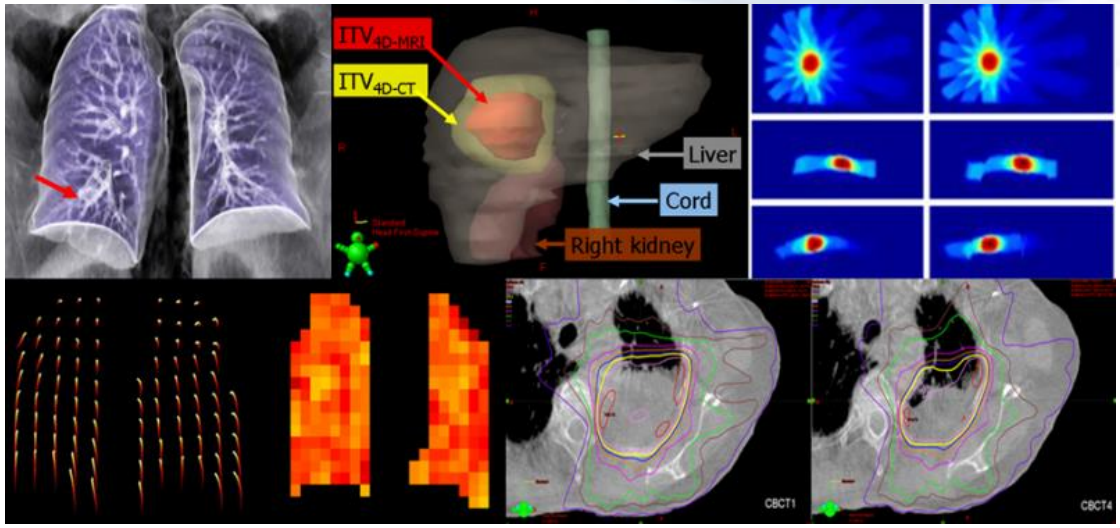
جامعة حفر الباطن
University of Hafr Al Batin

