Open books, notes, laptop, epad, cell phone, 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, and bubble sheet. OK to search on Google.
Please use the bubble sheet to indicate your answers. Only the bubble sheet will be marked.
Total of 16 questions (worth 50 points). Roughly 1 point per minute.

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

P (kPa)	T (℃)	Td (℃)
20	-60	
26	-60	
35	-49	
70	10	
80	7	
95	22	
100	30	14

Question
(points)

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

A	B	C	D	E
80	76	64	35	26

2   (4)   Approximately at what pressure (kPa) is the level of free convection (LFC)?

A	B	C	D	E
80	76	64	35	26

3   (4)   Approximately at what pressure (kPa) is the equilibrium level (EL)?

A	B	C	D	E
76	64	35	26	22

4   (3)   Approximately at what pressure (kPa) is the top of the mixed layer (i.e., the boundary layer)?

A	B	C	D	E
80	76	64	35	26

5   (3)   Approximately at what pressure (kPa) is the tropopause?

A	B	C	D	E
80	76	64	35	26

6   (3)   What is the static stability of the environment at the 30 kPa pressure level?

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

7   (3)   For the sounding air parcel at 100 kPa, what is its approximate relative humdity (%)?

A	B	C	D	E
25	35	45	55	65

8   (3)   What is the approx. potential temperature (℃) of the environmental air (not the rising air parcel) at P = 35 kPa?

A	B	C	D	E
-50	-40	10	30	42

9   (4)   If the CAPE ≈ 3500 J/kg, then thunderstorm intensity is likely:

A	B	C	D	E
Ordinary CB	Marginal Supercell	Supercell, no tornado	Supercell & EF0-EF1 tornado	Supercell & EF2-EF5 tornado

10 (3) Given the **N. Hemisphere** Doppler radar display below (Fig 1), if the radar is located at position D, then the weather at location E is likely a

A	B	C	D	E
gust front convergence zone	divergence zone under a downburst	cyclonically rotating tornado	anti-cyclonic rotating tornado	southwest wind
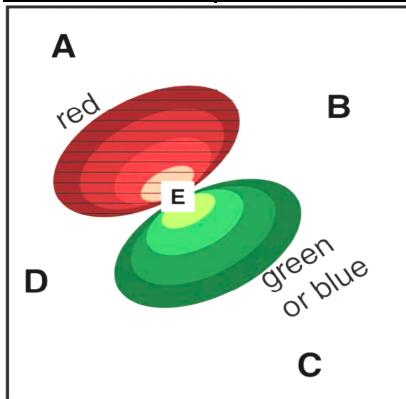
Fig. 1.
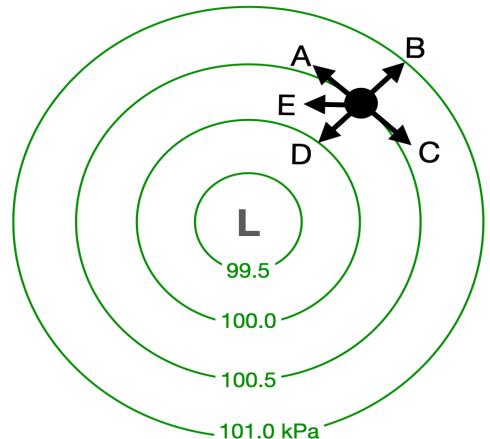
Fig. 2.

11 (3) In the **Fig. 2** sketch of a mid-latitude cyclone in the **N. Hemisphere**, which vector represents the likely gradient wind direction for the sketched air parcel (black dot)?

A	B	C	D	E

12 (2) Name the cloud shown in figure 3.

A	wall
B	arc
C	mammatus
D	beaver tail
E	derecho

Fig. 3.

Image credit:
Greg Johnson

13 (4) Given a column of air over Vancouver with a positive relative vorticity initially. If the column vertical thickness increases and it moves southward, then its relative vorticity ___ .

