2922/301
ATMOSPHERIC SCIENCE
Oct./Nov. 2022
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN ENVIRONMENTAL SCIENCE AND TECHNOLOGY

MODULE III

ATMOSPHERIC SCIENCE

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
   answer booklet;
   non-programmable scientific calculator.
*This paper consists of **TWO** sections; A and B.*
*Answer **ALL** the questions in section A and any **THREE** questions from section B in the answer booklet provided.*
*Each question in section A carries **4** marks while each question in section B carries 20 marks.*
Maximum marks for each part of a question are as shown.
***Candidates should answer the questions in English.***

This paper consists of 4 printed pages.

Candidates should check the question paper to ascertain that all the
pages are printed as indicated and that no questions are missing.

Turn over

SECTION A (40 marks)

Answer ALL the questions in this section.

1. (a) Name **two** divisions of the ionosphere. (2 marks)

   (b) Explain the importance of the ionosphere in relation to communication. (2 marks)

2. State **four** factors which affect daytime warming near the earths surface. (4 marks)

   cloud cover; Topography, vegetation cover, latitude

3. (a) Define absolute humidity *Is ē actual amount of water vapour in ē atmos regardless of ē temperature* (2 marks)

   (b) Compare the absolute humidification of Mombasa town in Mombasa county and Lodwar town in Turkana county in Kenya. *At mombasa there is a heats up to make the water body whi air humid* (2 marks) *In lodwar more ... less humid is no water*

4. Distinguish between radiation and advection types of frost. (4 marks)

5. Describe **two** types of lapse rates as used in cloud development. *Adiabatic temp ch Non adiabatic temp change* (4 marks)

6. Draw a droplet radius versus time graph describing the growth of a cloud droplet in warm clouds by condensation and collection process. (4 marks)

7. Explain the working principle of the mercury barometer. (4 marks)

8. Describe the persistence forecasting method. *assumes that what the weather is do today is what it will continue to do* (4 marks)

9. State **four** characteristics of the dissipating stage of a thunderstorm's life cycle. (4 marks)

   ✓stable air, calm weather

10. Draw labelled diagrams describing coronas produced through diffraction by a:

    (a) tiny water droplet; (2 marks)

    (b) large water droplet. (2 marks)

7 vacuum open end mercury bath
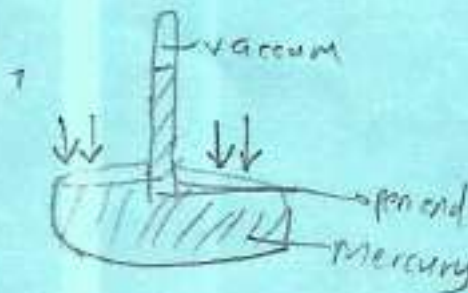
The atmospheric pressure acts on the weight of ē air colum above the mercury bath. It pushes the mercury up up to a certain height. At this hight the atmospheric pressure is equal to the weight of mer column.

SECTION B (60 marks)

Answer any THREE questions from this section.

11. (a) State **five** differences between convective heat transfer and radiative heat transfer mechanisms. (10 marks)

(b) Explain diffuse solar radiations. (2 marks)

(c) (i) Determine the maximum wavelength of the radiation emitted by the sun with a surface temperature of 5800 K. (3 marks)

(ii) Name the electromagnetic spectrum on which the wavelength in (i) above will fall. (1 mark)

(d) Explain why a snow-covered surface becomes very cold at night compared to daytime. (4 marks)

12. (a) Using labelled diagrams, describe the following atmospheric lifting mechanisms:

(i) convergent; (3 marks)
(ii) orographic; (4 marks)
(ii) convectional. (4 marks)

(b) (i) Describe the prerequisites for the formation of absolute stability in cloud development. (3 marks)

(ii) Describe the reasons contributing to the absolute stability of inversions. (3 marks)

(iii) Name **three** types of clouds formed as a result of uplift along a frontal boundary. (3 marks)

13. (a) State **three** factors necessary in the formation of thunderstorms. (3 marks)

(b) With the aid of labelled diagrams, outline the formation of a tornado. (13 marks)

(c) Describe the process of forming the step leader in lightning phenomenon. (4 marks)

14. (a) Explain the factors which lead to formation of radiation inversion at night. (7 marks)

(b) Explain **three** consequences of temperature inversion in a city. (6 marks)

(c) State **four** reasons for the slow rate of warming of a water body. (4 marks)

(d) (i) Write a mathematical equation relating the in-coming solar radiation with outgoing infrared radiation on the earth's surface. (1 mark)

(ii) State the relationship between net radiation and heating of earth's surface. (2 marks)

15. (a) State **two** forces necessary for the formation of wind. (2 marks)

(b) (i) Describe geostropic wind. (2 marks)

(ii) Draw a labelled diagram describing a geostrophic wind in the northern hemisphere. (8 marks)

(c) Explain **four** differences between a land breeze and a sea breeze. (8 marks)

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