INTRODUCTION TO MEDICAL PHYSICS

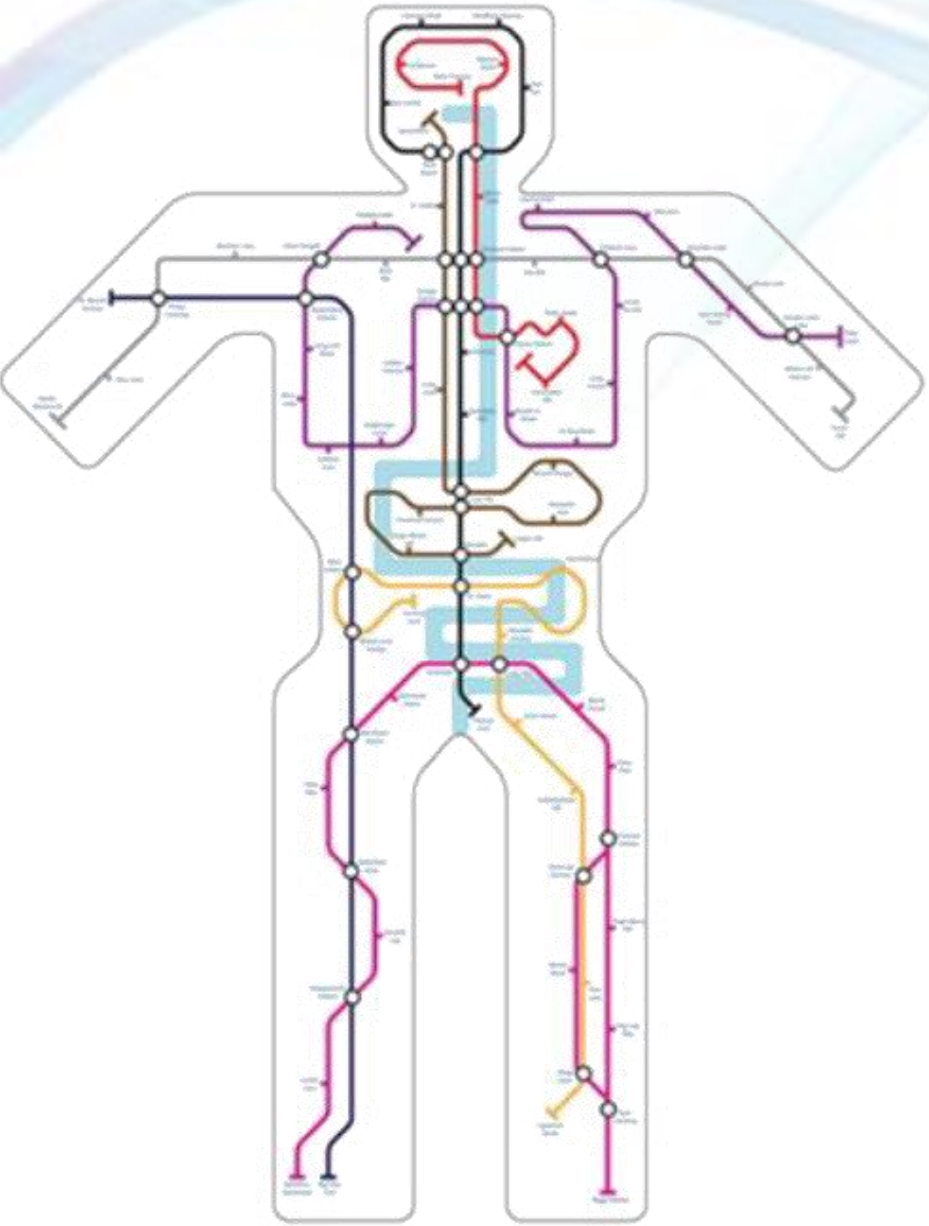

SIEMENS
MAGNETOM
Symphony
Maestro Class

Medical Physics

Medical physics is the application of physics to medicine. All areas of physics can be applied to medicine (Mechanics, electromagnetism, thermodynamics, nuclear physics, optics, fluids,…..)



