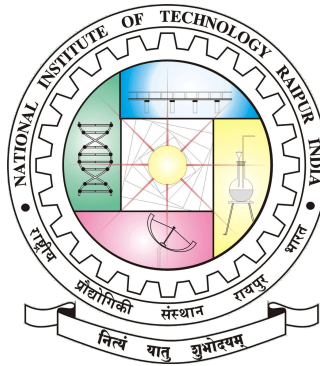


**National Institute Of Technology, Raipur**



## **Assignment-1**

# **Summary of Chapter 1, "An introduction to human body"**

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# 1 The Human Body and Homeostasis

Human Body is all about maintaining the Homeostasis and restoring the maintained condition of the Body.

**Anatomy** : It is the science of body structure and the relationship among them.

**Physiology** : It is the science of body functions-how the body parts works.

## 1.1 Levels of structural organisation and body systems

From the smallest to largest, there are six levels of human organisation.

1. **Chemical Level** : atoms (*C,H,O,N,Ca,etc*) and molecules (*DNA,Glucose,etc*).
2. **Cellular level** : basic structural and functional units of an living organisms like (*nerve cells, epithelial cells, etc*).
3. **Tissue level** : Group of cells and the materials surrounding them that work together to perform a particular function. Four basic types of tissue are : *Epithelial tissue, Connective tissue, Nervous tissue, etc*.
4. **Organ level** : Structures that are composed of two or more different types of tissues having specific functions and usually recognizable shapes like *skin, stomach, heart, liver, lungs, brain, etc*.
5. **System level** : Organs combines to form organ systems. Like *skeleton, cardiovascular, endocrine, lymphatic, respiratory, reproductive, etc*.
6. **Organismal level** : All the parts of the human body functioning together constitute the total organism.

## 1.2 Characteristics of the Living Human Organism

Certain processes distinguish organisms : **1. Metabolism** : Sum of all chemical process that occur in the body. Its two phases are Anabolism and Catabolism. **2. Responsiveness** : It is body's ability to detect and respond to changes. **3. Movement** : It includes motion and coordination of whole body. **4. Growth** : It is an increase in body's cells and its growth. **5. Differentiation** : It is the development of a cell from an unspecialized to a specialized state. **6. Reproduction** : The formation of new cells for tissue growth, repair or replacement or the production of new individual. Formation of new cells occurs through fertilization and cell division.

## 2 Homeostasis and Body Fluids

Homeostasis is the maintenance of relatively stable condition in the body's internal environment in response to changing conditions.

### 2.0.1 Homeostasis and body fluid

An important aspect of homeostasis is maintaining the volume and composition of body fluids. The proper functioning of body cells depends on precise regulation of the composition of various fluids like *Intercellular fluid, extra-cellular fluid, interstitial fluid, blood plasma, lymph, cerebrospinal fluid, synovial fluid, aqueous humor and vitreous fluid*.

### 2.0.2 Control of homeostasis

Homeostasis in the body is continuously being disrupted by external environment such as *intense heat, lack of oxygen*, etc. internal environment such as *glucose level*, social environment such as *work, school*, etc. Fortunately, the body has many regulating systems that can usually bring the internal environment back into balance. Most often, the nervous system and the endocrine system, working together or independently, provide the needed corrective measures.

## 2.1 Feedback System

A feedback system or feedback loop is a cycle of events in which the status of a body condition is monitored, evaluated, changed, remonitored, reevaluated, and so on.

A feedback system includes three basic components :-

- 1. Receptor :** It monitors the changes in a controlled condition and sends input to a control center.
- 2. Control center :** It evaluates the input it receives from receptors, and generates output command when they are needed in the form of nerve impulses or hormones or other chemical signals.
- 3. Effector :** It receives the output from the control center and produces a response or effect that changes the controlled condition.

### 2.1.1 Negative and Positive Feedback system

- ❑ If the response reverses the stimulus, a system is operating by **negative feedback**. eg:- Let the Blood pressure suddenly increases, then the sequence of events will occur which will reduce the BP and homeostasis is restored.
- ❑ If the response enhances or intensifies the stimulus, a system is operating by **positive feedback**. when a great amount of blood is lost , then the sequence of events will occur which will decrease the pumping action of the heart and BP continues to fall but it can be very dangerous.

## 2.2 Homeostasis imbalances

The body's ability to maintain homeostasis gives it tremendous healing power and also responsible for good health. The many health factors are the environment and your own behaviour, genetic makeup, the air you breathe, the food you eat, the thought you think. Many diseases are the result of poor health behaviour like smoking damages the lung's ability to repair itself.

A **disorder** is any abnormality of structure or function.

**Disease** is a more specific term for an illness characterized by a recognizable set of signs and symptoms.

## 2.3 Aging and Homeostasis

Aging is a normal process in which the body's capability to restore homeostasis is decreased. some common example are *wrinkled skin, digestive system, others*.

