EAS270, "The Atmosphere" Quiz 4 28 Nov, 2005

Professor: J.D. Wilson <u>Time available</u>: 25 mins <u>Potential Value</u>: 10%

Instructions: For all 16 questions, choose what you consider to be the best (or most logical) option, and use a pencil to mark that choice on the answer form. You may keep this quiz.

- 1. With a mean daily average temperature of -17.8° C, Winnipeg's January is climatologically colder than Edmonton's (-13.5° C). In reference to Fig. 1 (attached), one may explain this as being due to the statistical difference in _____
 - (a) latitude
 - (b) altitude
 - (c) dominant airmass type or source region $\checkmark \checkmark$
 - (d) baroclinicity
 - (e) latitude of the ITCZ
- 2. The Walker circulation is a feature of the observed General Circulation (GC) in the equatorial Pacific that _____
 - (a) redistributes energy and water vapour across longitude lines $\checkmark \checkmark$
 - (b) redistributes energy and water vapour across latitude lines
 - (c) is one of the three "cells" of the 3-cell GC Model
 - (d) occurs within the polar cell of the 3-cell GC Model
 - (e) is unrelated to the El-Nino phenomenon
- 3. The 3-cell model for the General Circulation suggests that at latitude 30° one will find ______ surface pressure while at latitude 60° one will find ______ surface pressure.
 - (a) low; low
 - (b) high; high
 - (c) high; low $\checkmark \checkmark$
 - (d) low; high
 - (e) negative; positive
- 4. A key factor in Rossby's idealized mathematical theory of the longwaves is _____
 - (a) surface topography
 - (b) surface friction
 - (c) the Bergeron process
 - (d) the Polar Front Theory
 - (e) latitudinal variation of the Coriolis force $\checkmark \checkmark$

- 5. A sea-breeze is most likely to occur
 - (a) after a cloudy, windy morning
 - (b) after a sunny, calm morning $\checkmark \checkmark$
 - (c) after a cloudy, calm morning
 - (d) after a rainy, calm morning
 - (e) in conjunction with a cyclonic storm
- 6. The direction of spin in a dust devil is _____
 - (a) random from case to case, with no bias $\checkmark \checkmark$
 - (b) cyclonic
 - (c) anticyclonic
 - (d) anticyclonic in the northern hemisphere, cyclonic in the southern hemisphere
 - (e) cyclonic in the northern hemisphere, anticyclonic in the southern hemisphere
- 7. Cool, fair summer weather on the Canadian prairies is associated with _____ air, while air streaming off the Pacific onto British Columbia is _____
 - (a) mP, mT
 - (b) cP , mT
 - (c) cP , mP $\checkmark \checkmark$
 - (d) mP, mA
 - (e) cP , cT
- 8. On the CMC 850 mb analysis, a feature that can be taken to signify a classical "front" would be _____
 - (a) an occlusion
 - (b) a belt (linear region) of very strong winds
 - (c) a warm sector
 - (d) thunderstorms
 - (e) a belt of closely-spaced isotherms associated with a Low $\checkmark \checkmark$
- 9. The northern polar jetstream is _____ in winter than in summer, and is located farther
 - (a) stronger; north
 - (b) stronger; south $\checkmark \checkmark$
 - (c) weaker; north
 - (d) weaker; south
 - (e) weaker; east

- 10. Which of the following is not an ingredient of the conceptual model for Cyclogenesis?
 - (a) stationary front separating warmer and cooler air masses (thermal contrast)
 - (b) winds blowing parallel to the front
 - (c) wind shear across the front
 - (d) tightly-spaced isotherms oriented perpendicular to the front $\checkmark \checkmark$
 - (e) arrival of a shortwave trough, causing upper divergence
- 11. Upper level divergence _____ ascent, and is more likely to be found in a longwave trough _____ region
 - (a) induces; entry
 - (b) suppresses; entry
 - (c) induces; exit $\checkmark \checkmark$
 - (d) suppresses; exit
 - (e) cancels; baroclinic

For the remaining questions, please refer to the attached analyses.

- 12. The Polar Front Theory suggests one ought to be able to locate a surface cold front in association with the mid-latitude storm north of the Great Lakes (Fig. 2). Furthermore a cold front is often located along a "kink" in the isobars, such as is indicated by the heavy dashed line. What other analysed features suggest a cold front lies along that line?
 - (a) shift in wind direction
 - (b) temperature contrast
 - (c) dewpoint contrast
 - (d) pressure trends
 - (e) all of the above $\checkmark \checkmark$
- 13. Referring to the 850 mb analysis (Fig. 3), the point marked '**a**' is _____ and at '**b**' we can identify _____
 - (a) in the cold sector; cold advection
 - (b) in the warm sector; warm advection $\checkmark \checkmark$
 - (c) in the warm sector; cold advection
 - (d) in the cold sector; warm advection
 - (e) calm; the 0° isotherm

- 14. The 850 mb feature lying towards the SW border of Alberta in the lee of the Rockies is referred to as _____
 - (a) a Rossby wave
 - (b) a shortwave
 - (c) baroclinic wave
 - (d) trough of warm air aloft $\checkmark \checkmark$
 - (e) vorticity maximum
- 15. Steady snowfall (symbol $\mathbf{x}\mathbf{x}$) was reported at a station far to the west of the surface front, and far SSW from the low (ie. the station lying close to the 5th isobar ringing the low). The snow is probably associated with
 - (a) warm frontal cloud
 - (b) cold frontal cloud
 - (c) the lake effect $\checkmark \checkmark$
 - (d) baroclinicity
 - (e) an occluded front
- 16. On the 850 mb chart, a station in the NW corner is circled by a dashed line, indicating suspicious data. In your opinion, the element that is probably in error is _____
 - (a) temperature
 - (b) dewpoint
 - (c) height
 - (d) wind speed $\checkmark \checkmark$
 - (e) wind direction



Figure 1: January mean sea-level pressure (source: Aguado & Burt, Fig. 8-4(a)).



Figure 2: CMC surface analysis, 12Z Nov 16, 2005.



Figure 3: CMC 850 mb analysis, 12Z Nov 16, 2005.