Medical physics is mainly involved in the development of new instrumentation and technology used for diagnosis and also for treatments.



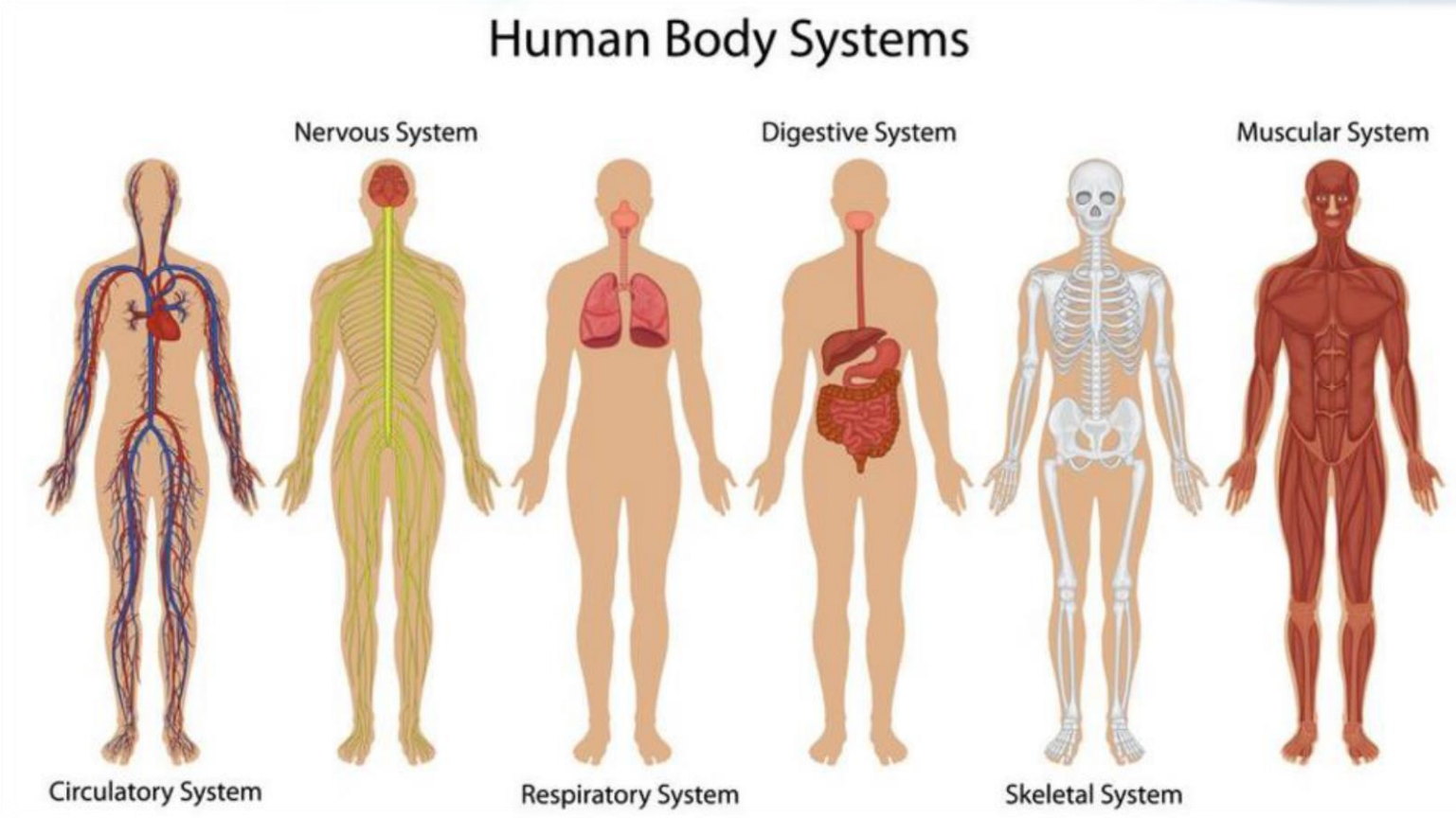
The human body is a very complex system. Concepts of modeling in physics can be applied to simulate different activities of the human body systems:

