Geography 141 -- Exam 1 Review

As you study for the midterm, you should focus first on lecture notes and lab exercises. The reason I provide the materials you have seen in lectures and labs is because I think that these are the most important facts, skills and concepts to understand. For that reason, the test will focus on these same points as well. Use the book as a very important secondary resource to clarify points of confusion and provide detail that we do not have time to get into during the lecture period. The following is a list of topics that you should emphasize in your review.

Unit 1

Introduction to geography, where & why questions, physical/human/GISc parts of geography, subfields such as climatology, biogeography, geomorphology, soils, marine geography, hydrology and water resources, Scientific nature of understanding , scientific method, hypotheses, observation and experiment, theory, laws, Systems, conservation laws, subsystems, open/closed systems, feedback, equilibrium, models, orders of magnitude

Unit 2

Earth shape and size, sort-of an ellipsoid, various "spheres" (atmosphere, lithosphere, hydrosphere, biosphere, cryosphere), distribution of land and water amongst hemispheres, continents and oceans, continental shelf, continental slope, abyssal plains, mid-ocean ridges, deep-ocean trenches.

Unit 3

Maps, cartography, rotation of earth, degrees, parallels and meridians, great and small circles, equator and latitude, prime meridian and longitude, coordinate systems, vertical datums & mean sea level, Projections, scale, conformal (shape/area preserving), equal-area, orthographic, cylindrical (like Mercator), conic, planar, compromise projections like the Robinson. , Isolines, contour lines, evolving technologies (GIS, GPS, RS), Story about Eratosthenes

Unit 4

Gravity, Earth's planetary motion, elliptical orbit, perihelion, aphelion, speed of light, solar constant (1372 W/sq. m) at top of atm, Reasons for seasons, (a) revolution, (b) rotation [circle of illumination, polar axis], (c) axis tilt [plane of the ecliptic], (d) axial parallelism, (e) sphericity ; March of the seasons, insolation, day-length variation, zenith & solar altitude, subsolar point, insolation changes with seasons, Tropic of Cancer, Tropic of Capricorn, Arctic Circle, Antarctic Circle, Vernal and Autumnal Equinox, Summer and Winter Solstices, Sunrise, sunset, dawn, twilight

Unit 5

Energy and heat transfer – thermal energy, heat vs. temperature, EM radiation, longwave, shortwave, emission by sun and earth, conduction , convection, sensible heat, latent heat; Global energy balance – energy transfers are both radiative and nonradiative, solar radiation into the atm (180-220 W/m2 tropics – 240-280 W/m2 low-lat deserts), direct and diffuse radiation, albedo, terrestrial radiation, greenhouse gases and greenhouse effect, effect of clouds?, counterradiation, latitudinal variations in net radiation,

Unit 6

Composition and Structure of the atmosphere; weather vs. climate, main ingredients of the atm (N_2, O_2, Ar, CO_2, H_2O, CH_4, O_3) – Highlight CO_2, H_2O, CH_4, photochemical reactions, isotopes such as N^{15}, traces gases, ppm (CO_2 +~ 390 ppm), ppb (CH_4 =~ 1800 ppb), residence times, atmospheric particulates, photosynthesis; homosphere, heterosphere, constant vs. variable gases, history of atmospheric gases, CO_2 variability, H_2O, O_3 issues, ozone hole, aerosols, troposphere, tropopause, lapse rate, stratosphere, temperature inversions, stratopause, mesosphere (ionization, auroras), mesopause, thermosphere

Unit 7

Temperatures of the lower atmosphere; kinetic energy, temperature vs. heat, thermometer, Celsius vs. Fahrenheit vs. Kelvin, environmental lapse rate (6 deg 1000m average only!), concept of atmospheric stability, dry adiabatic lapse rate (10 deg C/1000m), saturated (or moist/wet) adiabatic lapse rate (4 – 9 deg C/1000m), condensation. ELR>DALR [unstable], ELR<SALR[stable], DALR>ELR>SALR [conditionally unstable] – conditionally unstable means unstable if condensation occurs & stable otherwise, weather balloons, assessing stability by looking at the atmosphere, temperature inversions and air pollution, urban dust domes; horizontal distribution of temperatures: daily and yearly cycles, land/water heating differences, maritime effect vs. continentality, advection, isotherms, temperature gradient

