is determined by comparison with a mercurial barometer or a standard precision aneroid barometer. If a qualified meteorologist is not available to make this adjustment, adjust by first removing only one-half the apparent error. The tap the case gently to assist the linkage to adjust itself, and repeat the adjustment. If the remaining error is not more than half a millibar (0.015 inch), no attempt should be made to remove it by further adjustment. Instead, a correction should be applied to the readings. The accuracy of this correction should be checked from time to time.

REF1059
Microbarograph an instrument for high-precision automatic recording of variations in atmospheric pressure. The sensing element of a microbarograph is a bellows (aneroid) unit, which is mounted in a miniature pressure chamber that has good thermal insulation. The interior volume of the pressure chamber can be in communication with the atmosphere only if a valve is open, but the inner space of the aneroid capsule is in continuous communication with the atmosphere through a tube. If the valve is closed, a change in the atmospheric pressure relative to the original value in the pressure chamber causes a deformation of the aneroid capsule, which is transmitted to a rod and then, by means of a system of levers, to a pointer. The recorder scale of a microbarograph is 10–30 times larger than for an ordinary barograph. The period of rotation of the drum and its chart may be 10 min to 4—6 hr.

REF1060
Instrument error: Inaccuracy due to imperfection or incorrect adjustment can be determined by comparison with a standard precision instrument. The National Weather Service provides a comparison service. In major U. S. ports a Port Meteorological Officer carries a portable precision aneroid barometer for barometer comparisons on board ships which participate in the Voluntary Observing Ship (VOS) program of the National Weather Service. The portable barometer is compared with station barometers before and after a ship visit. If a barometer is taken to a National Weather Service shore station, the comparison can be made there. The correct sea-level pressure can also be obtained by telephone. The shipboard barometer should be corrected for height, as explained below, before comparison with this value. If there is reason to believe that the barometer is in error, it should be compared with a standard, and if an error is found, the barometer should be adjusted to the correct reading, or a correction applied to all readings. Height error: The atmospheric pressure reading at the height of the barometer is called the station pressure and is subject to a height correction in order to make it a sea level pressure reading. Isobars adequately reflect wind gconditions and geographic distribution of pressure only when they are drawn for pressure at constant height (or the varying height at which a constant pressure exists). On synoptic charts it is customary to show the equivalent pressure at sea level, called sea level pressure. This is found by applying a correction to station pressure. The correction depends upon the height of the barometer and the average temperature of the air between this height and the surface. The outside air temperature taken aboard ship is sufficiently accurate for this purpose. This is an important correction which should be applied to all readings of any type barometer. See Table 31 for this correction.

REF1061
The aneroid barometer measures the force exerted by atmospheric pressure on a partly evacuated, thin-metal element called a sylphon cell (aneroid capsule). A small spring is used, either internally or externally, to partly counteract the tendency of the atmospheric pressure to crush the cell. Atmospheric pressure is indicated directly by a scale and a pointer connected to the cell by a combination of levers. The linkage provides considerable magnification of the slight motion of the cell, to permit readings to higher precision than could be obtained without it. An aneroid barometer should be mounted permanently. Prior to installation, the barometer should be carefully set. U.S. ships of the Voluntary Observing Ship (VOS) program are set to sea level pressure. Other vessels may be set to station pressure and corrected for height as necessary.

An adjustment screw is provided for this purpose. The error of the instrument is determined by comparison with a mercurial barometer or a standard precision aneroid barometer. If a qualified meteorologist is not available to make this adjustment, adjust by first removing only one-half the apparent error. The tap the case gently to assist the linkage to adjust itself, and repeat the adjustment. If the remaining error is not more than half a millibar (0.015 inch), no attempt should be made to remove it by further adjustment. Instead, a correction should be applied to the readings. The accuracy of this correction should be checked from time to time.