For example:

the modeling of the blood flow in the study of the body's circulatory system.

Human Body Systems

The human body is made up of different systems working together to keep the body in health. We can use analogies with physics to simulate the function of these systems and to understand the connections between them.



Application to Medical Diagnosis

Different techniques of diagnosis and medical instruments are based on physical principles such as, the measurement of the body temperature, the measurement of the blood pressure, the eye pressure, the heart pulse,…

Medical imaging (X-rays radiology, Magnetic Resonance Imaging MRI, ultra-sound scan,…) is a very useful discipline of medical diagnosis.

Stethoscope

The figures shows an old and a new instrument for breathing diagnosis

Medical Instruments

Blood Pressure Measurements

Sphygmomanometer

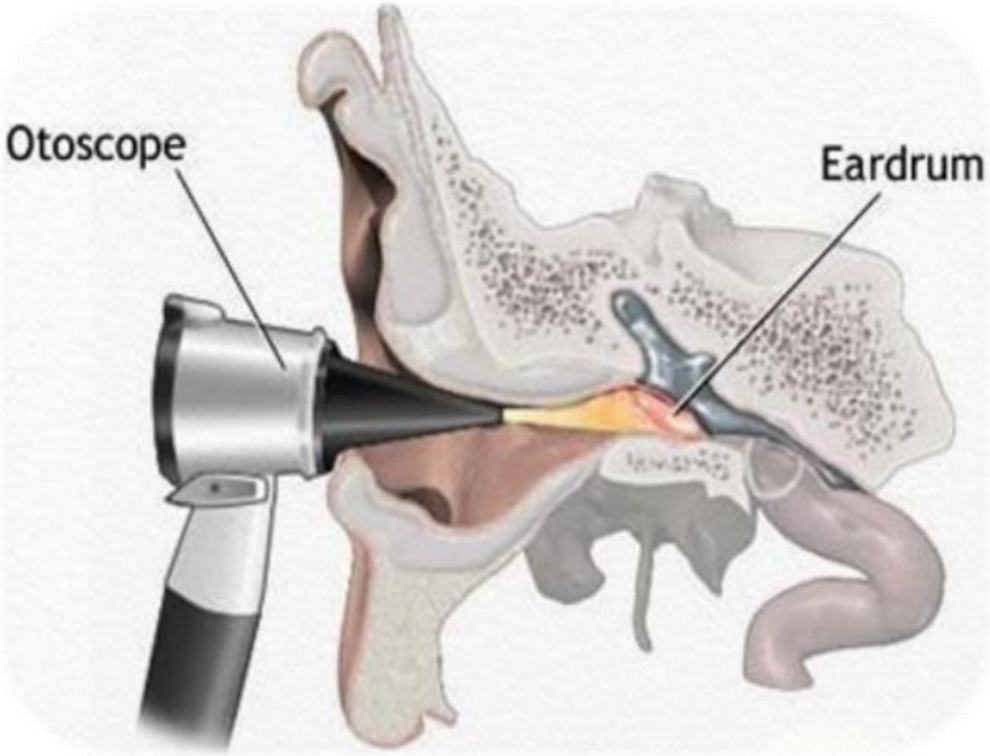
Digital Wrist Tensiometer

Body temperature Measurements

Medical Mercury Thermometer

Infrared Era Thermometer

Medical Instruments



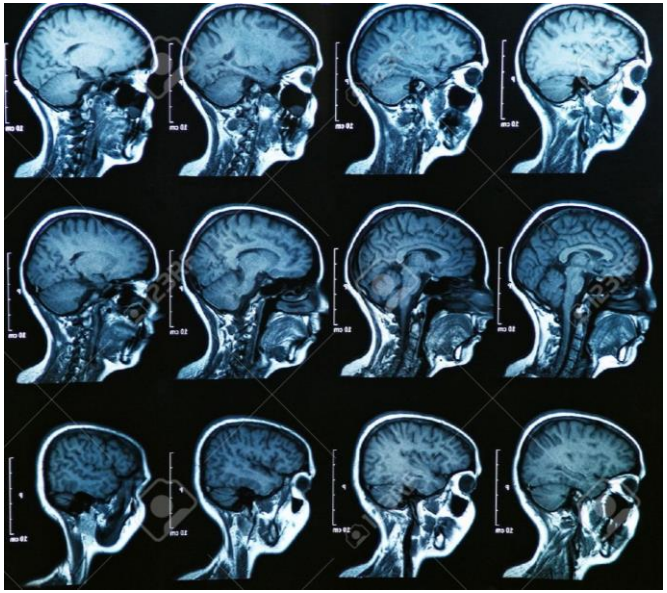
Otoscope

An otoscope is a medical device typically having a light and a set of lenses, used for the visual examination of the eardrum and the canal of the outer ear.

Medical Instruments

Magnetic resonance Imaging MRI

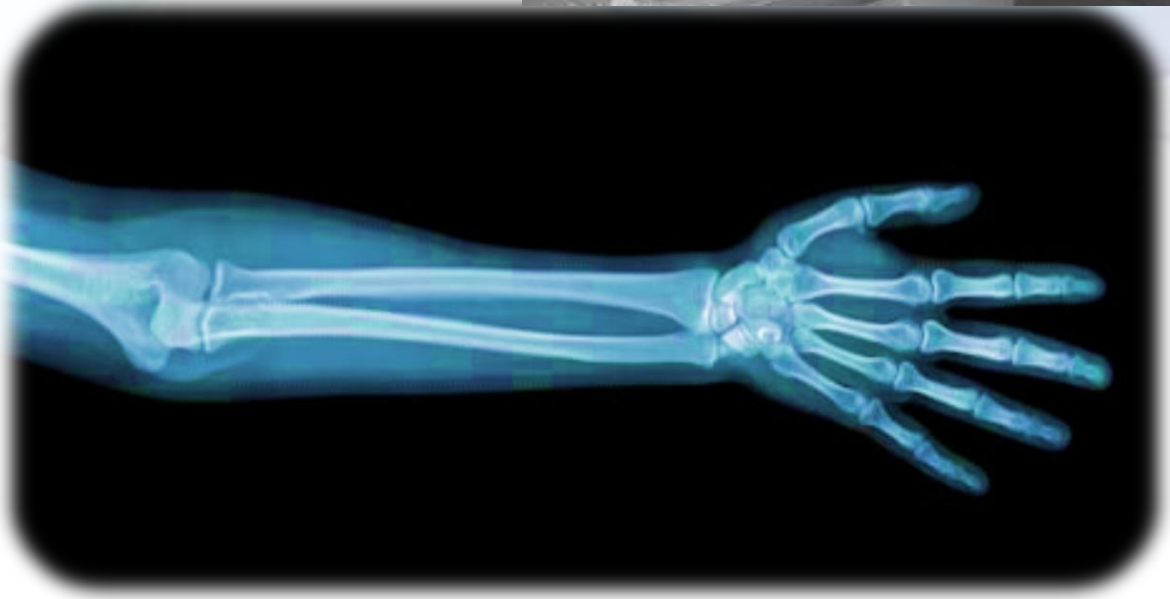
MRI uses the property of the nuclear magnetic resonance NMR to image the nuclei of atoms inside the body, specially the hydrogen atom H since the body tissues contain lots of water. MRI is used for pathologic diagnosis such as lesions in the brain.



