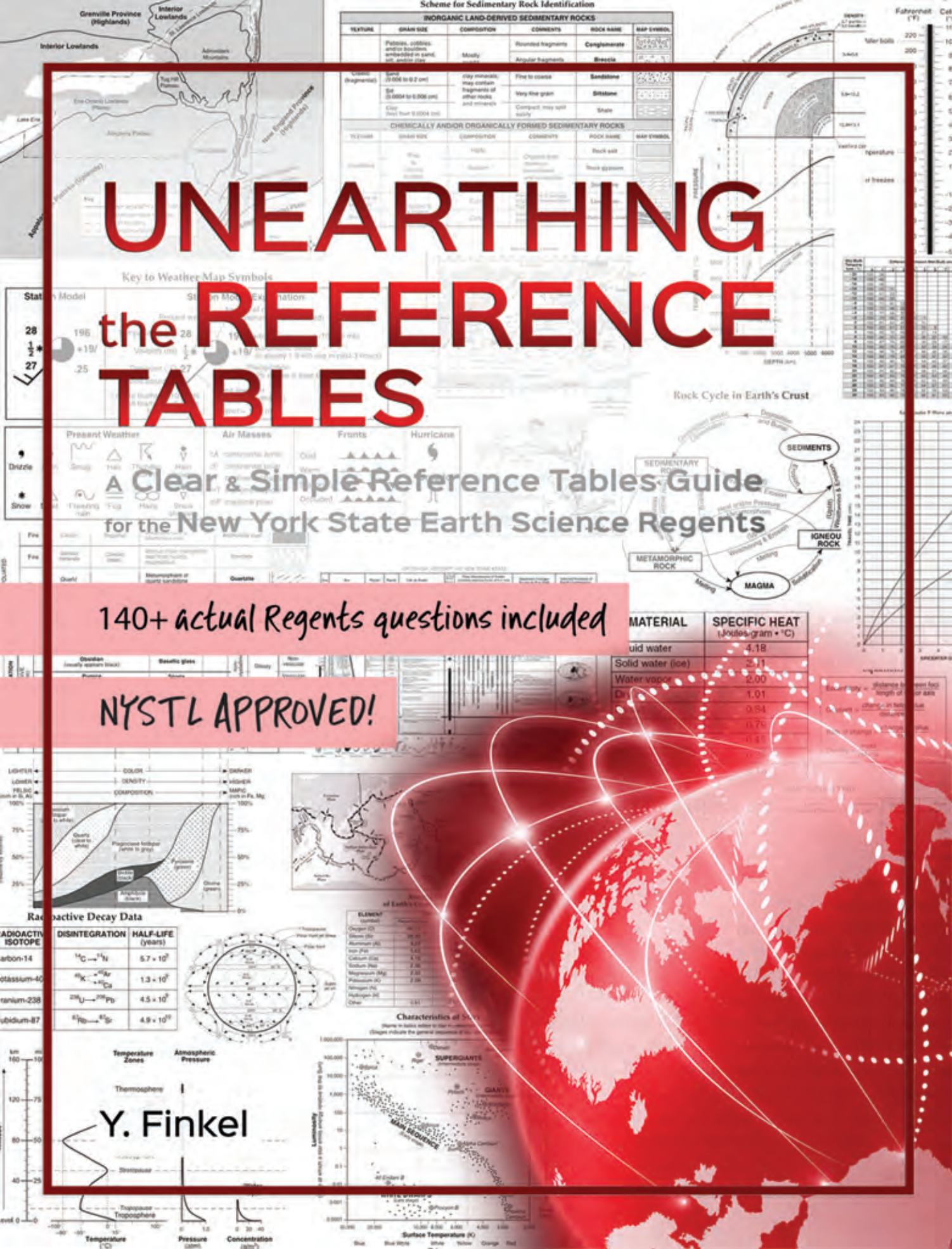
UNEARTHING
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A Clear & Simple Reference Tables Guide
for the New York State Earth Science Regents
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THE

REFERENCE TABLES

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for the

New York State Earth Science Regents

Y. Finkel

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What is This Book & How Do I Use It?

> **Before you begin this examination, you must be provided with the *2011 Edition Reference Tables for Physical Setting/Earth Science*. You will need these reference tables to answer some of the questions.**

Did you know that about 35-50% of every Earth Science Regents is composed of questions entirely based on the Earth Science Reference Tables?

