> **Open books, notes, laptop, epad, calculator. (Communications with other people is NOT allowed.)**
> OK to separate all the sheets. Put your Name & ID on all sheets. Do NOT re-staple. ChatGPT NOT allowed.
> Turn in all question sheets, thermo diagrams, hodographs, and bubble sheet.
> Please use the bubble sheet to indicate your answers. Only the bubble sheet will be marked. Total of 17 questions

Plot this sounding on the attached thermo diagram. Then use it for the following 9 questions.

P (kPa)	T (°C)	Td (°C)
20	-35	
31	-35	
35	-30	
60	0	
80	20	
89	20	
95	26	
100	35	20

Question
(points)

1   (3)   At what pressure (kPa) is the lifting condensation level (LCL)?

A	B	C	D	E
95	89	81	72	60

2   (3)   At what pressure (kPa) is the level of free convection (LFC)?

A	B	C	D	E
89	81	72	60	35

3   (3)   At what pressure (kPa) is the equilibrium level (EL)?

A	B	C	D	E
72	60	35	31	27

4   (3)   At what pressure (kPa) is the top of the mixed layer?

A	B	C	D	E
95	89	84	72	60

5   (3)   At what pressure (kPa) is the tropopause?

A	B	C	D	E
72	60	35	31	27

6   (3)   At what pressure (kPa) is the bottom of the convective inhibition region?

A	B	C	D	E
95	89	84	72	60

7   (3)   What is the static stability of the environment at the 50 kPa pressure level?

A	B	C	D
stable	neutral	unstable	(not enough info to answer)

8   (3)   For an air parcel that starts at 100 kPa, when it reaches P = 80 kPa, what is its relative humdity (%)?

A	B	C	D	E
20	27.8	37.5	45	100

9   (3)   What is the potential temperature (°C) of the environmental air (not the rising air parcel) at P = 45 kPa?

A	B	C	D	E
-15	-6	17	20	50

Plot the following wind profile on the hodograph provided, to answer the following 2 questions.

z (km)	M (m/s)	direction (°)
0	0	-
1	5	30
2	10	60
3	15	100
4	20	130
5	25	160
6	35	180

10   (3)   If a thunderstorm forms in this environment, the approximate normal storm motion is

A	B	C	D	E
220° at 15 m/s	100° at 15 m/s	240° at 10 m/s	180° at 35 m/s	140° at 10 m/s

11   (3)   If a thunderstorm forms in this envionment and splits into two, the dominant one will likely be a ____ mover.

A	B	C	D
Right	Normal	Left	(not enough info to answer)

12   (3)   Suppose the height of the 50 kPa isobaric surface is 5.02 km altitude at one location, but

decreases to 5.00 km at a location that is 100 km further north. Assume $f_c = 1\times10^{-4}\ s^{-1}$.
The magnitude of the geostropic wind is approximately _____ m/s .

A	B	C	D	E
2	5	10	15	20

13   (3)   and the direction of that geostropic wind from the previous exercise is

| A	B	C	D	E
north	east	south	west	upward

14   (3)   As a layer of air gets warmer, the height difference increases between the two isobaric levels marking
the top and bottom of that layer. The equation that describes this is called the _____ equation.

A	B	C	D	E
Planck	hydrostatic	omega	thickness	hypsometric

15   (3)   For the Doppler radar image at right,
what phenomenon is it observing?

| A	cyclonic tornado
B	anticyclonic tornado
C	downburst
D	gust front
E	straight-line winds

green or blue
red
y
x
radar
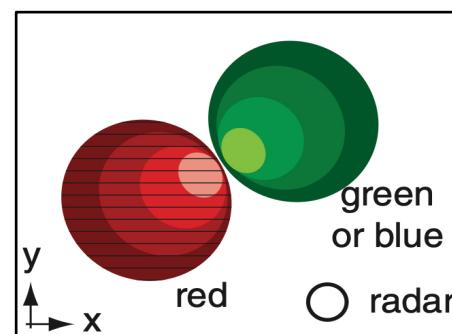
16   (3)   A column of air of depth 5 km has a relative vorticity of

$1\times10^{-5}\ s^{-1}$ at latitude 50°N. If it moves 5° of longitude to the east, it's relative vorticity will

A	B	C	D	E
increase	stay the same	decrease	change sign	become zero

17   (3)   Which has the best match of concepts?

