

Quiz #5

August 12, 2011

One point each:

1. Ridges are elongated lows aloft. T E
 2. A warmer air mass is vertically thicker than a cooler air mass. I F
 3. Hydrostatic equilibrium describes the balance between gravity and the centripetal force. T E
 4. Thunderstorms can be triggered by terrain, fronts, or intense daytime heating. I F
 5. Supercells are a special, long lived class of thunderstorm with a rotating updraft. I F
 6. Ordinary thunderstorms have short life cycles of 5 - 10 minutes. T E
 7. Squall lines are extensive, linear collections of thunderstorms ahead of cold fronts. I F
 8. Doppler radar can see tornadoes. T E
 9. Hurricanes commonly form from easterly waves passing out off West Africa. I F
 10. Winds flow anticyclonically in towards the eye of a hurricane at lower levels. T E
 11. Hurricanes do not form on the equator because the Coriolis force is large there. T E
 12. No hurricanes have ever been reported along the coast of Brazil. T E
13. What type of air mass is associated with lake-effect snow?
- mT mP cP mA
14. An occluded front marks the _____ stage of midlatitude cyclone development.
- initial open wave mature frontal wave
15. Mid-latitude cyclones formed behind mountain barriers are called _____.
- gustnadoes lee cyclones typhoons haboobs
16. The April 25-28, 2011, tornado outbreak formed from what kind of thunderstorm?
- squall line mesoscale convective complex supercell air mass thunderstorm

17. A tropical storm is weaker than a hurricane but stronger than a _____.

tropical depression

tropical cyclone

tropical mesocyclone

typhoon

Two points each:

18. List two conditions necessary for the formation of supercell thunderstorms.

Strong wind shear (wind speed or direction changing with height)--this produces rotation
Conditional instability and a capping inversion--allows instability to build

19. List two conditions necessary for tropical cyclone development.

Warm SST (>27C) over large area
Weak vertical wind shear so that convection can organize

20. Where does the rotation come from in a supercell?

Vertical wind shear combined with convection. Vortex tube tilting.

21. Where does the rotation come from in a hurricane?

Coriolis. Hurricanes can't form at the equator.

Three points each:

23. List the three ways in which a hurricane can decay.

Move over cool water
Move over land (no moisture source)
Move toward jet stream (wind shear increases)

24. Describe the vertical structure necessary for an intensifying mid-latitude cyclone, and explain *why* this configuration leads to intensification.

Westward tilt with height. Upper level low displaced westward of surface low means the region of divergence aloft is stacked over the region of surface convergence. This drives upward air motion, and a deepening low.

Tornadoes [separate page on original exam]

Hot and dry air from the Mexican Plateau overrides warm and moist air from the Gulf of Mexico in the Tornado Alley region. This moisture contrast creates a conditional instability. Strong jet stream provides the wind shear needed for supercell development. Also, divergence aloft (downstream of trough) reinforces ascending air over surface low.