Earth Science Regents Review #4
Weather

Topics Reviewed:
Weather Factors
Temperature
Humidity
Air Pressure
Winds
Station Models
Air Masses and Fronts
Weather Maps & Weather Predictions
Severe Weather
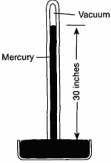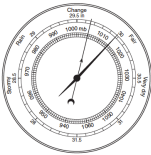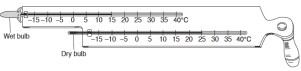
PLUS 25 Practice Regents Questions
with Answers!

19)**WEATHER FACTORS**

a) **Weather**: short term atmospheric (**troposphere**) conditions in a specific area at a specific time

b) **Temperature**: how warm or cold an area is measured in degrees using a **thermometer**

i) **ESRT page 13**: temperature conversions

ii) **Isotherms** connect equal temperatures on a map

c) **Humidity**: amount of moisture in an area measured using a **sling psychrometer**

i) Expressed as a percentage (**relative humidity**) or **dew point temperature** (˚C)

ii) **ESRT page 12**: Relative Humidity & Dew Point charts

iii) The closer the air temperature and dew point temperature, the higher the relative humidity.

d) **Air Pressure**: weight of the air on the ground measured in millibars or inches of mercury using a **barometer**

i) **ESRT page 13**: air pressure conversions

ii) **Isobars** connect equal air pressures on a map

iii) **High pressure**: cool and dry (heavy, sinking air); spins outward & clockwise

iv) **Low pressure**: warm and moist (light, rising air); spins inward & counterclockwise

e) **Winds**: horizontal movement of air from high pressure to low pressure

i) Wind direction is measured using a **wind vane**.

(1) Winds are always named for the direction they are coming from.

ii) Wind speed is measured using an **anemometer**.

(1) The closer the high and low pressure, the faster the wind speed.

iii) Breezes near the coast change direction depending upon time of day

(1) **Sea breeze** (daytime): land warms up faster than ocean water. This results in the land having a lower pressure than the ocean. The wind blows from the ocean to the land.

(2) **Land breeze** (nighttime): land cools down faster than ocean water. This results in land having a higher pressure than the ocean. The wind blows from the land to the ocean.

f) Weather Instruments

Barometer measures air pressure	Sling psychrometer measure humidity	Wind vane measures wind direction	Anemometer measures winds speed

g) **Station Models**: a diagram that summarizes ten pieces of weather information (**see ESRT page 13**)

   i) No units are recorded on a station model.

   ii) To convert barometric pressure to 3-digit abbreviation, take off 9 or 10 in the front and remove the decimal and units.

   iii) To convert from 3-digit abbreviation to barometric pressure:

   (1) If number is greater than 500, add 9 to front and a decimal between the last two numbers. Add units (millibars). Example 998 = 999.8 mb

   (2) If number is less than 500, add 10 to front and a decimal between the last two numbers. Add units (millibars). Example: 084 = 1008.4mb

20) PREDICTING WEATHER

   a) Air Masses & Fronts (**ESRT page 13**)

   i) **Air mass**: temperature and humidity of air

   (1) **cP** (cold & dry) air masses originate from Central Canada.

   (2) **mT** (warm & wet) air masses originate from the Gulf of Mexico.

   ii) **Front**: boundary between two air masses. Front symbols indicate the air mass that is behind it and always point in the direction the air mass is moving.

   (1) **Cold front**: cold air moves into a region occupied by warm air causing strong, quick storms. Precipitation always occurs at the cold front. Cold air is behind the cold front.

   (2) **Warm front**: warm air moves into a region occupied by cold air causing gentle, prolonged precipitation. Precipitation always occurs ahead of the warm front. Warm air is behind the warm front.
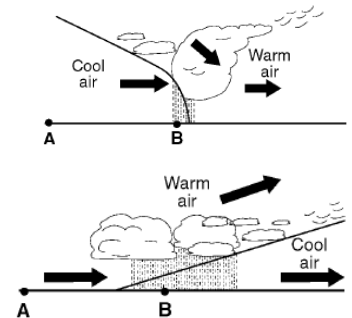
   b) Weather Maps

   i) Used to show current weather conditions and can be used to predict weather

   (1) In the U.S., all weather systems move northeast since we are in the SW wind belt

   ii) **Isobars**, **isotherms**, **fronts**, and **station models** may be shown on the map.

