

The final exam will be comprehensive in the material that it covers. In addition to reading the textbook and using this study guide, be sure to study your review questions and the in-class activities. Remember, your review questions should have complete sentences or detailed outline form so answers are understandable without looking at the review questions. Do the review questions in a LARGE Blue Book, purchased at the bookstore, unless you have received prior approval from me for another submission format.

Check the college final exam schedule for the day and time of your final. Here is a link to it:

<http://www.wou.edu/provost/registrar/finals.php>; there is also one in the header of my home page. If you cannot take the final as scheduled, you must make a request of the Dean of Arts and Sciences or the Vice President of Student Affairs for permission to have your final on an alternate day. It is not common that a student will be given this permission: special circumstances must exist. Let me know ahead of time, so I can advise you.

TERMS TO KNOW

Absolute stability	Circle of illumination	Cyclone
Abyssal plain	Cirrus	Density
Adiabatic lapse rate	Climate	Deranged drainage
Aerosol	Climate system	Dew-point temperature
Air mass	Cloud	Divergence
Air pressure barometer	Clouds of vertical development	Dry adiabatic lapse rate
Albedo	Cold front	Eccentricity
Anemometer	Condensation	Electromagnetic radiation
Aphotic zone	Conduction	Environmental lapse rate
Arid climate	Continental air mass	Equatorial low
Atmospheric Stability	Continental shelf	Equinox—September and March
Beach	Convection	Evaporation
Benthos	Convergence	Eye and eyewall of tropical cyclone
Biomass fuel	Coriolis effect	Feedback loop
Breakwater	Crevasse	Fiord
Carbon fixation	Cumulus	Fog

Freezing nuclei	Low clouds	Polar Easterlies
Front	Low pressure center	Polar front
Frontal wedging (lifting)	Marine terrace	Polar high pressure
Geostrophic wind	Marine west coast climate	Precession
Geothermal power	Maritime air mass	Pressure gradient
Glacial drift	Middle clouds	Prevailing wind
Glacial period	Mid-latitude cyclone	Radiation (heat transfer)
Glacial striation	Mild mid-latitude climate	Rain
Glaze ice	Monsoon	Rain shadow
Hail	Monsoon climate	Rain shadow desert
Hanging valley	Moraine	Reflection, reflectivity
High clouds	Mountain and valley breezes	Relative humidity
High pressure center	Neap tide	Rock flour
Highland climate	Nearshore zone	Rotation
Humid continental climate	Nekton	Saturation
Humid subtropical climate	Nuclear fission	Savannah climate
Hurricane	Obliquity	Scattering of incoming energy
Ice cap climate	Occluded front	Seasonal temperature contrast
Ice sheet	Orographic lifting	Severe mid-latitude climate
Ice shelf	Oxygen isotope ratio	Snow
Inches of mercury	Ozone	Solstice—December and June
Inclination of axis	Perihelion	Source region
Infrared	Photic zone	Spring tide
Instability	Photovoltaic cell	Stable air
Interglacial period	Phytoplankton	Steppe climate
ITCZ: Intertropical convergence zone	Plankton	Storm surge
Isobar	Pleistocene Epoch	Stratus
Jet stream	Pluvial lake	Sublimation
Lake effect snow	Polar air mass	Sub-polar low pressure
Land and sea breezes	Polar climate	STHP: Subtropical high pressure

	Tropical air mass	Visible light
Temperature	Tropical rain forest	Warm front
Thermal expansion	Tropical storm	Wavelength
Thermocline	Troposphere	Weather
Thermohaline circulation	Tundra climate	Westerly wind belt
Thunderstorm	U shaped valley	Wet adiabatic lapse rate
Tidal power	Ultraviolet	Wind
Tide	Unstable air	Wind power
Tornado	Upwelling	Zone of accumulation
Trade winds	Valley/alpine glacier	Zone of wastage

Earth's relation to Sun

- Axial tilt leads to seasons, solstice and equinox: know details and dates of these, and general relation of latitude to day length
- Know names of special circles of Earth's surface defined by Sun relation
- How does Earth's relation to Sun affect temperature? Why?

