



NATIONAL OPEN UNIVERSITY OF NIGERIA  
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA  
FACULTY OF SCIENCES  
DEPARTMENT OF PURE AND APPLIED SCIENCE  
September 2020\_1 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. (i) List five factors causing environmental problems 5marks  
(ii) Give comprehensive explanation of any of two factors listed above 5marks  
(iii) Differentiate between nuclear fission and nuclear fusion 3marks
- b. (i) State two examples of heat engine 2marks  
(ii) Give two uses of heat engine 2marks  
(iii) State the basic principle in operating the heat engine 2marks
- c. State the environmental problems resulting from fossil fuel steam plants and effect in environment 3marks

**QUESTION 2**

- a. State five properties in which the terrestrial atmosphere is characterized 5marks
- b. Explain the vertical diminution of density with height 3marks
- c. List four environmental problems facing mankind 4marks

**QUESTION 3**

- a. (i) Derive an equation to obtain the distribution of number density with height 5marks  
(ii) Write an equation to express the efficiency  $\eta$  of the ideal Carnot engine 3marks
- b. (i) When keeping the efficiency of the ideal Carnot engine as high as possible, what quantity of water is needed in the plant? 2marks  
(ii) Give major material responsible for air pollution. 2marks

**QUESTION 4**

- a. Derive an equation to express an adiabatic atmosphere. 8marks

- b. Assuming that  $P_o = 1.01 \times 10^5 \text{ Nm}^{-2}$ ,  $\rho_o = 1.23 \text{ kgm}^{-3}$ ,  $Y = 1.4$  and  $g = 9.80 \text{ ms}^{-2}$ , estimate the limit of the adiabatic atmosphere. 4marks

**QUESTION 5**

- a. Derive an expression to obtain temperature profile of an adiabatic atmosphere 10marks
- b. State the other name for temperature gradient 2marks

**QUESTION 6**

- a. (i) List eight planets contains in the solar system 4marks
- (ii) Estimate the value of the mean of the earth's orbit given that  $T = 365.256$  mean solar days,  $m_2 = \frac{1}{354710}$  solar masses and  $k = 0.01721$ . 4marks
- b. Write an expression to illustrate Kepler's third law, hence state the usual meaning of each term. 4marks