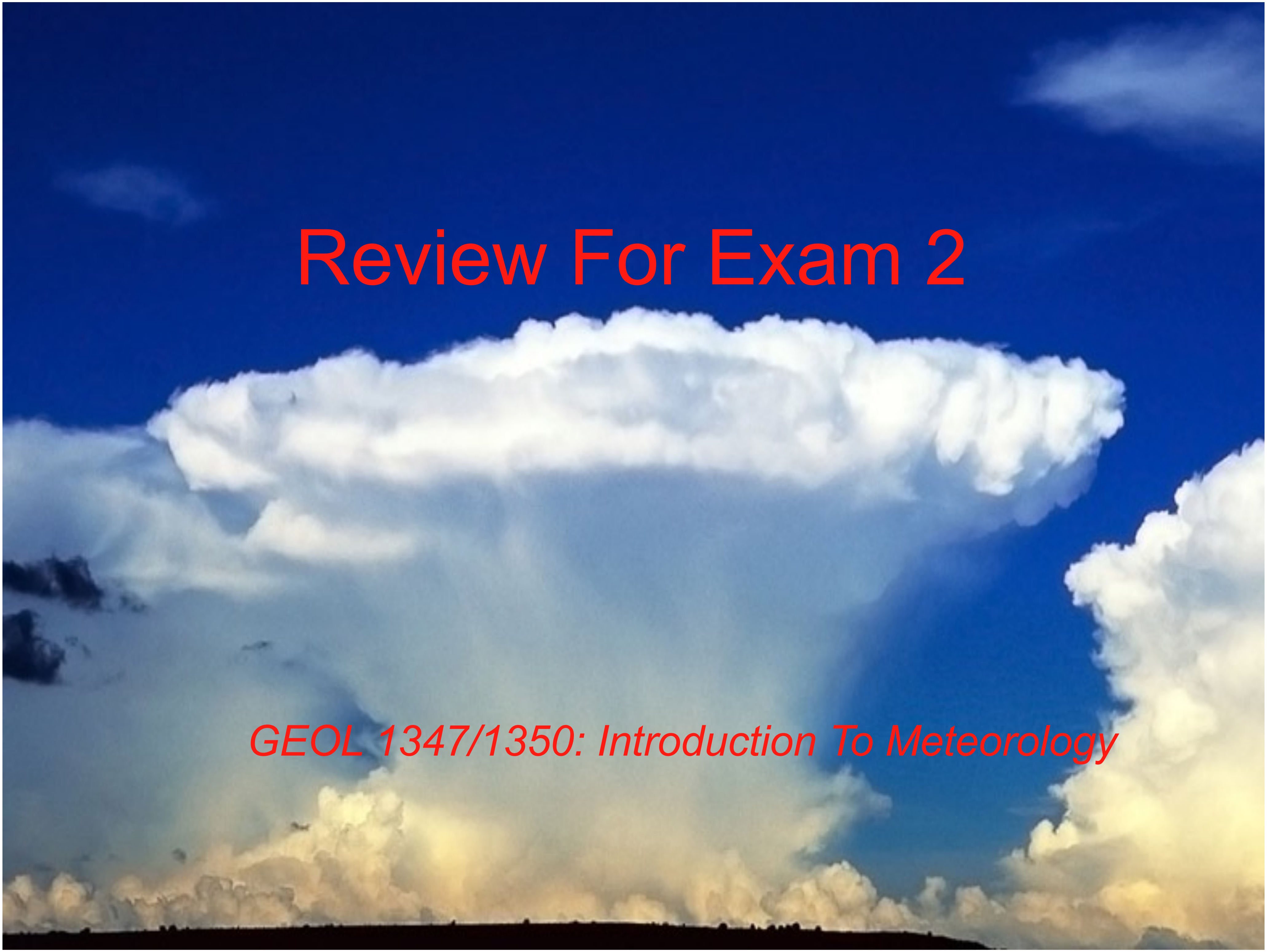


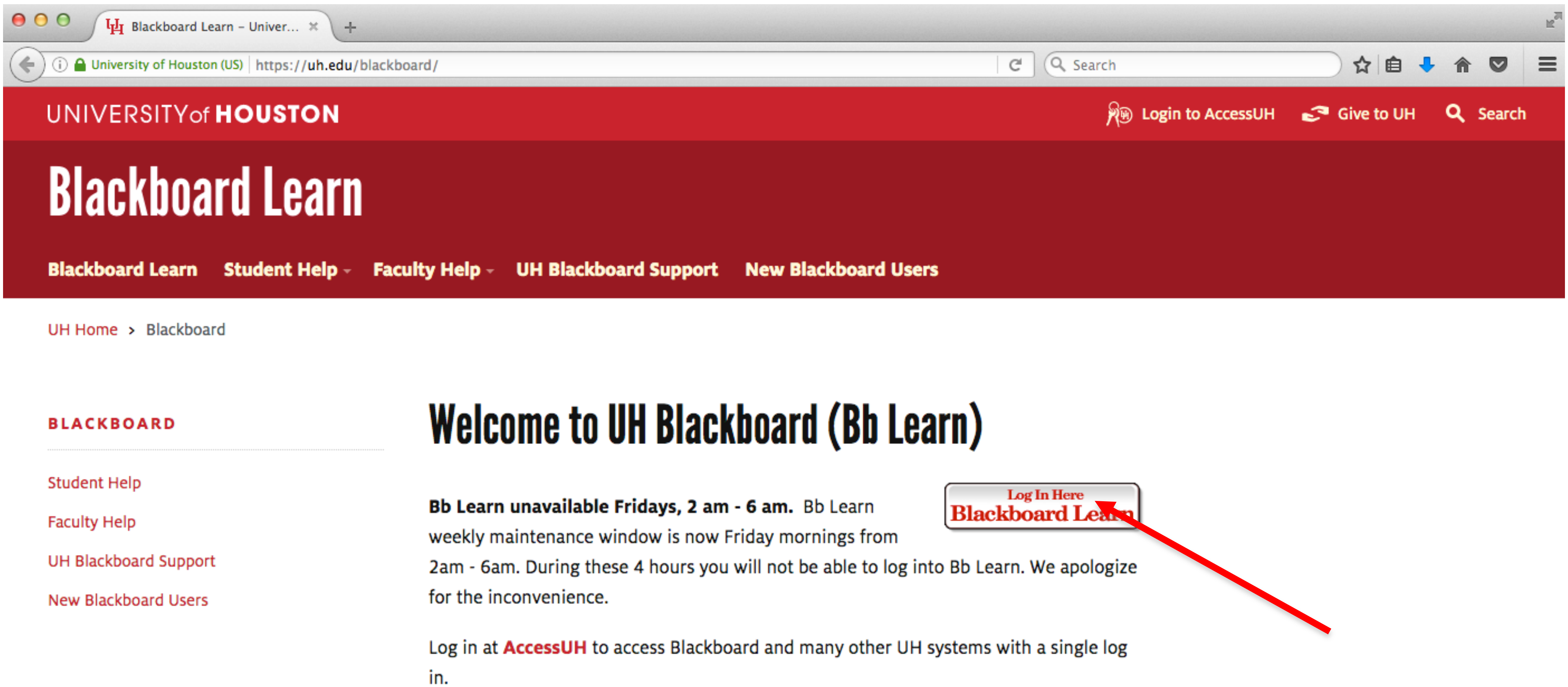
Review For Exam 2

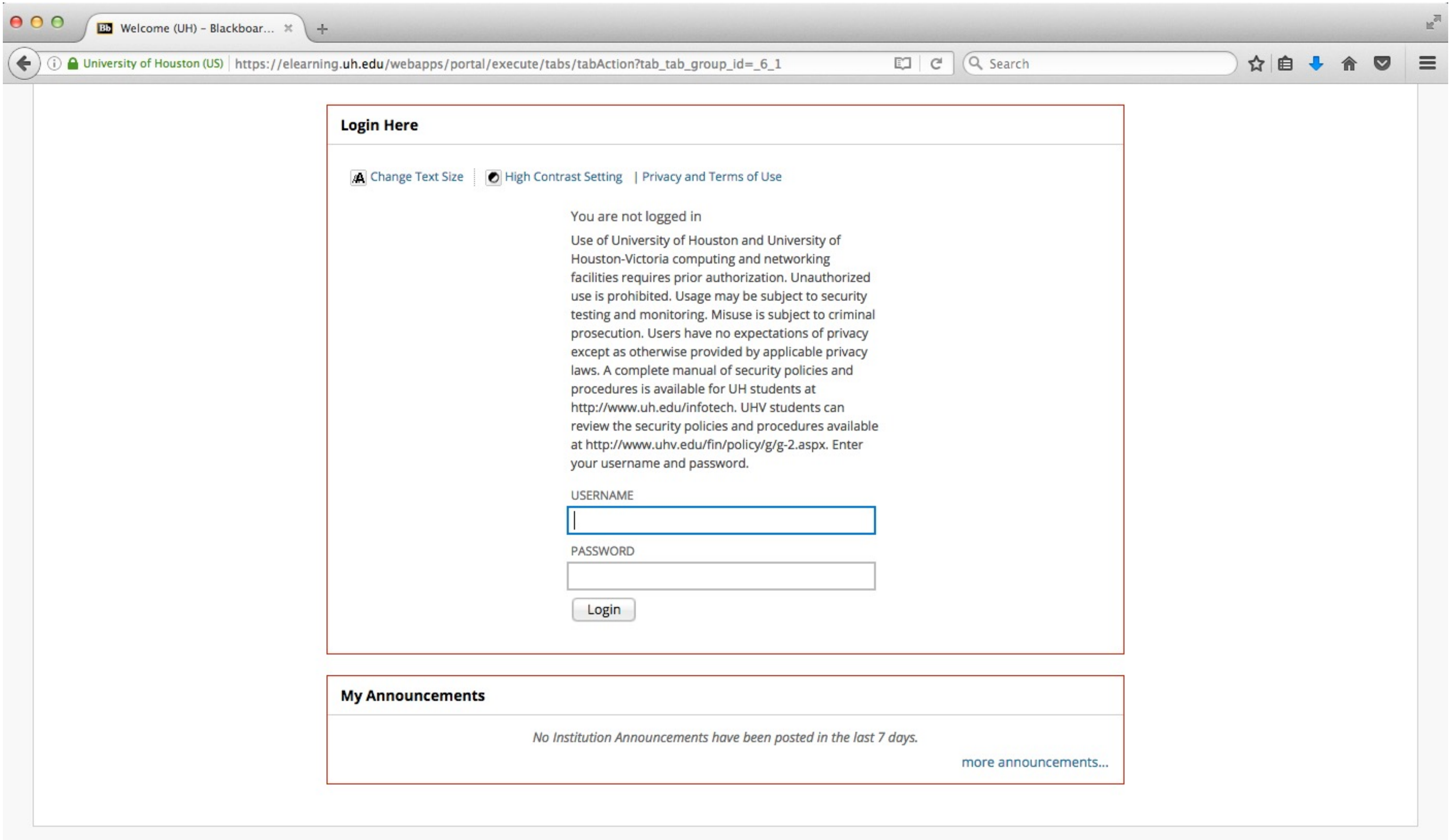
GEOL 1347/1350: Introduction To Meteorology

Exam 2

Online Test on Blackboard

Website: https://uh.edu/blackboard/





Username and password are your Cougarnet username and password.

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elearning.uh.edu/webapps/portal/execute/tabs/tabAction?tab_tab_group_id=_42_1

Update

2023SP-12302-GEOL1347-Introduction To Meteorology
Instructor: Xun Jiang;

2023SP-13425-GEOL1147-Introductory Meteorology Laboratory
Instructor: Xun Jiang; Thishan Dharshana Karandana Gamalathge;

2023SP-14968-GEOL1147-Introductory Meteorology Laboratory
Instructor: Mohammad Jahirul Alam; Xun Jiang;

2023SP-17814-GEOL1147-Introductory Meteorology Laboratory
Instructor: Morshad Ahmed; Xun Jiang;

2023SP-19560-GEOL1147-Introductory Meteorology Laboratory
Instructor: Xun Jiang; Shailaja Wasti;

My Announcements

No Institution Announcements have been posted in the last 7 days.

No Course or Organization Announcements have been posted in the last 7 days.

more announcements...

