2528/301
2922/301
ATMOSPHERIC SCIENCE
June/July 2020
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 indicated.
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.

SECTION A (40 marks)

*Answer **ALL** questions in this section.*

1. (a) Define solar flux density. (2 marks)

   (b) The mean distance (d) of the earth from the sun is $1.5 \times 10^{11}\ m$ and the solar luminosity (L) is $3.9 \times 10^{26}\ W$. Calculate the solar flux density. (2 marks)

2. Explain why snow covered surfaces become very cold at night. (4 marks)

3. List **four** factors which affect day time warming on the earth's surface. (4 marks)

4. In reference to figure 1, explain the suitability of absolute humidity in measuring humidity. (4 marks)

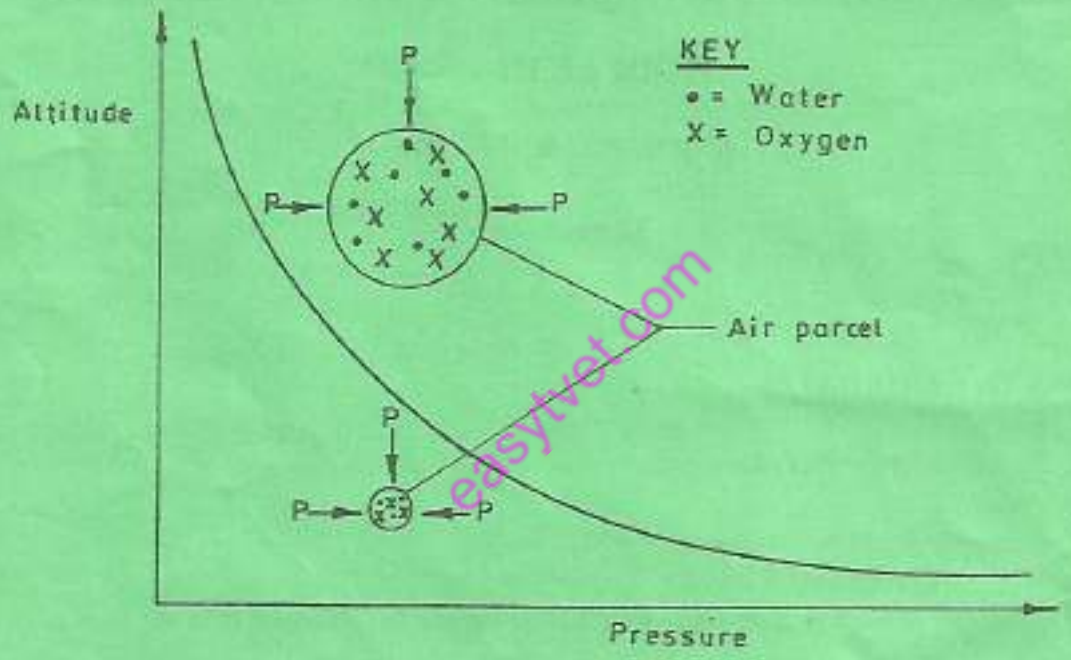

Fig. 1

5. Distinguish between hygroscopic and hydrophobic cloud condensation nuclei. (4 marks)

6. State **four** conditions necessary for the formation of fog. (4 marks)

7. Explain why global winds do not blow along a straight North-South line. (4 marks)

8. Describe the effect of cloud cover on the daytime temperatures of a location. (4 marks)

9. Explain the occurrence of the loud sound that immediately follows a lightning flash. (4 marks)

10. Explain why some clouds appear white in colour. (4 marks)

SECTION B (60 marks)

*Answer any **THREE** questions from this section.*

1. (a) (i) Match the heat transfer mechanism shown in table 1 with the corresponding description. (3 marks)

Table 1

Heat transfer mechanism	Description
Conduction	Transfer of energy is via electromagnetic waves
Convection	Transfer of energy is via molecular motions
Radiation	Transfer of energy is via mass movement of a substance

(ii) Describe the most appropriate period of a cloud-free day when formation of thermals is likely to occur. (2 marks)

(b) List the **three** primary radiations emitted by the sun. (3 marks)

(c) (i) Define earth-atmosphere energy balance. (2 marks)

(ii) Figure 2 is a diagram showing the earth's energy balance. Name the parts labelled **A, B, C, D, E, F, G, H, I** and **J**. (10 marks)

