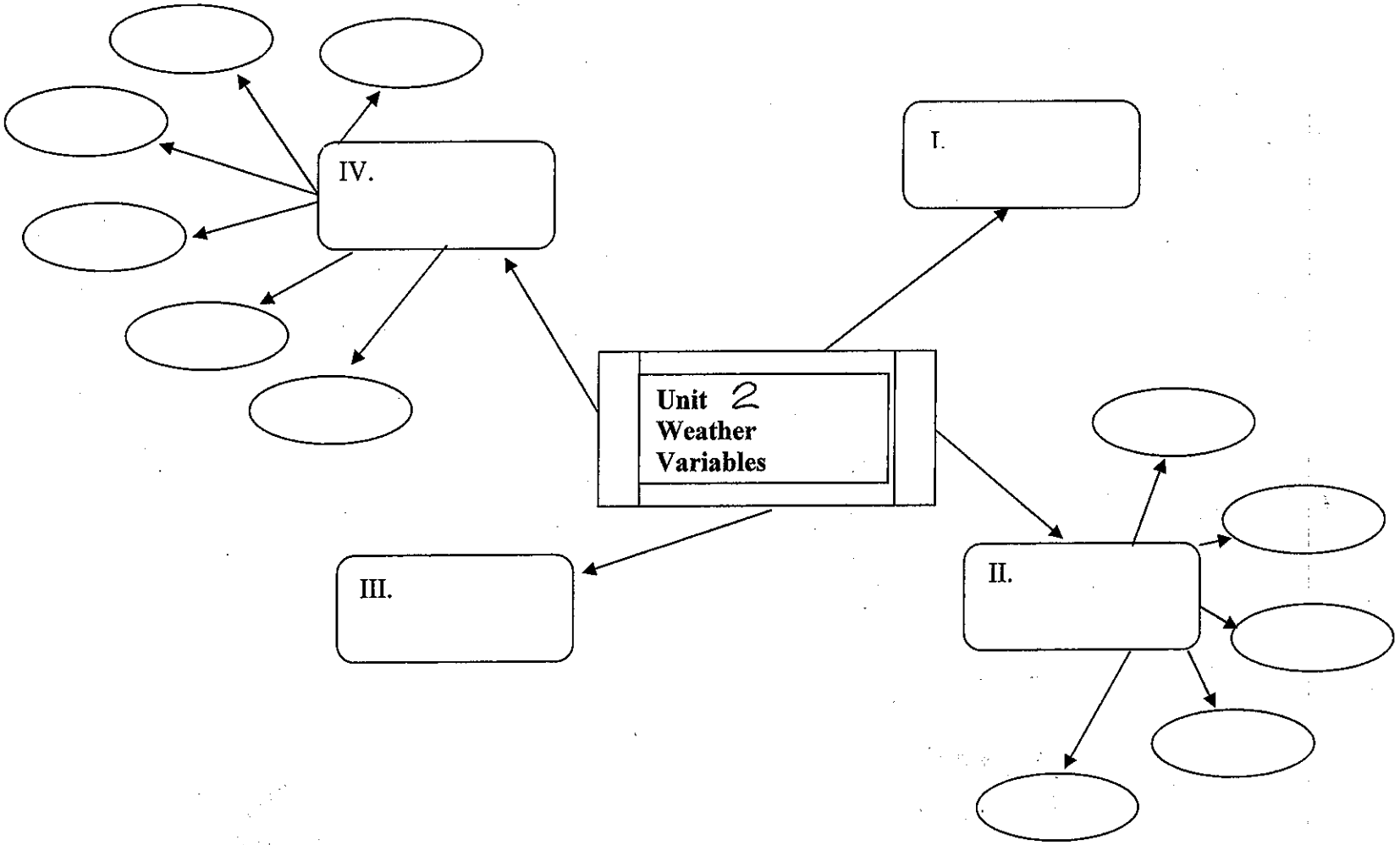
Name _____
Date _____
Period _____

Notepacket 2 Weather Variables
Earth Science



# I. Describing Weather

- What is Weather? [illegible]
- It is the short-term condition of the atmosphere and the changes that occur within the atmosphere or troposphere.
- Changes are mainly the result of unequal heating by solar radiation (sunlight) of the Earth's landmasses, oceans and atmosphere.
- Atmospheric variables are the characteristics of the atmosphere that change: temperature, pressure, dew point, humidity and wind.
- Atm. variables are interrelated and interactions are complex.
- _____ (scientists that study the weather) make field charts of these variables and then can make predictions (forecasts).