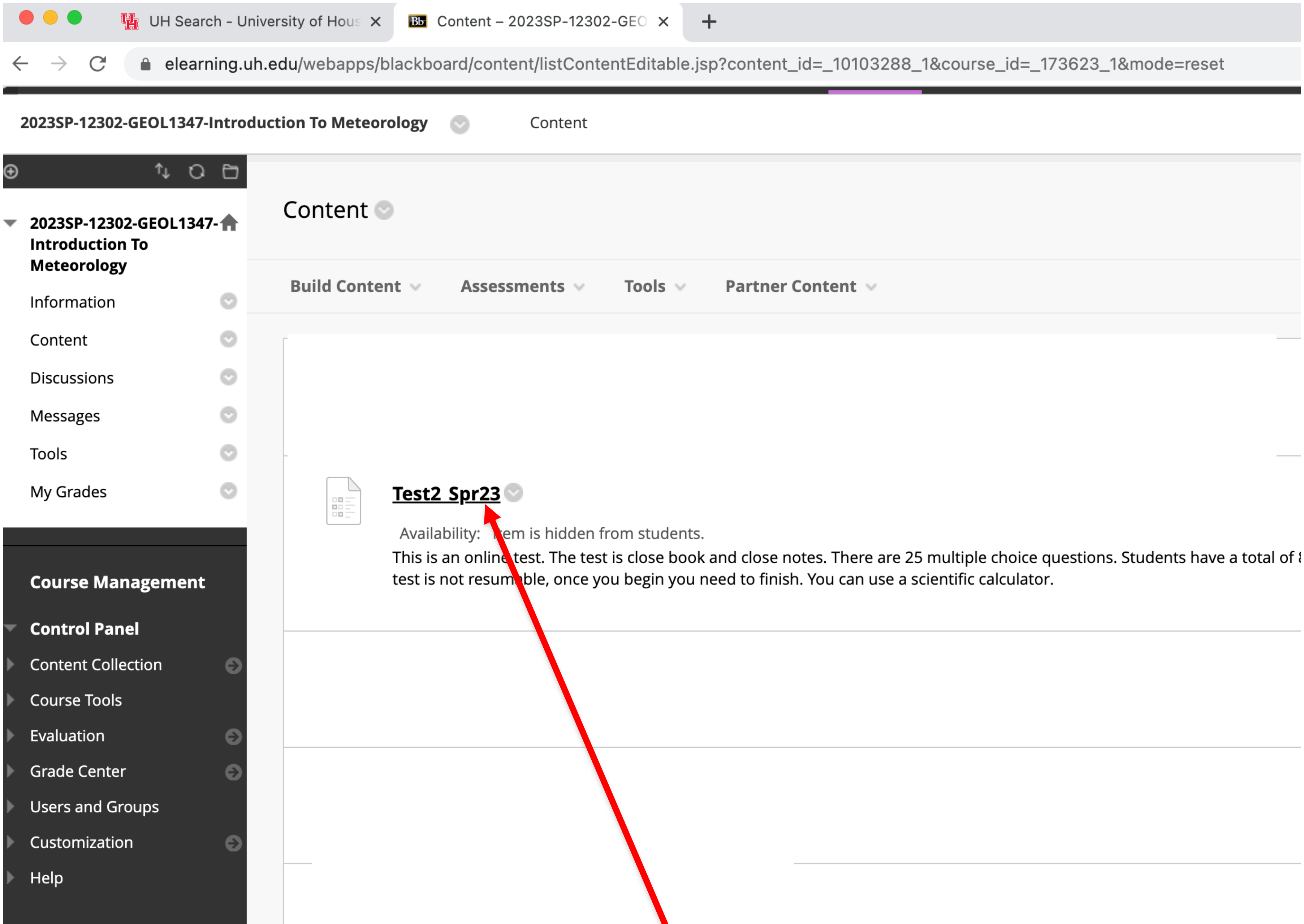
Connect your students to their required and supplemental course materials through Blackboard using the UH Libraries' Course Reserves service. The Libraries can help you obtain and post copyright-cleared articles, book chapters and more for your students to access easily through Blackboard. Use the available self-service options or let our friendly Course Reserves staff take care of everything for you!

Website: https://libraries.uh.edu/services/course-reserves/

Email: libreserves@uh.edu

Phone: 713-743-9730

Emergency Preparedness Faculty Guide



You should be able to see Test 2 after 1pm on Mar 2. Please finish the test during 1pm-2:30pm.

- The test is close book and close notes.
- There are 25 multiple choice questions.
- Time limit is 80 mins.
- Once started, the test must be completed in one sitting. Do not leave test before clicking save and submit.
- The test will save and submit automatically when the time expires.
- Please take the test during 1pm-2:30pm on Mar 2.
- You can use a scientific calculator.