   (1) Precipitation will always occurs at the cold front, ahead of the warm front, and in the area of the low pressure center.

   iii) Radar and satellite maps can show areas of precipitation and clouds.
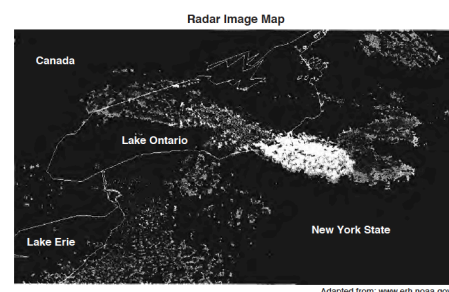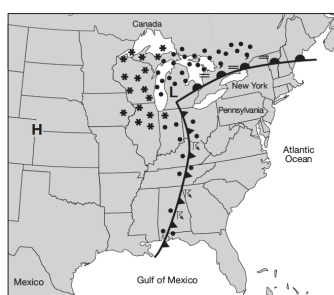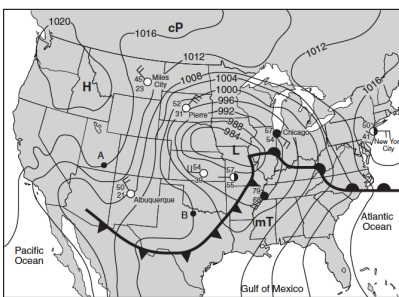
c) Severe Weather:

   i) Loss of property, personal injury, and loss of life can be reduced by effective emergency preparedness.

      (1) **General storm preparation**: Have back-up food & water supply, first aid kid, battery-operated flashlight, generator

   ii) **Hurricanes**: large low pressure system with very fast winds that forms over warm ocean water. Hazards include storm surge and flying debris.
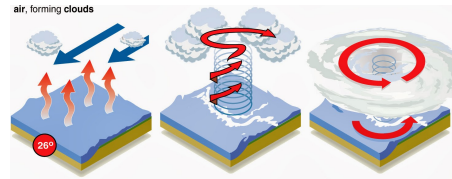
   iii) **Tornadoes**: when a cold, dry air mass quickly moves into an area occupied by a warm, moist air mass forming a vortex (winds moving counterclockwise & inward)
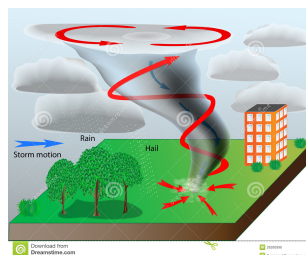
   iv) **Lake Effect Snowstorms**: Cold air mass passes over a warm lake. The air becomes warmer and picks up water vapor. When the air mass moves over the cold land, the air cools and the heavy snowfall occurs. Occurs east of the Great Lakes. (Caused by differences in specific heat of water and land)
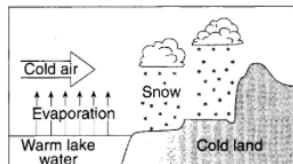
   v) **El Nino**: Change in worldwide weather pattern caused by when the Peru Current warms and reverses flow
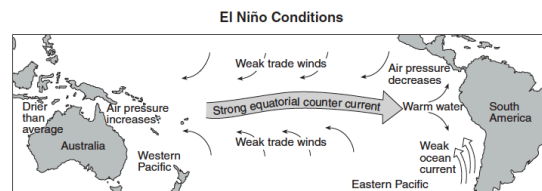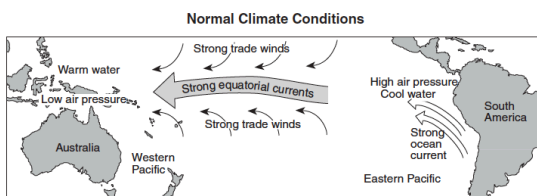
   vi) **Monsoons**: seasonal changes in the direction of winds and precipitation that develop as the result of large changes between continental and ocean temperatures

