



University College Dublin
An Coláiste Ollscoile, Baile Átha Cliath

SEMESTER I EXAMINATION 2009/2010

MAPH 40500
Synoptic Meteorology

Extern examiner: Professor Keith Shine
Head of School: Professor Mícheál Ó Searcóid
Lecturer: Professor Peter Lynch*

Time Allowed: 2 hours

Instructions for Candidates

Answer **all (5)** questions.
All questions carry equal marks.
Total: 100 marks.

Instructions for Invigilators

Non-programmable calculators may be used during this examination.

Question 1 (20 marks)

In Figure 1, synoptic reports for six Irish weather stations, valid at 0600Z, 17 October 2009 are given. From these, supply the following information:

- Temperature and dew point at Roches Point
- Mean sea level pressure at Valentia Observatory
- Wind direction and speed at Cork Airport
- Visibility at Shannon Airport
- Pressure tendency at Casement Aerodrome
- Height of cloud base at Dublin Airport
- Rainfall over previous 12 hours at Valentia
- Present weather at Shannon Airport

Include signs and units as appropriate.

SYNOPSIS from 03952, Roches Point (Ireland) | 51-48N | 008-15W | 40 m

SM 17/10/2009 AAXX 17061 03952 35/74 /3503 10074 20067 30280 40331 57007
06:00-> 333 20073 3/004=

SYNOPSIS from 03953, Valentia Observatory (Ireland) | 51-56N | 010-15W | 9 m

SM 17/10/2009 AAXX 17061 03953 12681 30060 10092 20071 30291 40328 57009 69902 82502
06:00-> 333 20094 31003 55000 82630 92428=

SYNOPSIS from 03955, Cork Airport (Ireland) | 51-51N | 008-29W | 153 m

SM 17/10/2009 AAXX 17061 03955 12570 10102 10065 20057 30131 40333 57009 69902 81500
06:00-> 333 20060 31003 55008 81624=

SYNOPSIS from 03962, Shannon Airport (Ireland) | 52-42N | 008-55W | 14 m

SM 17/10/2009 AAXX 17061 03962 11959 00601 10074 20067 30312 40337 57010 69902 71011
06:00-> 333 20051 3/000 55023=

SYNOPSIS from 03967, Casement Aerodrome (Ireland) | 53-18N | 006-26W | 97 m

SM 17/10/2009 AAXX 17061 03967 12270 12502 10009 20009 30225 40345 57011 69902 81600
06:00-> 333 20004 31102 55025 81703 92600=

SYNOPSIS from 03969, Dublin Airport (Ireland) | 53-26N | 006-15W | 68 m

SM 17/10/2009 AAXX 17061 03969 12580 10000 10032 20032 30234 40342 56012 69902 81500
06:00-> 333 20022 31102 55038 81628 92600=

Figure 1. Synoptic reports for 0600Z, 17 October 2009 for six Irish stations

Question 2 (20 marks)

Consider the plotted observations in Figure 2. One or more of the six lines AA', BB', CC', DD', EE', FF' and GG' separates different air masses?

For each line selected:

- (a) Give *detailed reasons* why it represents such a division
- (b) Describe the air mass on each side of the line
- (c) State what kind of front it represents.