Exam 2

Cover: L5 (Air Temperature); L6 (Humidity, Condensation, and Clouds-I); L7 (Humidity, Condensation, and Clouds-II); L8 (Cloud Development and Precipitation-I)

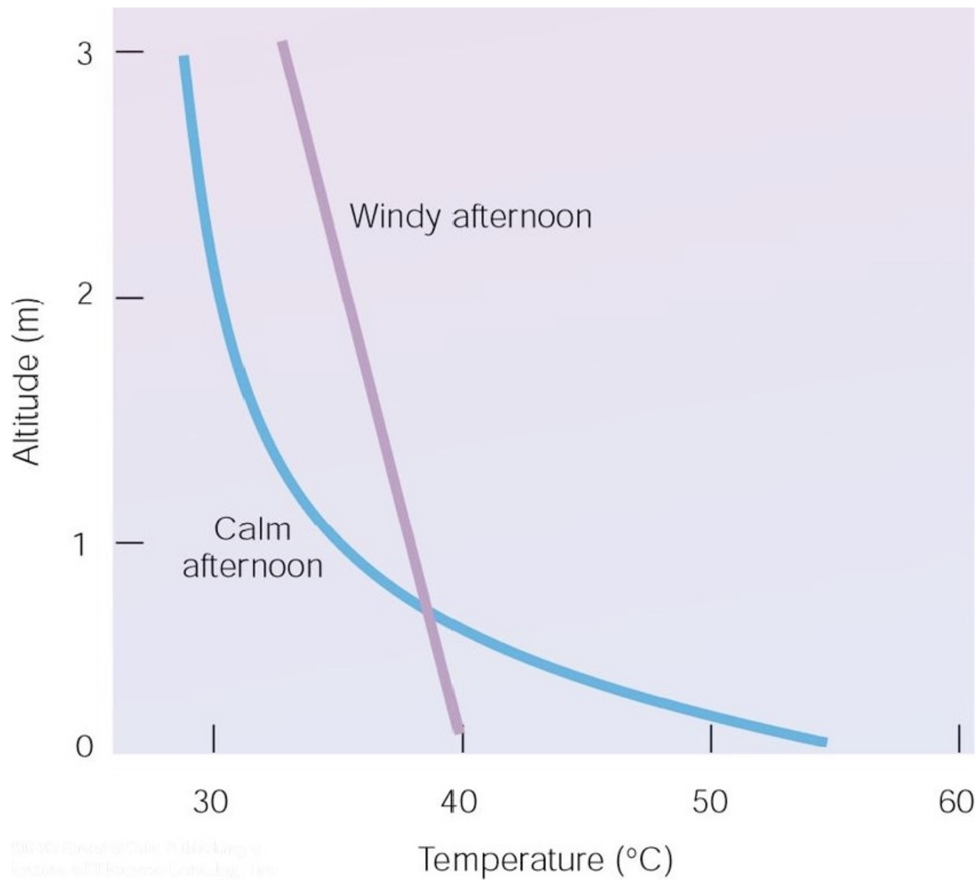
