**Biomaterial**

Biomaterial is used to make devices to replace a part or a function of the body in a safe, reliable, economic, and physiologically acceptable manner. A variety of devices and materials are used in the treatment of disease or injury. Commonplace examples include sutures, needles, catheters, plates, tooth fillings, etc. A biomaterial is a materials of synthetic as well as of natural origin in contact with tissue, blood, and biological fluids, and intended for use for prosthetic, diagnostic, therapeutic, and storage applications without adversely affecting the living organism and its components. According to these definitions, one must have a vast field of knowledge or collaborate with different specialties in order to develop and use biomaterials in medicine and dentistry. The uses of biomaterials include replacement of a body part which has lost function due to disease or trauma, to assist in healing, to improve function, and to correct abnormalities.

**Uses of Biomaterials:**

**Problem area Examples**

Replacement of diseased or damaged part -Artificial hip joint, kidney dialysis machine

Assist in healing - Sutures, bone plates, and screws

Improve function - Cardiac pacemaker, intraocular lens

Correct cosmetic problem -Augmentation mammoplasty, chin augmentation

Aid to diagnosis - Probes and catheters

Aid to treatment - Catheters, drains

Biomaterials are governed by the interaction between the material and the body; specifically, the effect of the body environment on the material and the effect of the material on the body. It should be evident from any of these perspectives that most current applications of biomaterials involve structural functions, even in those organs and systems which are not primarily structural in their nature, or very simple chemical or electrical functions. Complex chemical functions such as those of the liver and complex electrical or electrochemical functions such as those of the brain and sense organs cannot be carried out by biomaterials at this time.

**Classification of Biomaterials:**

Biomaterials can broadly be classified as: i) Biological biomaterials; and ii)  
Synthetic biomaterials. Biological materials can be further classified into soft and hard tissue types. In the case of synthetic materials, it is further classified into: a) Metallic; b) Polymeric; c) Ceramic; and d) Composite biomaterials.

1. **Biological Materials:**

**- Soft Tissue:** Skin, Tendon, Pericardium, Cornea

**- Hard Tissue:** Bone, Dentine, Cuticle

**2. Synthetic Biomedical Materials:**

**- Polymeric:** Ultra High Molecular Weight Polyethylene(UHMWPE),

Polymethylmethacarylate (PMMA), Polyethyletherketone (PEEK), Silicone, Polyurethane (PU), Polytetrafluoroethylene (PTFE).

**- Metallic:** Stainless Steel, Cobalt-based Alloy (Co-Cr-Mo), Titanium Alloy (Ti-Al-V), Gold, Platinum.

**- Ceramic:** Alumina (A1 203), Zirconia (Zr02),Carbon, Hydroxylapatite [Ca10(PO4)6 (OH)2], Tricalcium Phosphate [Ca3(PO4)2], Bioglass [Na20( CaO)(P203)(Si02)],

Calcium Aluminate [Ca(A1204)].

**- Composite:** Carbon Fiber (CF)/PEEK, CF/UHMWPE, CF/PMMA , Zircon /Silica.