TRANSDUCERS

Introduction

- A transducer is an electronic device that converts energy from one form to another for various purposes like measurement or Information transfer eg.,Pressure sensors.
- Common examples include microphones, loudspeakers, thermometers, position and pressure sensors, and antenna.

Transducer efficiency

- Efficiency is an important consideration in any transducer. Transducer efficiency is defined as the ratio of the power output in the desired form to the total power input. Mathematically, if P represents the total power input and Q represents the power output in the desired form, then the efficiency E is given by:

- $E = Q/P$

Contd..

- No transducer is 100-percent efficient; some power is always lost in the conversion process. Usually this loss is manifested in the form of heat. S ome antennas approach 100-percent efficiency.
- The worst transducers, in terms of efficiency, are incandescent lamps. A 100-watt bulb radiates only a few watts in the form of visible light. Most of the power is dissipated as heat

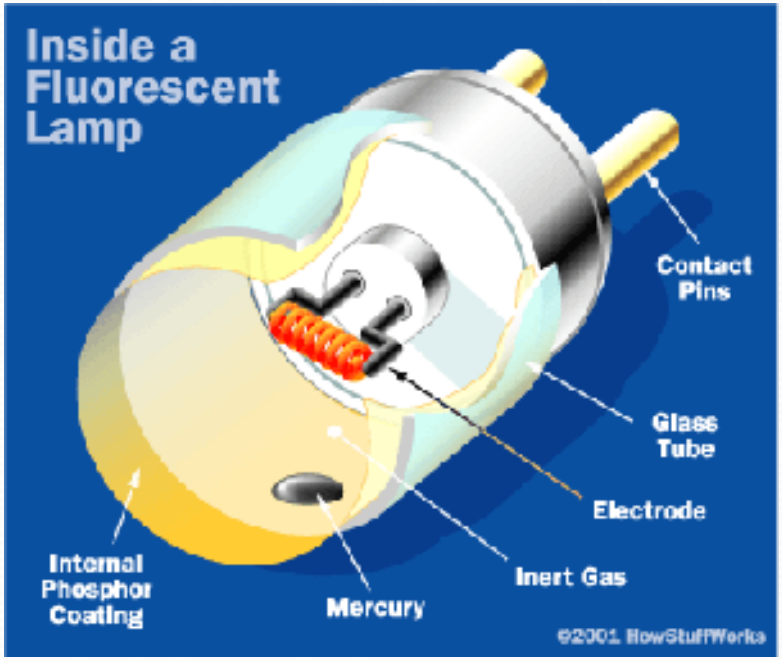
Transducer Types

- Electromagnetic
- Electrochemical
- Electromechanical
- Electro acoustic
- Photoelectric
- Electrostatic
- Thermoelectric
- Radio acoustic

