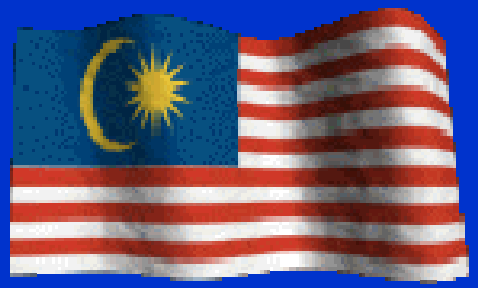


Electronics and Information and Communication System.

Chapter 8

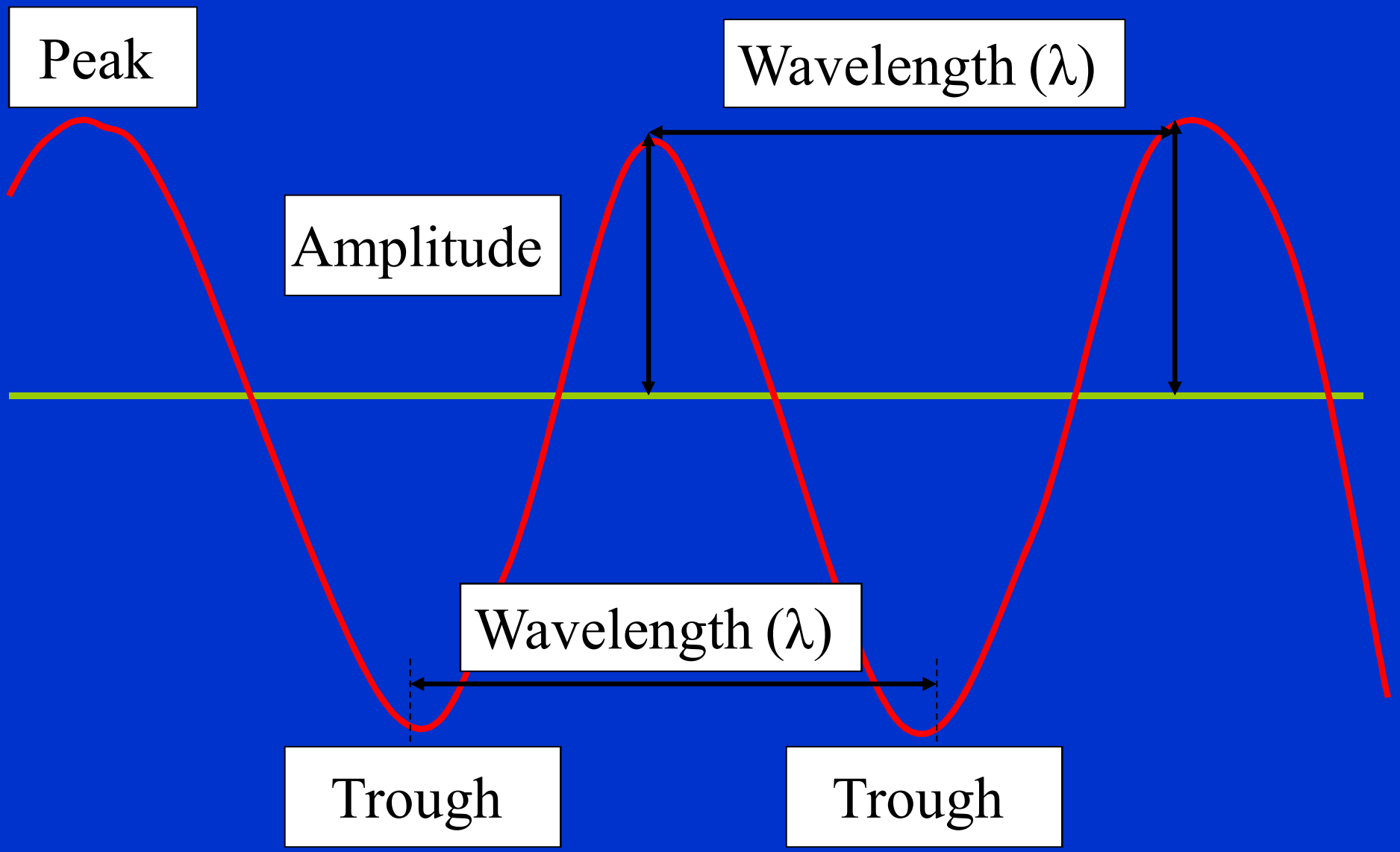
UNDERSTANDING RADIOWAVE

- When a stone is dropped into a lake, the potential energy is changed to kinetic energy and subsequently to wave energy in the form of ripples.
- These ripples move up and down and travel outward sending energy across the lake.