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The aneroid barometer measures the force exerted by atmospheric pressure on a partly evacuated, thin-metal element called a sylphon cell (aneroid capsule). A small spring is used, either internally or externally, to partly counteract the tendency of the atmospheric pressure to crush the cell. Atmospheric pressure is indicated directly by a scale and a pointer connected to the cell by a combination of levers. The linkage provides considerable magnification of the slight motion of the cell, to permit readings to higher precision than could be obtained without it. An aneroid barometer should be mounted permanently. Prior to installation, the barometer should be carefully set. U.S. ships of the Voluntary Observing Ship (VOS) program are set to sea level pressure. Other vessels may be set to station pressure and corrected for height as necessary. An adjustment screw is provided for this purpose. The error of the instrument is determined by comparison with a mercurial barometer or a standard precision aneroid barometer. If a qualified meteorologist is not available to make this adjustment, adjust by first removing only one-half the apparent error. The tap the case gently to assist the linkage to adjust itself, and repeat the adjustment. If the remaining error is not more than half a millibar (0.015 inch), no attempt should be made to remove it by further adjustment. Instead, a correction should be applied to the readings. The accuracy of this correction should be checked from time to time.

REF1063
A barometer is a scientific instrument that is used to measure air pressure in a certain environment. Pressure tendency can forecast short term changes in the weather. Many measurements of air pressure are used within surface weather analysis to help find surface troughs, pressure systems and frontal boundaries.

REF1064
A hygrometer is an instrument used for measuring the moisture content in the environment. Humidity measurement instruments usually rely on measurements of some other quantity such as temperature, pressure, mass or a mechanical or electrical change in a substance as moisture is absorbed. By calibration and calculation, these measured quantities can lead to a measurement of humidity. Modern electronic devices use temperature of condensation, or changes in electrical capacitance or resistance to measure humidity changes.

REF1065
A psychrometer consists of two thermometers, one which is dry and one which is kept moist with distilled water on a sock or wick. The two thermometers are thus called the dry-bulb and the wet-bulb. At temperatures above the freezing point of water, evaporation of water from the wick lowers the temperature, so that the wet-bulb thermometer usually shows a lower temperature than that of the dry-bulb thermometer. When the air temperature is below freezing, however, the wet-bulb is covered with a thin coating of ice and may be warmer than the dry bulb. Relative humidity is computed from the ambient temperature as shown by the dry-bulb thermometer and the difference in temperatures as shown by the wet-bulb and dry-bulb thermometers. Relative humidity can also be determined by locating the intersection of the wet- and dry-bulb temperatures on a psychrometric chart. Psychrometers are commonly used in meteorology, and in the HVAC industry for proper refrigerant charging of residential and commercial air conditioning systems. The sling psychrometer, where the thermometers are attached to a handle or length of rope and spun around in the air for a few minutes, is sometimes used for field measurements, but is being replaced by more convenient electronic sensors. Alternatively a whirling psychrometer uses the same principle, however the two thermometers are fitted into a device that resembles a ratchet or football rattle.

REF1066
Relative humidity and dew point are measured with a hygrometer. The most common type, called a psychrometer, consists of two thermometers mounted together on a single strip of material. One of the thermometers is mounted a little lower than the other, and has its bulb covered with muslin. When the muslin covering is thoroughly moistened and the thermometer well ventilated, evaporation cools the bulb of the thermometer, causing it to indicate a lower reading than the other. A sling psychrometer is ventilated by whirling the thermometers. The difference between the dry-bulb and wetbulb temperatures is used to enter psychrometric tables (Table 35 and Table 36) to find the relative humidity and dew point. If the wet-bulb temperature is above freezing, reasonably accurate results can be obtained by a psychrometer consisting of dry- and wet-bulb thermometers mounted so that air can circulate freely around them without special ventilation. This type of installation is common aboard ship.