MRI Scan

MRI Device

Medical Instruments



X-Ray Imaging

An X-ray is a painless medical test that helps physicians diagnose. Radiography involves exposing a part of the body to a small dose of ionizing radiation to produce images inside of the body. X-rays are the oldest and most frequently used form of medical imaging.

Medical Instruments

Fluoroscopy

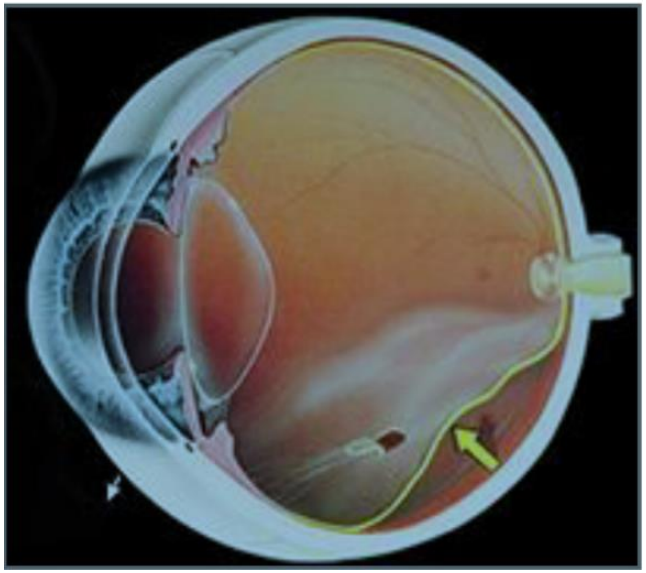
One of the most important benefits of this procedure is that it allows the doctor to view the body's inner systems while they are actually functioning. For example, a doctor can watch a patient's stomach as it digests food, allowing the doctor to obtain valuable diagnostic information.

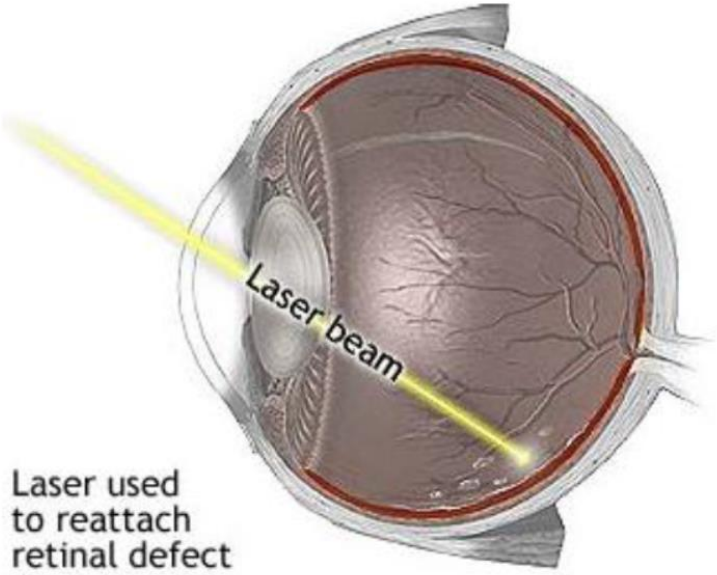
Medical Surgery

Laser Surgery (Photocoagulation)

Retinal detachment occurs when part of it is lifted from its normal position in the back of the eye ball.