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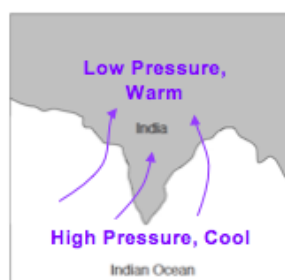
PRACTICE REGENTS QUESTIONS

1. Most of Earth's weather events take place in the
    (1) thermosphere   (2) mesosphere   (3) stratosphere   (4) troposphere

2. The station model below shows several weather variables recorded at a particular location.

62   970

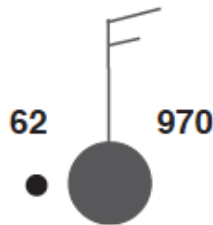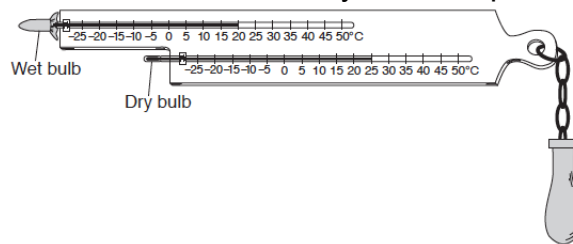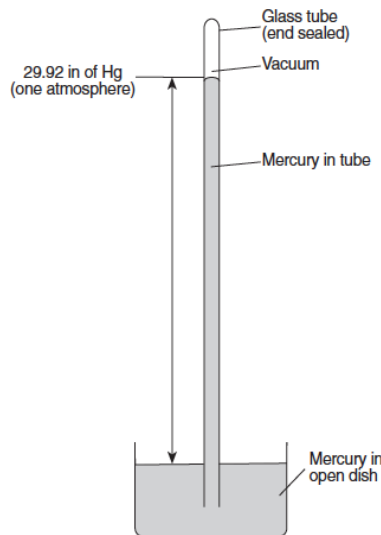What was the most likely dewpoint at this location?
    (1) 32°F   (2) 40°F   (3) 61°F   (4) 70°F

3. What is the dewpoint when the dry-bulb temperature is 8°C and the wet-bulb temperature is 2°C?
    (1) 28°C   (2) 6°C   (3) 3°C   (4) -9°C

4. The diagram below represents the wet-bulb and dry-bulb temperatures on a sling psychrometer.

–25 –20 –15 –10 –5 0   5 10 15 20 25 30 35 40 45 50°C
Wet bulb
–25 –20 –15 –10 –5 0   5 10 15 20 25 30 35 40 45 50°C
Dry bulb

What was the relative humidity of the air when these temperatures were recorded?
    (1) 5%   (2) 17%   (3) 20%   (4) 63%

5. The diagram below represents a weather instrument.

Glass tube
(end sealed)

29.92 in of Hg
(one atmosphere)

Vacuum

Mercury in tube

Mercury in
open dish

(Not drawn to scale)

Which weather variable was this instrument designed to measure?
    (1) air pressure   (2) dewpoint   (3) relative humidity   (4) amount of precipitation

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6. What is the usual surface wind pattern within a Northern Hemisphere low-pressure system?
    (1) clockwise and outward   (3) counterclockwise and outward
    (2) clockwise and inward   (4) counterclockwise and inward

7. Which set of instruments is correctly paired with the weather variables that they measure?
    (1) wind speed – barometer   (3) wind speed – wind vane
       wind direction – wind vane   wind direction – barometer
    (2) wind speed – anemometer   (4) wind speed – anemometer
       wind direction – wind vane   wind direction – barometer

8. Monsoons develop as a result of
    (1) large changes between the temperatures of a continent and neighboring oceans
    (2) a continent and neighboring oceans having nearly the same temperatures
    (3) air rising over Earth's equatorial region
    (4) air sinking over Earth's polar regions

9. Which station model shows a wind direction from the southeast?

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

Base your answers to questions 10 through 12 on the weather station model below and on your knowledge of Earth science. The model shows atmospheric conditions at Oswego, New York.

