NATS 101, Section 13, Fall 2010
Midterm Examination #3
Study Outline

Chapter 11 – Air Masses & Fronts

Air Masses: Be able to identify and classify by source and region cP, mP, mT, cT, mA, and cA. What are prerequisites for formation of these airmasses? What are their physical characteristics? How do they influence the climate of North America?
Fronts: What is a front? Know the difference between a warm, cold, stationary and occluded front. What is their structure in the vertical and what types of weather is associated with each of them? (e.g. cloud types and type of precipitation, etc.). What are the conditions like before and after each of these fronts pass?

Chapter 12 - Middle-Latitude Cyclones

Cyclogenesis, polar-front theory. Where do cyclones tend to form and why? What is the role of upper level divergence and convergence? How is a mature mid-latitude cyclone depicted on a surface weather map with associated cold, warm, and occluded fronts? Know the relationship to fronts and associated weather (e.g. Colorado Low example).

Chapter 13 – Weather Forecasting

Simple Types: Persistence, Trend, Analogue, Climatology, Out of the Hat, Body Parts. Understand the difference amongst all these different weather forecast methods, and each of their short comings.
NWP: Numerical weather prediction, despite the long term, really means computer modeling. Understand the difference among the simple forecast methods and how are they used as a “sanity” check on numerical weather prediction. How do these models “see” terrain features, and why does this play an important factor? Provide examples of how these are useful. Know the different steps in NWP. How is an NWP model structured? What happens in post processing? What are the differences in limited area models & global climate models (GCMs)? How about the differences in climate prediction vs. weather prediction?
Chaos: Inherent in NWP and independent of the model. Simply know that a small change in an initial state will cause a big change in a future prediction. This puts a hard limit on weather forecasting of 2 weeks.

Chapter 14 – Thunderstorms and Tornadoes

Thunderstorms: What atmospheric conditions are necessary for formation of thunderstorms? What are the stages in the life cycle typical air mass

thunderstorm? What are the various types of more organized severe thunderstorms and what additional atmospheric conditions are necessary for their formation? What kind of damage can the more severe types of thunderstorms cause? What time of day and where do thunderstorms most often form?
Tornadoes: What thunderstorm type(s) favor the formation of tornadoes? What atmospheric conditions are favorable for the formation of tornadoes (i.e. loaded gun sounding)? What is the structure of thunderstorms containing tornadoes? The Enhanced Fujita scale is a classification developed by both meteorologists and engineers to determine the strength of a tornado. Know the classifications of F0-F5. Know how to survive a tornado.
Western U.S. hazards: How and why are thunderstorms in the western U.S. different than those in the eastern U.S? What special types of dangers are associated with them? (e.g. flash floods, haboobs, microbursts, hail).
Lightning: What explains the existence of lightning in thunderstorms and why does it occur mainly over land areas? Be able to explain how a negative cloud-to-ground lightning bolt forms from a charged cloud (e.g. high speed video shown in class). There is a specific sequence that is typically followed. Once the sequence is completed, we see lightning instantly but we do not hear thunder until later (sometimes much later). Why is this? What causes thunder? How can we use thunder to determine the distance of lightning from you and the cause of thunder? Know how to decrease your odds of getting struck

Chapter 15 - Hurricanes

Hurricanes: What conditions are necessary for hurricane formation (i.e. environmental conditions and triggers)? Where do hurricanes derive their energy and how is this different from mid-latitude cyclones? What dictates their motion? How about their development sequence? Where do they tend to form and why? Be able to describe the structure of a mature hurricane. How are they classified by the Saffir-Simpson scale and what is classified as a major hurricane?
Hazards: What causes more damage from a hurricane, winds, rain, flooding, or storm surge? Be able to explain the storm surge, and how a hurricane generates a storm surge. Which sides of a hurricane are strong and weak? Why?

Additional notes: As in previous exams, be prepared to demonstrate your artistic skills!