During photocoagulation your Surgeon directs a laser beam through a contact lens or ophthalmoscope designed for this procedure. The laser makes burns around the retinal tear, and the scarring that results usually "welds“ the retina to the under lying tissue.

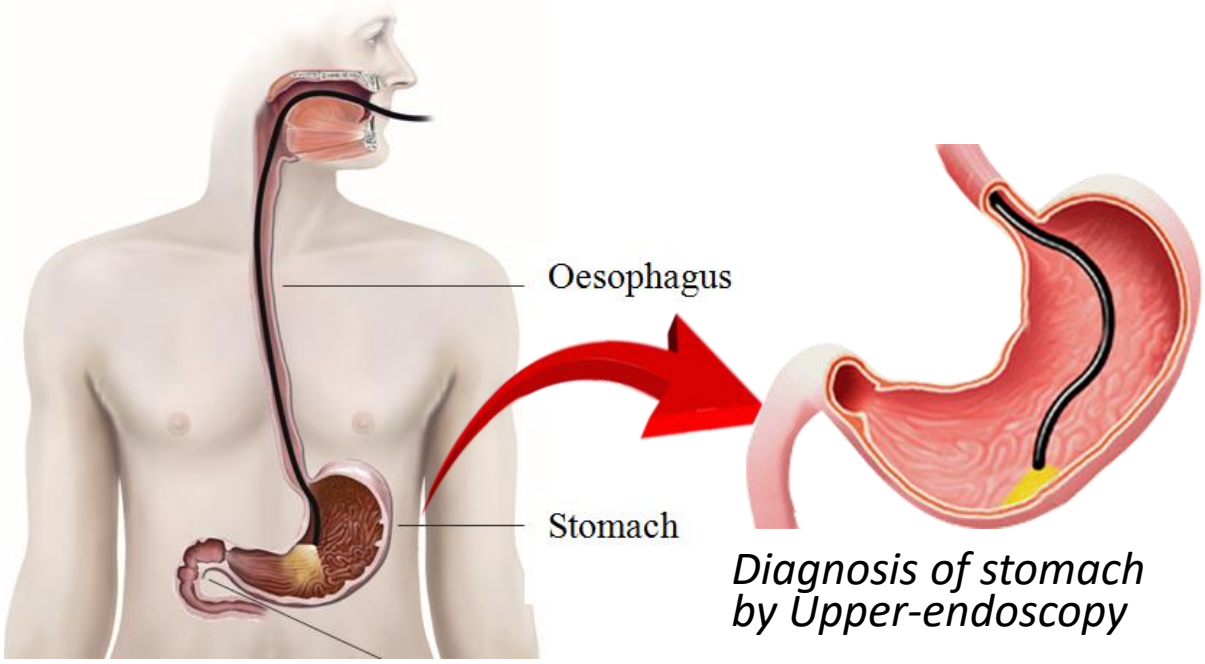




Endoscopy

An endoscope is along, thin and flexible tube which has a light and a video camera.

Endoscopic surgery uses scopes going through small incisions or natural body openings in order to diagnose and treat disease. Another popular term is minimally invasive surgery (MIS), which emphasizes that diagnosis and treatment scan be done with reduced body cavity invasion.