Unit 8

Wind and Pressure, what causes pressure, barometer, pressure vs. altitude, Causes of Atmospheric Circulation: (1) spatially unequal net radiation, (2) earth's rotation around its axis, (3) frictional drag on the air by the earth. Mapping of pressure & isolines, Pressure Gradient Force, Coriolis Effect (and its latitudinal variation), Frictional Force (only effective up to 2000 up into the atm), geostrophic winds vs. surface winds, cyclones and anticyclones, sea and land breezes, mountain/valley breeze systems, cold air drainage and katabatic winds such as Chinook & Santa Ana winds

Unit 9

Atmospheric circulation, zonal vs. meridianal flow, hypothetical flow on a non-rotating earth, equatorial lows/ITCZ, subtropical high, northeast trade and southeast trades, westerlies, polar highs, polar easterlies, polar front, subpolar low, jet streams, Hadley Cells, latitudinal movement north & south during the year, Bermuda and Pacific Highs, polar cell, Canadian and Siberian Highs, Aleutian, Icelandic, and Southern Hemisphere Subpolar Lows; Secondary surface circulation such as monsoons; Circulation of the Upper Atm, zonal flow, polar and subtropical jet streams (also equatorial jet),

Unit 10

Ocean circulation; mixed layer, thermocline, deep ocean, generation of ocean currents by surface winds, Coriolis, and density differences, gyre circulations, warm currents, upwelling, deep-sea currents and thermohaline circulation, ENSO & other oscillations

Unit 11

Atmospheric moisture and the water balance; physical properties of water, physical states of water and the energy exchanges between them, water vapor, melting, latent heat of fusion, evaporation, latent heat of vaporization, sublimation, condensation, freezing, deposition. Humidity, vapor pressure, dew, dew-point temperature, relationship of saturation vapor pressure and temperature, specific humidity, relative humidity, Mountain Example of adiabatic rates and humidity. The hydrologic cycle, hydrosphere, precipitation, runoff, groundwater. Evapotranspiration, potential and actual evapotranspiration, clouds and condensation nuclei, example of weekend rain. Basic cloud types – stratus, cumulus, cirrus, and height modifiers such as altostratus and cirrostratus, and nimbostratus, cumulonimbus for rain clouds. Precipitation, formation mechanisms including the ice-crystal (or Bergeron) effect and collision coalescence, forms of precipitation, rain, snow, sleet, freezing rain, hail, The concept of the water balance, global variations in the water balance.

Unit 12

Air masses, source regions, maritime tropical, continental tropical, maritime polar, continental polar, continental arctic, maritime equatorial, movements of air masses. Lifting mechanisms; convergent-lifting precipitation, ITCZ, frontal precipitation – fronts, warm fronts, cold fronts; convectional precipitation, air-mass thunderstorms; orographic precipitation, rain shadow effect.

Unit 13 (Only doing a portion of the unit)

Two Weather examples: Hurricanes and Midlatitude Cyclones. Easterly waves, tropical depression/storm/cyclone, Hurricanes. Polar jet stream, cyclogenesis, Weather sequence in a midlatitude cyclone (p. 164).

Unit 14

Climate, climate normal, climate classification (and pros and cons). Koppen climate classification system, Major Koppen groups [First Letter]: A (Tropical), B (Dry), C (Mild Mid-latitude), D (Severe Mid-Latitude), E (Polar), H (Highland). [Second Letter]: f, m, w (Tropical modifiers), s, w, f (C & D modifiers)T, F (Polar modifiers), S, W (Dry modifiers), concept of the hypothetical continent, global distribution of climates

Unit 15

Tropical (A) and Dry (B) climates. Climographs. Rainforest (Af), Monsoon Forest (Am), Savanna (Aw), Desert (BW), Steppe (semi-arid) (BS). Deforestation and desertification.

Unit 16

Mild Midlatitude (C) climates. Humid Subtropical (Cfa) vs. Marine West Coast (Cfb, Cfc), Oregon?. Mediterranean climate (Cs), Dry-Winter (Cw) also known as the subtropical monsoon climate.

Unit 17

Higher Latitude (D, E) and High-Altitude (H) climates. Major severe midlatitude (D) climates; Humid Continental (Dfa, Dfb) vs. Subarctic (Dfc, Dfd), permafrost. Polar (E) Climates; Tundra (ET) vs. Icecap (EF); High-Altitude (H) climates – importance of vertical zonation.