Name_____

Synoptic Lab, MET 421, Test 1

1) Rank the following tropical ocean basins from 1 to 6 in terms of mean annual tropical cyclones. Some are merged because they are "tied." (6 pts)

   Northeast Pacific ____
   Eastern Australia & Southwest pacific; North Atlantic; Southwest Indian _____
   North Indian ____
   South Atlantic; Southeast Pacific ____
   Western Australia ____
   Northwest Pacific ____

2) For the North Atlantic (3 pts)
   What is the mean number of tropical storms and hurricane? ____
   What is the mean number of hurricanes? _____
   What is the mean number of major hurricanes (category 3 or more)? _____

3) Draw the surface wind features of a typical monsoon and trade wind trough for the Northern Hemisphere. On the global map below, indicate where the August monsoon trough and trade wind troughs are located. Show the monsoon trough with a dashed line, and the trade wind trough as a solid line. (8 pts)

Monsoon trough

_____ 20°N

_____10°N

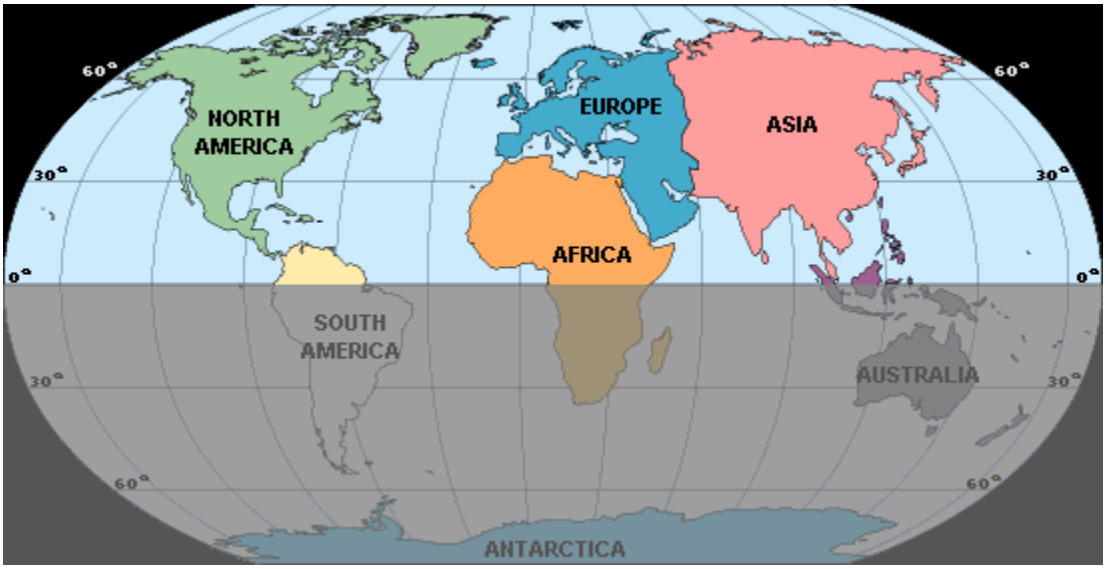
_____ 0°N

Trade wind trough

_____ 20°N

_____ 10°N

_____ 0°N



4) What is the range of winds for a Category 1 hurricane in the United States? (1 pt) _____

5) What is the range of winds for a Category 4 hurricane in the United States? (1 pt) _____

6) If $\Delta Z' = +600\ m$ for the entire layer of a warm-core cyclone, and $p_{env} = 1010\ mb$, compute p_{sfc}. (1 pt)

7) What day does typically the major hurricane season begin in the North Atlantic? (1 pt) _____

8) What day is the typical peak of the hurricane season in the North Atlantic? (1 pt) _____

9) For the typical tropical cyclone composite (5 pts)
What height in meters do eyewall winds peak? ____
What is a typical inflow speed in ms^{-1} in the hurricane boundary later? _____
What pressure level does the eye temperature peak? _____
How much does temperature decrease in the boundary layer from the environment to the eyewall? _____
What is the eyewall relative humidity in the boundary layer? _____

10) List four factors which contribute to storm surge. List three uses of SLOSH. List three uses of ADCIRC (8 pts).

11) List six general factors conducive to tropical cyclone genesis. What is the mathematical criterion for barotropic instability? (8 pts)

12) List 2 synoptic features which contributed to the August 2016 record flood in Baton Rouge. Using http://www.weather.gov/lmrfc/climate_precipitable_water_climatology , where does this event's precipitable water rank in terms of climatology percentile? (3 pts)

13) Where is the preferred region for tornadoes during a landfalling tropical cyclone? Do they prefer the eyewall or outer spiral bands? Are they typically more numerous in landfalling tropical storms or hurricanes? (3 pts)

14) List five attributes of a tropical cyclone undergoing extratropical transition (5 pts)

15) Briefly list two possible theoretical causes for eye formation in tropical cyclones (2 pts)

16) How does a tropical cyclone overcome adiabatic expansion cooling in the boundary layer and a developing warm-core aloft to maintain buoyancy in the eyewall? (4pts)

17) For a tropical cyclone, discuss the products, models, procedures, and guidelines used during a forecast discussion for track. There needs to be detail in the discussion. (10 pts)

18) For a tropical cyclone 3 days from landfall, discuss the products, models, procedures, and guidelines used during a forecast discussion for intensity change. There needs to be detail in the discussion. (12 pts)