2528/301
2922/301
ATMOSPHERIC SCIENCE
June/July 2018
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 pages are printed as indicated and that no questions are missing.

SECTION A (40 marks)

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

1. Name the layers of the atmosphere starting with the one closest to the earth's surface. (4 marks)

(1) troposphere (3) Mesosphere
(2) Stratosphere / Ozonosphere (4) Thermosphere / Ionosphere

2. Explain why amplitude modulation (AM) radio waves signals travel farthest at night than in the day. (4 marks)

because they is less sun wave

3. (a) State the **three** modes of energy transfer between the earth's surface and the atmosphere. (3 marks)

- conduction - Radiation
- convection

(b) Identify the kind of heat transfer that can occur through space. (1 mark)

Radiation

4. (a) Write a mathematical expression for determining absolute humidity in an air parcel. (2 marks)

Absolute humidity = $\frac{\text{Relative humidity}}{\text{Maximum}} \times 100$

(b) Explain the limitation of using absolute humidity as a moisture variable for a parcel of air that is rising and expanding. (2 marks)

5. Distinguish between accretion and aggregation growth processes in cold clouds. (4 marks)

6. Using Figure 1, describe thermal circulation cycle of a sea breeze. (4 marks)

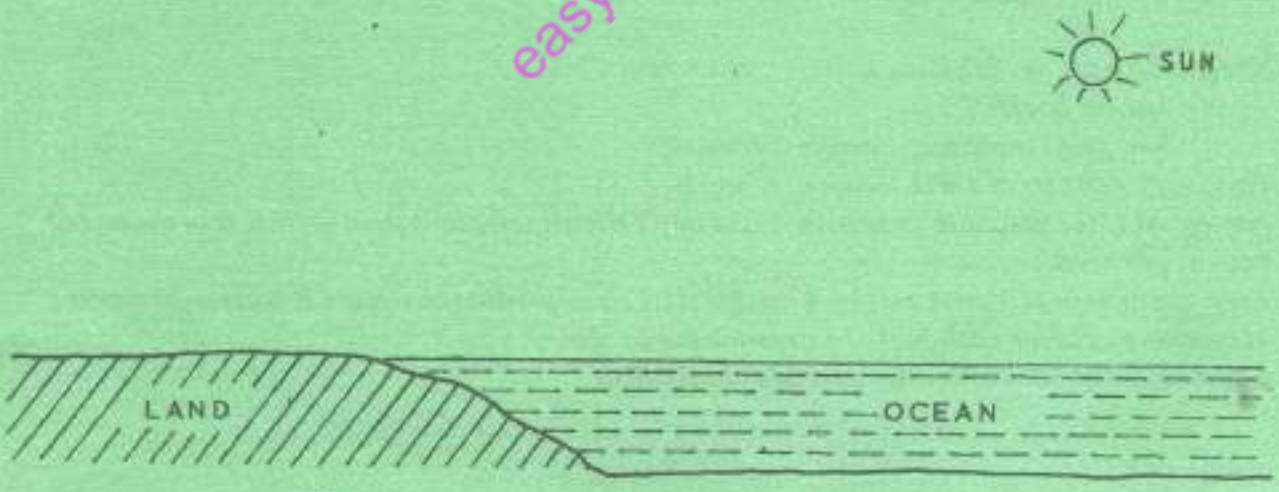

Fig. 1

7. (a) State any **two** methods applied in weather forecast. (2 marks)

(b) Explain the necessity of studying past weather patterns. (2 marks)

8. Describe **two** consequences of having high concentration of tropospheric aerosols on the climate of a location. (4 marks)

9. (a) Define the term supercell thunderstorm. (2 marks)

(b) Explain the formation of a mesocyclone. (2 marks)

10. Explain the appearance of the following colours on an object resulting from solar radiation:

(a) white colour. (2 marks)

(b) red colour. (2 marks)

SECTION B (60 marks)

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

11. (a) (i) With the aid of a diagram, describe traverse wave. (4 marks)
(ii) List any **two** examples of traverse waves. (2 marks)

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

(c) (i) Define earth's energy balance. (2 marks)
(ii) Use a labelled diagram to describe the earth's energy balance. (8 marks)

12. (a) Pressures at different points in Figure 2 were obtained as 0.5, 0.1, 2 and 1 atms. Identify the pressure values corresponding to points **A**, **B**, **C** and **D**. (4 marks)

Fig. 2

(b) (i) Use a labelled diagram of the earth to illustrate Coriolis effect. (6 marks)
(ii) State **one** exception where Coriolis effect does not apply. (1 mark)

(c) Describe the formation of wind. (5 marks)

(d) State any **four** requirements necessary for a tropical cyclogenesis to develop. (4 marks)

13. (a) Describe 'air mass thunderstorms'. (2 marks)

(b) Use a labelled diagram to describe the **three** stages in the life cycle of a thunderstorm. (11 marks)

(c) (i) Differentiate between the damage pattern on trees by a tornado and a micro-burst wind system. (2 marks)

(ii) State **three** similarities of down bursts and tornadoes. (3 marks)

(d) Explain the importance of naming hurricanes. (2 marks)

14. (a) List any **five** sources of data used in determining climates in the past. (5 marks)

(b) Explain any **three** factors that have contributed to the sharp increase in carbon dioxide levels in the atmosphere since the 19th century. (6 marks)

(c) (i) Define the term 'sunspots'. (2 marks)

(ii) Explain the relationship between coronal mass ejections and sunspots. (3 marks)

(d) Describe any **two** merits of using the Koppen climate classification system. (4 marks)

15. (a) (i) Describe the formation of dew. (2 marks)

(ii) Explain why dew forms in a clear, calm night. (4 marks)

(b) Explain the difference in magnitude of dry adiabatic lapse rate and moist adiabatic lapse rate. (3 marks)

(c) (i) Draw a labelled diagram showing the lifted condensation level, moist adiabatic lapse rate and dry adiabatic lapse rate in relation to temperature and altitude. (6 marks)

(ii) Use the environmental lapse rate (T_e) to state the condition for absolute humidity. (3 marks)

(d) Define the term convectional lifting. (2 marks)

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