REF1067
True And Apparent Wind An observer aboard a vessel proceeding through still air experiences an apparent wind which is from dead ahead and has an apparent speed equal to the speed of the vessel. Thus, if the actual or true wind is zero and the speed of the vessel is 10 knots, the apparent wind is from dead ahead at 10 knots. If the true wind is from dead ahead at 15 knots, and the speed of the vessel is 10 knots, the apparent wind is 15 + 10 = 25 knots from dead ahead. If the vessel reverses course, the apparent wind is 15 – 10 = 5 knots, from dead astern. The apparent wind is the vector sum of the true wind and the reciprocal of the vessel's course and speed vector. Since wind vanes and anemometers measure apparent wind, the usual problem aboard a vessel equipped with an anemometer is to convert apparent wind to true wind.

REF1068
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REF1069
Isotherm : A line of equal temperature on a weather map.

REF1070
Isobars are lines on a weather map joining together places of equal atmospheric pressure . On the map the isobar marked 1004 represents an area of high pressure, while the isobar marked 976 represents an area of low pressure. The numbers measure the atmospheric pressure in millibars. Simply put, barometric pressure is the measurement of air pressure in the atmosphere, specifically the measurement of the weight exerted by air molecules at a given point on Earth. ... Barometric pressure also changes with the weather—or rather, the weather changes with changes in barometric pressure.

REF1071
An isobar, (meaning 'weight') is a line of equal or constant pressure on a graph, plot, or map; an isopleth or contour line of pressure. More accurately, isobars are lines drawn on a map joining places of equal average atmospheric pressure reduced to sea level for a specified period of time. In meteorology, the barometric pressures shown are reduced to sea level, not the surface pressures at the map locations. The distribution of isobars is closely related to the magnitude and direction of the wind field, and can be used to predict future weather patterns. Isobars are commonly used in television weather reporting.

REF1072
The prevailing wind in a region of the Earth's surface is a surface wind that blows predominantly from a particular direction. The dominant winds are the trends[clarification needed] in direction of wind with the highest speed over a particular point on the Earth's surface. A region's prevailing and dominant winds are the result of global patterns of movement in the Earth's atmosphere. In general, winds are predominantly easterly at low latitudes globally. In the mid-latitudes, westerly winds are dominant, and their strength is largely determined by the polar cyclone. In areas where winds tend to be light, the sea breeze/land breeze cycle is the most important cause of the prevailing wind; in areas which have variable terrain, mountain and valley breezes dominate the wind pattern. Highly elevated surfaces can induce a thermal low, which then augments the environmental wind flow. Wind roses are tools used to display the direction of the prevailing wind. Knowledge of the prevailing wind allows the development of prevention strategies for wind erosion of agricultural land, such as across the Great Plains. Sand dunes can orient themselves perpendicular to the prevailing wind direction in coastal and desert locations. Insects drift along with the prevailing wind, but the flight of birds is less dependent on it. Prevailing winds in mountain locations can lead to significant rainfall gradients, ranging from wet across windward-facing slopes to desert-like conditions along their lee slopes. Prevailing winds can vary due to the uneven heating of the Earth.

REF1073
Roaring forties,, areas between latitudes 40° and 50° south in the Southern Hemisphere, where the prevailing winds blow persistently from the west. The roaring forties have strong, often gale-force, winds throughout the year. They were named by the sailors who first entered these latitudes.

REF1074

The trade winds set up a system of equatorial currents which at times extends over as much as 50° of latitude or more. There are two westerly flowing currents conforming generally with the areas of trade winds, separated by a weaker, easterly flowing countercurrent.

REF1075
Known to sailors around the world as the doldrums, the Inter-Tropical Convergence Zone, (ITCZ, pronounced and sometimes referred to as the “itch”), is a belt around the Earth extending approximately five degrees north and south of the equator. Here, the prevailing trade winds of the northern hemisphere blow to the southwest and collide with the southern hemisphere’s driving northeast trade winds. Due to intense solar heating near the equator, the warm, moist air is forced up into the atmosphere like a hot air balloon. As the air rises, it cools, causing persistent bands of showers and storms around the Earth’s midsection. The rising air mass finally subsides in what is known as the horse latitudes, where the air moves downward toward Earth’s surface. Because the air circulates in an upward direction, there is often little surface wind in the ITCZ. That is why sailors well know that the area can becalm sailing ships for weeks. And that’s why they call it the doldrums.

