

Geography 304: PHYSICAL METEOROLOGY AND CLIMATOLOGY

Fall 2002

Dr. Sara C. Pryor

REVIEW SHEET FOR MID-TERM EXAMINATION

Total marks available: 40

Contribution to your final grade for G304: 30%.

Exam date: Monday 28th October IN CLASS

Review session: Wednesday 23rd October. SB131 5-6pm

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 long answer questions (8 marks each)
- Total marks: 40.

Answer all of the questions in Part A and B and two of the three 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.

COURSE OUTLINE: Key concepts & readings

Topic	Aguado & Burt	Stull
The atmosphere: Composition & structure	Chap 1	Chap 1
<ul style="list-style-type: none">• What are the permanent gases, variable gases and particles that comprise our atmosphere? What does these terms mean?• Carbon dioxide concentrations: What are the time scales on which they vary and why?• Water vapor concentrations: What are the time scales on which they vary and why? What are the implications of greenhouse warming for water vapor concentrations in the atmosphere & how might that feedback into the warming?• How does pressure and atmospheric density vary with height? Why do we pressurize aircraft cabins?• What is the hypsometric equation (how can it be used)? What is meant by hydrostatic equilibrium?• How does temperature vary with height?		
Radiation. Energy balance. Climate. Climate change.	Chap 2, 3, 15 & 16	Chap 2 & 3
<ul style="list-style-type: none">• How is energy transferred in the atmosphere? E.g. What is latent heat exchange?• What do Stefan-Boltzmann's law, Wiens law and the Inverse-square law describe?• Satellite images: What do visible and infrared images show?• Radars: How are they use in atmospheric science? How do they measure the amount and location of precipitation? What are the limitations of radar in terms of remotely sensing precipitation?• What is the solar constant?• What does the energy balance model describe? Be able to apply it. What do the terms emissivity and albedo mean?• What are the factors that can modify the global mean temperature? What are the		

Milankovitch cycles? How does sun spot activity affect global climate?

- Be able to summarize the terms in the global energy budget.
- What is net radiation and how does it vary with latitude?
- What are the major differences between continental and maritime climates?
- What are the terms in the surface energy balance? How do they vary depending on surface type?
- What is the greenhouse effect? Which gases are responsible for the greenhouse effect? Why has the DTR reduced during the C20th?

Water in the atmosphere.

Chap 4, 5 Chap 5, 6
& 6 & 8

- How do we measure the water vapor (humidity) content?
- How does temperature dictate how much water vapor will or can be present in the atmosphere? (i.e. how does saturation vapor pressure or relative humidity vary with temperature?)
- How do we estimate the cloud condensation level?
- Understand 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?
- What is plotted on a skew-T log-P diagram? How is it used? What are the (a) lifting condensation level and (b) level of free convection?
- What are the cloud classes we discussed? How are they related to stability?
- What are CCN? What determines whether they will be activated? What are the Kohler curves? What do the concepts of critical super-saturation and critical radius mean?
- How are cloud droplets converted into rain or snow? Understand collision-coalescence and ice-crystal theories.
- Precipitation forcing: How is air forced to rise? Understand convection, orographic and frontal cloud and precipitation.

Atmospheric pressure & flow.

Chap 7, 8 Chap 9,
 10 & 11

- Atmosphere pressure: Why does it vary in space?
 - What are the forces that act on air: Pressure gradient force, Coriolis force, and Friction.
 - What is geostrophic flow? How is this concept used?
 - General circulation: What are the features of the global circulation?
-

Study hints

- Read your lecture notes.
- Read the text books. Use the review questions at the end of each chapter to test your knowledge and understanding.
- Look back over your assignments.
- Focus your studying on this review guide.
- A past exam is available on: <http://php.indiana.edu/~spryor/> (click on G304) but note this exam has a slightly different style to that I will give you and while the content is similar it is not identical to the material we have covered.

Hints for the mid-term exam

- Read the question and make sure you answer it.
- Answer all questions: A blank answer is a 0 answer, I never apply negative marks for 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.