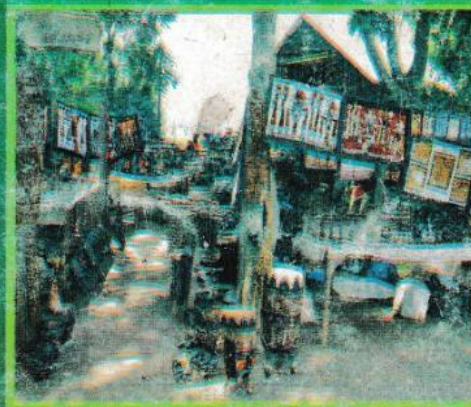
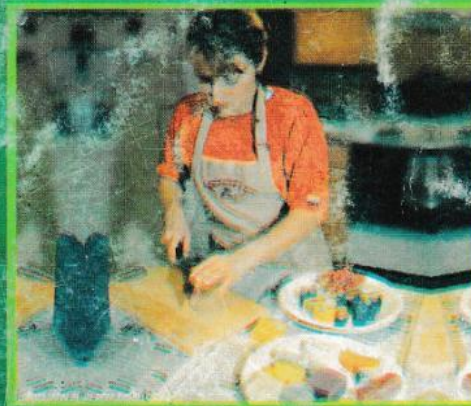




# SCIENCE TEACHERS ASSOCIATION OF NIGERIA

Chemistry Panel Series 4

## LINKING SCHOOL CHEMISTRY WITH LEARNERS DAY-TO-DAY ACTIVITIES



A Hand Book for Chemistry Teachers

Editors

Elder Olayiwola M.A (Ph.D)(MSTAN)

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**P. O. Box 5257, Kano.**

**Tel: 080-28912466**



Published 2009 by  
© SCIENCE TEACHERS ASSOCIATION OF NIGERIA  
CORPORATE ADDRESS:  
STAN OFFICE  
Government College Campus  
P.M.B. 5075, Apata, Ibadan,  
Oyo State.

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ISBN 978-978-902-790-3

Printed by:  
**ABIOYE DYNAMIC PRINTERS,**  
59, Yoruba Road, Sabon Gari,  
P. O. Box 5257, Kano.  
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## **CHAPTER FOUR**

### **ENVIRONMENTAL PHENOMENA/EXPERIENCES: AN EFFECTIVE APPROACH TO TEACHING/LEARNING THE CONCEPT OF ENERGY**

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#### **INTRODUCTION**

Various approaches have been used to make teaching and learning of science meaningful and effective. Innovative teaching methods such as inquiry, concept mapping, cooperative and use of environments have been reported by many researchers (Eshiet 1996, Okebukola 1984, Ezeudu 1998). However, the problem of poor performance of students in science especially Chemistry, is still on the high side. Some topics in Chemistry are considered difficult to teach by science teachers (Okebukola 2005). These topics include among others Nuclear Chemistry, Chemical equation, Energy Changes, Rates of Reaction and Reduction processes. Eshiet (1998), Ibole (2007) and Udo (2007) advocated the use of familiar and naturally occurring phenomena in teaching Chemistry concepts. The use of phenomena will reduce the abstractness associated with the teaching/learning of Chemistry concepts. Uche and Umoren (1998) defined phenomena as things, features, events and other environmental resources in natural habitat.

The linking of science teaching/learning especially chemistry to day-to-day activities will actualize and expand the learning process in the following ways:

- Better understanding of the concept
- Enhanced creativity
- Activate the three domains of learning.
- Establish connection between theory and practice
- Serves as a bridge between classroom and environment
- Reduces the abstract idea associated with Chemistry concepts.

**What the students will learn at the end of this lesson, the students should be able to**

- Define energy and energy conservation
- Classify various energy resources
- Name and explain at least four forms of energy
- List with examples common environmental experiences and natural occurrences in energy transformation.
- Write 3 different ways each by which energy can be conserved in (a) industry, (b) Homes and (c) Transportation.

### **DEFINITION AND ENERGY PATHWAY**

Energy is defined as the ability to do work. The sun is the primary source of energy and it produces large amount of heat and light energy which changes from one form to another.

Energy pathway is the changing of sun energy from one form to another and this may involve the storing of sun's energy for a long period in plants such as coal, oil, natural gas and micro organisms. This stored energy is recaptured when burnt. The energy transformation obeys the Law of Conservation of energy which states that energy is neither created nor destroyed. The total energy of a system is the sum of various forms of energy such as kinetic, potential, electrical and heat.

### **CLASSIFICATION OF ENERGY RESOURCES**

Everything in the environment is a potential source of energy. Almost all sources of energy are in chemical nature. Energy resources can be classified based on the source, ability to burn or not to burn and also due to its replacement.

**Primary Energy:** This includes all forms of energy created by the sun which is in the form of potential energy.

**Secondary energy:** These are produced from the primary forms through mechanical, thermal and nuclear reactions into usable energy.

**Renewable Energy:** This class of energy are constantly created and replenished from time to time. They include Bio-energy from Biomass, wind hydro energy, geothermal and tidal.

**Non Renewable:** This type of energy is not renewable or replaced by natural process

e.g. petroleum, natural gas, coal and nuclear energy.

**Combustible:** These are resources that require burning or heating before the stored energy is released to do work. They include; charcoal, biomass, natural gas and petroleum.

**Non Combustible:** This class of energy resources does work without any form of heating. They include wind, solar energy, running water and tide.

## FORMS OF ENERGY

There are various forms of energy. Each type of energy can exist as potential or kinetic energy which can be converted to other forms of energy. The different forms of energy include:

**Heat Energy:** This form of energy comes from the sun and combustible substances or chemistry reaction. Heat energy is measured in joule. However, calorie is also use to measure heat energy in food. Heat energy always flow from a higher temperature to a lower temperature. Table 1 shows some common activities and the amount of energy used.

