WEEK	TOPIC	CONTENT
1-2	PHYSICS IN THE REAL WORLD	Construction of a model transmission system using a transformer -Need for use of machines in doing work i) Easier ii) Quicker II) more conveniently -instances of the use of machines i) At home ii) In offices iii) In industry iv) in agriculture v) in transportation etc. - Repairs and maintenance of machines i) Need for repairs of machines ii) Need for regular maintenance of machines iii) Maintenance schedule of machines
3-4	ENERGY AND SOCIETY	-Dams and Energy Production i) location of dams for producing electricity in Nigeria principle of production of electricity from a dam
5-6	Semiconductor	
7-8	ROCKETS AND SATELLITES	-Component parts of rockets and satellites -Functions of rockets and satellites -uses of rockets and satellites NIGERIAN SATELLITE -Nigeria Sat-1 I) Features of Niger Sat ii) Its operation and uses -NICOM SAT 1 i) Features of NICOM-SAT 1 ii) It operation and uses

TOPIC: ROCKET, SATELLITE

Rocket

These are self-propelled device that obtains it thrust by ejecting a stream of fast-moving fluid through its rear end. The force of these hot gases shooting out in one direction causes the rocket to move in the opposite direction. A rocket engine is the most powerful engine for its weight. Other forms of propulsion, such as jet-powered and propeller-driven engines, cannot match its power.

Uses of rocket

1. For fireworks used in entertainment
2. For firing missiles
3. Sounding rocket for carrying scientific instrument to high altitude for scientific research
4. Jet-Assisted-Take-Off (JATO) rocket for airlifting heavy laden planes
5. Life-saving rocket used for carrying lifeline rope to stranded ships
6. Saturn V rocket which carries human to the moon
7. Rocket ejection seats safely boost pilots out of jet planes during emergencies
8. Signal rocket launched from ships in distress to signal for help.

Components of the rocket

1. Propellant tank: it stores the fuel or the propellant
2. Combustion chamber, this is where the fuel is burnt to produce the hot gases that gives the rocket a forward thrust.
3. Nozzle; this is the opening at the rear of the rocket from where the hot gas escape.
4. Fins: these are located at the side of the rocket to stabilize it and maintain it direction of motion in space.
5. Payload: this depends on the function of the rockets.

SATELLITES

A body moving in an orbit around another bigger body is called a satellite. A body that moves around a planet is called a satellite.

NATURAL SATELLITES: The objects that are moving in orbit by nature itself around a planet are called natural satellites. For example, moon is the natural satellite for the earth. The earth is a satellite for the sun.

ARTIFICIAL SATELLITES: Man also has placed artificially some satellites to move in orbit around the desired planets. Artificial satellites are carried by rockets to the predetermined height, a few hundred kilometers above the surface of the earth. At this height the air is in a rarefied state and hence air friction is negligible. After reaching the predetermined height, the satellite is given very high horizontal velocity so that it remains moving in a nearly circular orbit.

CLASSIFICATION OF ARTIFICIAL SATELLITES

1. Earth resource satellites
2. Meteorological satellites
3. Satellites carrying microwave sensors.

USES OF SATELLITES

1. For telecommunication
2. For identification of place on the earth
3. To enhance military intelligence
4. Tor meteorological studies
5. Scientific study of the earth
6. For space science

Since the launch of the first artificial satellite in 1957, thousands of satellites had been positioned to orbit the earth

Component of satellites

Basically, satellite consists of the following:

1. Power generation and distribution system: most satellite uses solar energy from the sun. They also contain rechargeable batteries to store energy during eclipse.
2. Command and data handling system. It contains antennae to receive and transmit signal and computers to process these signals
3. Payload: this contains measuring instruments and imaging devices or any other items relating to the mission of the satellite.
4. Protective shielding: this protect the satellite against the cold, intense radiation forms the sun, collision of space rocks, …
5. Rocket thrusters' system: this is necessary so as to move the satellite back to position when there is a shift or when the need arises to move the satellite to another location around the earth

SEMICONDUCTOR

A Semiconductor is a material which has an electric conductivity intermediate in value between that of a a good conductor and that of a good insulator.

TYPES OF SEMICONDUCTOR

1. Intrinsic semiconductor
2. Extrinsic semiconductor

INTRINSIC SEMICONDUCTOR OR PURE SEMICONDUCTOR

TYPES

germanium and silicon

STRUCTURE

They possess a crystalline structure i.e. the atoms are arranged in orderly manner and they have four valence electrons. They are in group IV of the periodic table.

CONDUCTIVITY

Below room temperature pure germanium is a poor electrical conductor.

At room temperature, thermal energy of the valency electron may become greater than the energy binding it to its nucleus, such an electron becomes liberated from the bonds and becomes free electron by moving out of its position in the atom. This leaves a vacancy at the electron's former position. This vacant space is called hole. An electron from a neighboring atom can move into the vacancy.

