



THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

P.O. Box 62157

MAIN EXAMINATION

00200 Nairobi - KENYA

SEPTEMBER – DECEMBER 2019 TRIMESTER Telephone: 891601-6

FACULTY OF SCIENCE

DEPARTMENT OF PHYSICS

REGULAR PROGRAMME

PHY 310: ENVIRONMENTAL PHYSICS

Date: DECEMBER 2019

Duration: 2 Hours

INSTRUCTIONS: Answer Question ONE and ANY other TWO Questions

Q1. a) Define the following terms:

(5marks)

- i) Environmental physics
- ii) Diffusion
- iii) Convection
- iv) Radiation
- v) Bowen Ratio

b) List the main parameters that determine the survival of the species in the physical environment of plants and animals.

(5marks)

c) State and explain four gas laws

(4marks)

d) Differentiate between direct and diffuse solar radiation

(3marks)

e) Explain how the second law of thermodynamics affects the transportation of heat between animals and their environment

(3marks)

f) State Newton's law of cooling

(2marks)

e) A person sitting reading a book releases radiant energy of between 70 and 100 W. Calculate how much energy the person is radiating. Assuming surface temperature of 350C, that room temperature is 200C, and the body surface area is 1.8 m².

(4marks)

g) Outline the sources of atmospheric aerosol particles

(4marks)

Q2. a) State three physical properties of gases

(3marks)

b) What is kinetic theory of gases

(2marks)

c) Explain how the gas laws affect the existence of animals and plants in their environment **(8marks)**

d) State the third law of thermodynamics

(2marks)

e) What is convective energy transfer coefficient?

(2marks)

f) Explain factors that affect radiation in the environment

(3marks)

Q3. a) Differentiate between forced and natural convection

(2marks)

b) Discuss the following modes of heat transfer

(8marks)

- i) Conduction
- ii) Convection
- iii) Radiation
- iv) Evaporation

c) State Stefan's law

(2marks)

d) By giving suitable examples differentiate between hypotherm and hypertherm

(4marks)

e) Explain three important features conduction occurs in soils

(6marks)

Q4. a) Outline the major difference between Bowen ratio and Eddy correlation

(4marks)

b) What is “Apparent” and “True” Canopy Resistances

(2marks)

c) Discuss the “aerodynamic method” and “Bowen ratio method” used in measurements of Fluxabove Canopies

(8marks)

d) Define the following terms :

(6 marks)

- i) Hydrology
- ii) Physiology
- iii) Ecology

Q5. a) Explain how metabolism in human is related to the first law of thermodynamics

(4marks)

b) Explain the applications of gas laws within the environmental aspects

(6marks)

c) Discuss how global warming affects the existence of animals and plants in the environment

(6marks)

d) Explain how homeotherms and poikilotherms adapt to different environmental changes

(4marks)

END