WHAT IS A WAVE

- Disturbance (often in the form of vibration or oscillation) that is produced repeatedly, and transfers energy.
- Examples: Sound and light
- Waves can be described using a number of standard variables including frequency, wavelength, amplitude and period.

A graphical presentation of a wave



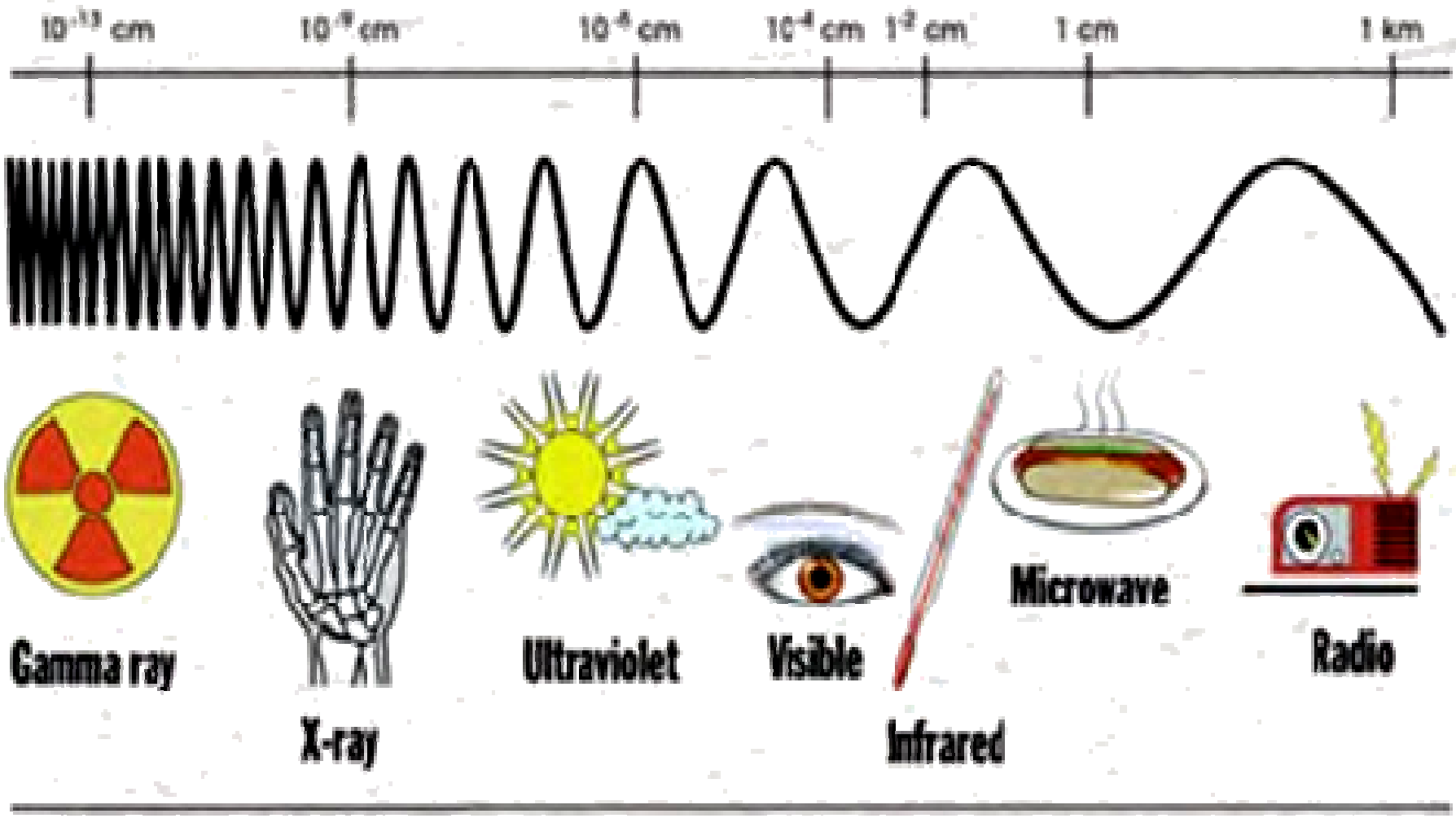
- The **frequency,*f***, of the wave is the number of complete waves passing a given point in the medium for each second - measured in Hertz (Hz)
- The **wavelength, A,** is the distance between two successive points, which are in the same phase - measured in metres (m).
- The **amplitude, *a,*** of a wave is the maximum displacement of particles from their rest position. - measured in metres (m).
- The **period, *T,*** of a wave is the time needed for each particle to complete one full wave movement - measured in seconds.