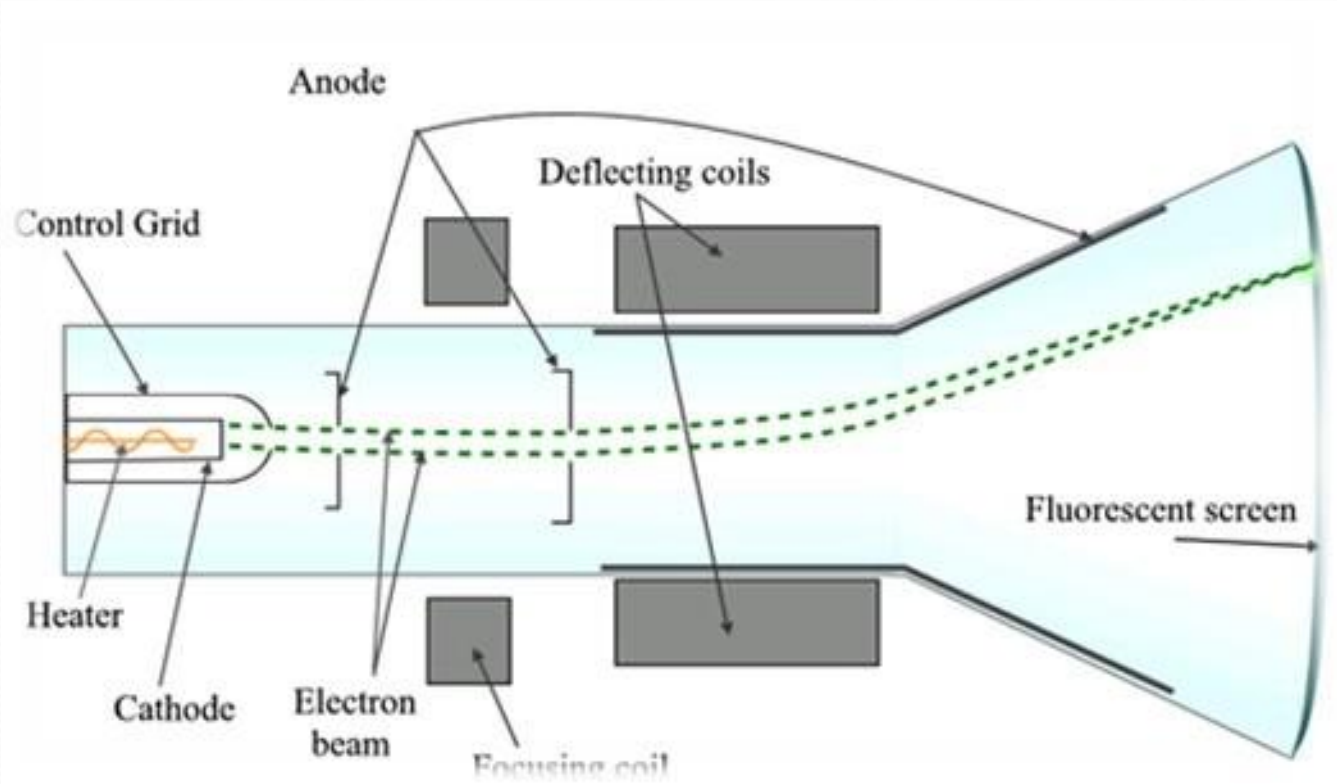
Electromagnetic transducers

- A ntenna - converts electromagnetic waves into electric current and vice versa.
- Cathode ray tube (CRT) - converts electrical signals into visual form
- Fluorescent lamp, light bulb - converts electrical power into visible light
- Tape head - converts changing magnetic fields into electrical form

ANTENNA



Fluorescent lamp



CATHODE RAY TUBE

Electrochemical Transducers

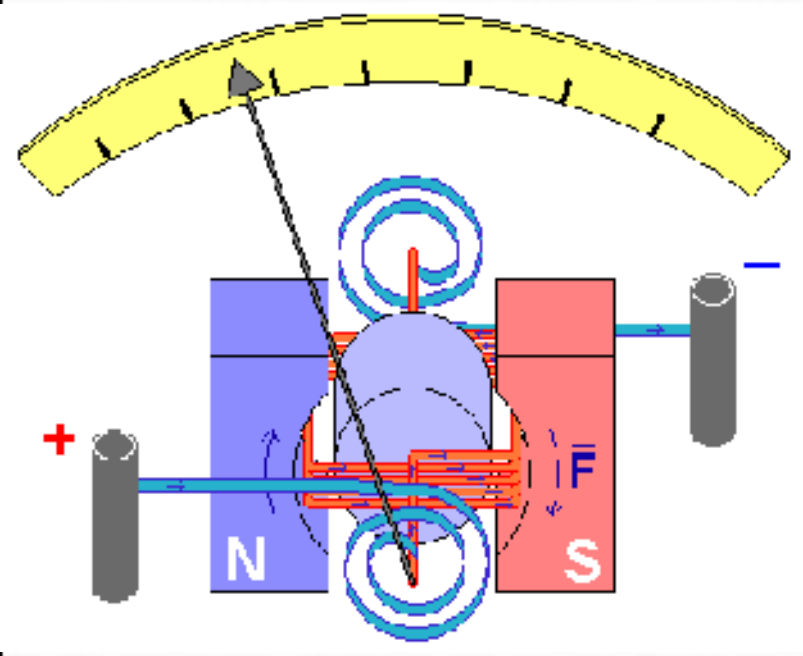
- pH probes-an electronic instrument used to measure the pH (acidity or basicity) of a liquid.
- A n electro galvanic fuel cell- an electrical device used to measure the concentration of oxygen gas in medical equipment.