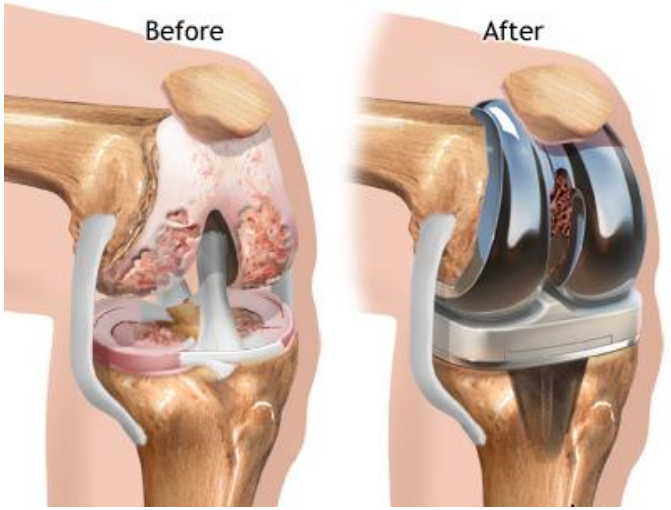
Diagnosis of stomach by Upper-endoscopy

Prosthesis

Prosthesis is the replacement of a missing or a defect parts of the body by an other made artificially and assuming the same function as the missing part.

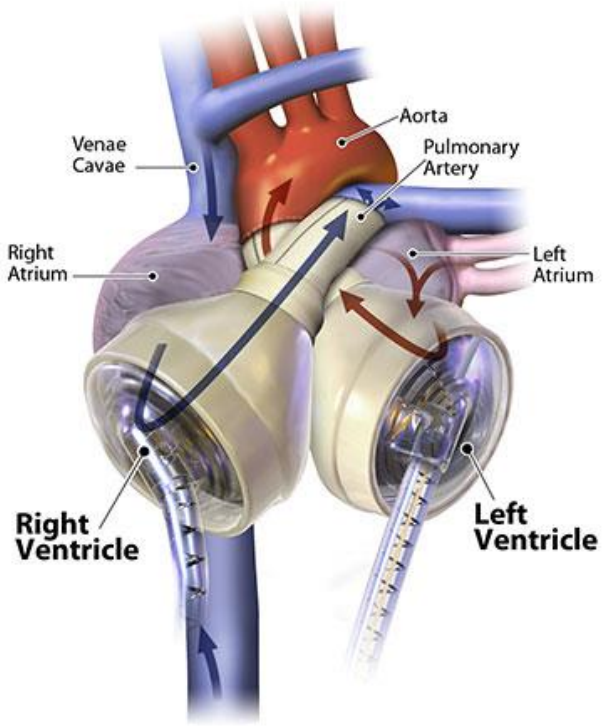
Hearing Aid

Artificial Leg

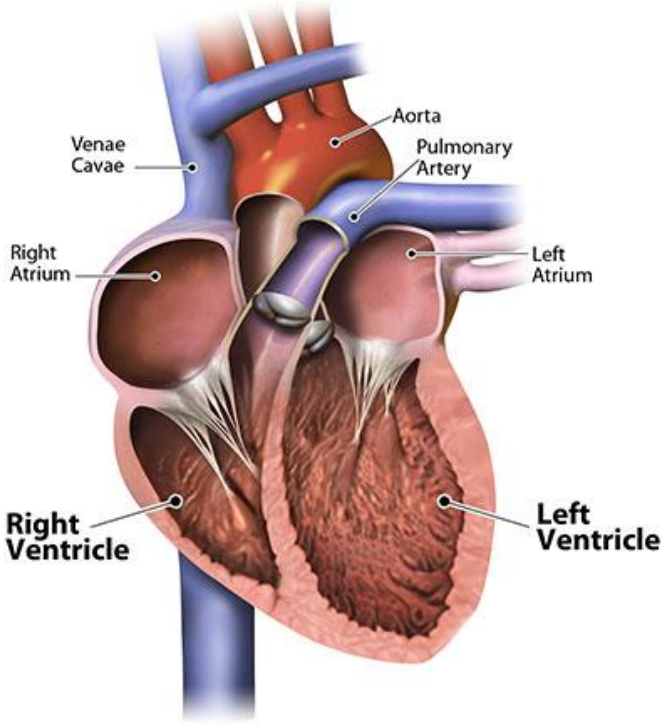


Cartilage Prosthesis of Knee

Artificial devices to replace vital organs continues to be a human dream for thousands of people around the world who are waiting for a heart or a kidney grief.



Total Artificial Heart



Human Heart