And did you know that a raw score of approximately 50% on the Earth Science Regents converts to a scale score of 65%? (with at least $^{9}/_{16}$ lab credits)

If you know how to read *every* table on the Earth Science Reference Tables, that's terrific.

But what if you don't?

Gaining a clear understanding of the reference tables is crucial for the Earth Science Regents.

The good news is that one of the best-kept secrets of the Earth Science regents is that the reference tables-based questions are the *easiest part of the regents* by far **– if you know how to use the reference tables.**

That's where this book comes in. ***Unearthing the Reference Tables: A Clear & Simple Reference Tables Guide*** is a book that:

- Gives step-by-step instructions in **clear** and **simple** terms on how to easily decipher each one of the 28 charts on the Earth Science Reference Tables
- Highlights important information often asked on the Earth Science Regents
- Provides actual regents questions at the end of each section, along with answers and brief explanations

To Get the Most Out of This Book:

Read the book aloud with a friend so you don't miss anything important.

As you read through the book, follow along with a separate copy of the Earth Science Reference Tables. This way, you won't have to keep flipping pages from the tables to their explanations.

If you are pressed for time, start with the tables that appear most often on the regents. On each table, notice this icon  with a number. This represents the average number of questions on that table per regents.

For example, on the Radioactive Decay Data Chart, you see 

. This means that there is approximately 1 question per regents on this table.

After you finish reading about each table, do the **practice regents questions** on the table to ensure you understood it correctly. The practice questions are conveniently included after each section, symbolized by this icon: 

Note: Some regents questions have been edited slightly.

In addition, the "More Practice" section at the end of the book organizes all the reference tables-based regents questions from the June 2012-June 2017 regents by table.

These extra questions will provide you with even more opportunity to exercise the Reference Tables skills you have learned from this guide. This way, you will be fully prepared to tackle those questions on your upcoming regents exam.

Good luck!

Y. Finkel

Contents

NEW YORK STATE

EARTH SCIENCE REFERENCE TABLES

PAGE 13

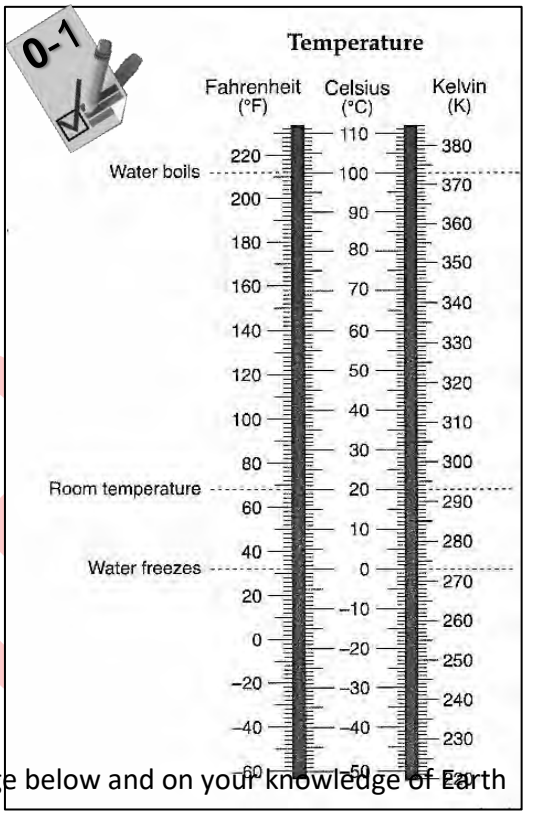
- Temperature
- Pressure
- Key to Weather Map Symbols

Temperature

This table converts between the three **temperature** scales. ***Fahrenheit***, ***Celsius*** and ***Kelvin.***

Reading the Table:

- To *convert* from one **temperature scale** to another: **slide your finger** or, for more accurate results, a **paper**, across the chart.
- Every small black line represents **2 degrees** in **Fahrenheit** and **1 degree** in **Celsius** and **Kelvin**.
  - ➔ **Ex:** Convert 170° F to °C and °K.
    - ✓ 77° C, 350° K.
- Note the **boiling** and **freezing points** of **water** and **room temperature** indicated on the table.
  - ➔ **Ex:** Freezing point of water = **32° F/0° C/273° K**