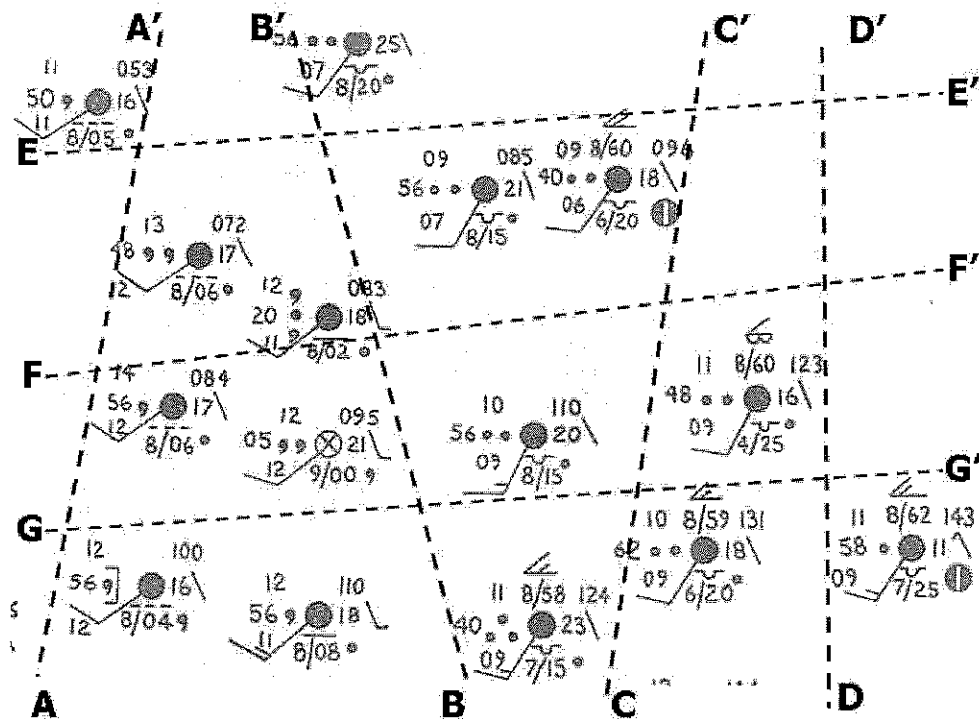


Figure 2.

Question 3 (20 marks)

A tephigram with vertical profile of temperature and dew point is shown in Figure 3. From the given data, deduce the following values:

- Pressure at the freezing level
- Temperature, dew point and wet bulb temperature at 1000 hPa

(c) Potential temperature and wet bulb potential temperature at 850 hPa

(d) Equivalent potential temperature and relative humidity at 500 hPa

Specify units in every case.

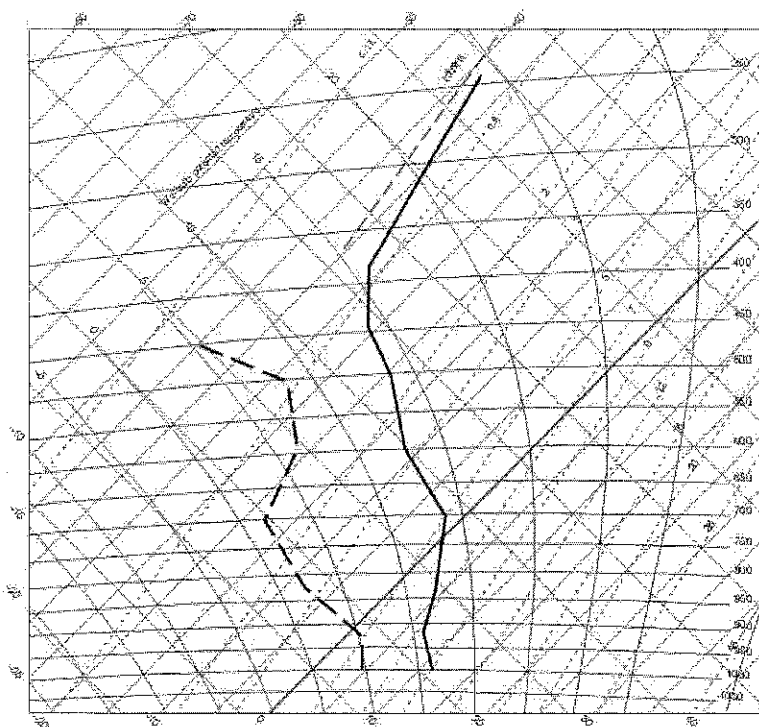


Figure 3 (A large format colour version will be provided).

Question 4 (20 marks)

In Figure 4, four synoptic charts are shown, labelled (A), (B), (C) and (D). In each case, describe the synoptic situation in Ireland.

For each of the four charts, write a summary in a form suitable for a radio weather bulletin. Using only the information in the chart, include the following details:

- General description of the pressure pattern
- Expected wind direction or directions
- Temperature, relative to the seasonal average
- Likelihood of occurrence of precipitation
- Any other expected weather phenomena (fog, thunder, etc.).