          31   995
          *
          29
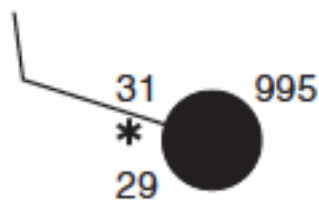
10. Fill in the correct information for each weather variable listed for this station model.

Air temperature: _____ °F   Wind speed: _____ knots

Dewpoint: _____ °F   Cloud cover: _____ %

11. Explain how the data on the station model indicate a high relative humidity.

12. Convert the coded air pressure shown on the station model into the actual millibars of air pressure.

13. The winds shift from southwest to northwest as heavy rains and hail begin to fall in Albany, New York. These changes are most likely caused by the arrival of
(1) an mT air mass (3) a cold front
(2) a cT air mass (4) a warm front

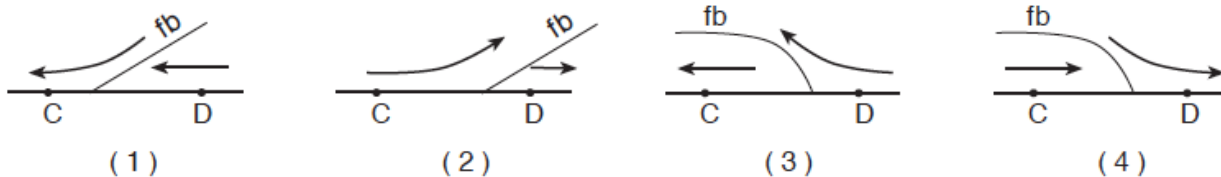14. The weather map below shows a portion of a low-pressure system.
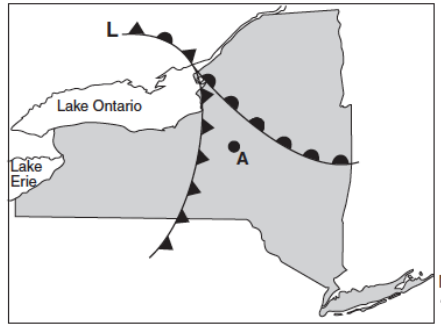
Which front will most likely pass over location A during the next two hours?
(1) warm (2) stationary (3) occluded (4) cold

Base your answers to questions 15 through 17 on the weather map below and on your knowledge of Earth science. The map shows a low-pressure system with two fronts extending from its center (L). Points A, B, C, and D represent locations on Earth's surface. Two different air masses are labeled.
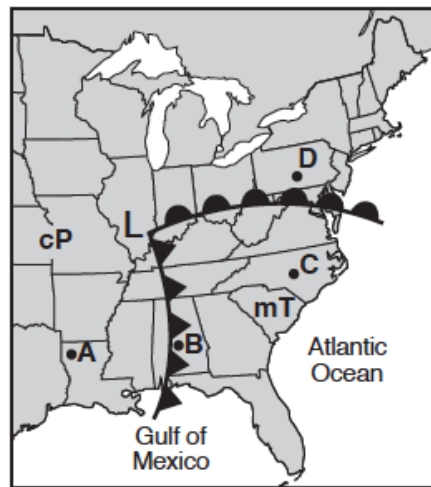
15. Which atmospheric conditions describe the air mass that is influencing weather conditions at location C?
(1) cool and dry (2) cool and moist (3) warm and dry (4) warm and moist

16. Which locations are most likely experiencing precipitation?
(1) A and B (2) B and C (3) C and D (4) D and B

17. Which cross section best represents the frontal boundary (fb) and general pattern of air movements between locations C and D?