REF1076
The trade winds or easterlies are the permanent east-to-west prevailing winds that flow in the Earth's equatorial region (between 30°N and 30°S latitudes). The trade winds blow predominantly from the northeast in the Northern Hemisphere and from the southeast in the Southern Hemisphere, strengthening during the winter and when the Arctic oscillation is in its warm phase. Trade winds have been used by captains of sailing ships to cross the world's oceans for centuries and enabled colonial expansion into the Americas and trade routes to become established across the Atlantic and Pacific oceans. In meteorology, the trade winds act as the steering flow for tropical storms that form over the Atlantic, Pacific, and southern Indian Oceans and make landfall in North America, Southeast Asia, and Madagascar and eastern Africa. Trade winds also transport African dust westward across the Atlantic Ocean into the Caribbean Sea, as well as portions of southeastern North America. Shallow cumulus clouds are seen within trade wind regimes and are capped from becoming taller by a trade wind inversion, which is caused by descending air aloft from within the subtropical ridge. The weaker the trade winds become, the more rainfall can be expected in the neighboring landmasses.

REF1077
A small craft advisory is a type of warning issued by the National Weather Service in the United States, most frequently in coastal areas. It is issued when winds have reached, or are expected to reach within 12 hours, a speed marginally less than gale force. The term wind advisory is used in place of small craft advisory when winds of the same force occur at, or are forecast for, inland locations. A lake wind advisory is issued for winds just below this range, because unobstructed winds across the open waters of a lake are normally faster than across land. The wind speed that triggers the advisory has changed over time. Until the late 1960s, the threshold was 32 to 38 miles per hour (or 28 to 33 knots). At some point, the lower limit was reduced to 23 miles per hour (20 knots). Today, however, most places have standardized on 25 to 38 miles per hour (22 to 33 knots), encompassing the combined ranges of forces 6 and 7 on the Beaufort scale. GALE WARNING: To indicate winds within the range 34 to 47 knots are forecast for the area. STORM WARNING: To indicate winds 48 knots and above, no matter how high the speed, are forecast for the area. However, if the winds are associated with a tropical cyclone (hurricane), the STORM WARNING indicates that winds within the range 48-63 knots are forecast. HURRICANE WARNING: An announcement that hurricane conditions (sustained winds of 74 mph or higher) are expected somewhere within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane warning is issued 36 hours in advance of the anticipated onset of tropical-storm-force winds. NOTE: A "HURRICANE WATCH" is an announcement that hurricane conditions (sustained winds of 74 mph or higher) are possible within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours in advance of the anticipated onset of tropical-storm-force winds. NOTE: A SPECIAL MARINE WARNING is issued whenever a severe local storm or strong wind of brief duration is imminent and is not covered by easting warnings or advisories. No visual displays will be used in connection with the Special Marine Warning Bulletin; boaters will be able to receive these special warnings by keeping tuned to a NOAA Weather Radio station or to Coast Guard and commercial radio stations that transmit marine weather information. NATIONAL WEATHER SERVICE RETIRES ITS COASTAL WARNING DISPLAY PROGRAM As of February 15, 1989, the National Weather Service retired its Coastal Warning Display network nationwide. For over 100 years, display stations were established at yacht clubs, marinas, and Coast Guard stations to hoist flags, pennants and colored lights to warn mariners of storms at sea. The display stations were individually notified by the National Weather Service to raise the signals and again to lower them when the hazards passed. The National Weather Service paid for the visual signals; however, the display stations were operated by other agencies or volunteers. Although the Coastal Warning Display program has been formally discontinued, U.S. Coast Guard and other stations may continue to display warning signals without the direct participation of the National Weather Service. News - Beginning June 1, 2007, U.S. Coast Guard

formally re-established a Coastal Warning Display program at selected small boat stations which will hoist display flags to warn of small craft advisories, gale warnings, storm warnings and hurricane warnings. Occasionally an informal lesser advisory, known as "small craft exercise caution," is issued for wind speeds lighter than those that call for a small craft advisory. Criteria for this vary in different localities; sometimes a range of 19 to 24 miles per hour (17 to 21 knots) is observed, or in some places 17 to 23 miles per hour (15 to 19 knots) may be used.