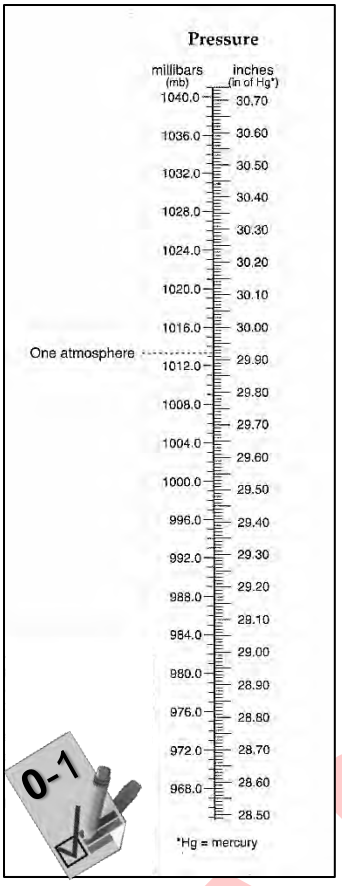
93. Base your answer to this question on the passage below and on your knowledge of Earth science.

Cosmic Microwave Background Radiation

In the 1920s, Edwin Hubble's discovery of a pattern in the red shift of light from galaxies moving away from Earth led to the theory of an expanding universe. In the 1960s, satellite probes found that cosmic microwave background radiation fills the universe uniformly in every direction and indicated a temperature of about 300 kelvins (K). This radiation has been cooling as the universe bas been expanding.

The current temperature indicated by the cosmic microwave background radiation is
(1) higher than the temperature at which water boils
(2) between the temperature at which water boils and room temperature
(3) between room temperature and the temperature at which water freezes
(4) lower than the temperature at which water freezes

Pressure



Atmospheric/Barometric/Air Pressure – the *weight of the air* pushing down onto Earth.

It's measured both in ***millibars***, with an ***aneroid* barometer**, and with ***inches of mercury***, with a ***mercury* barometer.**

ANEROID BAROMETER

You must recognize this picture as a tool that measures air pressure.

The table **converts air/barometric pressure** from ***millibars (mb)*** to ***inches of mercury (in of Hg)*** and vice versa.

Reading the Table:

- Each **dark black line** on the millibar side (*left* side) is **1 millibar**, and each dark line on the inches side (*right* side) is **0.01** (one hundredth) **inches**.
- To ***convert*** between scales, slide **finger** or **paper** across the chart.
  - ➔ **Ex:** 1021.0 mb = 30.15 in of Hg
  - ➔ **Ex:** 984.5 mb ≈ 29.07 in of Hg
- The table also shows ***standard air pressure*** (air pressure at sea level) expressed in **atmospheres**.
  - ➔ Standard air pressure is **1 atm** = **29.92 in of Hg** = **1013.2 mb**

94. What is the average air pressure exerted by Earth's atmosphere at sea level, expressed in millibars and inches of mercury?

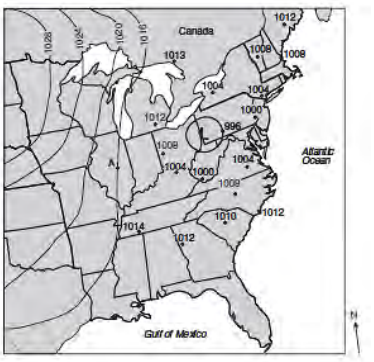
(1) 1013.25 mb and 29.92 in of Hg
(2) 29.92 mb and 1013.25 in of Hg
(3) 1012.65 mb and 29.91 in of Hg
(4) 29.91 mb and 1012.65 in of Hg

95. *The diagram below shows an instrument used in weather forecasting.

This instrument measures atmospheric

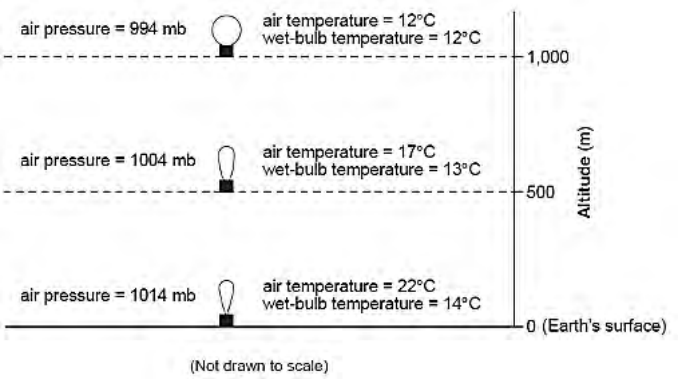
(1) wind speed
(2) wind direction
(3) pressure
(4) temperature

96. Base your answer to this question on the weather map below and on your knowledge of Earth science. The weather map shows atmospheric pressures, recorded in millibars (mb), at locations around a low-pressure center (L) in the eastern United States. Isobars indicate air pressures in the western portion of the mapped area. Point A represents a location on Earth's surface.