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

Base your answers to questions 18 through 21 on the weather map below, which shows the locations of a high-pressure center (H) and a low-pressure center (L) over a portion of North America. The isolines indicate surface air pressures.
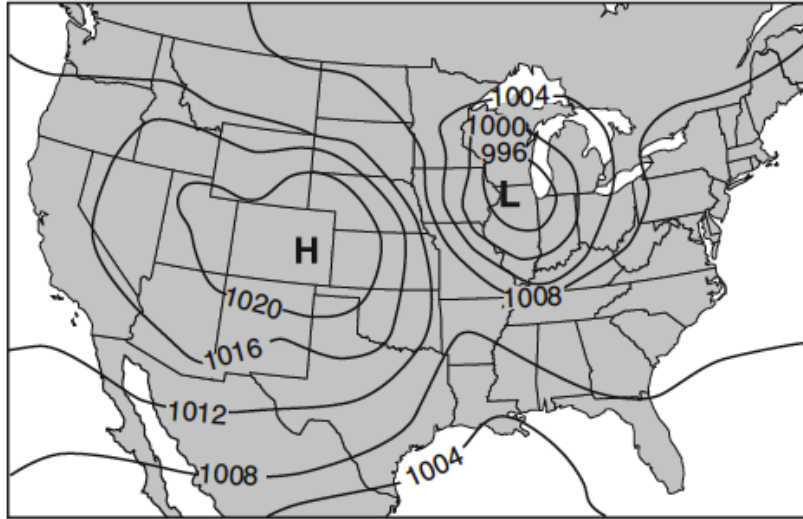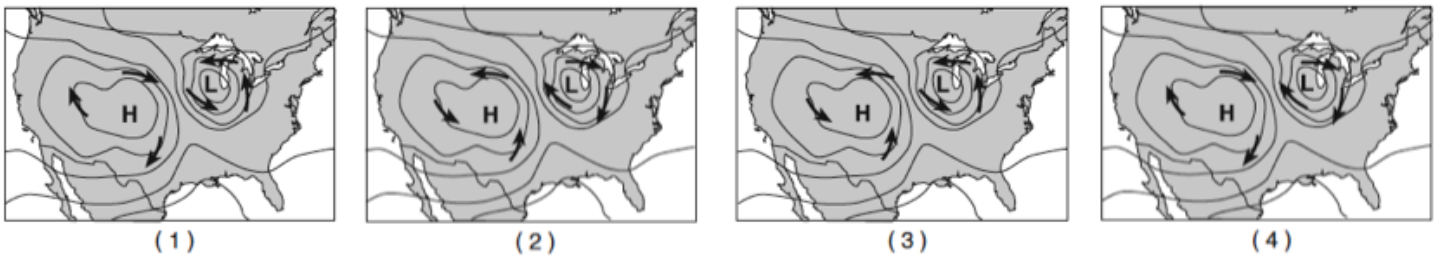

18. The data used to construct the isolines on this map were recorded in which units?
    (1) inches   (2) millibars   (3) feet   (4) meters

19. Which map shows the most likely location of clouds associated with these pressure centers?

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

20. The arrows on which map best show the pattern of surface winds around these two pressure centers?

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

21. The arrows on which map show the most likely path in which these two pressure centers will move over the next few days?

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

Base your answers to questions 22 through 25 on the weather map in your answer booklet and on your knowledge of Earth science. The map shows air temperatures (in °F) at locations in the northeastern United States and part of Canada. Syracuse, New York, is labeled. Line AB represents a stationary frontal boundary.
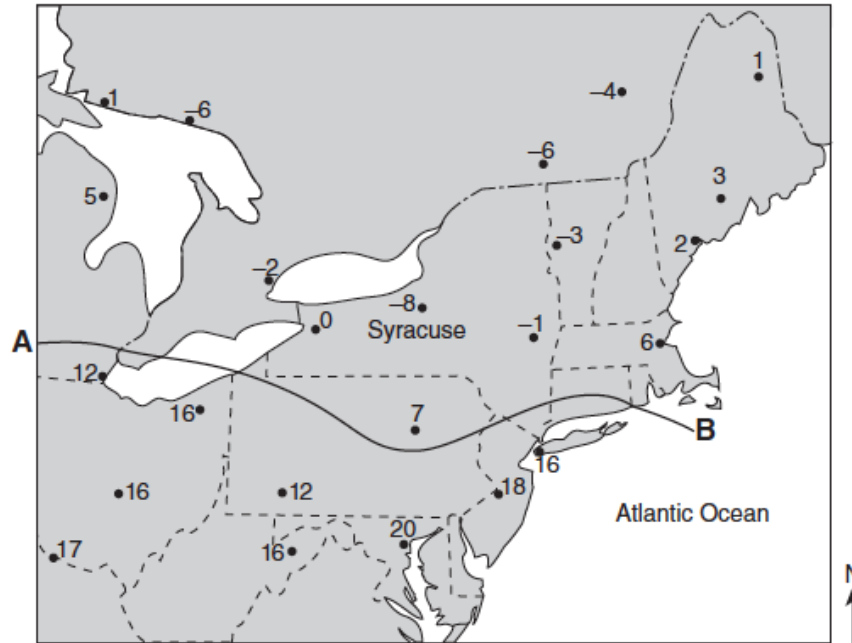

