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

DEPARTMENT OF PURE AND APPLIED SCIENCE

2021_2 EXAMINATIONS

COURSE CODE: **PHY457**

COURSE TITLE: **ENVIRONMENTAL PHYSICS**
CREDIT UNIT: **3**
TIME ALLOWED: **(2½ HRS)**

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

QUESTION 1

a.(i) Write short note on the energy cycle. **4 Marks**
(ii) List the three (3) types of weathering. **3 Marks**
b.(i) Write the required set of equations of motion in a many-body problem. **4 Marks**
(ii) The energy conservation equation of the system is given by

$$\frac{1}{2}v^2 - \frac{\mu}{r} = C$$

Write the meaning of each term. **3 Marks**
c.(i) Briefly explain fossil-fuel steam plants. **4 Marks**
(ii) Differentiate between adiabatic atmosphere and isothermal atmosphere. **4 Marks**

QUESTION 2

a. Mention all the objects contains in the solar system. **4 Marks**
b. Estimate the value of *a* (the mean radius of the earth's orbit) given that $T \approx 365.256$ mean solar days, $m_2 \approx \frac{1}{354710}$solar masses and $k \approx 0.01721$. **4 Marks**
c. A satellite orbiting at a height of 576km above the surface of the earth. What must the orbital speed of satellite be if it is to remain in a circular orbit? **4 Marks**

QUESTION 3

a. At what height above the surface of the earth must all synchronous satellites be placed in orbit? ($T = 8.64 \times 10^4$s, $R = 6400k$) **6 Marks**
b. Briefly describe the process of data collection using remote sensing. **4 Marks**
c. Give the classification of remote sensing. **2 Marks**

QUESTION 4

a. All synchronous satellites are put into orbit whose radius $r = 4.23 \times 10^7$m. The orbit is in the plane of the equator. The arc length *s* that separates two adjacent synchronous satellites is 7.4×10^5m. Find the angular separation of the satellites in degrees. **5 Marks**

b. Differentiate between passive remote sensing and active remote sensing. **4 Marks**

c. In finding the solution to the two-body problem, consider two bodies of masses m_1 and m_2 separated by a linear displacement r. State the expression for the Newton's second law of motion and also represent the information using diagram. **3 Marks**

QUESTION 5

a. Derive the angular momentum integral. **6 Marks**

b. Write the mathematical form of Kepler's second law. **2 Marks**

c. The orbit of a satellite about the earth is classified by the value of the eccentricity *e*, copy and complete the following table. **4 Marks**

1	$0 < e < 1$	The orbit is an ellipse
2	$e = 1$	
3	$e > 1$	
4		The orbit is a circle

QUESTION 6

a. Write the equations of next three integrals (of the area), C_1, C_2 and C_3. **5 Marks**

b. The terrestrial atmosphere contains gases, clouds and other airborne particles called aerosols. Copy and complete the following table. **3 Marks**

Nitrogen	
	21%
Other gases	

c. Write short note on pressure-gradient winds. **4 Marks**