The conductivity of a semiconductor increases when it is irradiated with electromagnetic waves of a certain maximum wavelength or temperature is increased.

CARRIERS OF ELECTRICITY

a. free electrons which have negative charges
b. Holes which have positive charges.

APPLICATION OF ELECTRIC FIELD

When an electric field is applied the charge, carriers move in opposite directions. Holes behave like positive charged particle.

EXTRINSIC SEMICONDUCTOR OR IMPURE SEMICONDUCTOR

Addition of impurity to the pure semiconductor is called **doping**. This is done to increase its conductivity.

TYPES

a. n-type
b. p-type

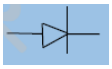
a. n-type

This is done by doping into germanium with small amount of arsenic(donor). Arsenic is in group 5; it has five valency electrons. Germanium has four valency electrons so, four of the valency electrons of Arsenic forms a covalent bond with germanium. The fifth valency electron is very loosely bound, it does not participate in covalent bond. Conductivity is due to the movement of electron. The majority carrier of current are negative electrons while the minority carrier are holes.

b. p-type

Adding atoms of an element in Group 3 e.g Boron or indium to germanium produces a p-type. Boron has three valency electrons, to form covalent bond with germanium, it can take electron from germanium, leaving a hole in germanium. This hole acts as a positive charge that can move through the crystal; the boron is called the acceptor. Conduction is due to movement of holes. The majority carrier of current are holes.

SEMICONDUCTOR DEVICES

1. Rectifier (p-n Junction diode) 

2. photocell

3. light emitting diode (LED)

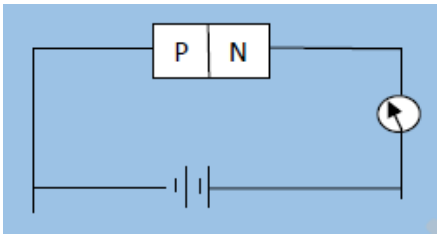
Rectifier (p-n Junction diode)

To fabricate a p-n junction is to deposit some n-type material on the very clean surface of p-type material. It acts as current rectifier i.e. allows current to flow only in one direction (forward bias) and little or nothing in the reverse bias. It can change alternating current to direct current.

FORWARD BIAS

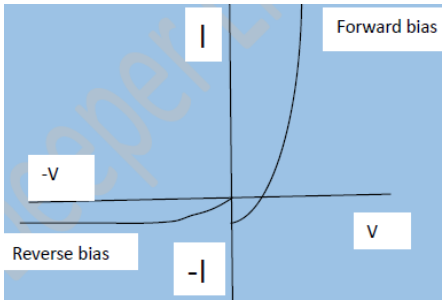
If the positive terminal of the battery is connected to the p- region and the negative terminal to the n-region, the positive terminal repels the numerous holes across the junction and the negative terminal repels the electrons across the junction, thus holes plentiful in the p-region flow easily across the junction into the n-region. Free electrons, plentiful in the n-region easily into p-region, these movement of charge constitute a forward current. The p-n junction diode in this arrangement has a fairly low resistance and conducts well.

REVERSE BIAS



Connecting the negative terminal of the battery to the p-region and positive terminal to the n-region gives a reverse bias. The negative terminal repels electrons from p-region to n-region and positive terminal repels holes from n-region to p-region, but there are few free electrons in the p-region and very few holes in the n-region. As a result, the current in the reverse direction is much smaller than that with the same potential difference in the forward direction.

I-V CHARACTERISTICS FOR P-N JUNCTION DIODE



The graph does not obey ohm's law.

p-n junction diode has a low resistance in one direction (forward bias) and a high resistance in the reverse bias. Thus, it can be used as a current rectifier to change a.c to d.c.