A	B	C	D	E
gradient wind / drag	adiabatic / radiative heating	low / anticyclone	advection / Lagrangian	arc cloud / haboob

Tephigram

• State lines are thin.
• Process lines are thick, and are labeled with temperature where they cross P = 100 kPa.
(θ_w = wet-bulb potential temp.)

T

θ_w

θ

°C

Mixing Ratio (g/kg)

Height (km)

Temperature (°C)

Pressure (kPa)

Moist Adiabat θ_w

Dry Adiabat $\theta = 50°C$
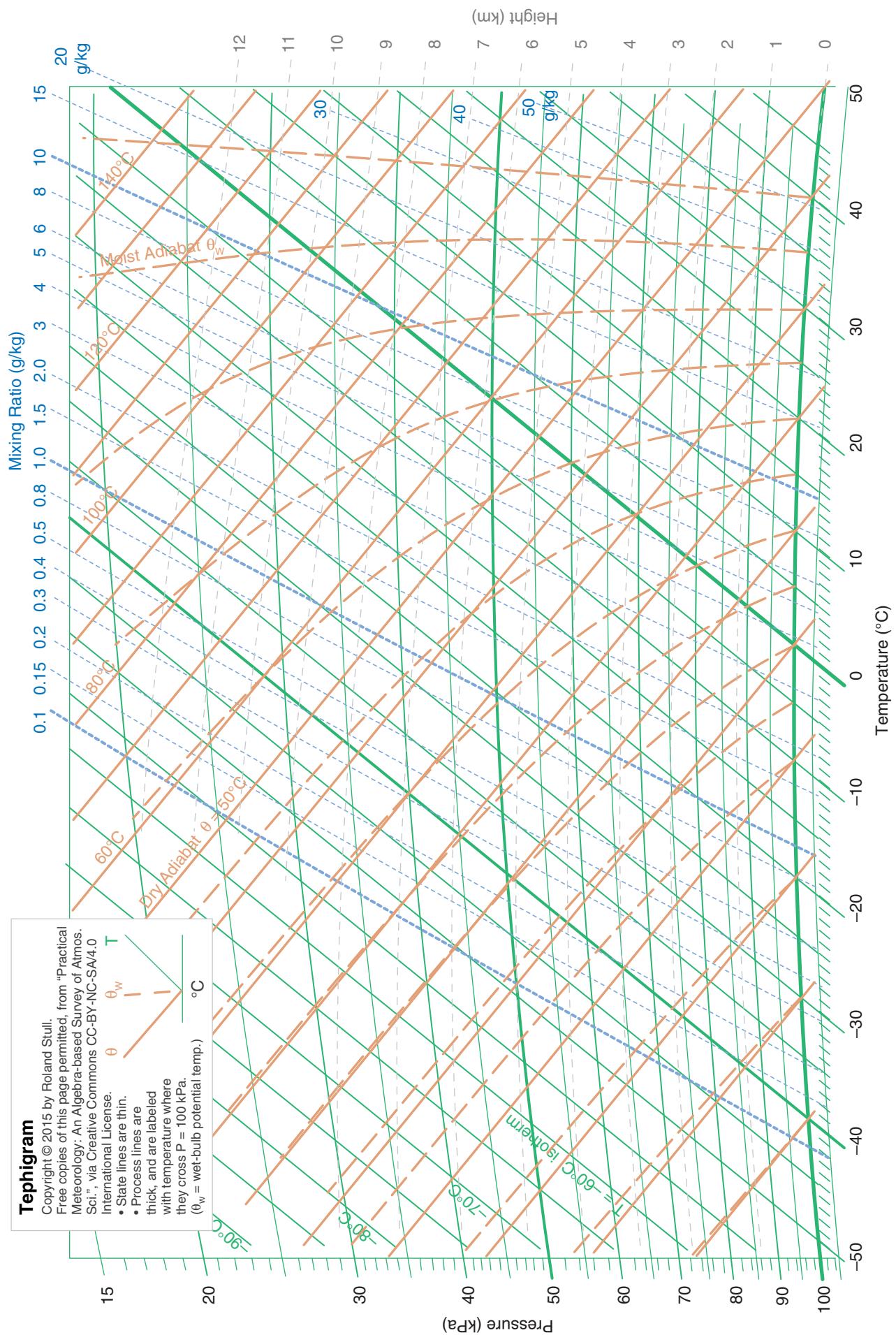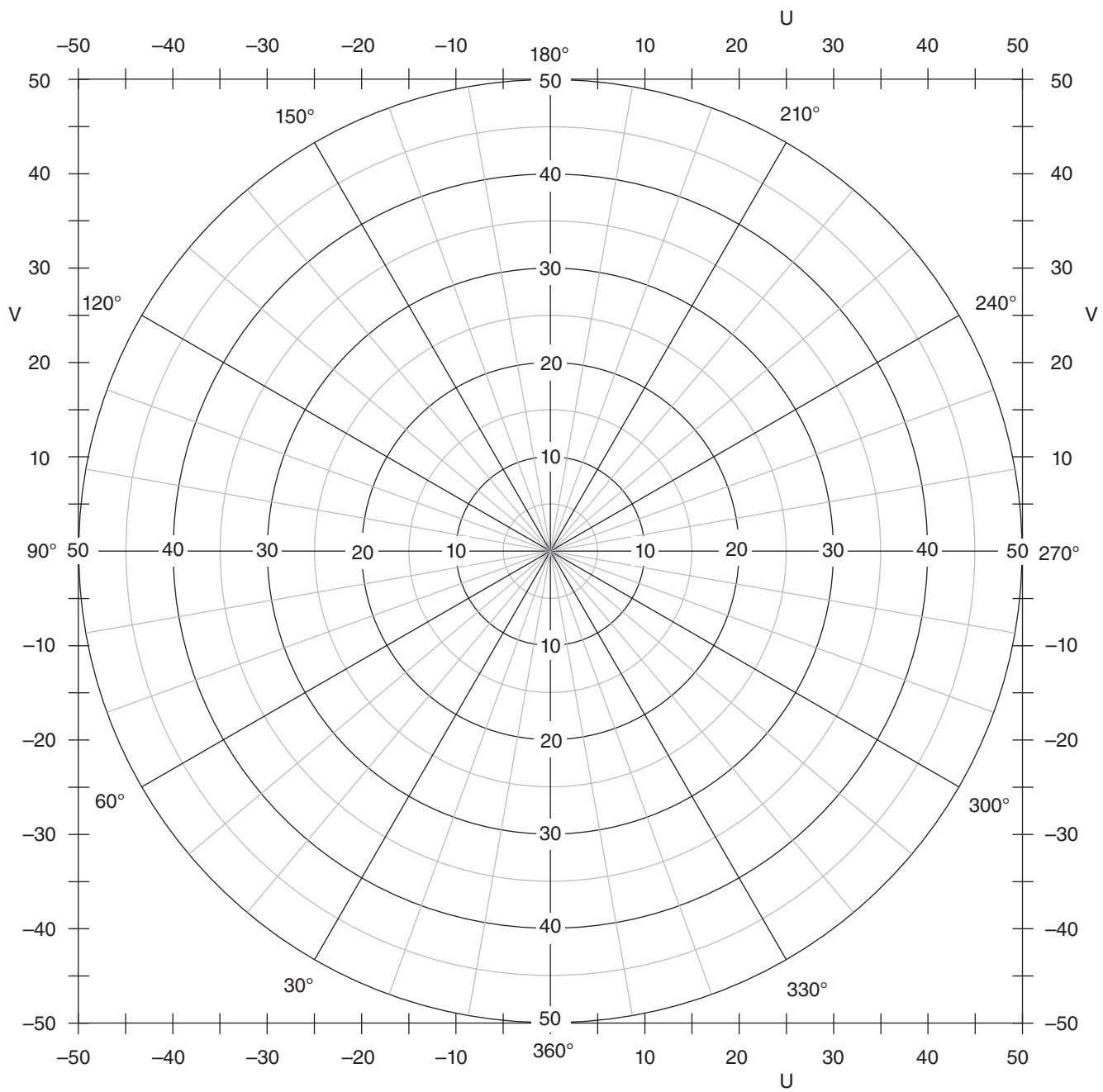
Figure 14.51
Blank hodograph for you to copy and use. Compass angles are direction winds are <u>from</u>. Speed-circle labels can be changed for different units or larger values, if needed.

LAST NAME

FIRST NAME

TEST FORM
(A) (B) (C) (D)

ID NUMBER

1	A B C D E
2	A B C D E
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11	A B C D E
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83	A B C D E
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91	A B C D E
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93	A B C D E
94	A B C D E
95	A B C D E
96	A B C D E
97	A B C D E
98	A B C D E
99	A B C D E
100	A B C D E