pH probes

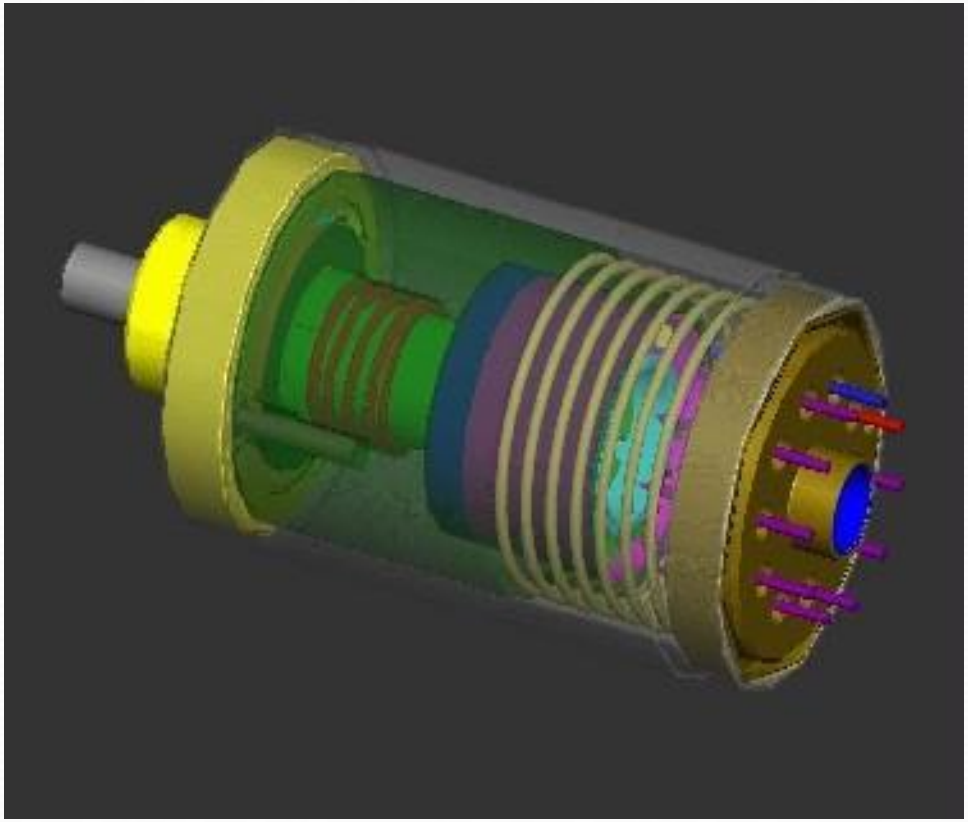
Electro galvanic fuel cells

Electromechanical transducers

- Galvanometer-an instrument for detecting and measuring electric current. It is an analog electromechanical transducer that produces a rotary deflection, through a limited arc, in response to electric current flowing through its coil.
- A ccelerometer- a device for measuring acceleration and gravity induced reaction forces.
- Rotary motor, linear motor ,Vibration powered generator are some examples of this type.



GALVANOMETER



ACCELEROMETER

Electroacoustic transducers

- Geophone - convert a ground movement (displacement) into voltage .
- Hydrophone - converts changes in water pressure into an electrical form.
- Loudspeaker, earphone - converts changes in electrical signals into acoustic form.
- Microphone - converts changes in air pressure into an electrical signal.

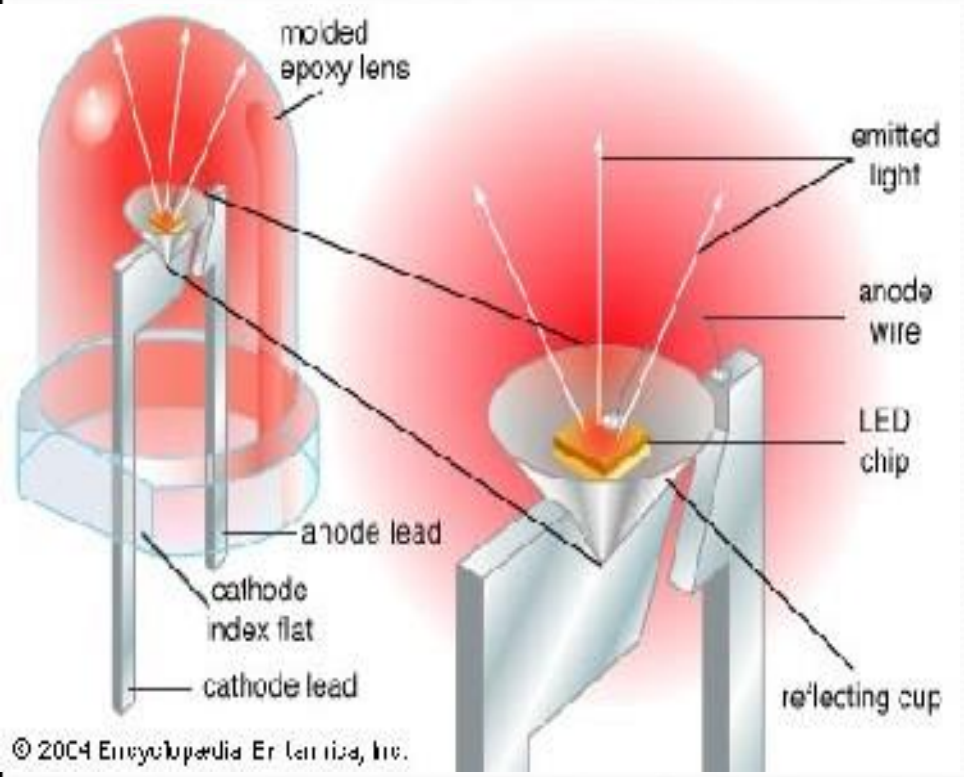
GEOPHONES

LOUDSPEAKERS

EARPHONES

Photoelectric transducers

- Laser diode, light-emitting diode - convert electrical power into forms of light
- Photodiode, photo resistor, phototransistor, photomultiplier tube - converts changing light levels into electrical form.



