

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE

PHYS 417: ENVIRONMENTAL AND RENEWABLE ENERGY PHYSICS

STREAMS:

TIME: 2 HOURS

DAY/DATE: THURSDAY 13/12/2018

8.30 A.M – 10.30 A.M

INSTRUCTIONS:

Answer question one and any other two questions

QUESTION ONE (30MKS)

1. a) Differentiate between renewable and non renewable energy sources and give any two examples of each [3marks]
- b) Rank the following carbon based fuels in order of lowest to highest gross energy density; diesel, ethanol, conventional gasoline and kerosene-based jet fuel [3 mark]
- c) What are the advantages and disadvantages of electrical energy in an alternating current [3 marks]
- d) In the classification of coal, which type is best suited for domestic heating? Give reasons for your answer. [4 marks]
- e) When hydrogen fuel is burned, almost all of the carbon in the fuel burns completely to form CO_2 , which is the principle gas causing the green house effect and thus global climate change. On average 0.59 kg of CO_2 is produced for each kWh of electricity generated from a power plant that burns natural gas. A typical new household uses about 10,000 kWh of electricity per year. Determine the amount of CO_2 production that is due to the refrigerators in a city with 250,000 households [5 marks]
- f) Based on the temperature distribution in the atmosphere explain briefly the changes in temperature gradient. [5marks]
- g) Explain any two factors affecting soil thermal conductivity [4marks]
- h) Explain the useful effects of ozone [4 marks]

QUESTION TWO (20MKS)

2. a) i) Explain the origin of ozone (O₃) [3marks]
ii) Explain both useful and harmful effects of ozone [2marks]
b) Describe the major causes of global warming [5 marks]
c) Based on the temperature distribution in the atmosphere, explain different layers of the temperature and explain the changes in temperature gradient within these layers [10 marks]

QUESTION THREE (20MKS)

3. a) The hydrological cycle sustains the continuous movement of water on, above and below the earth's surface.
i) Describe the components of hydrological cycle [6marks]
ii) Using diagrammatic representation of hydrological cycle, explain the multiple cycles that make up the earth's water cycle [4marks]
b) Explain the origin and distribution of ions in the atmosphere [5marks]
c) How much power could a hydroplant generate with a stream of effective height 20 m and a flow rate of 600 litres per minute? Assume the plant is 80% efficient [5marks]

QUESTION FOUR (20MKS)

4. a) Discuss the major causes of land pollution and how they can be mitigated [6marks]
b) Discuss the problems to be solved in institutional arrangements to protect global environmental media [7marks]
c) Based on the temperature distribution in the atmosphere, explain different layers of temperature and explain changes in temperature gradient within this layers [7marks]

QUESTION FIVE (20MKS)

5. a) Differentiate between monochromatic absorptance and spectral reflectance [2marks]
b) Give an equation of radiant flux and explain the terms involved [3marks]
c) Define and explain the factors affecting parameters in the soil heat transfer; internal conductivity, heat capacity and thermal diffusivity [9marks]
d) Explain the three major heat transport processes in the soil [6marks]