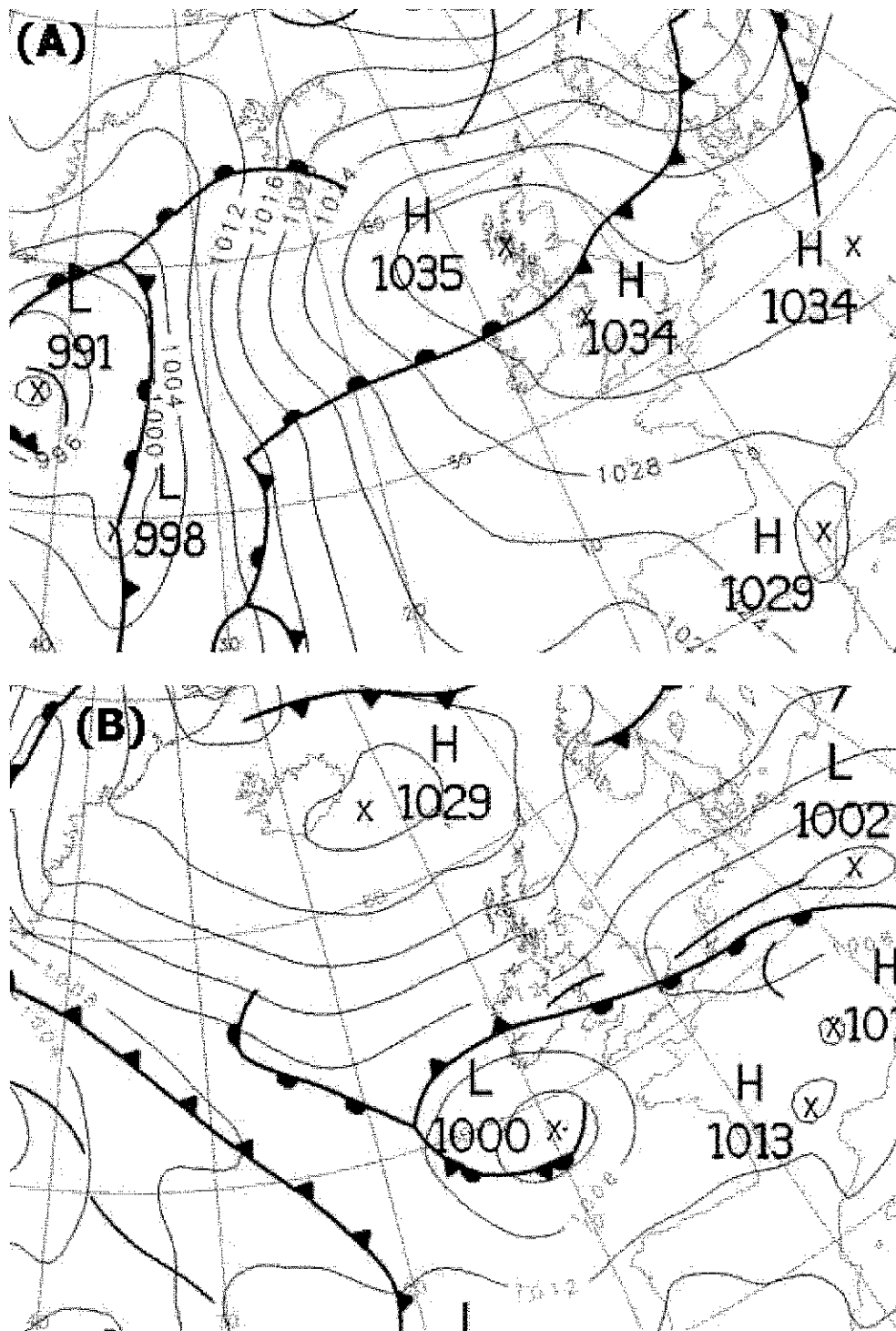


Figure 4. (A) and (B)