- **Reflection** - the change of direction of waves, due to hitting a reflective surface.
- **Refraction** - the change of direction of wave when it enters a new medium.
- **Diffraction** - the spreading out of waves, for example when they travel through a small opening or slit.
- **Interference** - the superposition of two or more waves from coherent sources.

ELECTROMAGNETIC SPECTRUM

- Light wave and radio wave are non-mechanical waves, known as electromagnetic waves.
  - can travel through vacuum.
  - Example: light from the Sun can reach the Earth because it does not need a medium to travel.
- An electromagnetic wave is a combination of electric and magnetic wave.

The electromagnetic waves spectrum



- Radio waves, microwaves, light, x-rays and infrared rays are made up of electromagnetic waves.
- All the electromagnetic waves are part of the electromagnetic spectrum.
- All the waves in this spectrum share the same speed, which is the speed of light

RADIO WAVES IN COMMUNICATION

- Radio waves are everywhere.
- Can send over a very long distance and they can travel through vacuum.
- Carries all the information needed for radios, televisions and mobile phones to create sound and pictures.

- Each radio or television station has a specific frequency - can tune the radio or television set according to the frequency.

Electronic components and their functions

Component	Functions
Resistor	•A resistor is an electronic component that resists the flow of current. •It produces a voltage drop between its terminals. •A capacitor is a device that can store energy. •The electric charges are stored in a pair of conductors separated by an insulator. •One conductor holds the negative charge while the other conductor holds the positive charge.

Component	Functions
Capacitor	•A capacitor is often referred to as a condenser. •A capacitor only lets alternating current pass through it. It does not allow direct current pass through. There are two main types of capacitor; fixed and variable. •A variable capacitor and inductors are applied together in a radio receiver to select information in particular frequency bands. •A radio receiver relies on a variable capacitor to tune to the station frequency.

Component	Functions
Diode	• A diode is a component that restricts the direction of movement of charge carriers. • It allows an electric current to flow in one direction, but essentially blocks it in the opposite direction. • Diodes are used as demodulation in AM radio receivers.
Transistor	• Electronic device which can be used for amplification, switching, voltage stabilisation, signal modulation and many other functions. • It is based on its input voltage that controls the current it draws from a connected voltage source. • In radio, transistors are used as amplifiers.

Component	Functions
Inductor	• An inductor is an electronic device used in electrical circuits for its property of inductance. Inductance is an effect that results from the magnetic field that forms around a current carrying conductor. Inductance is measured in Henrys.
Speaker	•A speaker converts electrical signals into sound wave.

Component	Functions
Transformer	An electrical or electronic device that transfers energy from one electrical circuit to another by magnetic coupling without using any moving parts. Used to convert between high and low voltages. Impedance is the effective resistance of an electric. In radio, small transformers are often used to isolate and link different parts of radio receivers and audio amplifiers. The transformers convert high current low voltage circuits to low current high voltage, or vice versa.

TRANSMISSION OF RADIO SIGNALS

- Combination of electric wave and magnetic wave.
- These waves are electromagnetic waves that travel through space at the speed of light.
- Audio waves or sound waves are brought to the receiver (radio) by the radio waves through the modulation process.