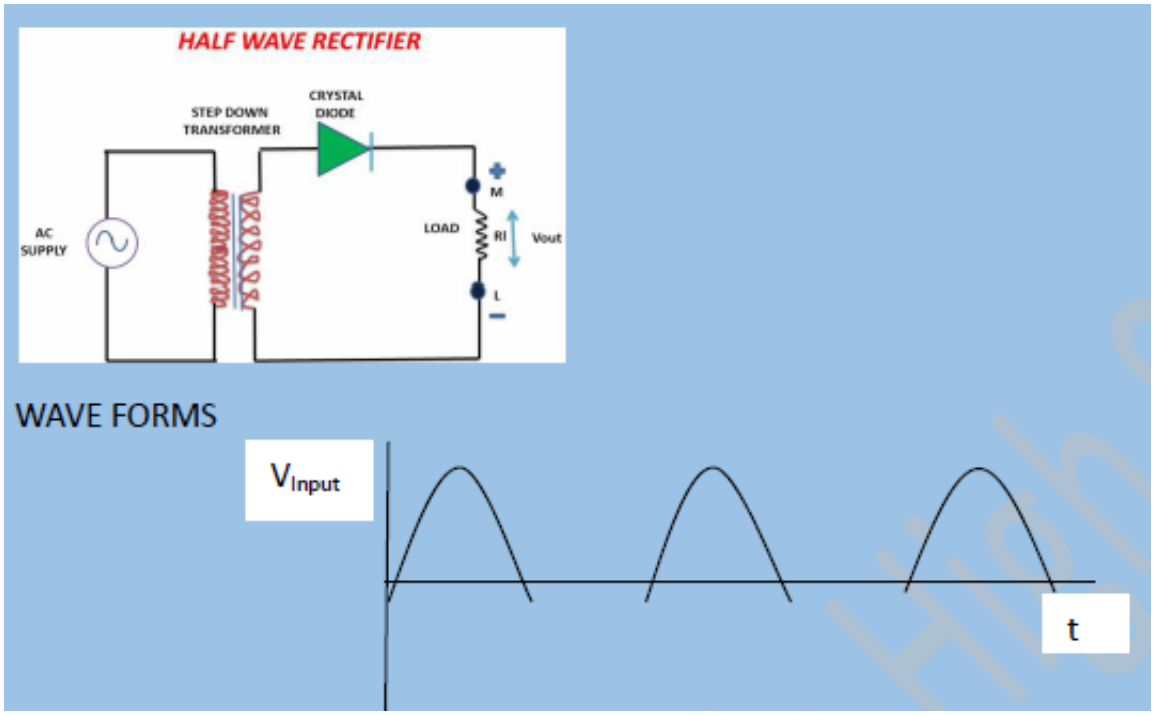
ADVANTAGES OF p-n JUNCTION OVER THERMIONIC DIODE

I. It is much smaller

2. it needs a small p.d to operate in a radio receiver
3. it requires no time to warm up to produce current carriers.
4. it is cheaper to manufacture in large quantities and less liable to break.

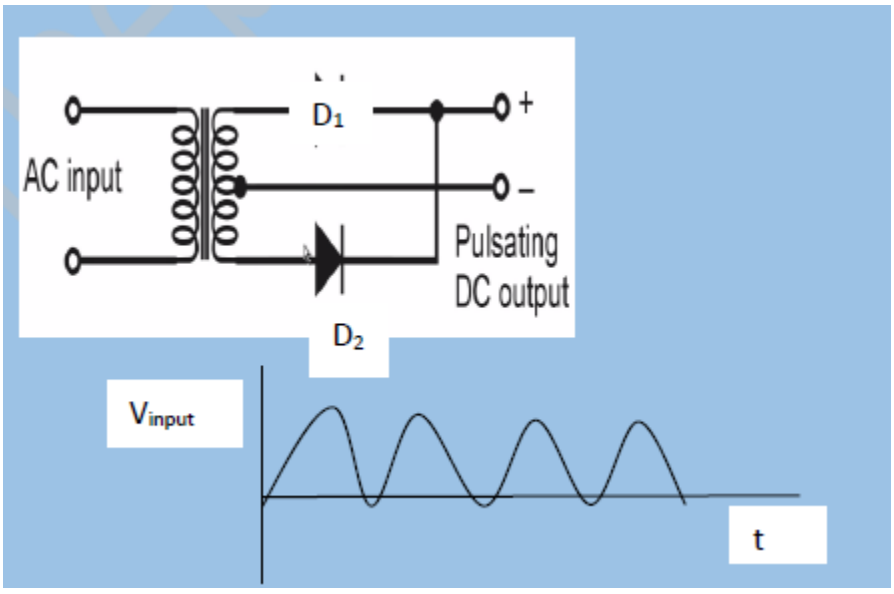
HALF-WAVE RECTIFIER

In half wave rectifier, if a.c supply is applied at input, positive half cycle appears across output and negative half cycle suppressed. Only one crystal diode is used.



FULL-WAVE RECTIFIER

It has two diodes, D_1 produces one half of the cycle, D_2 produces another one half of the circuit. The output is equivalent to a steady voltage together with varying voltages. To filter of the fluctuations, a filter circuit is used which consists of a high inductance in series with a large capacitance, since inductance and capacitance are in series with voltage, very little of the varying voltage appears.



PRACTICE QUESTIONS

1. Which of the following statements about a diode is correct ?
A. Reverse bias diodes have low resistance
B. Forward bias diodes have high resistance
C. Forward bias diodes produce high current
D. Forward bias diodes function as a result of heat.
2. Which of the following is a semiconductor material?
A. Copper B. Silicon C. Steel D. Iron
3. In a common emitter configuration, the output voltage is through the
A. resistor B. Base C. Collector D. emitter
5. The bond between silicon and germanium is
A. dative B. covalent C. trivalent D. ionic