

National University of Lesotho
BSc. and BSc. Ed. Supplementary Examination
PG 3413 – Synoptic Meteorology

August, 2023

Marks: 100

3 Hours

Instructions:

- Answer any **four (4)** questions.
 - Where applicable illustrate your answer with equations and diagrams.
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Question 1

- a) Describe the **two (2)** types of models used in climate and weather prediction. (10)
- b) Briefly explain what the tropics are. (8)
- c) Differentiate between a climate outlook and a weather forecast. (7)

[25]

Question 2

- a) Explain how atmospheric and oceanic circulations contribute to the meridional transport of heat. (15)
- b) Discuss **two (2)** major differences between midlatitude and tropical atmospheric circulatory systems. (10)

[25]

Question 3

- a) Describe any **three (3)** temperate disturbances affecting the weather and climate of Southern Africa. (15)
- b) Outline the lifecycle of a single cell storm. (10)

[25]

Question 4

- a) Explain any four (4) factors that are responsible for the highly variable weather and climate in the midlatitude regions. (16)
- b) Compare and contrast supercell and line storms. (9)

Question 5

- a) Briefly explain any **five (5)** necessary conditions in the large-scale environment for tropical cyclogenesis to occur. (10)
- b) Outline the different stages in the development of a mid-latitude cyclone. (15)

[25]

Question 6

Use the accompanying plotted (T- Φ) tephigram in figure 1 to determine the following:

- a) The mixing and saturation mixing ratio at the 750 hPa pressure level. (3)
- b) The height of the base of the lowest cloud. (5)
- c) The height and thickness of the inversion layer. (5)
- d) The freezing level. (2)
- e) The potential temperature of a parcel of air with a temperature of 2.2 °C at 850 hPa pressure level. (5)
- f) The vapour pressure and saturation vapour pressure at the 850hPa pressure level. (5)

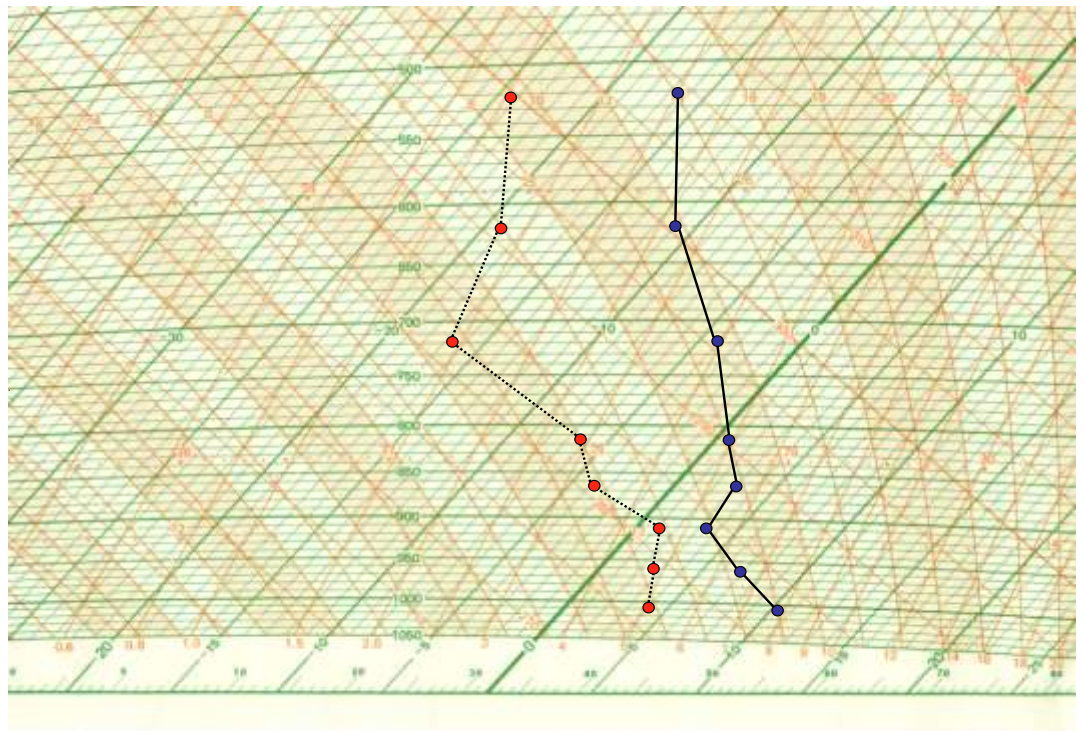


Figure 2. Plotted (T- Φ) tephigram