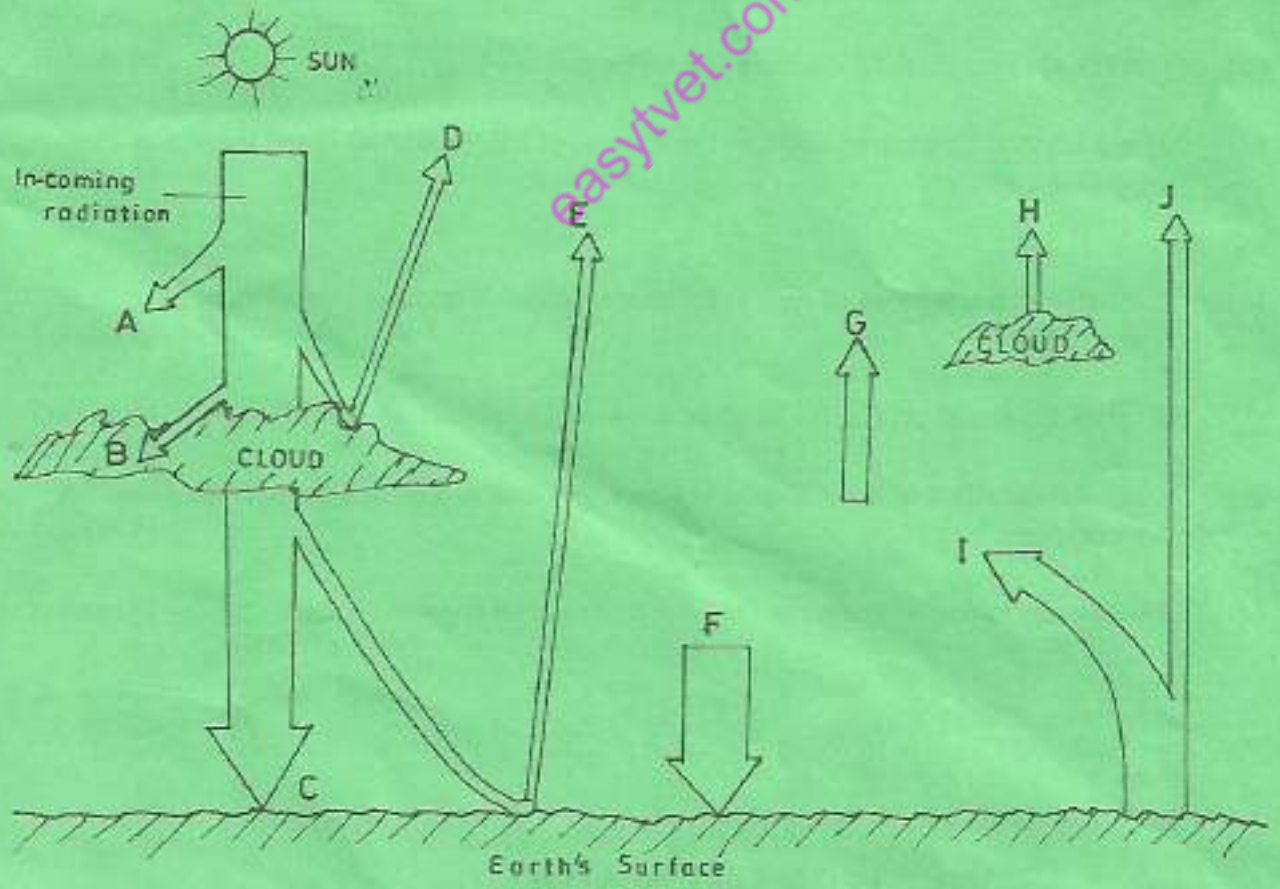

Fig. 2

12. (a) With the aid of a labelled diagram, describe the growth of a cloud droplet in the tropics by collision process. (10 marks)

(b) Compare the process of formation of hail with that of snow flakes in cold clouds. (6 marks)

(c) State **four** factors which contribute to the formation of precipitation in warm clouds. (4 marks)

13. (a) Draw a labelled diagram describing a Torricellian barometer. (5 marks)

(b) (i) Define jet streams. (3 marks)

(ii) Explain the cause of jet streams. (2 marks)

(iii) Describe the significance of jet-streams to flying planes in the stratosphere. (7 marks)

(c) Define sea breeze. (3 marks)

14. (a) Use a labelled schematic diagram to describe the **three** stages of a typical single cell thunderstorm's life cycle. (10 marks)

(b) Outline **six** steps in the formation of a tornado. (6 marks)

(c) Use a labelled diagram to describe the fly path of a light aircraft flying through a microburst system. (4 marks)

15. (a) State **five** characteristics of type B Köppen Climate's classification scheme. (5 marks)

(b) Explain the use of coral reefs in understanding past climates. (5 marks)

(c) Describe the effect of the Pinatubo volcanic eruption of 1991 on the average global temperatures. (5 marks)

(d) Discuss the impact of reducing beef consumption on climate change. (5 marks)

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