REF1078
A veering wind is a wind that turns clockwise with height. An example of a veering wind would be a southeast wind at the surface and a west wind at 700 millibars. The wind turns in the same direction as a clock from the surface to 700 millibars. A veering wind is associated with warm air advection and dynamic lifting (primarily because a south wind in the PBL transports warmer air to the north). The magnitude of warm air advection is a function of wind speed and the pre-existing thermal gradient. Weak winds will result in weak advection. Winds often veer ahead of cold fronts (in the warm sector of a mid-latitude cyclone). A backing wind is a wind that turns counter-clockwise with height. An example of a backing wind would be a north wind at the surface with a west wind at 700 millibars. A backing wind is associated with cold air advection and dynamic sinking. Winds back behind cold fronts. A way to remember the difference between the two is the memorize the set of letters CVW and CCBC, where CVW stands for (Clockwise, Veering, Warm air advection) and CCBC stands for (CounterClockwise, Backing, Cold air advection)

REF1079
Land and sea breezes. The breezes that, on certain coasts and under certain conditions, blow from the land by night and from the water by day.

REF1080
A monsoon is a seasonal change in the direction of the prevailing, or strongest, winds of a region. Monsoons cause wet and dry seasons throughout much of the tropics. Monsoons are most often associated with the Indian Ocean. Monsoons always blow from cold to warm regions.

REF203
Dew Point: The temperature to which air must be cooled, at a given pressure and water-vapor content, for it to reach saturation; the temperature at which dew begins to form.

REF362
Advection Fog : a type of fog that results from the advection of moist air over a cold surface and the cooling of the air to its dew point that follows; this type of fog is most common in coastal regions. Fog resulting from the transfer of warm, humid air over a cold surface, especially a cold ocean surface, or (comparatively rarely) from the transport of air that is relatively very cold over an ocean surface that is relatively very warm.

REF364
Advection Fog : a type of fog that results from the advection of moist air over a cold surface and the cooling of the air to its dew point that follows; this type of fog is most common in coastal regions. Fog resulting from the transfer of warm, humid air over a cold surface, especially a cold ocean surface, or (comparatively rarely) from the transport of air that is relatively very cold over an ocean surface that is relatively very warm. Dew Point : The temperature to which the air must be cooled for water vapor to condense and form fog or clouds.

REF889
Buys Ballot's law. In the Northern Hemisphere, if you face the wind the atmospheric pressure decreases toward your right and increases toward your left. In the Southern Hemisphere the reverse is true. The law is useful in locating centers of cyclones and anticyclones. Buys Ballot’s law. . A rule useful in locating the center of cyclones and anticyclones. It states that, facing away from the wind in the northern hemisphere, the low pressure lies to the left. Facing away from the wind in the southern hemisphere, it is to the right; named after Dutch meteorologist C. H. D. Buys Ballot, who published it in 1857.

REF937
millibar, n. A unit of pressure equal to 1,000 dynes per square centimeter, or 1/l,000th of a bar. The millibar is used as a unit of measure of atmospheric pressure, a standard atmosphere being equal to 1,013.25 millibars or 29.92 inches of mercury.

REF939

The horse latitudes are located at about 30 degrees north and south of the equator. It is common in this region of the subtropics for winds to diverge and either flow toward the poles (known as the prevailing westerlies) or toward the equator (known as the trade winds). These diverging winds are the result of an area of high pressure, which is characterized by calm winds, sunny skies, and little or no precipitation. According to legend, the term comes from ships sailing to the New World that would often become stalled for days or even weeks when they encountered areas of high pressure and calm winds. Many of these ships carried horses to the Americas as part of their cargo. Unable to sail and resupply due to lack of wind, crews often ran out of drinking water. To conserve scarce water, sailors on these ships would sometimes throw the horses they were transporting overboard. Thus, the phrase 'horse latitudes' was born.