Close-book Exam

Exam counts 25% of the total grade.

Daytime Warming

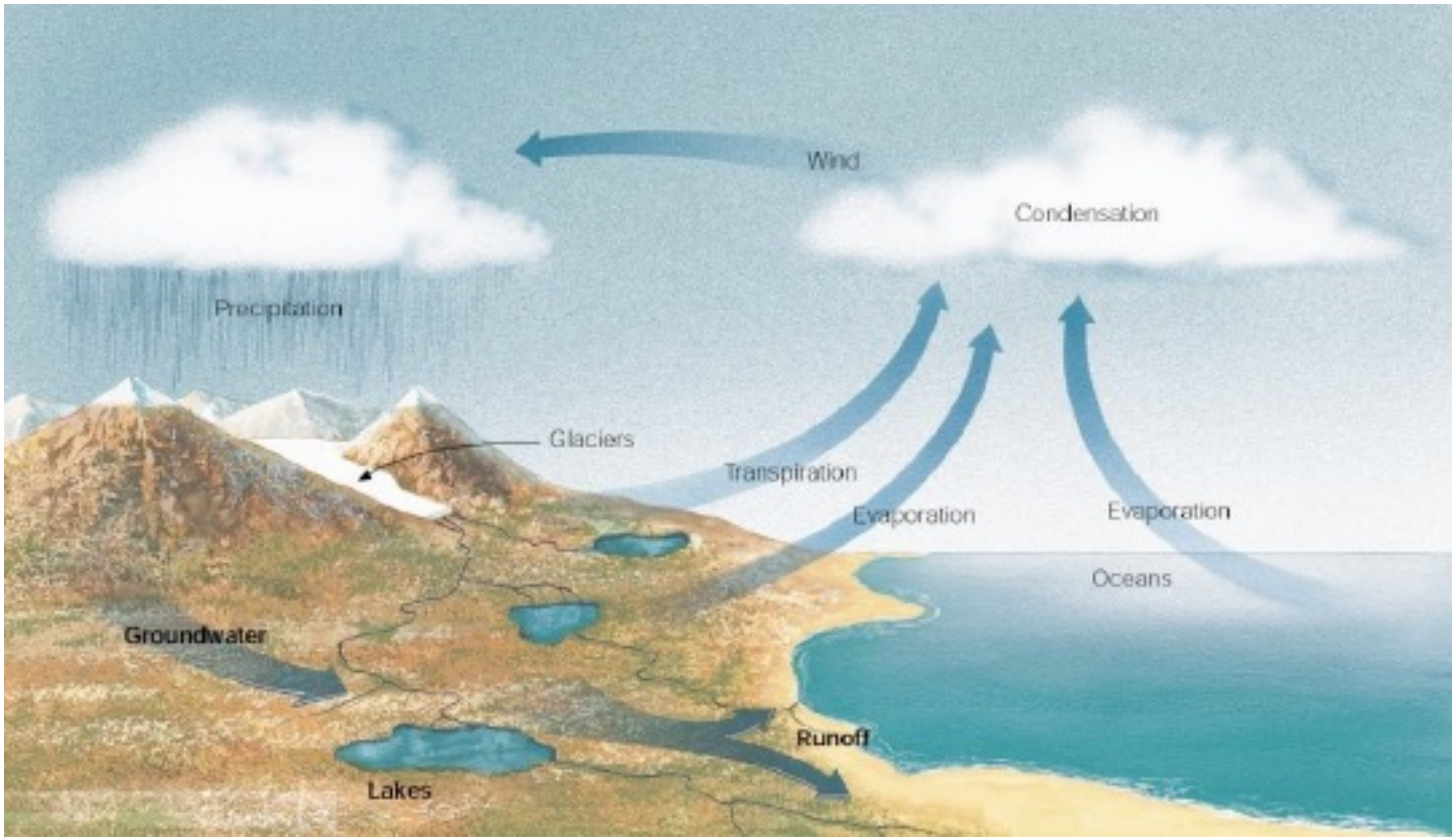
- On windy days, turbulence eddies are able to mix hot, surface air with cooler air above.

