

## Review of Major/Important topics discussed Earth Science

This might help you study. Note that the relative amount of space given a topic here will not necessarily have any bearing as to how important it will be for the test. This list is given to you as a public service. The absence of something on this list *does not necessarily mean* that it won't appear on the test.

- Logarithmic plotting – Be able to plot and interpret graphs that use logarithms on either or both axes.
- Composition of the Atmosphere. Know what substances are and are not major components of the atmosphere.
- Vertical Structure of the Atmosphere. Know what divides layers of the atmosphere; know how temperature varies with height in each layer.
- Energy Budget – Know that the Earth MUST BE in radiative equilibrium at all times somehow. Be able to list various fates of radiation.
- Long Wave vs. Short Wave Radiation – Know the difference, know the source of each, and why they have different fates. Be able to describe how each interacts with the ground, atmosphere, clouds, gases, and aerosols.
- Heat Transfer – Understand and be able to describe/define the differences between heat and temperature. Understand the three methods of heat transfer (conduction, convection, radiation) and be able to distinguish between them.
- Adiabatic Heating and Cooling – Understand what “adiabatic” means. Describe what happens to a parcel of air as it rises or falls in the atmosphere.
- Phase Changes / Latent Heat – Know each of the three basic phases of matter. Know what it is called when one phase changes into another. Understand and be able to interpret a phase diagram. Understand and be able to define latent heat. Explain how latent heat can operate as a means of energy transfer.
- Pressure / Vapor Pressure – Understand that every condensed phase substance has a vapor pressure that depends on its temperature and basic properties. Understand that atmospheric pressure is a result of the combined forces of individual particulates

interacting with the surface. Understand how pressure changes with height in the atmosphere. Understand how the vapor pressure of water is a function of temperature but DOES NOT rely on the air above it. Be able to explain why the statement “the air is like a sponge, the higher the temperature, the more room in the sponge, and the more water the air can hold” is WRONG. Explain how a sling psychrometer works. Understand dew point.

- Humidity – Be able to define and write down an equation for humidity. Explain supersaturation. Explain equilibrium vapor pressure. Explain and understand how a barometer works.
- Evaporative Cooling – Explain how evaporation is a cooling process in terms of latent heats, phase transformations, and other appropriate physical ideas. Explain how the happy dipping bird works.
- Cloud Formation – Explain the elements needed to form a cloud. Know and be able to define cloud condensation nuclei. Know the three broad classes of clouds.
- Aerosol Particles – Be able to tell the difference between an aerosol and an aerosol particle. Be able to explain why we care about aerosol particles. Describe particulate influence on climate, climate change, and weather.
- Precipitation – Understand and be able to explain the collision/coalescence process and the Bergeron process. Know that the type of precipitation depends on the conditions aloft and the conditions experienced by the precipitation on the way down. Know several types of precipitation beyond the basic rain and snow. Know the shapes of raindrops and ice crystals.
- Greenhouse Effect – Understand why the Greenhouse Effect is necessary for human life. Understand what makes something a greenhouse gas. Be able to differentiate between how a greenhouse works and the greenhouse effect.
- Global Warming – Be able to summarize and evaluate common arguments for and against global warming based on factual evidence.
- Climate Change and Feedbacks, Uncertainty – Understand what a feedback process is. Explain and identify some feedbacks in the atmosphere. Be able to tell the difference between a valid and invalid feedback mechanism. Be able to make definitive statements regarding the uncertainty involved in a measurement or phenomena.

- General Circulation / Fronts / Air Masses / Winds – Be able to describe the mechanisms for surface wind generation. Be able to describe what causes the general circulation. Be able to qualitatively describe the general circulation. Know what a front is and how it moves. Know what an air mass is and how it moves. Be familiar with the Navier-Stokes relationship in a qualitative way.
- Surface Maps, Radar, Numerical Weather Prediction – Be able to read a weather map. Know basically how a radar works, what it tells us, and what it does not tell us. Be able to explain basically how the nightly weather report is made.
- Station Models – Be able to interpret and read a station model symbol.
- Everything – Be able to apply and integrate the material you learned to answer thought-experiments related to atmospheric and weather phenomena. Be able to evaluate the validity of statements; reason completely, coherently, and precisely; and estimate the magnitude of various atmosphere-related quantities.