Table 1: Common activities and Amount of heat energy use

Activity	Calories per minute
Resting	0.8
Burning	13.0
Walking	3.5
Dancing	6.5
Swimming	8.0
Riding a bicycle	6.0

**Mechanical Energy:** This is the energy due to position (potential) or movement (kinetic) of an object e.g. When an hammer is raised to hit a nail, it has potential energy and becomes kinetic when dropped on the object.

**Nuclear energy:** Matter is made up of particles called atoms. Nuclear or tomic energy is released when the nucleus of the atoms break to form new nucleus. This form of energy is associated with radioactive elements like Uranium.

**Chemical Energy:** This is energy stored in bonds between atoms. Chemical energy is stored in food, petroleum, wood, coal oil which when bond breaks releases large amount of energy.

**Electromagnetic Energy** is produced by the flow of electrons or groups of electrons through a conducting material. Light is a form of electromagnetic energy.

**Light Energy:** It is the form of energy the eyes can detect. Light energy is produced when electrons change energy levels to an atom by falling back from a higher level to a lower energy level. By this, a packet of light energy (photons) is given off.

**Radiant Energy:** These are energy transferred by radiation. This energy includes infra red waves from the sun, burning fire and electric furnace or electric coils.

**Electrical Energy** Electrical energy is a flow of electrons generated from chemical reaction or electric spark. It is a commonly used energy by house hold appliances.

**Sound Energy:** This energy is caused by vibrations and transmitted by the waves set up by vibrating body. Sound energy is what courses sensation in the ear that results in hearing. The loudness of sound is measured in Decibel.

## **ENERGY CONVERSION**

Energy conversion is of significant importance to man because his day today activities require various forms of energy for sustainability. Though energy may be converted from one form to another, some conversions are more common than others. This conversion can be exemplified with common occurring practices or phenomena as shown in Table 2.



Table 2: Common phenomena/Experience and Energy Conversion

**PHENOMENA/EXPERIENCES**

**ENERGY CONVERSION**

1. Striking of match stick	Chemical – kinetic – heat
2. Pendulum Clock	Potential – kinetic – sound
3. Drumming, Clapping/Sweeping and Breaking Firewood	Chemical – kinetic
4. Rubbing of ruler and Grinding	Chemical – kinetic – heat – Sound
5. Lightening and Electric Spark	Electrical – Light
6. Thunder	Electrical – sound
7. Dryer/Heater	Electrical – heat
8. Charging of Phone	Electrical – Potential
9. Gas Explosion	Chemical – sound
10. Running	Chemical – Kinetic – heat
11. Writing	Chemical – Kinetic
12. Germinating Plant	Chemical – Potential – Heat
13. High Wind	Potential – Kinetic – Sound
14. Sunlight	Chemical – Light + heat
15. Vision (Eye)	Light – Electrical (Photocells)
16. Glowing Splint/Electric Bulb	Chemical – Light + Heat.
17. Food Decay/Digestion food	Chemical – Heat

**ALTERNATIVE ENERGY SOURCE**

For years now, many countries including Nigeria solely depend on oil, coal, wood and water as their main source of energy. Today, increase in population and life style of man has called for alternative energy source. The fossil fuel is not renewable and no one knows when the supply will be exhausted. Alternative energy sources are new energy sources that man is beginning to develop for energy supplies. They are safer and long lasting without much environmental problems as in fossil fuels. These new sources of energy include:

- (a) **Use of Biomass:** These are plant materials such as corn cobs, sugar cane shaft garbage and manure, and animal dung. Biomass is easily replenished.
- (b) **Wind Energy:** Wind is used to generate electricity wind generators do not pollute air and water.
- (c) **Solar Power:** This is the use of solar cells to convert sunlight directly into electricity and heat.



- (d) **Synthetic fuel:** These are ethanol and methanol made from biomass by fermenting corn or sugar cane and methanol from wood. They burn very well and produced less carbon II oxide.
- (e) **Geomothermal energy:** This is heat produced by not magma or modem rock beneath the earth surface. Water from the surrounding can be used in turbine to generate electricity.

## **ENERGY CONSERVATION**

The rate of energy consumption is getting higher on daily basis because of increase in population and man's daily activities. Energy conservation means using less energy in order to preserve natural resources. The need for economic use of energy and the environmental implications of generating energy on daily basis is very relevant now than ever. Okebukola (2007), advocated energy saving measures like walking short distance recycling switching off unwanted light in order to combat energy wastages. The three major areas of energy consumption are the homes, transport and industries. Energy conservation in these areas will enhance the overall preservation of energy resources in the environment. This can be achieved through the following measures.

**Home:-** Use of flow control in showers and taps, switching off appliances such as dryers television, radio, fans, air conditioners, iron when not in use, recycling of garbage and newspapers, cans, bottle, use saw dust or charcoal stove.

**Transport:** Energy can be saved by walking short distances, using bicycles, using public transport or sharing with a friend where possible. Using fuel economy car, good maintenance of car engines and driving at moderate speed.

**Industries:** Use of efficient machines in manufacturing recycling, putting off lights and engines when not in use.

## **CONCLUSION**

Energy is indispensable in life. The primary source of energy is the sun. Energy can be

renewable or non-renewable, combustible or non-combustible and can change from one to another. The different forms of energy are heat, light, sound, chemical, mechanical electrical and nuclear energy.

Economic use of energy resources is of great importance. Alternative source of energy such as solar power, use of biomass geothermal and synthetic fuel are now use to generate energy which are environmental friendly than fossil fuel. The use of common experiences phenomena in teaching/learning energy concepts will enhance students' understanding.

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