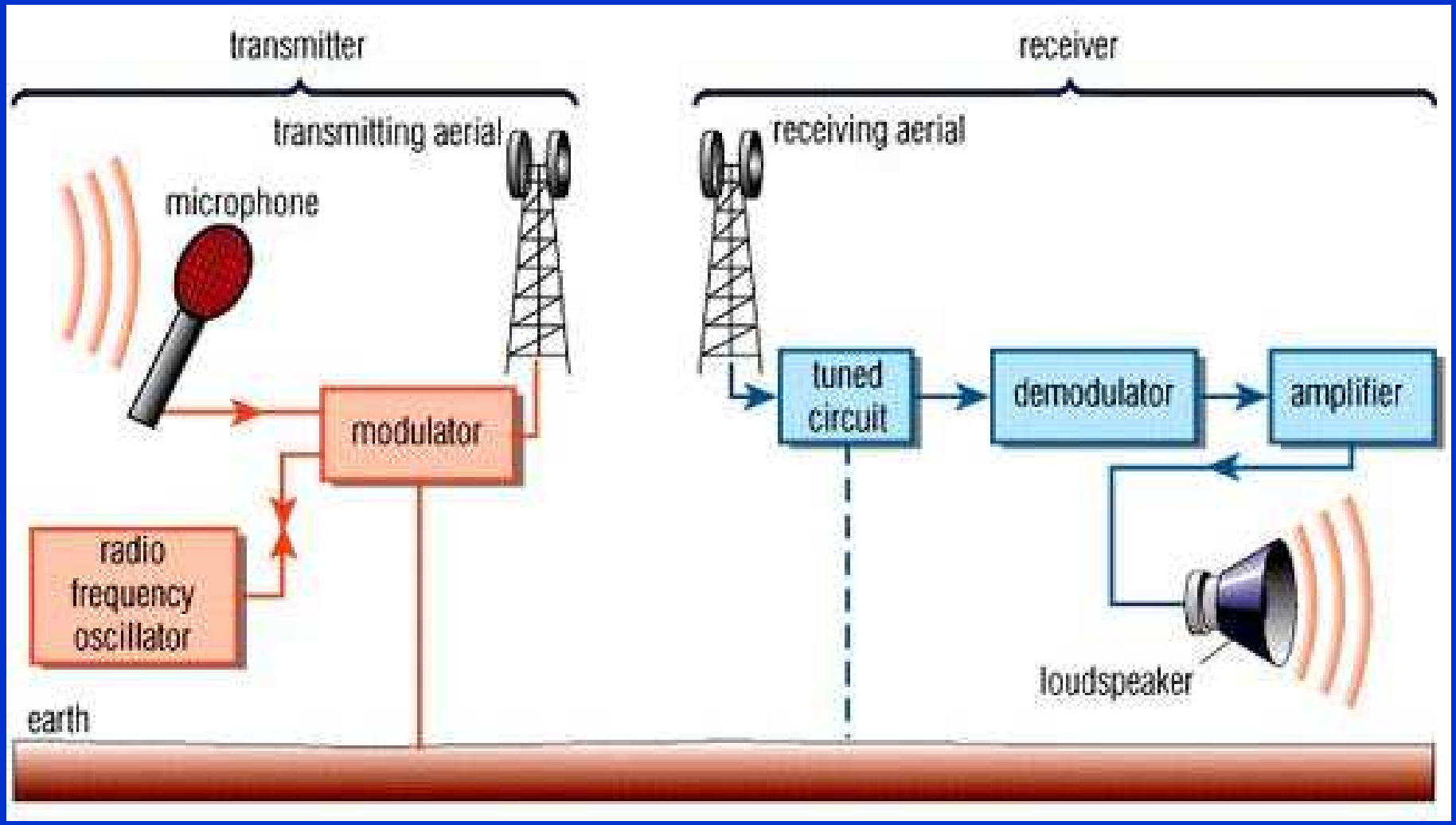
- Radio waves have high frequencies whereas sound waves have much lower frequencies.
- To transmit sound by radio it is necessary to superimpose the sound frequencies to a radio wave
- As the radio wave carries the electrical analogue of the original sound - carrier wave.
- Amplitude modulation in AM radio signal modifies the energy level of the individual carrier waves to produce an envelope of varying amplitude corresponding to the sound waves.

- In frequency modulation (in FM radio signal), the carrier amplitude is kept constant.
- The wave frequency is being increased or reduced to produce a frequency analogue of sound.
- The wave is amplified so it is strong enough to be sent over a long distance through a transmitter.

RECEPTION OF SIGNALS IN THE RADIO RECEIVER SYSTEM.

- The **radio receiver** detects and **demodulates** the radio waves.
- Demodulation - process in which sound waves are separated from the radio waves.
- After demodulation, the sound waves are amplified through the amplifying circuits to produce a signal that is strong enough to be converted into sound waves using a speaker.

TRANSMISSION OF RADIO SIGNALS



RADIO COMMUNICATION SYSTEM

- A pair of walkie talkies allow direct communications between two people.
- A walkie-talkie can act as a radio transmitter and a radio receiver.
- Mobile phones use radio waves and physical lines to transmit call

COMMUNICATING VIA SATELLITE

- A **satellite** is any object that orbits another object.
- The term satellite normally refers to an artificial satellite that orbits the Earth.
- **Communication satellites** - artificial satellites stationed in space for the purposes of **telecommunications** by using **radio** waves.
- The communication satellites contain radio wave reflectors.

- The reflectors bounce the radio waves transmitted from ground transmitters, for example, from the radio and television stations to the radio and television at home.
- A communication satellite reflects radio waves from the ground transmitter.
- A communication satellite makes it possible to transmit radio waves over a very long distance.

THE BENEFIT OF INFORMATION AND COMMUNICATION TECHNOLOGY TO MANKIND

- Information and communication technology (ICT) is the method of sending and receiving information via electronic devices.
- ICT involves technologies such as radio and the newer digital technologies like computers, satellite, mobile phones, and the Internet.

- Use mobile phones to chat with your friend, use computers to browse the Internet, and withdraw money from Automated Teller Machines (ATMs).