LIGHT EMITTING DIODE

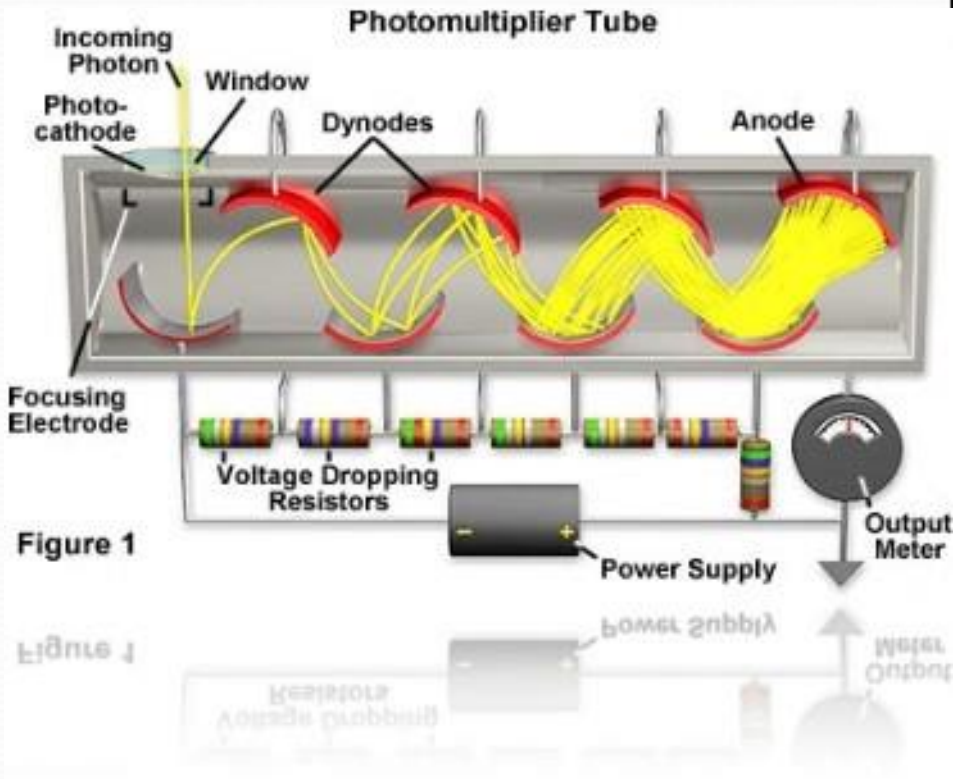


PHOTO MULTIPLIER TUBE

Electrostatic transducers

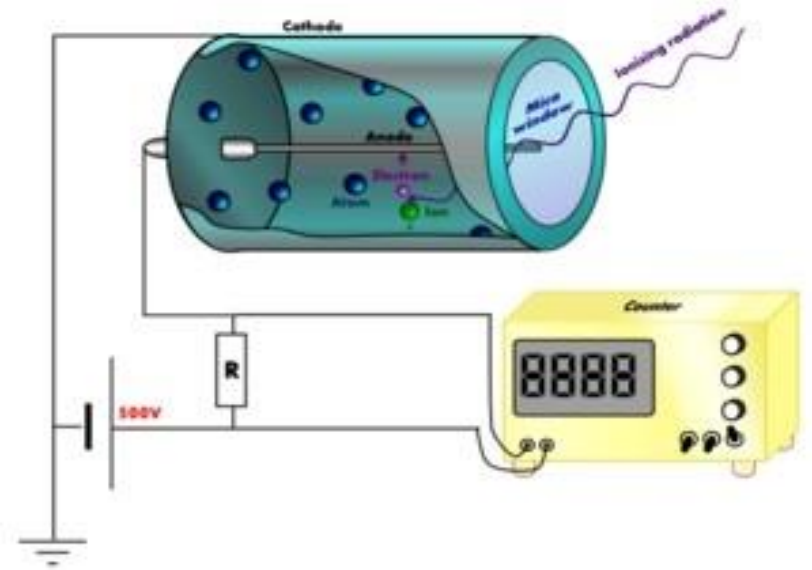
- Electrometer-an electrical instrument for measuring electric charge or electrical potential difference.

Thermoelectric transducers

- RTD(Resistance Temperature Detector)-To predict change in electrical resistance of some materials with changing temperature.
- Thermocouple-to convert thermal potential difference into electric potential difference.
- Thermistor are some of the examples of this type of transducers.

Radioacoustic transducers

- Geiger-Muller tube used for measuring radioactivity.
- Radio Receiver.



GM COUNTER