Geography 304: PHYSICAL METEOROLOGY AND CLIMATOLOGY
Fall 2002
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REVIEW SHEET FOR FINAL EXAMINATION
Total marks available: 40
Contribution to your final grade for G304: 30%.

Exam date: 7:15-9:15pm Monday 16th December
Review session: In class Wednesday 11th December

Format of the exam
Part A: 12 multiple choice questions (1 mark each)
Part B:6 short answer questions (2 marks each)
Part C: 2 of 4 long answer questions (8 marks each)
Total marks: 40.
Answer all of the questions in Part A and B and two of the four from Part C.
If I need you to use an equation I will provide it – So DO NOT memorize the equations – remember how to apply them and what they mean.

Key concepts & readings

Topic	**Aguado & Burt**	**Stull**
The atmosphere • Pressure: How does pressure and density vary with height? What is the hypsometric equation (how can it be used?)? What is meant by hydrostatic equilibrium? • Structure: How does temperature vary with height?	Chap 1	Chap 1
Radiation. Energy balance. Climate. Climate change. • Energy transfers: How is energy transferred in the atmosphere? For example: What is latent heat exchange? What does the energy balance model describe? • Energy laws: What do Stefan-Boltzmann's law, Wiens law and the Inverse-square law describe? Know how to use these laws. • Satellite images: What do visible and infrared images show? Be able to identify synoptic systems, fronts and different cloud types on these images. • Radars: How do they measure the amount and location of precipitation? • Climate change: What are the factors that can modify the global mean temperature? (e.g. changing Earth-Sun distance, varying solar output etc). • Energy balance: What are the terms in the surface energy balance? How do they vary depending on surface type? What is the greenhouse effect?	Chap 2, 3, 15 & 16	Chap 2 & 3
Water in the atmosphere. • Adiabatic processes. What are the environmental lapse rate, dry adiabatic lapse rate and the saturated adiabatic lapse rate? • Stability principles: Which is the difference between stable, unstable and neutrally stratified layers? What is an inversion? • Skew-T log-P diagrams: Be able to plot and interpret one. Know what inversions and cloud layers look like on them. • Cloud formation processes: What is the lifting condensation level and the level of free convection? What are CCN? What determines whether they will be	Chap 4, 5 & 6	Chap 5, 6 & 8

activated? What are the Kohler curves (what do they tell us about whether droplets will grow)? Understand collision-coalescence and ice-crystal theories.		

Atmospheric pressure & flow. • Forces and flow: What are the forces that act on air: Pressure gradient force, Coriolis force, and Friction. How do you calculate a geostrophic wind speed? What assumptions are used to derive the geostrophic wind approximation and how is it used? • General circulation: What are the features of the global circulation? What causes them? • Atmosphere-Ocean interactions: What defines a monsoon, where do they occur and why?	Chap 7, 8	Chap 9, 10 & 11
Synoptic meteorology: • Air masses and fronts: How do we define air masses? How are air masses modified in the atmosphere? What is a front? What is a dry line? What types are fronts are present in the atmosphere and what type of weather are they associated with? What is meant by ana and kata fronts? • Synoptic scale circulations: What are cyclones and anticyclones? What sort of weather are they associated with? How do cyclones form? Where do cyclones form? What are the upper-level conditions that lead to cyclogenesis? What is warm air advection and where do we look for it? • Weather maps: Know how to decode a station model. Know what is portrayed on a weather map and how. What is plotted on a 500 mb chart? Be able to make a forecast from a surface weather map. • Thunderstorms: What are the environmental conditions that favor thunderstorm development (and why)? How do we forecast thunderstorms? (i.e. what are the indices used and how are they calculated?) What are downdrafts and how are they caused? • Tornadoes: Where do they form (and why?)? What scale is used to measure tornado intensity? What are the limitations of this scale? Where does the rotation for a tornado originate? • Tropical cyclones: Where do hurricanes form (and why?) What are the environmental conditions that favor hurricane development? What are the parameters used to forecast the hurricane season (and why)? Where are the highest wind speeds observed in a hurricane and why?	Chap 9, 10, 11, 12 & 13	Chap 12, 13, 15 & 16
Human effects: • Urban environments: Why are urban areas warmer than rural areas? (i.e. how does land use impact the surface energy budget). • Stratospheric ozone: What is causing the formation of ozone holes? What are the implications of ozone holes for life on earth? What is the UV index?	Chap 14	Chap 17

Study hints

Read your lecture notes.
Read the text books.
Look back over your assignments.
Focus your studying on this review guide.
Past exams are available on: http://php.indiana.edu/~spryor (note: they have a very slightly different format to the exam you will receive)

Hints for the exam

- Read the question and make sure you answer it.
- Answer all questions - a blank answer is a zero answer, I never apply negative marks for giving an incorrect answer.

- Make sure that you use your time wisely - some questions are worth more than others.
- **Bring a calculator, ruler, pen and pencil to the exam**.