# II. Atmospheric Variables

A. _____ a measure of the amount of heat energy.

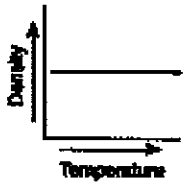
- More heat energy = greater temperature
- What is the main source of heat energy for our atmosphere?
- The amount of heat energy emitted from the sun is fairly constant but the amount that reaches the earth varies because of the following:
  - i. The angle at which solar radiation strikes the earth.
    1. straight on = _____
    2. angle = _____
  - ii. The number of hours of solar radiation per day.
    1. summer = more hours = _____
    2. winter = less hours = _____
  - iii. The amount of cloud cover.
    1. Solar radiation is reflected, refracted or absorbed.
    2. more cloud cover during the day = _____
    3. more cloud cover at night = _____
  - iv. The type of surface that absorbs solar radiation
    1. dark, rough surfaces (land) absorbs faster = _____
    2. light-colored, smooth (oceans) absorbs slower = _____
- Why does the air temperature change through out the day?
- Why does the seasonal temperature change?
- Temperature is measured with a _____
- Continuous temperature readings are made with a thermograph.
- What causes air to move in our atmosphere?

1/10

#1

Which graph best represents the relationship between air temperature and air density in the atmosphere?

(1)

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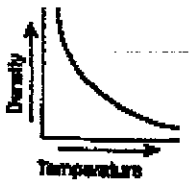


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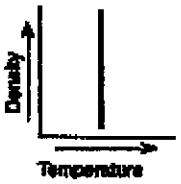


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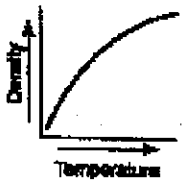



#2

Base your answer to the following question on the *Earth Science Reference Tables*.

A temperature of 73° Fahrenheit is approximately equal to a temperature of

(1) 17° Celsius
(2) 23° Celsius
(3) 26° Celsius
(4) 162° Celsius

## B. Air pressure

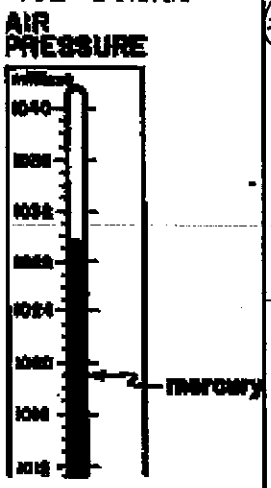
- Air pressure is
- Air is a mixture of _____
- A gas contains many tiny individual molecules that are far apart and moving rapidly.
- Why doesn't our atmosphere float off into space?

- You can NOT sense the changes in the air pressure but a barometer can.
- There are two main types of barometers:
  i. _____ barometer - air pushes down on mercury then the mercury will rise up a tube.
  ii. _____ barometer – no air, the can has a spring scale. As the air pushes against it the spring records how much pressure.
- One atmosphere is the average pressure at sea level = 1013.2 millibars.
- In general, when the barometric pressure is rising, _____ weather is moving in. Falling means _____ weather is approaching.
- Air pressure gradient controls the _____ of the wind.
  i. The higher the gradient (closer the lines) the _____ the wind velocity.

2/10

#3

What is the air pressure indicated by the diagram of the mercury barometer at the right?




(1) 1028.1 mb
(2) 1028.5 mb
(3) 1029.5 mb
(4) 1031.0 mb

#4 According to the *Earth Science Reference Tables*, an atmospheric pressure of 978 millibars is equal to

(1) 28.76 inches of mercury
(2) 28.88 inches of mercury
(3) 28.92 inches of mercury
(4) 29.00 inches of mercury

the *Earth Science Reference Tables*.

#5 What is the average atmospheric pressure at sea level?

(1) 1.0 atmosphere (3) 0.1 atmosphere
(2) 2.0 atmospheres (4) 4.0 atmospheres

On a July afternoon in New York State, the

#6 barometric pressure is 29.85 inches and falling. This reading most likely indicates

(1) an approaching storm
(2) rapidly clearing skies
(3) continuing fair weather
(4) gradually improving conditions

## C. Humidity

- Water vapor is
- Why is water vapor important?
- There are two ways to express humidity:
  - i. _____ humidity is the number of grams of water vapor in 1 cubic meter of air. This is seldom directly measured.
  - ii. _____ humidity is the ratio of the water vapor actually in the air compared to the maximum amount of water vapor that the air can hold at that temperature. (The air is holding __% of the water vapor that it can hold.)