Convert the air pressure at location A from millibars to inches of mercury. _____ **in of Hg**

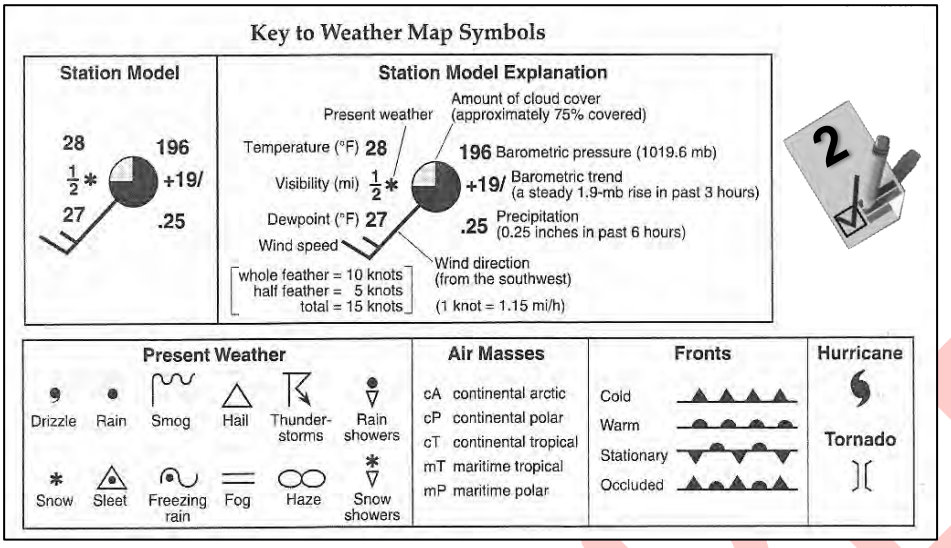
97. Base your answer to this question on the diagram below and on your knowledge of Earth science. The diagram represents a weather balloon as it rises from Earth's surface to 1000 meters (m). The air temperature and wet-bulb temperature values in degrees Celsius (°C) and the air pressure values in millibars (mb) are given for three altitudes.



*Identify the names of the instruments carried by the weather balloon that recorded the air pressure and air temperature.

Air pressure: _____
Air temperature: _____

Key to Weather Map Symbols



This table shows common ***weather map symbols*** and their **explanations**.

Station Model & Station Model Explanation

These two tables go hand in hand. The **station model** on the *right* explains the symbols on the station model on the *left*.

STATION MODEL – model used by meteorologists to represent **weather conditions**.

Reading the Table:

Starting from the *top left* and *counterclockwise* around the model:

- ***Temperature*** - measured with a ***thermometer***; expressed in **°F**.
  - ➔ An air temperature of **34° F** is represented like this on a station model: 34
    - ✓ **NOTE:** DO NOT WRITE "**° F**" on your model. The correct station model format for temperature is a number without the degree symbol or "F".
  - ➔ On the sample, the temperature is ***28° F***.

- ***Visibility*** – how far ahead you can see – measured in **miles**.
  - ➔ On a station model, a visibility of 2½ miles is represented like this: 2½
  - ➔ On the sample, visibility is ***½ mile***.

- ***Present weather*** – describes the weather using the **PRESENT WEATHER symbols** on the *bottom left* of the table.
  - ➔ Present Weather Symbols:
    - ✓ **Smog –** smoky (polluted) fog
    - ✓ **Rain showers** – a brief, sudden rainstorm
    - ✓ **Sleet** – snow that melts on its way down
    - ✓ **Freezing rain** – rain that freezes on contact with Earth
    - ✓ **Haze** – a collection of water droplets in atmosphere not dense enough to be considered a cloud
    - ✓ **Snow showers** – a brief, sudden snowstorm
  - ➔ A present weather of **rain** is represented on a station model like this: •◯
  - ➔ On the sample, the present weather is ***snow***.

- ***Dewpoint*** - measured with a ***psychrometer***; expressed in **°F**. Since the dewpoint table on RT 12 is expressed in degrees Celsius, be sure to *convert* to degrees Fahrenheit if using these two tables together.

  - ➔ A dewpoint of 82° F is represented on a station model like this: 82◯
    - ✓ DO NOT WRITE "**° F**" on the station model.
  - ➔ On the sample, the dewpoint is ***27° F***.

