

COVENANT UNIVERSITY  
NIGERIA

*TUTORIAL KIT*  
*OMEGA SEMESTER*

PROGRAMME: PHYSICS

COURSE: PHY 229

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## PHY 229: Energy and Environment

**CONTRIBUTORS: Abodunrin T.J.**

1. Distinguish between conventional and non-conventional energy sources.
2. Use the following table to make a comparison between conventional and non-conventional sources of energy. Complete the table.

S/No	Parameters	Conventional Energy Supplies	Non-Conventional Energy Supplies
1.	Source		
2.	Examples		
3.	Nature of Occupancy		
4.	Normal State		
5.	Initial intensity		
6.	Life time of Supply		
7.	Cost at sources		
8.	Conversion process/ Transmission & Distribution media		
9.	Cost of equipment		
10.	Variation & Control		
11.	Location for use		
12.	Scale of production		
13.	Skills of production		
14.	Skills for utilization		
15.	Context of utilization		
16.	Dependence		
17.	Safety		
18.	Pollution & Environmental Impact		
19.	Ecology damage		
20.	Esthetics		
21.	Economics		
22.	Over benefit in present context		

3. Draw a flow pattern from the information on the table to differentiate between Conventional and Non Conventional Energy.
4. Write short notes on:
  - (a) Reforms in the Energy Sector
  - (b) Energy priorities for developing countries
  - (c) Access and affordability
  - (d) Energy and environment
  - (e) Energy efficiency
5. Explain the role of energy in Economic Development.
6. In the Nigerian context, how can energy development be promoted to energy autonomy; as a part of integrated Energy Planning.

7. Compare the direct costs to the consumer using a succession of ten 100-W incandescent light bulbs with efficiency to visible light of 5%, a lifetime of 1000 h, and a price of 50 naira with one compact fluorescent lamp giving the same illumination at 22% efficiency, a lifetime of 10,000h, and a price of N3.00. Assume a price of electricity of 10 cents per KWh.
8. How many KWh would a 1000 MW nuclear power plant generate in a year?
9. How large would a square of side L need to be so that if it were covered by 10% efficient solar cells in the middle of the Sahara desert, the power generated would be able to satisfy the world's present energy needs? Assume that the incident solar radiation striking each square meter of the Earth's surface is approximately 1000W. (Ans. 600 Km that's assuming the sun shines for ½ a day).
10. Describe the plant- 'Miscanthus' and explain why it is the current best candidate for biofuel production.
11. (a) What does the actual efficiency of photosynthesis depend on in a given location?  
 (b) The total energy stored worldwide in the sugar produced by photosynthesis is about  $8.4 \times 10^{21}$  J per year, the annual incoming solar radiation in a year is  $3.8 \times 10^{24}$  J. If the efficiency of the system is 3%-6% in collecting sunlight, find:  
 (i) The fraction of sunlight that is stored in sugars;  
 (ii) What area of the Earth's surface is covered with photosynthetic organisms (approximately)  
 Answer.  
 (a):
  - Light intensity
  - Atmospheric concentration of CO<sub>2</sub>
  - Surrounding temperature
  - The wavelength of light present in the light spectrum
- (b) (i) : Fraction =  $\frac{8.4 \times 10^{21}}{3.8 \times 10^{24}} = 0.22\%$   
 (ii) Efficiency = 3%  
 $0.22\% = 0.067 \times 0.22\% = 0.033$  i.e between 3.3% and 6.7%
12. Discuss the Kyoto conference agreements of 1997 in relation to climate change and the conference penalty for non conformance.
13. Do a review on the costs of energy generation with respect to :
  - Capital and running costs of renewable and conventional generation plant
  - Mention the three components of electricity generation costs and distinguish between them
 Relate them to annual charge rate.

Answer:

(i) The capital cost ( cost of the plant: price of land / rent ( running cost); grid connection, initial cost of financing

(ii) O & M cost: operating and maintenance costs: insurance, rents, local government taxes ,labour cost and maintenance

(iii) Cost of fuel

Annual charge rate =  $\frac{\text{Capital cost} + \text{O \& M cost} + \text{Cost of fuel}}{\text{Lifetime}}$

14. An integrated energy farm could be created on the basis of energy and food requirement of a given population. Assuming farm land, necessary data such as climate, soil is available. In arid or semi-arid regions, irrigation is a possibility. Show a graphical presentation of the planning and implementation steps.
15. Discuss the market trends of situating of shore turbines in Nigeria. Would it combat the epileptic power supply? Illustrate the pros and cons; its limitations and suggest viable solutions for the way forward.
16. What are the prospects of hydrogen as a new technology fuel? (Mention its use as a fuel cell, its production, reaction, storage, transport and characteristics).
17. Carry out an environmental assessment on conventional energy and fossil energy supply in view of:
  - threat to world climate
  - depletion of ozone layer
  - premature death of forests
  - pollution of water by acid rain
  - urban air pollution
  - toxic contamination of lakes, rivers and seas
  - excessive consumption of scarce water reserves
  - nuclear radiation risks and unresolved water storage issues.
18. Relate worldwide consumption of petro polymers and biopolymers to environmental world impact. Predict trends for the future in terms of economic trends; give a researcher over view.
19. What other economies could subsidize hydro energy production in Nigeria? Discuss at least three categories of utilization of conventional resource. Mention the present utilization, compare it with the past trends and project their usage in the near future.
20. Fossil fuels are considered to be major contributors of greenhouse gases; carbon dioxide is also generated by bio fuels. Justify the reason for bio fuels being considered as a conventional energy source, discuss the electrical efficiency of these plants.