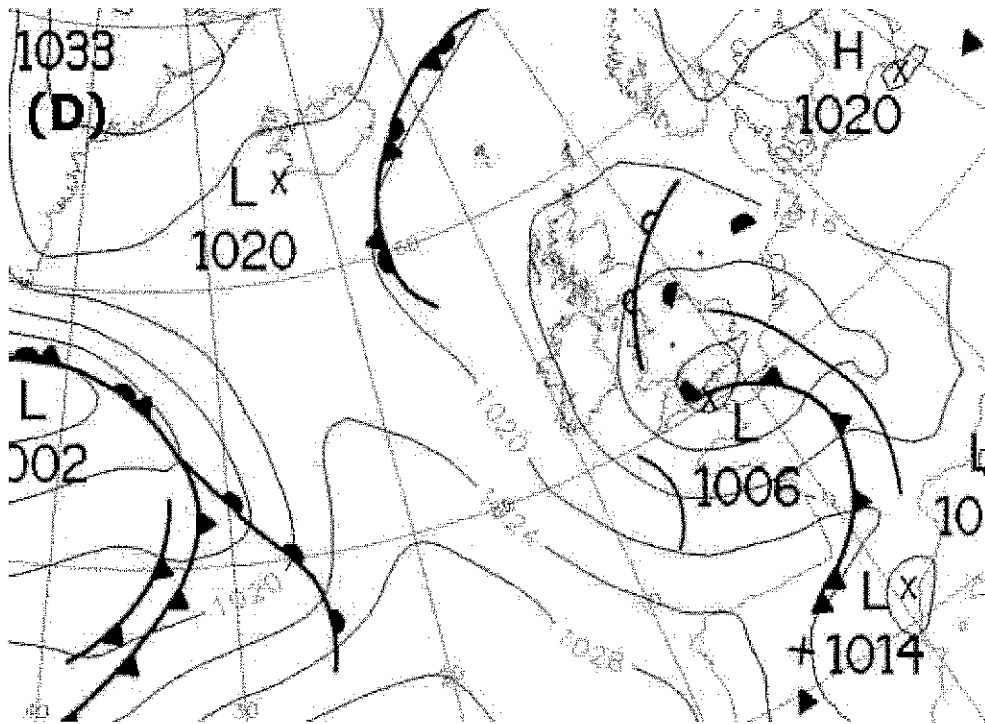
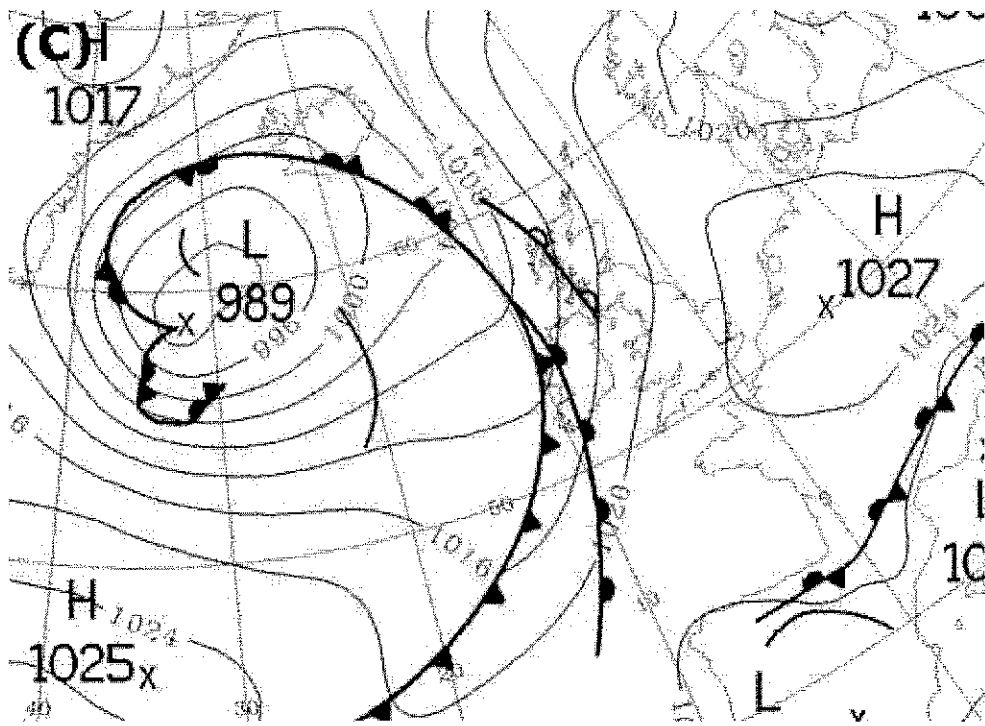


Figure 4. (C) and (D)

Table 1: Passage of Warm Front

	<i>Before front</i>	<i>At front</i>	<i>After front</i>
<i>Wind</i>	Backs slowly	Sharp veer	Steady again
<i>Dew Point</i>	Slow increase	Sharp rise	Steady
<i>Pressure</i>	Falling	Steady	Usually steady
<i>Temperature</i>	Steady	Falls in rain	Milder
<i>Cloud</i>	Increasing and lowering in rain	Thick layers	Thin layers, some breaks
<i>Visibility</i>	Good becoming moderate	Poor in rain	Moderate or poor
<i>Weather</i>	Rain becoming moderate or heavy	Short burst of moderate rain	Damp and drizzly

Question 5 (20 marks)

Table 1 (above) shows the pattern of changes in various atmospheric variables associated with the passage of a warm front. The following variables are given: wind, dew point, pressure, temperature, cloud cover, visibility and weather. The generic behaviour of each variable as the front approaches, as it passes and after the frontal passage is given.

Construct a similar table for the passage of a cold front. Include all the variables: wind, dew point, pressure, temperature, cloud cover, visibility and weather. Give the expected changes as the front approaches, as it passes and after the frontal passage.

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