FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SCHOOL OF PHYSICAL SCIENCES
DEPARTMENT OF GEOGRAPHY.

Second Semester Examination 2014/2015 Session
Course Title: Atmospheric Thermodynamics and Precipitation Processes
Course Code: MET 322
Instructions: Answer **Question 6** and any **other three Questions**. The use of relevant diagrams and illustrations shall be rewarded. **Time allowed**: 2hrs. 30 Minutes

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1. (i) State the first law of thermodynamics as it relates to the atmosphere.
   (ii) State the ideal gas equation and explain each term of the equation.
   (iii) Calculate the density of water vapor which exerts apressure of 9 mb at 20°C.
2. (i) Using the kinetic theory of matter, explain what happens to a mass of snow as it falls through a warm atmosphere.
   (ii) Explain the process(s) involved when a towering cumulus cloud becomes a Cumulonimbus cloud when seeded with a super cooled water droplet.
   (iii) What pressure (in mb) is exerted by a layer of air having a thickness of 1,300m and an average density of 1.15Kg/M^3. Take gravitational acceleration to be 9.8m/s^2.
3. Write short and explanatory notes on **any three** of the following
   (i) Hydrostatic balance
   (ii) Barometric formula
   (iii) Geopotential
   (iv) Enthalpy
   (v) Entropy
4. (i) State the Clasius Claperyon equation and explain its relevance in atmospheric thermodynamics.
   (ii) The vapour pressure of water is 1.0 atmosphere at 373K, and the enthalpy of vaporization is 40.7KJmol^{-1}. Estimate the vapour pressure at temperature 363K and 383K respectively.
5. Discuss the thermal stratification of the atmosphere and explain its relevance to precipitation processes.

6. (a) Define the tephigram and mention three other thermodynamic diagrams used in weather analysis.

   b. Use the figure supplied to construct the following:

      (i) Saturated adiabat

      (ii) Mixing ratio

      (iii)Lifting condensation level

   c. By showing the various positions of ELR, DALR and SALR, use the figure to explain any three of the following:

      (i) Absolute stability in the atmosphere

      (ii) Conditional instability of the atmosphere

      (iii) Convective instability

      (iv) Adiabatic lifting

NAME :

MATRIC. NO

1 per student

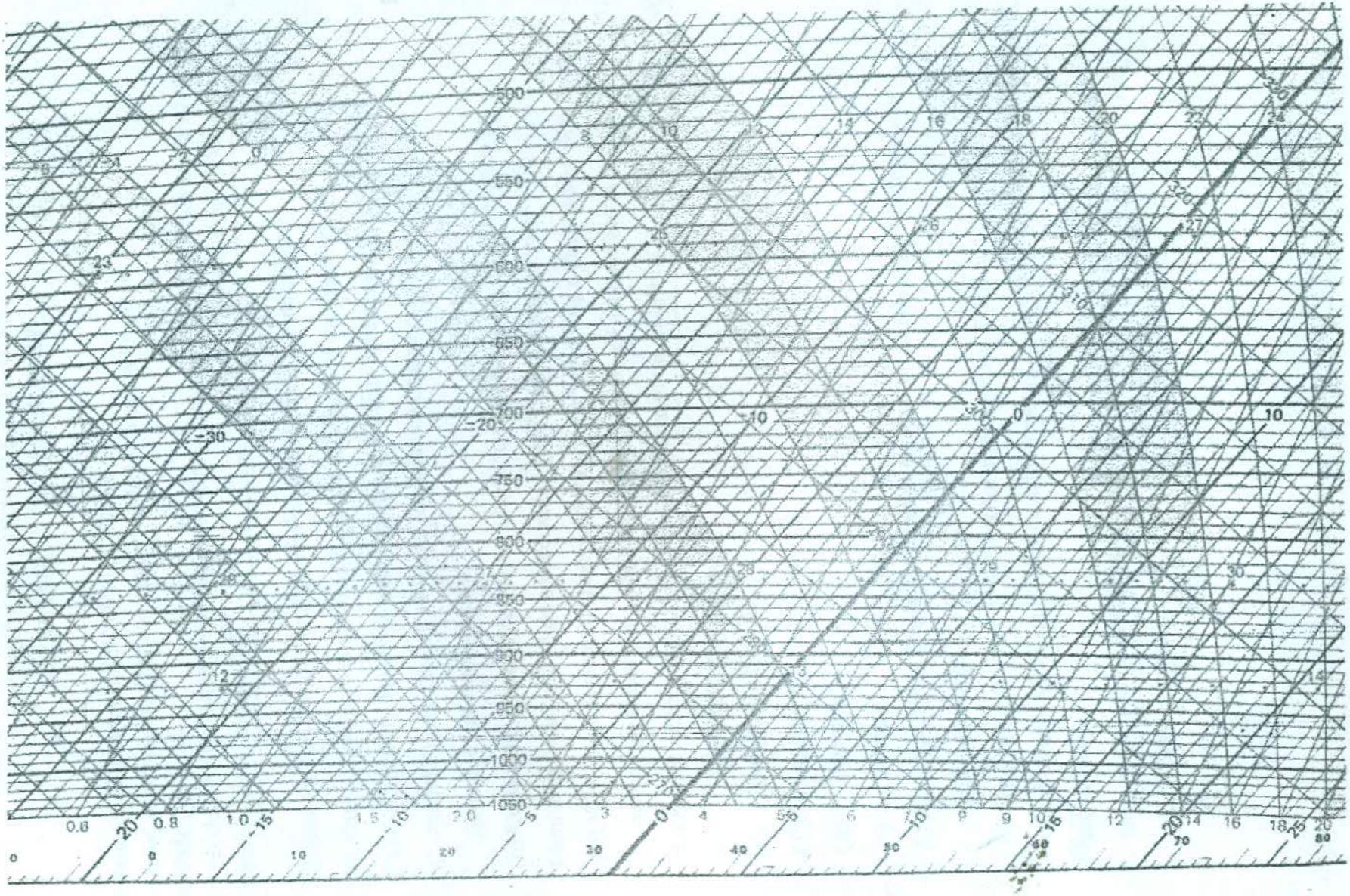

FIGURE 1.0 : THE TEPHIGRAM