★

★

- 100% relative humidity = rain or fog
- 0% relative humidity = desert
- Relative humidity can be calculated by using a

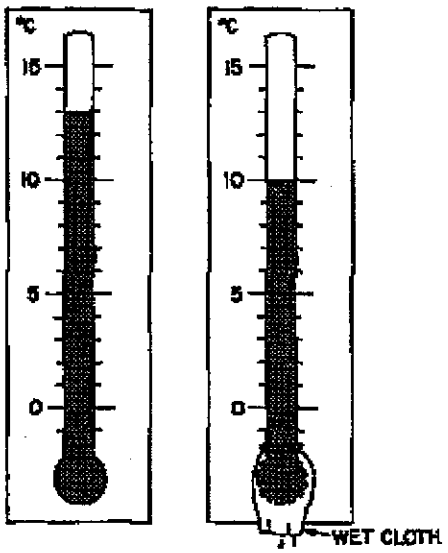
_____ _____

  - i. Wet bulb measures evaporation temperature
  - ii. Dry bulb measures air temperature

3/10

- _____ is the temperature at which the water vapor in the air fills to capacity and will begin to condense (change from a gas to a liquid).

#7 The two thermometers below show the dry-bulb and wet-bulb temperatures of the air.




According to the dewpoint temperature chart in the *Earth Science Reference Tables*, what is the approximate dewpoint temperature of the air?

(1) –25°C (3) 3°C
(2) 7°C (4) 4°C

#8 Base your answer to the following question on the *Earth Science Reference Tables*.

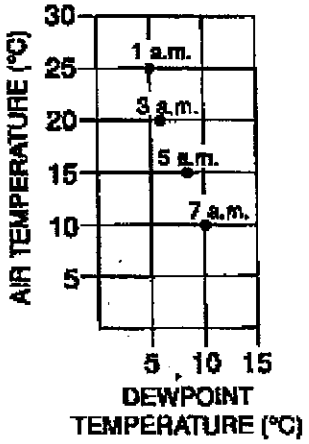
When the dry-bulb temperature is 14°C and the wet-bulb temperature is 8°C, the relative humidity is

(1) 6% (3) 25%
(2) 22% (4) 41%

#9 Most of the water vapor in the atmosphere is found in the

(1) mesosphere (3) troposphere
(2) thermosphere (4) stratosphere

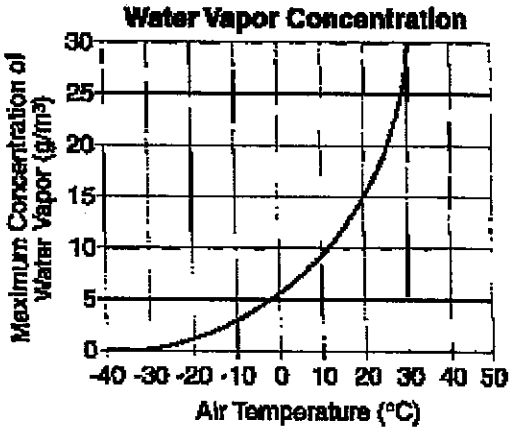
#10 The graph below shows the air temperature and dewpoint temperature at one location at four different times during one morning.




At what time was the chance of precipitation the greatest?

(1) 1 a.m. (3) 3 a.m.
(2) 5 a.m. (4) 7 a.m.

#11 The graph below shows the maximum possible amounts of water vapor that air can hold at different temperatures.




What is the approximate maximum amount of water vapor that a cubic meter of air can hold at 20°C?

(1) 15 g (3) 25 g
(2) 20 g (4) 30 g

4/10

## D. Air movements

i. Why does air move in the atmosphere?

- _____ are vertical movements of air.
- _____ is horizontal movements of air.
- Wind is described by both air direction and speed.
- A wind is named for the direction from which it blows.
- A wind vane is a pointer that shows the direction.
- An _____ is an instrument that measures wind speed.
- Circulation of air is affected by the Earth's rotation.