- This form of mechanical stirring, called forced convection, helps the thermals to transfer heat away from the surface more efficiently.



Temperature gradient is smaller in windy day than calm day.

Where does the moisture in the atmosphere come from ?



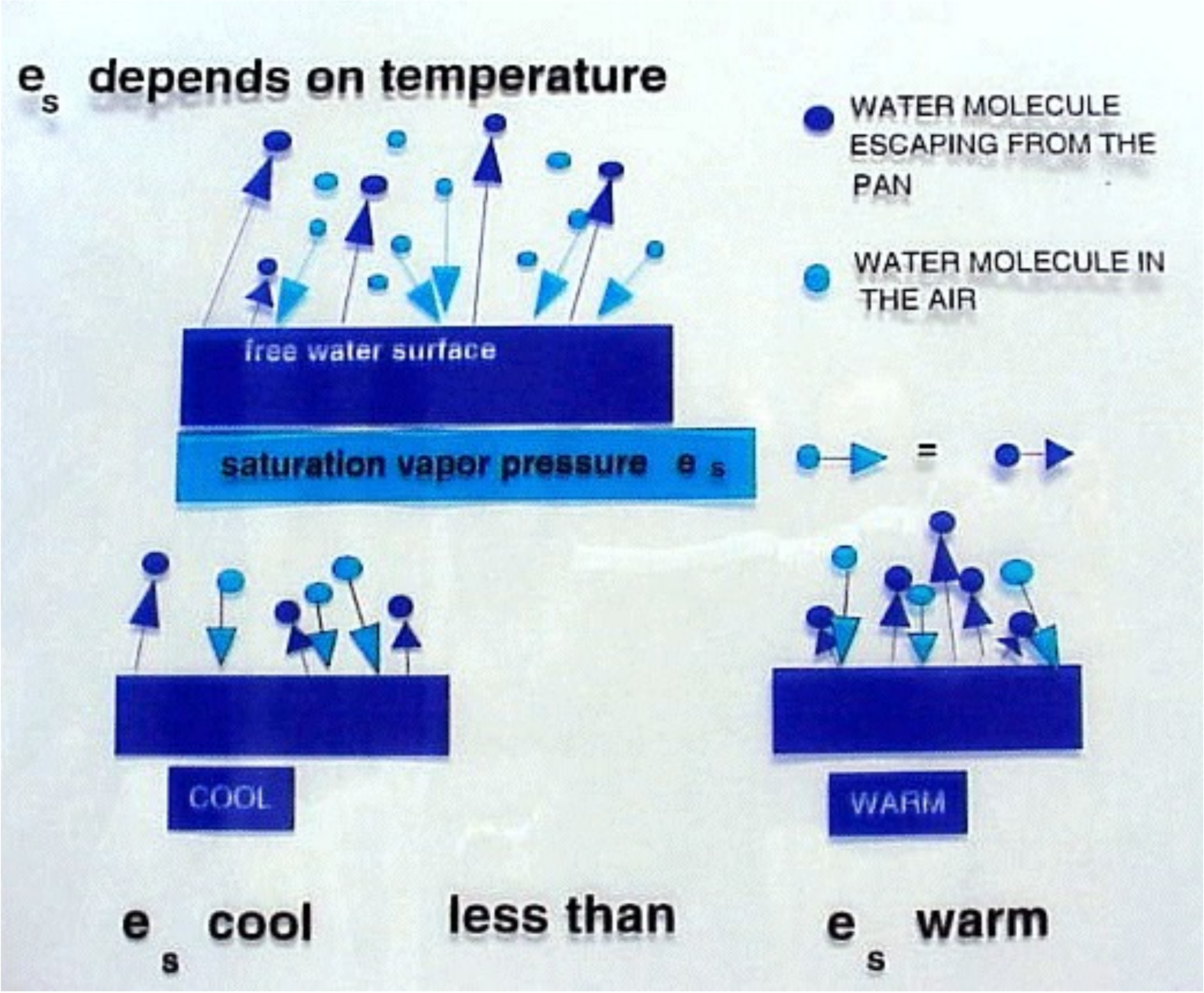
Major Source

Evaporation from ocean

Major sink

Precipitation

Saturation vapor pressure e_s depends upon temperature
higher temperature, higher e_s,
more water vapor that the air can hold



- The saturation vapor pressure of water increases with temperature
  - At higher T, faster water molecules in liquid escape more frequently causing equilibrium water vapor concentration to rise
  - We sometimes say "warmer air can hold more water vapor"
- There is also a vapor pressure of water over an ice surface
  - The saturation vapor pressure above solid ice is less than above liquid water, $e_{s(water)} > e_{s(ice)}$ at all temperatures

Absolute Humidity - ρ_v

- Density of water vapor
  - A measure of the total number (mass) of water vapor molecules in a unit volume of air (1 m^3)
  - Absolute humidity = mass of water vapor / volume of air

    $\rho_v = m_v / V_{air}$, $m_v = n_v M_v$, M_v=18 g/mol

- Changes in volume cause changes in absolute humidity

Specific Humidity - q

- Ratio of mass of water to <u>total</u> mass of air in a unit volume
- Invariant to change in volume

$$q = \frac{m_v}{m}$$

Since q is on the order of 10^{-3} g_v/g_a, we prefer to use g_v/kg_a

q values normally range from 1 to 20 g_v/kg_a and decreases with increasing height

Relative Humidity – R.H.

The ratio of the amount of water vapor in the air compared to the amount required for saturation.

