

**GEO 215 GLOBAL ENVIRONMENTAL CHANGE**  
**Fall 2012**  
**FINAL EXAM Study Guide**

(80 minutes; worth 25% of final grade; graded out of 20 points)

**A. Definitions and explanations (1 point each; total 12 points)**

You will be required to answer 12 definition and explanation questions from the list below – 8 that I will select, and 4 more from a selection of 6 definitions.

**Subsidence** – Sinking of the Earth as a result of geologic or man-induced causes. An example of this could be groundwater extraction

**Northwest Passage** – Sea route through the Arctic Ocean connecting the Atlantic and Pacific oceans. Sea ice in Northwest Passage is gradually melting

**$\Delta T_{2x}$**  – The difference between two temperatures, an initial and a final after doubling CO<sub>2</sub>. It is the sensitivity of the climate to a doubling of CO<sub>2</sub>

**Perihelion** – Part of precession in Milankovitch cycle. Means close pass, it is when Earth is closest to the Sun on January 3rd. Northern hemisphere faces away from the sun

**Precession of earth's axis** – One of the Milankovitch cycles. It refers to a gradual shift in the orientation of Earth's axis of rotation. It is the wobbling of earth's axis

**Mauna Loa Observatory** – An atmospheric baseline station on Mauna Loa volcano that has been monitoring and collecting data relating to atmospheric change, mostly monitoring atmospheric carbon dioxide.

**REDD** – Reducing emission from Deforestation and Forest Degradation. Their objective is to reduce greenhouse gases by using market and financial incentives to reduce deforestation and forest degradation.

**CFC** – Chlorofluorocarbon is a compound that contains carbon, chlorine, hydrogen and fluorine. CFC's have been used as refrigerants, propellants in aerosols and solvents. They contribute to ozone depletion

**Aerosol** – Aerosols are a suspension of fine solid particles or liquid droplets in gas. Examples are clouds and air pollution. Aerosols reflect energy. CFC's are in aerosols, but they are no longer used.

**Sun spot** – More sun spots means that there will be higher levels of insolation. We only receive increased amounts of solar energy once a decade because sun spot cycles occur every 10-11 years

**Blackbody** – Chunk of matter that has oscillators that vibrate and can interact with light at all possible frequencies. Blackbodies absorb and emit radiation at all wavelengths. Most solids and liquids at the surface are pretty good blackbodies. Gases are not.

**Greenhouse effect** – Process where incoming short-wave radiation is reflected back to space as long wave radiation. Greenhouse gases absorb the long-wave radiation and give off heat in the process. This is a natural warming of earth's surface.

**Montreal Protocol** – In 1987, many countries came together to ratify phasing out of further production and release of chloroflorocarbons to the environment in order to protect the ozone layer

**Positive Feedback** – In a climate feedback loop, a positive feedback would make the temperature change larger than it would have been without the feedback, amplifying temperature change.

**Ice-Albedo feedback** – Positive feedback, where an input, such as a rise in greenhouse gases would raise temperature a little. This would then melt ice and reduce the albedo, allowing the dark ground to absorb more sunlight than the ice would have, and warming earth up more.

**Glacier** – Formed from compacted snow on a mountaintop and flow down mountains like silent rivers on ice. An indicator of climate change is the melting of glaciers.

**Sedimentary rocks** – Life on Earth has built up a sizable pool of reduced carbon in sedimentary rocks. It is a carbon reservoir

**Stratospheric Ozone** – Ozone in the Earth's stratosphere is created by ultraviolet light striking oxygen molecules. 90% of ozone is in the stratosphere. It is good because it protects against UV radiation and regulates global temperature. It is depleted by CFCs.

**TOMS** – Total Ozone Mapping Spectrometer. It is a satellite instrument for measuring ozone values.

**Climate Forcings** – They are changes in some parts of Earth's energy budget that affects the temperature of the earth. These could include Solar radiation, greenhouse gases from anthropogenic sources, aerosols, volcanic emissions (dust particles)

**Tree Ring** – Trees grow faster when the temperature is warmer, so the thickness of tree rings is used as a proxy for past temperature variations

**Kyoto Protocol** – An international agreement to limit CO<sub>2</sub> emissions. Not seen as effective because the US backed out of negotiations in 2001 and the US accounts for a large amount of CO<sub>2</sub> emissions

**Pollen Diagram** – Can be used to measure past records of climate. They are created using sediment samples along a sediment core to create a pollen diagram, which shows how the abundance of different pollen grains has changed over time.

**Tropospheric Ozone** – It is a pollutant that acts as a greenhouse gas and a major product of smog. It results from complex chemical reactions involving sunlight, Nox, gases, and VOCs

**Shifting Biomes** – Climate change and an increase in greenhouse gases will cause biomes to change, which could then lead to species extinction. Biomes will lose their distinct characteristics, and flora and fauna could be negatively affected.

**Larson Ice Shelf** – A piece of the Larsen ice shelf on the Antarctic peninsula collapsed into a sea of icebergs. They do not affect sea level because they were already floated in the water, but it restricts ice flow from the ice sheet farther inland toward the sea.

**Ice Shelf** – Floating ice, sometimes hundreds of meters thick, from an ice sheet that flows onto the water, but still attached to the ice sheet

**Aphelion** – Part of precession in the Milankovitch Cycle. It is when earth is farthest from the Sun on July 4<sup>th</sup>. Northern hemisphere faces towards the sun.

**Milankovitch Cycles** – There are 3 different cycles, including obliquity, precession and eccentricity. They refer to long term variations in the orbit of the earth.

**Oliquity of earth's axis** – Tilt of the Earth towards or away from the sun. The average tilt is 23.5 degrees. It affects intensity of incoming solar radiation and length of days and seasons.

**Charles Keeling** – American scientists whose recording of Carbon dioxide at the Mauna Loa Observatory first alerted the world to the possibility of anthropogenic contribution to the greenhouse effect. Known for the Keeling Curve, which measures the progressive buildup of carbon dioxide.

**Isostatic uplift** – Rise in the level of land relative to the sea. It occurs following the melting of continental glaciers and ice sheets as temperature rises. The land rises as a result of the removal of the weight.

**Gulf stream** – The Gulf Stream and the North Atlantic Drift is a powerful, warm, and swift Atlantic ocean current. The process of western intensification causes the gulf stream to be a northward accelerating current off the east cost of America.

**Greenhouse gas** – Gas that is capable of absorbing and emitting infrared light. Examples are CO<sub>2</sub>, water vapor, methane and ozone. Greenhouse gases are the fundamental cause of the greenhouse effect.

**Stefan-Boltzmann law** – Describes the power radiated from a black body in terms of its temperature. The total energy emitted is proportional to temperature. An object that can emit all