#12

Which factor is most directly related to wind velocity?

(1) dewpoint
(2) relative humidity
(3) cloud type
(4) pressure gradient

## E. Atmospheric transparency

- All of the gases in our atmosphere are transparent (see through).
- What types of substances might block our view in the air?
- Visibility is the horizontal distance through which the eye can distinguish objects in miles.
- Cloud cover is the fraction of the sky that is blocked by the clouds.

# III. Weather Stations

- Know how to read weather stations.
- Fill in the following data from the sample weather station

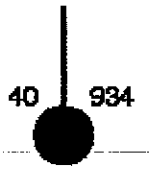
Wind direction:
Wind speed:
Temperature:
Dew point:
amount of precip:
barometric pressure:
cloud cover:

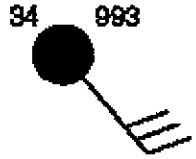
5/10

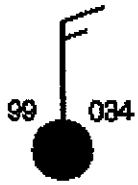
#13

. Which weather-station model shows an air pressure of 993.4 millibars?

(1) 

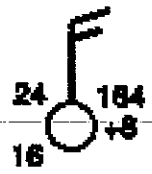

(3) 

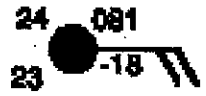

(2) 

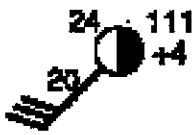

(4) 


#15

Which weather station model indicates the greatest probability of precipitation?

(1) 

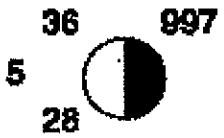

(3) 

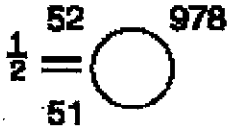

(2) 

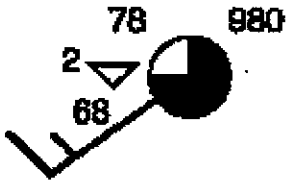

(4) 

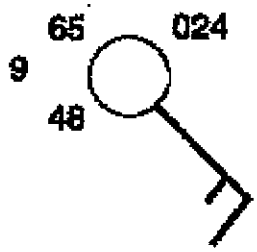

#14

At which weather station is visibility greatest?

(1) 

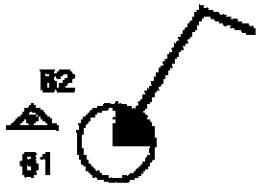

(2) 

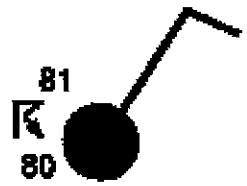

(3) 


(4) 


#16

Which weather station model represents a location where a thunderstorm is occurring?

(1) 


(3) 


(2) 


(4) 


# IV. Relationships

## A. Air pressure and air temperature:

- As air temperature increases, the air pressure _____.
  - i. Temp increases, faster, spread out, less dense
- As air temperature decreases, the air pressure _____.

6/10

i. Temp decreases, slower, closer, more dense

- As air pressure increases, the air temperature_____.
  i. Closer, hit each other more, more heat
- As air pressure decreases, the air temperature_____.
  i. Farther, don't hit each other, less heat

#17

As the temperature of the atmosphere at a given location increases, the air pressure will most likely

(1) decrease (3) remain the same

(2) increase

B. **Air pressure and humidity:**

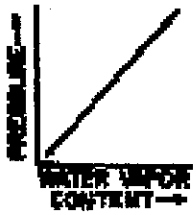
- Water vapor is much_____than other gases in the atmosphere.
- The higher the humidity, the _____the air pressure.
  i. Increase water vapor, lower weight molecules push out heavier molecules, lower pressure
- The lower the humidity, the higher the air pressure.

#18

. Which graph best shows the relationship between atmospheric pressure and water vapor content at the Earth's surface?

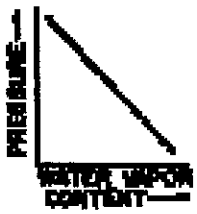
(1)


(3)




(2)


(4)




C. **Air temperature and humidity**

*

*

- If the temperature increases, the relative humidity will_____.
  i. Hotter, has the capacity to hold more, % decreases.
- If the temperature decreases, the relative humidity will_____.
  i. Hotter, less capacity to hold, % increases.