A	decreases and becomes negative
B	decreases but stays positive
C	doesn't change
D	increases and stays positive
E	(not enough information to answer)

14 (4) At a latitude of 50°N, the daily average globel heat flux on 1 April is 300 W/m^2 . This corresponds to a kinematic flux (K·m/s) of approximately

A. 3.69×10^5	B. 24	C. 2.4	D. 0.24	E. 0.024

15 (2) An example of a mesoscale convective system is a/an

A. LP supercell	B. lassic supercell	C. HP supercell	D. squall line	E. air-mass Tstorm

16 (2) The main factor that determines max hailstone size in a thunderstorm is

A	B	C	D	E
updraft speed	downburst speed	storm-relative helicity	liquid water mixing ratio	precipitation rate

Height (km)

12 11 10 9 8 7 6 5 4 3 2.5 2 1.5 1 0.5 0

Mixing Ratio (g/kg)

9 8 4 3 2 1.5 1.0 0.8 0.6 0.4 0.3 0.2 0.15 0.1

(g/kg)

10 15 20 25 30 40 50

Moist Adiabat θ_w

Dry Adiabat θ

100°C 90°C 80°C 70°C 60°C 50°C

Temperature (°C)

40 30 20 10 0 −10 −20 −30 −40 −50

Pressure (kPa)

20 30 40 50 60 70 80 90 100

−90°C −80°C −70°C −60°C Isotherm T

Skew-T Log-P Diagram

Copyright © 2015 by Roland Stull.
Free copies of this page permitted, from "Practical
Meteorology: An Algebra-based Survey of Atmos.
Sci.", via Creative Commons CC-BY-NC-SA/4.0
International License.
• 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.)

θ_w

T

θ

°C

LAST NAME

```
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
```
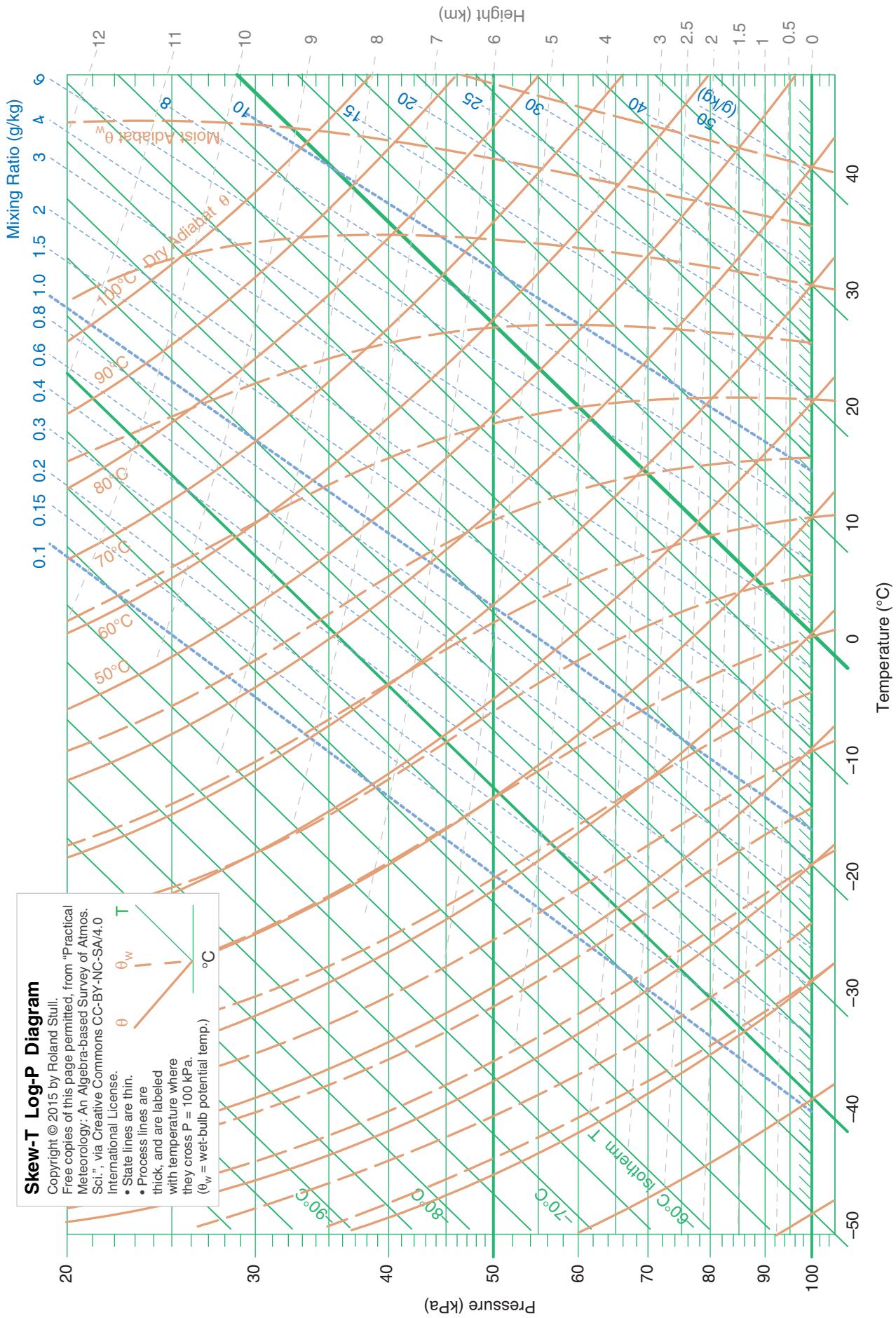
FIRST NAME

```
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
(A)(B)(C)(D)(E)(F)(G)(H)(I)(J)(K)(L)(M)(N)(O)(P)(Q)(R)(S)(T)(U)(V)(W)(X)(Y)(Z)
```