REF940
Relative Humidity : The amount of water vapor in the air, compared to the amount the air could hold if it was totally saturated. (Expressed as a percentage). The dew point is the temperature to which air must be cooled to become saturated with water vapor. When further cooled, the airborne water vapour will condense to form liquid water (dew). When air cools to its dew point through contact with a surface that is colder than the air, water will condense on the surface.[1][2] When the temperature is below the freezing point of water, the dew point is called the frost point, as frost is formed rather than dew.[3] The measurement of the dew point is related to humidity. A higher dew point means there is more moisture in the air.[

REF950
CLOUD FORMS 1. Cirrus: detached clouds, delicate and fibrous in appearance, generally white in color. Cirrus appear in the most varied combination of forms, such as tufts, lines drawn across the blue sky, branching featherlike plumes, and are often arranged in bands across the sky. These clouds are very thin, and the sun and the moon can be seen through them. They range in height from 20,000 to 40,000 feet. Cirrus clouds rarely result in rain. 2. Cirro-cumulus: patches of white flakes or rounded masses without shadows, arranged in groups or in lines resembling the sand on the seashore. Cirro-cumulus is often called the mackerel sky. These clouds range in height from 10,000 to 35,000 feet. 3. Cirro-stratus: a thin whitish veil, sometimes covering the sky completely and giving it a milky appearance; at other times presenting a fibrous structure like a tangled web. This cloud is responsible for halos around the sun and moon. This cloud is denser than the cirrus, though its height range is about the same. 4. Alto-cumulus: large rounded masses, partially shaded, arranged in groups or lines or waves sometimes so close together that their edges join. They range in height from 2,500 to 28,000 feet. They rarely result in precipitation. 5. Alto-stratus: a dense sheet of a gray or bluish color. At times it is very dark and thick, completely hiding the sun or moon. It ranges in height from 8,000 to 32,000 feet. 6. Strato-cumulus: large lumpy masses or rolls of dull gray, frequently covering the whole sky. This cloud form is seen more often in the winter, and its usual height is about 2,000 feet, though it may descend to 500 feet and rise to 12,000. 7. Stratus: a uniform layer of cloud, not very thick, hovering about 1,000 feet above the ground. Stratus often results in rain or snow. 8. Nimbo-stratus: a dense layer of dark, shapeless cloud with ragged edges ranges in thickness from 500 feet to five miles, and hovers usually at a height of 1,000 feet. This is the cloud that brings the steady downpour. 9. Cumulus: a thick cloud, dome-shaped with a horizontal base, commonly known as a cauliflower cloud. It is usually very thick, and usually floats at an altitude of 5,000 feet. The cumulus cloud is known as the cloud of fair weather. 10. Cumulo-nimbus: the typical thundershower cloud, appears in great masses in the form of mountains or towers. This is the thickest of all clouds, often reaching a depth of eight miles. This cloud is responsible for what is impolitely called" dirty weather." Indications by Appearance of Sky. The indications of weather afforded by the colors of the sky, and given herewith, are very useful in predicting approaching weather conditions at sea. A red sky at sunset presages fine weather; a red sky in the morning, bad weather or much wind, if not rain; a gray sky in the morning, fine weather. Soft-looking or delicate clouds foretell fine weather, with moderate or light breezes; hard-edged, oily-looking clouds, wind. A dark, gloomy blue sky is windy, but a light, bright blue sky indicates fine weather. Generally, the softer the clouds look the less wind, although rain may be expected; and the harder, more "'greasy," rolled, tufted, or ragged, the stronger the wind will prove. Also, a bright-yellow sky at sunset presages wind,; a pale-yellow, wet; and by the preponderance of red, yellow, or gray tints the coming weather may be foretold very nearly-indeed, if aided by instruments, almost accurately.