

## FIRST TERM E-LEARNING NOTE

**SUBJECT: PHYSICS**

**CLASS: SS3**

### SCHEME OF WORK

<b>WEEK</b>	<b>TOPIC</b>
1.	Electromagnetic Spectrum: Propagation, Detection and Uses
2.	Gravitational Field: Law, Gravitational Potential, Escape Velocity, Potential Energy in Gravitational Field.
3.	Electric Field: Coulombs Law, Electric Field Intensity, Electric Potential, Capacitor and Capacitance.
4.	Electric Cells: Primary and Secondary Defects of Simple Cells. Cells in Series and Parallel. Electrolysis: Electrolytes, Electrodes, Ions, Faraday's laws.
5.	Electrical Measurement of Resistance: Resistivity, Conductivity, Conversion of galvanometer to ammeter and Voltmeter, Methods of Measuring Resistance.
6.	Magnetism: Magnets and Magnetic Materials, Magnetization, Demagnetization, Magnetic Flux, Earth Magnetic Field.
7.	Electromagnetic Field: Magnetic Field around Current Carrying Conductors- Straight Conductor, Circular Conductor, Solenoid, Applications of Electromagnets-Electric Bell, Telephone Ear Piece.
8.	Electromagnetic Field: Force on Current Carrying Conductor in a Magnetic Field, Fleming's Left Hand Rule, Application- DC. Motor, Moving Coil Galvanometers.
9.	Electromagnetic Induction(i): Induced Current, Laws of Electromagnetic Induction, Fleming's Right Hand Rule, Induction Coil.
10.	Electromagnetic Induction(ii): Application in A.C and D.C. Generator, Transformer, and Power Transmission.

### REFERENCE TEXTBOOKS

- New School Physics by Prof. M.W Anyakoha
- New System Physics by Dr. Chow.et.al
- WAEC Past Questions Pack
- UTME Past Question Pack
- Masters Physics Practical Manual

## WEEK ONE ELECTROMAGNETIC WAVES

### CONTENT

- ✓ Definition and Concept
- ✓ Types of Radiation
- ✓ Detectors
- ✓ Uses

### DEFINITION AND CONCEPT

Electromagnetic waves are produced by electromagnetic vibrations. Electromagnetic waves have electrical origin and the ability to travel in vacuum. So, electromagnetic waves are regarded as a combination of traveling electric and magnetic forces which vary in value and are directed at right angles to each other and to the direction of travel. In other words, they are transverse waves.

### TYPES OF RADIATION

The electromagnetic waves consist of the following:

1. Radio waves with wavelength  $10^{-3}\text{m}$  to  $1000\text{m}$ .
2. Infra-red waves with average wavelengths of  $10^{-6}\text{m}$ .
3. Visible spectrum, known as light waves, with wavelengths of  $7 \times 10^{-7} \text{ m}$  for red rays.
4. Ultraviolet rays with wavelength of  $10^{-8}\text{m}$
5. X- rays with wavelength of  $10^{-10} \text{ m}$ .
6. Gamma –rays with wavelength of  $10^{-11}\text{m}$ .

**Radio waves:** Radio waves have the longest wavelengths. Radio waves are emitted from transmitters and carry radio signals to radio sets. The shortest radio waves are called microwaves. Microwaves are used in radar and in heating hence they are used in cooking.

**Infra-red waves** Infra-red waves are found just beyond the red end of the visible spectrum. They are present in the radiation from the sun or from the filament of an electric lamp. Many manufacturing industries used infra-red lamps to dry paints on painted items. They are also used for the treatment of muscular problems.

### VISIBLE SPECTRUM OR LIGHT WAVES

The visible spectrum is made up of red, orange, yellow, green, blue, indigo and violet rays. These are all colours of the rainbow. When these rays combine, they form a white light. In the visible spectrum, red rays have the longest wavelengths while the violet rays have the shortest wavelengths. The main source of light is the sun.

### ULTRA VIOLET RAYS

Ultra violet rays are located just beyond the violet end of the visible spectrum. Ultraviolet rays can be produced by quartz, mercury filaments, or the sun. Ultraviolet rays can cause certain materials to fluoresce (i.e glow).

### X-RAYS

X-rays are produced when fast moving electrons strike a metal target, which reduces their velocity. X- rays are used in hospitals to destroy malignant growth in the body and to produce X–ray photographs which can locate broken bones, Much of X-ray in the body is harmful and can lead to sterility and adverse change in the blood. X-rays are used in industries to locate cracks in metal castings and flows in pipes.

X-rays ionize gases and have a penetrating effect such that they pass through substances opaque to white light are diffracted by crystals and unaffected by either electric or magnetic fields.

### GAMMA – RAYS

Gamma – rays are emitted by radioactive substances such as cobalt. 60, uranium and polonium. Like x-rays, gamma rays ionize gases and darken photographic plates. Because of their shorter wavelengths gamma rays have a greater penetrating power.

### EVALUATION

1. Give three similarities of electromagnetic waves. Mention two distinguishing properties of infra-red and ultraviolet rays.
2. Mention and describe two important uses of x-rays.

#### DETECTORS

The detectors of the various radiations in the electromagnetic spectrum are

- i. Gamma rays - Geiger-Muller tube
- ii. X-rays - Photographic films
- iii. Ultraviolet rays- Photographic films, fluorescent substances
- iv. Visible rays - Eye, photographic film, photo electric cell
- v. Infra-red rays - Skin, thermometer, photo transistor, photographic film.
- vi. Radio waves - Radio set, Television set, Aerials

#### EVALUATION

1. How can you detect the following radiations? (i) x-rays, (ii) Visible rays, (iii) Infra-red rays.
2. Electromagnetic waves are regarded as transverse waves, why?

#### USES

- a. A knowledge of infra-red rays is used in developing infra-red telescopes, infra-red signaling lamps which are useful to soldiers fighting in darkness.
- b. With the aid of photographic film which...