- ***Wind speed*** – measured with an ***anemometer***; measured in **knots** on the table, but often given in **miles per hour (mi/h)** as well.

  - ➔ *Conversion* from **knots** to **mi/h**: **1 knot = 1.15 mi/h** (on the table)
    - ✓ **Knots X 1.15 = mi/h** → 3 knots = 3.45 mi/h
    - ✓ **Mi/h ÷ 1.15 = knots** → 10 mi/h = 6.6 knots
  - ➔ Wind speed in knots is shown with **feathers** (lines) branching out of one main line:
    - ✓ A *whole* feather is **10** knots; a *half* feather is **5** knots
    - ✓ A wind speed of **35 knots** is represented like this on a station model:
  - ➔ On the sample, the wind speed is ***15 knots*** and ***17.25 mi/h***

- ***Wind direction*** – the direction the wind is **coming from**; measured with a ***wind vane***. The direction the stick is pointing is the direction the wind is coming from.
  - ➔ A wind direction of **northwest** is represented on station model like this:
  - ➔ On the sample, the wind is *coming from* the ***southwest*** (and *heading towards* the ***northeast***).

- ***Precipitation*** – expressed in **inches in past 6 hours**; measured with a ***rain gauge/ruler***.
  - ➔ **0.68 inches of precipitation in the past 6 hours** is represented like this on a station model: .68
    - ✓ **NOTE:** DO NOT WRITE "**0**.68 **in**" on your model. The correct station model format is without a zero before the decimal point – just **".68**".
  - ➔ On the sample, ***0.25 inches*** of snow fell ***in the past 6 hours***.

- ***Barometric Trend*** – the air pressure pattern – tells you whether the air pressure (barometric pressure) has steadily risen **(+/)** or steadily dropped **(-\)** in the **past 3 hours** and by how much.
  - ➔ To *convert* from **station model code** to **millibars**, *add* a decimal point between the two numbers.
    - ✓ **Ex:** *+ 31/* → steady **3.1-mb rise** in the past 3 hours
    - ✓ **Ex:** *- 22* → steady ***2.2-mb drop*** in the past 3 hours
  - ➔ To *convert* from **millibars** to **station model code**, *remove* the decimal between the two numbers.
    - ✓ **Ex:** A steady *4.5-mb rise* in the past 3 hours → **+ 45/**
    - ✓ **Ex:** A steady *1.7-mb drop* in the past 3 hours → **- 17**
  - ➔ On the sample, the barometric trend is a ***steady 1.9-mb rise in the past 3 hours***.

- ***Barometric Pressure*** - expressed in a **3-digit station model code**. You must know how to *convert* this **code** into **millibars** and vice versa.

➔ **Station Model Code → Millibars:**

- ✓ If the number is **less than 500**, place a **10** in front of the first digit
- ✓ If the number is **500 or greater**, place a **9** in front of the first digit.
- ✓ Add a **decimal point** before the last digit.

993 = **9**99.3 **mb**
365 = **10**36.5 **mb**

➔ **Millibars → Station Model Code:**

- ✓ Remove decimal
- ✓ Drop 10 or 9 from beginning of number

988.2 mb = 882
1028.0 mb = 280

➔ On the sample, the barometric pressure is ***1019.6 mb***

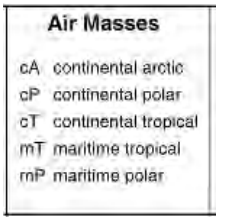
Air Masses

Air Mass – a large **body of air** in the troposphere with similar **temperature**, **pressure** and **moisture** characteristics.

This table gives you the **symbols** of common **AIR MASSES** and what they stand for, but NOT any explanations or examples of source regions – these you must memorize. (See below.)

Air Masses:

- Are *named* for their ***moisture content*** and ***temperature***
  - ➔ **continental** (land) = dry
  - ➔ **maritime** (water) = wet
  - ➔ **arctic** = very cold
  - ➔ **polar** = cold
  - ➔ **tropical** = warm
- Acquire their unique properties from their ***source region***
  - ➔ **cA** = continental arctic → **North of Canada**
  - ➔ **cP** = continental polar → **Central Canada**
  - ➔ **cT** = continental tropical → **Southwest U.S.**
  - ➔ **mT** = maritime tropical → **Gulf of Mexico**
  - ➔ **mP** = maritime polar → **North Pacific, North Atlantic Oceans**



Tornado/Hurricane Symbols

This table shows you the **symbols** for **hurricanes** and **tornadoes**, the two most major kinds of **severe weather**. You must be able to identify these symbols on a weather map.