TEST FORM

(A) (B) (C) (D)

ID NUMBER

```
(0)(1)(2)(3)(4)(5)(6)(7)(8)(9)
(0)(1)(2)(3)(4)(5)(6)(7)(8)(9)
(0)(1)(2)(3)(4)(5)(6)(7)(8)(9)
(0)(1)(2)(3)(4)(5)(6)(7)(8)(9)
(0)(1)(2)(3)(4)(5)(6)(7)(8)(9)
(0)(1)(2)(3)(4)(5)(6)(7)(8)(9)
(0)(1)(2)(3)(4)(5)(6)(7)(8)(9)
(0)(1)(2)(3)(4)(5)(6)(7)(8)(9)
```

Answers 1–35

#	A	B	C	D	E
1	(A)	(B)	(C)	(D)	(E)
2	(A)	(B)	(C)	(D)	(E)
3	(A)	(B)	(C)	(D)	(E)
4	(A)	(B)	(C)	(D)	(E)
5	(A)	(B)	(C)	(D)	(E)
6	(A)	(B)	(C)	(D)	(E)
7	(A)	(B)	(C)	(D)	(E)
8	(A)	(B)	(C)	(D)	(E)
9	(A)	(B)	(C)	(D)	(E)
10	(A)	(B)	(C)	(D)	(E)
11	(A)	(B)	(C)	(D)	(E)
12	(A)	(B)	(C)	(D)	(E)
13	(A)	(B)	(C)	(D)	(E)
14	(A)	(B)	(C)	(D)	(E)
15	(A)	(B)	(C)	(D)	(E)
16	(A)	(B)	(C)	(D)	(E)
17	(A)	(B)	(C)	(D)	(E)
18	(A)	(B)	(C)	(D)	(E)
19	(A)	(B)	(C)	(D)	(E)
20	(A)	(B)	(C)	(D)	(E)
21	(A)	(B)	(C)	(D)	(E)
22	(A)	(B)	(C)	(D)	(E)
23	(A)	(B)	(C)	(D)	(E)
24	(A)	(B)	(C)	(D)	(E)
25	(A)	(B)	(C)	(D)	(E)
26	(A)	(B)	(C)	(D)	(E)
27	(A)	(B)	(C)	(D)	(E)
28	(A)	(B)	(C)	(D)	(E)
29	(A)	(B)	(C)	(D)	(E)
30	(A)	(B)	(C)	(D)	(E)
31	(A)	(B)	(C)	(D)	(E)
32	(A)	(B)	(C)	(D)	(E)
33	(A)	(B)	(C)	(D)	(E)
34	(A)	(B)	(C)	(D)	(E)
35	(A)	(B)	(C)	(D)	(E)