22. On the map in your answer booklet, draw the isotherm for 0°F. Extend each end of the isotherm to the edge of the map.

23. Convert the air temperature at Syracuse from degrees Fahrenheit to degrees Celsius.

24. Write the two-letter weather map symbol for the type of air mass that is most likely located north of frontal boundary AB.

25. Explain why locations near the Atlantic Ocean have air temperatures that are warmer than locations farther inland.

PRACTICE REGENTS QUESTIONS – ANSWER KEY

1. 4 *(See Fact 19a)*

2. 3 *(See Fact 19c,iii)*

3. 4 *(See Fact 19c,ii)*

4. 4 *(See Fact 19c,ii)*

5. 1 *(See Fact 19f)*

6. 4 *(See Fact 19d,iv)*

7. 2 *(See Fact 19f)*

8. 1 *(See Fact 20c,vi)*

9. 2 *(See Fact 19g & ESRT p13)*

10. *(See Fact 19g & ESRT p13)*

    Air temperature = 31˚F

    Dew point = 29˚F

    Wind speed = 10 knots

    Cloud cover = 100%

11. Cloud cover is 100%; Air temperature and dew point temperature are close; It is snowing. *(See Fact 19c,iii)*

12. 999.5 mb *(See Fact 19g,iii,1)*

13. 3 *(See Fact 20a,ii,1)*

14. 4 *(See Fact 20a,ii & ESRT p13)*

15. 4 *(See Fact 20a,i & ESRT p13)*

16. 4 *(See Fact 20a,ii, 20b,ii,1 & ESRT p13)*

17. 2 *(See Fact 20a,ii,2 & ESRT p13)*

18. 2 *(See Fact 20b,ii & ESRT p13)*

19. 2 *(See 19d,iii & 19d,iv)*

20. 1 *(See 19d,iii & 19d,iv)*

21. 4 *(See 20b,i,1)*

22. (*See Fact 19b,ii*)
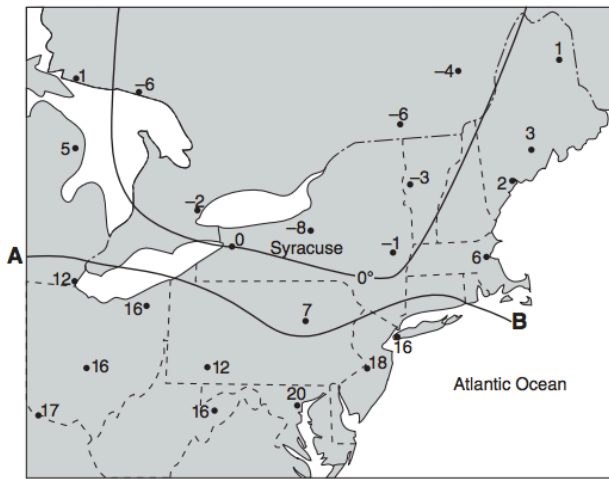
23. Any value from -20˚C to -24˚C. (*See 19b,i & ESRT p13*)

24. cP or cA or mP (*See 20a,i & ESRT p13*)

25. Water has a higher specific heat than the land does. (*See 18d*)