Hurricane – a severe tropical cyclone with *heavy rains* and *winds* moving at **75-150 mi/h**

Tornado – a violently destructive windstorm occurring over land characterized by a **funnel-shaped cloud** extending toward the ground

Fronts

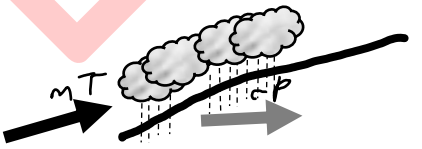
Front – **boundary** between two different air masses – a site of **rapid weather changes**

This table gives you the **symbols** for the four kinds of fronts, but *no explanations*. You must understand what kind of air masses each kind of front is composed of and what kind of weather each front will cause.

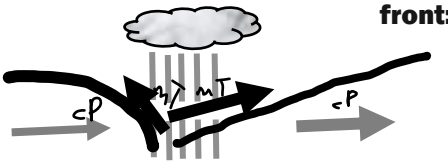
Fronts:

- **Cold Front** – **cP** (cold) overtakes **mT** (warm):
  - ➔ steep slope along boundary & warm air rises very quickly
  - ➔ this causes a short period of heavy rain
  - ➔ area is left with ***cold*** *weather*

- **Warm front** – **mT** (warm) advances towards **cP** (cold):
  - ➔ warm air mass slowly rises over the cold air mass
  - ➔ this causes long periods of gentle rain
  - ➔ area is left with ***warm*** *weather*



- **Occluded front** – **cold front** overtakes a **warm front:**
  - ➔ very **stormy**, unstable weather

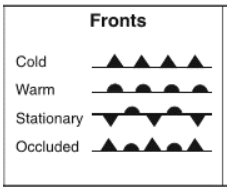


- **Stationary front** – **mT** is near **cP**:
  - ➔ neither is strong enough to push the other away
  - ➔ there's precipitation along the boundary

Reading the Table:

The front symbol **points** *in the direction* the front is advancing.

Ex:  The symbol to the left is a cold front coming from the west and traveling east.



98. *Which weather instrument is used to measure air temperatures recorded on a weather map?

(1) anemometer
(2) wind vane
(3) thermometer
(4) barometer

99. *Which weather map symbol is associated with extremely low air pressure?

(1) (2) (3) (4)

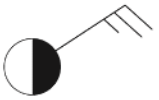
100. *Which area is the most common source region for cold, dry air masses that move over New York State?

(1) North Atlantic Ocean
(2) Gulf of Mexico
(3) Central Canada
(4) Central Mexico

101. Which weather map symbol is used to represent violently rotating winds that have the appearance of a funnel-shaped cloud?

(1) (2) (3) (4)

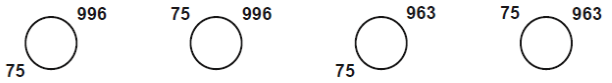
102. The weather station model below shows some of the weather data for a certain location.



What is the wind speed shown on the station model and *which instrument is used to measure the wind speed?

(1) 15 knots, measured by a wind vane
(2) 15 knots, measured by an anemometer
(3) 25 knots, measured by a wind vane
(4) 25 knots, measured by an anemometer

103. Which station model shows an air temperature of 75°F and a barometric pressure of 996.3 mb?



(1) (2) (3) (4)

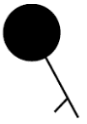
104. *Which station model represents a location that has the greatest chance of precipitation?

(1) (2) (3) (4)

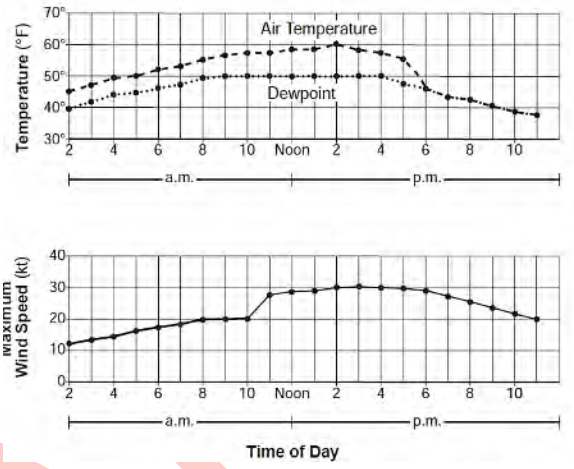
105. The table below lists some weather conditions for another location on this map.

