



NATIONAL OPEN UNIVERSITY OF NIGERIA  
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA  
FACULTY OF SCIENCES

DEPARTMENT OF PURE AND APPLIED SCIENCE

OCTOBER/NOVEMBER 2019 EXAMINATIONS

**COURSE CODE:** PHY 457

**COURSE TITLE:** ENVIRONMENTAL PHYSICS

**CREDIT UNIT:** 3

**TIME ALLOWED:** (2½ HRS)

**INSTRUCTION:** *Answer question 1 and any other four questions*

**QUESTION 1**

- A. Write short note on: (i) air pollution (2 marks)  
(ii) thermal pollution (2 marks)
- B. Suppose that 0.12 mol of an ideal gas in contact with a thermal reservoir that holds the temperature fixed at  $T_0 = 9.8^{\circ}\text{C}$ , has an initial volume of 1.3 L and does 14.0 J of work. What is (a) the final volume? (2.5 marks)  
and (b) what is the final pressure? (2.5 marks)
- C.(i) List four components of the planet Earth. (2 marks)  
(ii) Write short note on any two of the components of the earth. (4 marks)
- D. What should be the initial pressure of an adiabatic atmosphere if the initial density at an estimated height of 29.3 km from zero reference point is  $1.23 \text{ kgm}^{-3}$ , given the principal heat capacities ratio to be 1.4? (Take  $g = 9.8 \text{ ms}^{-2}$ ) (3 marks)
- E. Differentiate between passive remote sensing and active remote sensing (4 marks)

**QUESTION 2**

- A. List at least four energy resources that are readily available in human environment. (4 marks)
- B. Write short notes on any two. (8 marks)

### QUESTION 3

- A. Define the efficiency of a Carnot engine (2 marks)
- B. Imagine a Carnot engine that operates between the temperatures  $T_H = 850$  K and  $T_L = 300$  K. The engine performs 1200 J of work each cycle, which takes 0.25 s.
- (i) What is the efficiency of this engine? (2 marks)
- (ii) What is the average power of this engine? (2 marks)
- (iii) How much energy  $|Q_H|$  is extracted as heat from the high-temperature reservoir every cycle? (3 marks)
- (iv) How much energy  $|Q_L|$  is delivered as heat to the low temperature reservoir every cycle? (3 marks)

### QUESTION 4

- A. Describe in details, the energy cycle of the earth (8 marks)
- B. Briefly describe how the atmosphere acts like a blanket upon the earth. (4 marks)

### QUESTION 5

Write short notes on:

- (a) greenhouse effect (4 marks)
- (b) ozone layer depletion and (4 marks)
- (c) global warming. (4 marks)

### QUESTION 6

- A. List at least four objects that are contained in the solar system (4 marks)
- B. What are the planets that make up the solar system (4 marks)
- C. Calculate the mass of the Sun, if the period of the Earth's orbit around the Sun is  $3.156 \times 10^7$  s and at a distance of  $1.496 \times 10^{11}$  m from the Sun. (4 marks)