Answers 36–70

#	A	B	C	D	E
36	(A)	(B)	(C)	(D)	(E)
37	(A)	(B)	(C)	(D)	(E)
38	(A)	(B)	(C)	(D)	(E)
39	(A)	(B)	(C)	(D)	(E)
40	(A)	(B)	(C)	(D)	(E)
41	(A)	(B)	(C)	(D)	(E)
42	(A)	(B)	(C)	(D)	(E)
43	(A)	(B)	(C)	(D)	(E)
44	(A)	(B)	(C)	(D)	(E)
45	(A)	(B)	(C)	(D)	(E)
46	(A)	(B)	(C)	(D)	(E)
47	(A)	(B)	(C)	(D)	(E)
48	(A)	(B)	(C)	(D)	(E)
49	(A)	(B)	(C)	(D)	(E)
50	(A)	(B)	(C)	(D)	(E)
51	(A)	(B)	(C)	(D)	(E)
52	(A)	(B)	(C)	(D)	(E)
53	(A)	(B)	(C)	(D)	(E)
54	(A)	(B)	(C)	(D)	(E)
55	(A)	(B)	(C)	(D)	(E)
56	(A)	(B)	(C)	(D)	(E)
57	(A)	(B)	(C)	(D)	(E)
58	(A)	(B)	(C)	(D)	(E)
59	(A)	(B)	(C)	(D)	(E)
60	(A)	(B)	(C)	(D)	(E)
61	(A)	(B)	(C)	(D)	(E)
62	(A)	(B)	(C)	(D)	(E)
63	(A)	(B)	(C)	(D)	(E)
64	(A)	(B)	(C)	(D)	(E)
65	(A)	(B)	(C)	(D)	(E)
66	(A)	(B)	(C)	(D)	(E)
67	(A)	(B)	(C)	(D)	(E)
68	(A)	(B)	(C)	(D)	(E)
69	(A)	(B)	(C)	(D)	(E)
70	(A)	(B)	(C)	(D)	(E)

Answers 71–100

#	A	B	C	D	E
71	(A)	(B)	(C)	(D)	(E)
72	(A)	(B)	(C)	(D)	(E)
73	(A)	(B)	(C)	(D)	(E)
74	(A)	(B)	(C)	(D)	(E)
75	(A)	(B)	(C)	(D)	(E)
76	(A)	(B)	(C)	(D)	(E)
77	(A)	(B)	(C)	(D)	(E)
78	(A)	(B)	(C)	(D)	(E)
79	(A)	(B)	(C)	(D)	(E)
80	(A)	(B)	(C)	(D)	(E)
81	(A)	(B)	(C)	(D)	(E)
82	(A)	(B)	(C)	(D)	(E)
83	(A)	(B)	(C)	(D)	(E)
84	(A)	(B)	(C)	(D)	(E)
85	(A)	(B)	(C)	(D)	(E)
86	(A)	(B)	(C)	(D)	(E)
87	(A)	(B)	(C)	(D)	(E)
88	(A)	(B)	(C)	(D)	(E)
89	(A)	(B)	(C)	(D)	(E)
90	(A)	(B)	(C)	(D)	(E)
91	(A)	(B)	(C)	(D)	(E)
92	(A)	(B)	(C)	(D)	(E)
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)