Temperature (°F)	Dewpoint (°F)	Precipitation (inches in past 6 hours)	Present Weather
76	74	0.85	Rain showers

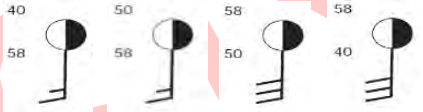
On the weather station model below, *using the proper format*, record the weather conditions listed in the table.



106. Base your answer to this question on the graphs below and on your knowledge of Earth science. The graphs show air temperatures and dewpoints in °F, and wind speeds in knots (kt) from 2:00 a.m. to 11:00 p.m. at a certain New York State location.



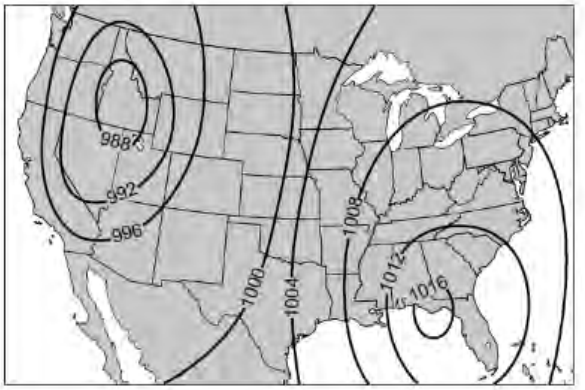
Which station model represents the weather data for this location at 4:00 p.m.?



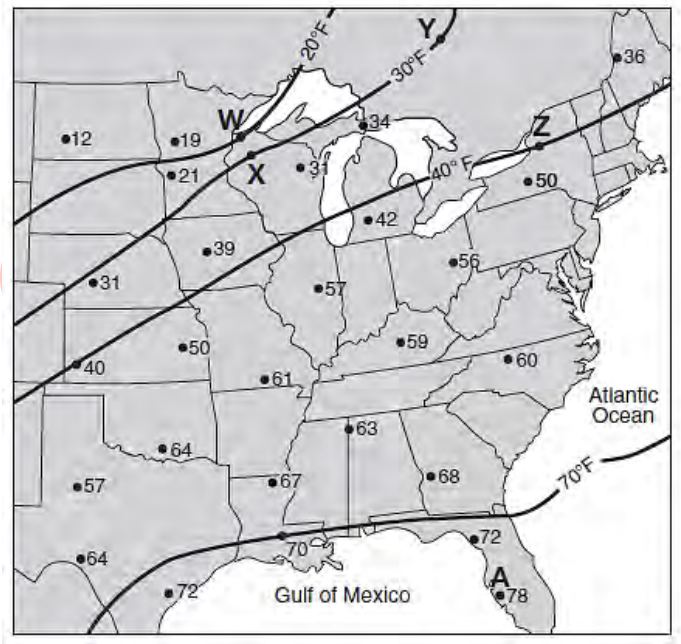
(1) (2) (3) (4)

107. A weather station recorded the barometric pressure on a weather station model as shown below.

On the map below, place an X to represent a possible location for this weather station.



108. Base your answer to this question on the map below and on your knowledge of Earth science. The map shows surface air temperatures for some locations in the United States on a day in November. The 20°F, 30°F, 40°F, and 70°F isotherms are shown. Points A, W, X, Y, and Z represent locations on Earth's surface.

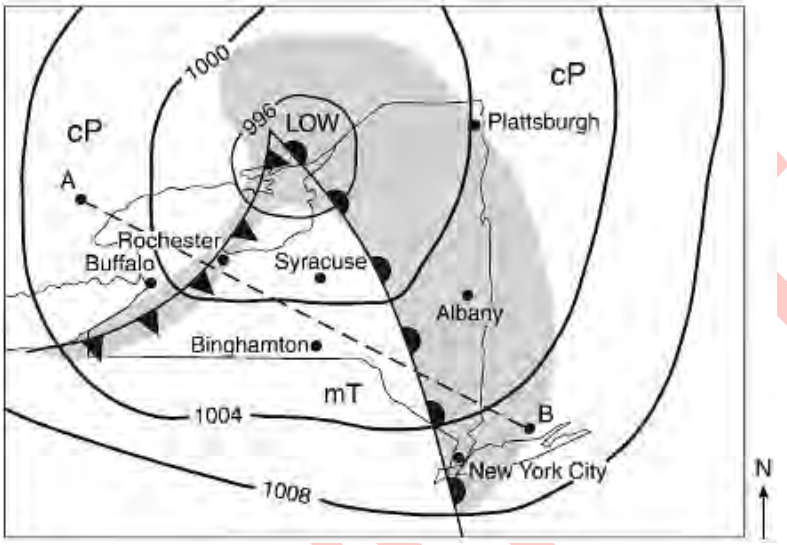


Identify the air temperature at Watertown, New York. ___**°F**

[See also Map of New York State on RT 2-3. This is a *very* challenging question!]