R.H. = water vapor content / water vapor capacity

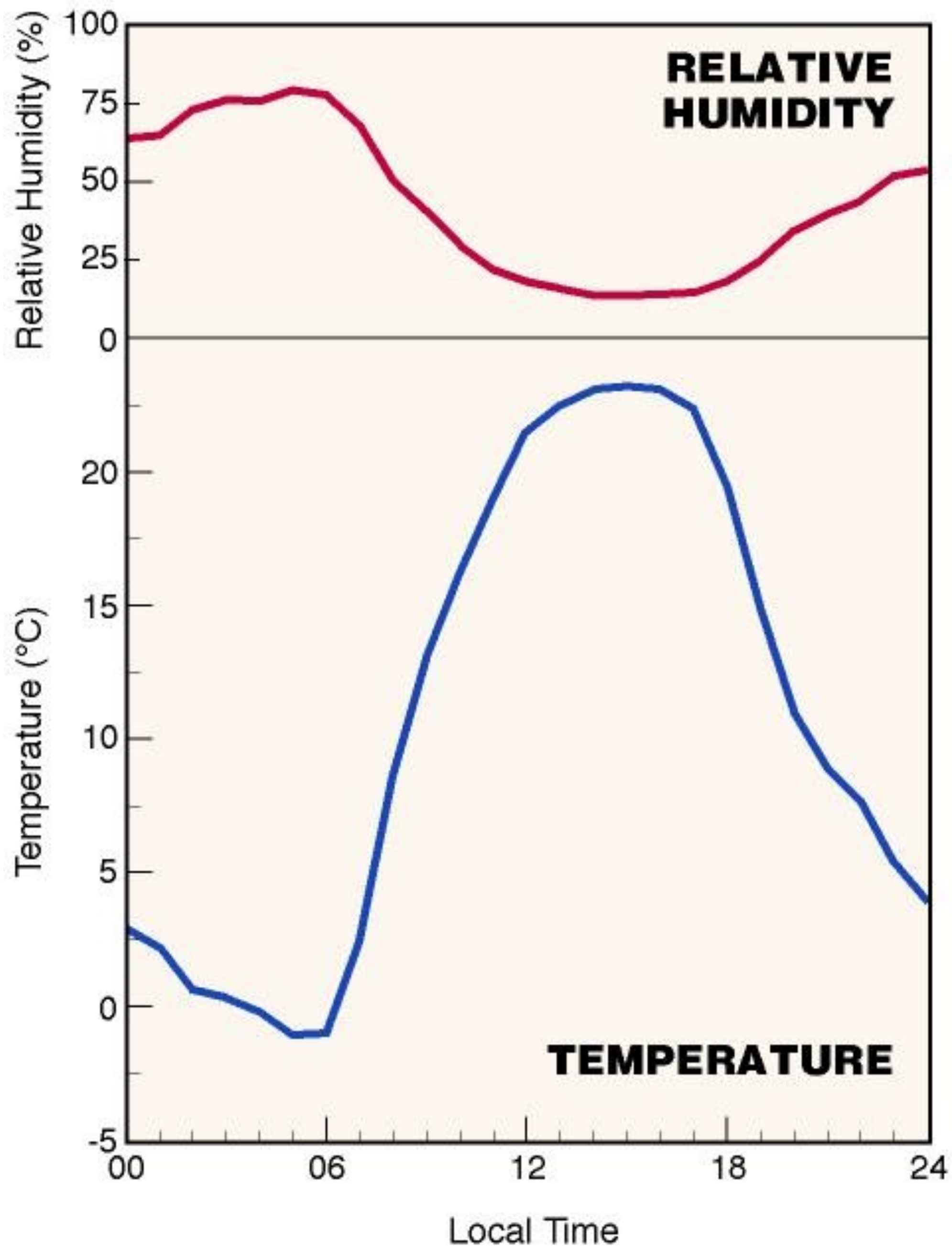
R.H = e/e_s

e: Vapor pressure; e_s: Saturation vapor pressure

Change of relative humidity in a day

What time of the day when relative humidity is usually high ?

As the air cools during the night, the relative humidity increases. The highest relative humidity occurs in the early morning, during the coolest part of the day.



Dew Point Temperature - T_d

- Temperature to which air must be cooled (at constant pressure and constant water vapor content) to become saturated.
- When $T=T_d$, $e_s(T_d) = e$, $q_s(T_d) = q$, $r_s(T_d) = r$
- T_d is less or equal to T
- Unlike relative humidity which is a measure of how near the air is to being saturated, dew point temperature is a measure of its actual moisture content. *The higher the dew point, the more water vapor in the air.*

- Dew point depression: $T- T_d$
- The larger the dew point depression is, the drier the air is, or the air is farther away from saturation

Summary of Cloud Types

	Layered	**Broken Layer**	**Separate**
High	Cirrostratus	Cirrocumulus	Cirrus
Middle	Altostratus	Altocumulus	
Low	Stratus Nimbostratus	Stratocumulus	
Vertical			Cumulus Cumulo-nimbus

Dry adiabatic lapse rate – the rate of temperature decrease of a rising *unsaturated* air parcel

$$\Gamma_d = -\Delta T / \Delta z = 9.8\ ^{o}C\ km^{-1} \approx 10\ ^{o}C\ km^{-1}$$

Stability is determined by comparing parcel's temperature with that of its environment

Simply speaking,

$T_{parcel} > T_{env}$ unstable

$T_{parcel} < T_{env}$ stable

$T_{parcel} = T_{env}$ neutral

Stability and lapse rate

Absolutely stable $\Gamma < \Gamma_s$

Absolutely unstable $\Gamma > \Gamma_d$

Conditionally unstable $\Gamma_d > \Gamma > \Gamma_s$

Neutral

$\Gamma = \Gamma_d$ for unsaturated air

$\Gamma = \Gamma_s$ for saturated air

Γ: Environmental Lapse Rate; Γ_d: Dry Adiabatic Lapse Rate; Γ_s: Moist Adiabatic Lapse Rate