7/10

As the dewpoint temperature and the air temperature approach the same value, the probability of precipitation

(1) decreases

(2) increases

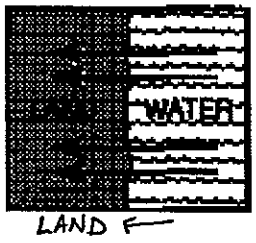
(3) remains the same

## D. Air pressure and winds.

#9

. Adjacent water and land masses are of equal temperature at sunrise. They are heated by the morning sun on a clear, calm day. After a few hours, a surface wind develops. Which diagram best represents this wind's direction?

(1)

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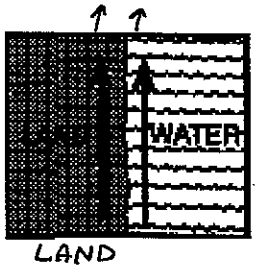


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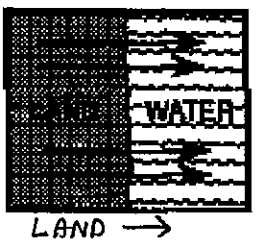
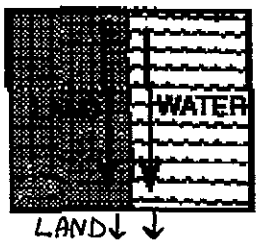



(4)




8/10

## E. Global Winds/ Planetary Winds

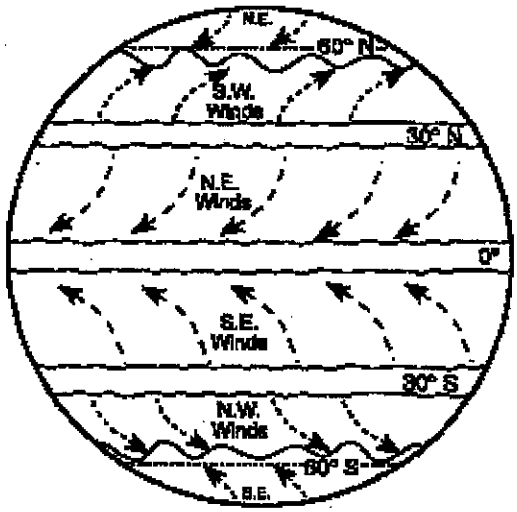
- Air currents are made from rising warm air and sinking cold air around the Earth.
- Global/Planetary winds are created by convection currents and the rotation of the Earth.
- _____ is the curving path of winds because of the Earth's rotation.
  - *i.* In the Northern Hemisphere everything is deflected to the _____.
  - *ii.* In the Southern Hemisphere everything is deflected to the _____.

#20

What is the general pattern of air movement on March 21 at Earth's Equator (0°)?

(1) upward, due to low temperature and high pressure
(2) upward, due to high temperature and low pressure
(3) downward, due to low temperature and high pressure
(4) downward, due to high temperature and low pressure

#22




The curved paths of the planetary winds are a result of

(1) changes in humidity
(2) changes in temperature
(3) Earth's rotation on its axis
(4) Earth's gravitational force

#21

According to the *Earth Science Reference Tables*, the prevailing winds at 45° S latitude are from the

(1) southwest
(2) northwest
(3) southeast
(4) northeast

## F. Cloud and Precipitation Formation.

- How does clouds form? _____
- Sublimation is the change of phase from a gas directly to a solid.
- _____ is a cloud whose base is at ground level. It forms when moist air at the ground level is cooled below its dew point.
- What good things does precipitation do for us? _____

9/10

#23

By which process does water vapor change into clouds?

(1) condensation (3) convection

(2) evaporation (4) precipitation

#24

The change from the vapor phase to the liquid phase is called

(1) evaporation (3) precipitation

(2) condensation (4) transpiration

#25

Condensation will most likely occur in a given volume of air when the air is

(1) saturated and contains no condensation nuclei

(2) saturated and contains condensation nuclei

(3) unsaturated and contains no condensation nuclei

(4) unsaturated and contains condensation nuclei

#26

Why is it possible for no rain to be falling from a cloud?

(1) The water droplets are too small to fall.

(2) The cloud is water vapor.

(3) The dewpoint has not yet been reached in the cloud.

(4) There are no condensation nuclei in the cloud.

#27

Which substance is a form of precipitation?

(1) frost (3) fog

(2) hail (4) dew

10/10