Base your answers to questions 109 and 110 on the weather map below and on your knowledge of Earth science.

The map indicates the location of a low-pressure system over New York State during late summer. Isobar values are recorded in millibars. Shading indicates regions receiving precipitation. The air masses are labeled mT and cP. The locations of some New York State cities are shown. Points A and B represent other locations on Earth's surface.

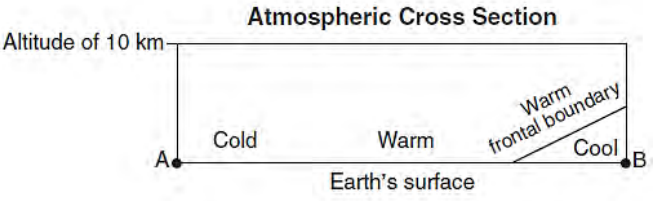


109. An air mass acquires the characteristics of the surface over which it forms. Circle either "land" or "ocean" below" to describe the type of Earth surface over which the mT air mass most likely formed and describe the relative temperature of that area.

Circle one: **land ocean**

Relative temperature of Earth's surface: _____

110. The cross section below represents the atmosphere along the dashed line from A to B on the map. The warm frontal boundary is already shown on the cross section. Draw a curved line to represent the shape and location of the cold frontal boundary



ANSWERS

TO THE

ON THE

NEW YORK STATE

EARTH SCIENCE REFERENCE TABLES

Earthquake P-Wave & S-Wave Travel Time

85) 2

86) 3

87) 2

88) 2

Dewpoint/Relative Humidity

89) 1

90) 1 (difference is 2, wet bulb temperature is always less than or equal to dry bulb)

91) 3

92) *Dewpoint*: 8°C; *Relative humidity:* 40% (Dry bulb thermometer measures regular air temperature, so the "air temperature" is the dry bulb temperature.)

Temperature

93) 2

Pressure

94) 1

95) 3 (diagram is aneroid barometer – you must recognize it)

96) 30 in of Hg

97) *Pressure:* barometer; *temperature:* thermometer

Key to Weather Map Symbols

98) 3

99) 4

100) 3

101) 3

102) 4

103) 4

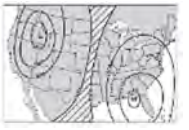
104) 2 (Air temperature and dewpoint are very similar → relative humidity is close to 100% → rain is likely.)

105) 

Note: 0.85 receives no credit because it is not in the proper weather station model format.

106) 3

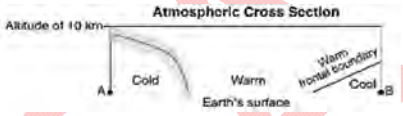
107) The center of the X should be within the diagonally lined area shown on the map below:



108) any value from 39°F to 41°F (Watertown is in New York. First locate New York within this map of the USA. New York is on the east coast and is north, close to Canada – the area with no state divisions on the map. If you look carefully and compare this map to the map on RT 3, you'll notice that the body of water near the letter Z on the map is Lake Ontario. Watertown is on the east side of Lake Ontario – so its temperature must be close to Z's temperature – around the 40 range.)

109) Ocean; warmer OR hot OR a tropical temperature

110) Line should start from line AB, pass between the cold and warm labels, and curve up to the left, as shown in the diagram below.



Selected Properties of Earth's Atmosphere

111) 1

112) 2

113) 3

114) Troposphere

Planetary Winds & Moisture Belts in the Troposphere

115) 3 (Answer is in the paragraph to the left of the Planetary Wind and Moisture Belts in the Troposphere table on RT 14.)

116) 4

117) 3

118) 1 (S.W. winds are coming from the southwest and moving towards the northeast.)

119) 4

120) 2

121) Barometer

122) NE/northeast/E/east

123) a straight or curved arrow drawn generally pointing toward the west or northwest as shown in diagrams below:

Electromagnetic Spectrum

124) 2

125) 1

126) 1

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