Atmosphere

- Composition: amount of three major components
- Names and characteristics of thermal zones of atmosphere
- Location of ozone. Why is it important? What is happening to it? Why?
- Fate of incoming solar radiation
- How the troposphere is heated from below

Temperature

- Major controls of temperature in locations on Earth's surface
- How do clouds affect daytime and nighttime temperatures, and why?
- Worldwide distribution of temperature

Water

- What is latent heat? What are the implications of water's phase changes on the temperature of the environment?
- Describe and be able to calculate relative humidity,
- Define dew point temperature. How is it often reached?
- What causes rainfall? How is it formed in clouds in mid-latitude locations?

Weather

- Be able to calculate changes in temperature with known lapse rates, and predict if the atmosphere will be stable or not
- What are the four major lifting mechanisms for the atmosphere? What happens as air is lifted?
- Identify cloud types from diagram
- How are hailstones formed?
- What is an air mass? How is it designated? What are the significant types of air masses, and how do they affect weather?
- Be able to distinguish the two types of fronts, and the weather associated with them.
- What are mid-latitude cyclones? Know their characteristics
- What are hurricanes? What kinds of things do hurricanes do?
- How are tornadoes formed? Where?

Pressure

- What causes wind? What is the Coriolis effect? How does it affect wind?
- How is pressure measured? What are the two types of pressure centers? Know details of each.
- Be able to identify the global pressure zones and wind belts on a map. How do these affect global precipitation patterns?
- How is wind described? Know information about localized winds
- What does pressure have to do with storms?

Climate

- Know the major divisions of Köppen climate system and the type of information needed to classify climates.
- Know the general characteristics of the climate types listed in the terms above.
- Climates are influenced by latitude, due to unequal heating of Earth. Understand the role of latitude, circulation of the atmosphere and ocean, elevation and land-water relationships have on specific climates.

Glaciers

- Glaciers are powerful moving masses of ice formed from recrystallization of snow. They erode by plucking rocks and grinding and scraping these against their beds.
- They move from their zone of accumulation to their zone of wastage.
- The position of the end of a glacier is related to its snow budget and the speed of its movement.
- There have been more than a dozen major ice-sheet advances in the past 3 million years.

Ice ages

- Causes include changes in the eccentricity of Earth's orbit, change in axial tilt (obliquity), and precession of the direction of axial tilt. These are superimposed upon one another, leading to the likelihood of glaciation.
- Polar land masses appear to be necessary for ice ages to occur.
- Ice age temperatures are documented in sea sediment oxygen isotope ratios—more O-18 than at other times indicates a cooler temperature.
- Oxygen ratios are preserved in the remains of marine organisms
- A number of positive-feedback mechanisms have been discovered or hypothesized that enhance formation of ice sheets. Know information about these feedback mechanisms:
 - Albedo: ice and cloud
 - Carbon dioxide levels: causes and effects
 - Sea level: and how it influences other mechanisms
 - Nutrient/trace element availability

Climate change/global warming

- What is El Niño? How does it affect various areas around Earth?
- How does carbon dioxide affect Earth's temperature
 - What causes fluctuations in carbon dioxide
 - What can be done to reduce carbon dioxide in atmosphere?
- Important greenhouse gases: carbon dioxide, water, methane, nitrous oxide, CFCs
- Alternatives to carbon-based fuels
 - Nuclear power
 - Safety concerns in short run and long run
 - Wind power
 - Direct mechanical use
 - Electricity
 - Solar power
 - Direct heating
 - Heat to create steam with parabolic mirrors
 - Photovoltaics
 - Geothermal power
 - Direct heating
 - Electrical generation
 - Hydro power
 - Direct mechanical use
 - Electricity from dams, wave energy, tidal energy