# 3 Body Position

Description of any region of body assume the body is in the anatomical position, in which the subject stands erect facing the observer, with the head level and the eyes facing directly forward, and the upper limbs are at the sides, with the palms turned forward. A body lying face-down is prone, body lying face-up is supine.

Regional names are term given to a specific regions of body. within the region, the specific body part have anatomical name and corresponding common names.

Directional terms indicate relationship of one part of body to another to precisely locate the various body structures.

**Planes** are imaginary flat surfaces that are used to divide the body or organs to visualize interior structures. A **midsagittal plane** divides the body organ or an organ into eight unequal laft and right side. A **frontal plane** divides the body or an organ into anterior(front) and posterior(back) portions. A **tranverse plane** divides the body or an organ into superior(upper) and inferior(lower) portions. A oblique plane passes through the body or an organ at an oblique angle.

**Sections** are cut of body or its organs made along a plane. They are named according to plane along with the made and space in body that help protect , separate and support internal organs. The cranial cavity contains the brain, and the vertebral canal contains the spinal cord. The diaphragm separates the throacic cavity from the abdominal cavity. Viscera are organs within the throacic cavity and abdominal cavity. A serous membrane line the wall of cavity and adhere to the viscera.

## 4 Medical Imaging

Medical imaging refers to techniques and procedures used to create images of the human body. Various types of medical imaging allow visualization of structures inside our bodies and are increasingly helpful for precise diagnosis of a wide range of anatomical and physiological disorder.

### 4.1 Magnetic Resonance Imaging (MRI)

This is based on the principal of magnetic field : The body is exposed to a high-energy magnetic field, which causes protons (small positive particles within atoms, such as hydrogen) in body fluids and tissues to arrange themselves in relation to the fields. Relatively safe but cannot be used on patients with metal in their bodies. Shows fine details for soft tissues but not for bones. Most useful for differentiating between normal and abnormal tissues. Used to detect *tumors and artery-clogging fatty plaques; reveal brain abnormalities; measure blood flow; and detect a variety of musculoskeletal, liver, and kidney disorders.*

## 4.2 Computed Tomography (CT)

In this form of computer-assisted radiography, an x-ray beam traces an arc at multiple angles around a section of the body. The resulting transverse section of the body, called a CT scan, is shown on a video monitor. Visualizes soft tissues and organs with much more detail than conventional radiographs. Differing tissue densities shown up as various shades of gray. Multiple scans can be assembled to build three dimensional views of structures. Whole-body CT scanning typically targets the torso and appears to provide the most benefit in screening for *lung cancers, coronary artery disease, and kidney cancers*.

## 4.3 Ultrasound scanning

High-frequency sound waves produced by a hand held wand reflect off body tissues and are detected by the same instrument. The image, which may be still or moving, is called a sonogram and is shown on a video monitor. *Safe, non-invasive, painless, and uses no dyes*. Most commonly used to visualize the fetus during pregnancy. Also used to observe the size, location and actions of organs and blood flow through blood vessels.

## 4.4 Coronary(cardiac) Computed Tomography Angiography (CCTA) Scan

In this form of computer-assisted radiography, an iodine containing contrast medium is injected into a vein and a beta blocker is given to decrease heart rate. Then numerous x-ray beams trace an arc around the heart and a scanner detects the x-ray beams and transmits them to a computer, which transforms the information into a three dimensional image of the coronary blood vessels on a monitor. The image produced is called a CCTA scan and can be generated in less than 20 seconds. Used primarily to determine if there are any coronary artery blockages (for examples, *atherosclerotic plaque or calcium*) that may require an intervention such as angioplasty or stent. The CCTA scan can be rotated, enlarged, and moved at any angle. The procedure can take thousands of images of the heart within the time of a single heart beat, so it provides a great amount of detail about the heart's structure and function.

## 4.5 Positron emission tomography (PET)

A substance that emits positrons (positively charged particles) is injected into the body, where it is taken up by tissues. The collisions of positrons with negatively charged electrons in body tissues produce gamma rays (similar to x-rays) that are detected by gamma cameras positioned around the subject. A computer receives signals from the gamma cameras and constructs a PET scan image, displayed in color on a video monitor. The PET scan shows where the injected substance is being used in the body. *In the PET scan, the black and blue colors indicate minimal activity; the red, orange, yellow, and white colors indicate areas of increasingly greater activity.* Used to study the physiology of body structures, such as *metabolism in the brain or heart.*

## 4.6 Endoscopy

Endoscopy involves the visual examination of the inside of the body organs or cavities using a lighted instrument with lenses called an endoscope. The image is viewed through an eyepiece on the endoscope or projected onto a monitor. Examples include *colonoscopy* (used to examine the interior of the colon, which is part of the large intestine), *laparoscopy* (used to examine the organs within the abdominopelvic cavity), and *arthoscopy* (used to examine the interior of a joint, usually the knee).