

Srinivasan College of Arts and Science

Perambalur 621 212

Department of Chemistry

Course Material

For B.CA Students

Subject Code: 16SNMECH2

Subject: Health Chemistry

Unit- I

HEALTH

Food:

Food is a substance consisting essential nutrients which is used in the body to sustain growth and vital processes and to furnish energy.

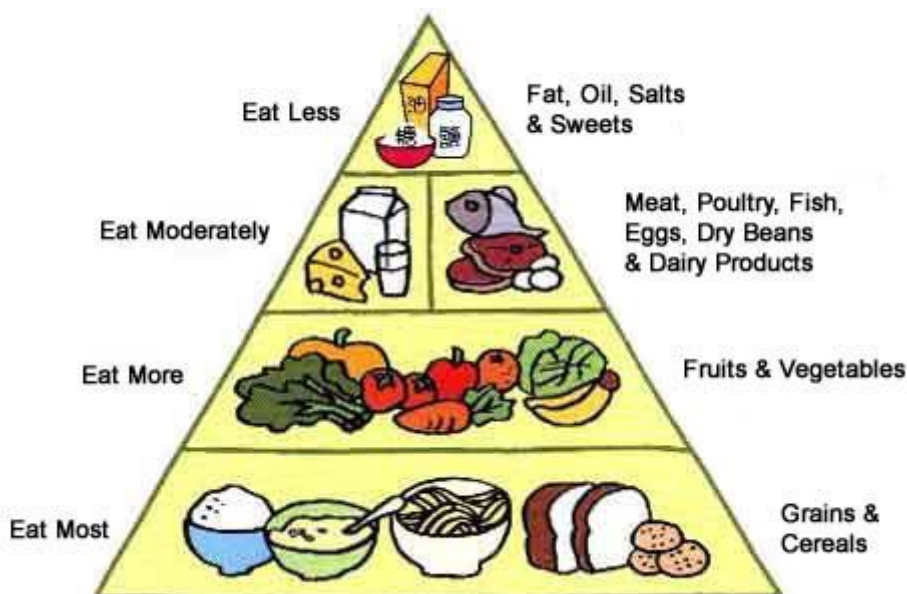
Plants, which convert solar energy to food by photosynthesis, are the primary food source.

The sequence of transfers of matter and energy in the form of food from organism to organism is called **food chain**.

The Food Pyramid is designed to make healthy eating easier. Healthy eating is about getting the correct amount of nutrients such as protein, fat, carbohydrates, vitamins and minerals for the maintenance of good health.

Foods that contain the same type of nutrients are grouped together on each of the shelves of the Food Pyramid. This gives you a choice of different foods from which to choose a healthy diet. Following the Food Pyramid as a guide will help you get the right balance of nutritious foods within your calorie range.

Original USDA Food guide:



So in a nutshell, healthy eating involves:

- plenty of vegetables, salad and fruit
- a serving of wholemeal cereals and breads, potatoes, pasta and rice at every meal - go for wholegrain varieties wherever possible
- some milk, yoghurt and cheese
- some meat, poultry, fish, eggs, beans and nuts
- a very small amount of fats, spreads and oils
- and a very small amount or no foods and drinks high in fat, sugar and salt

Mal nutrition and Under nutrition:

Good nutrition - an adequate, well balanced diet combined with regular physical activity – is a foundation of good health.

Poor nutrition - inadequate and imbalance diet, it can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity.

Malnutrition: It is an umbrella term for poor nutrition, whether that is excess consumption of nutrients (overnutrition) or inadequate consumption or absorption of one or more nutrients (undernutrition).

Malnutrition: Malnutrition, in all its forms, includes undernutrition (wasting, stunting, underweight), inadequate vitamins or minerals, overweight, obesity, and resulting diet-related non-communicable diseases.

The term malnutrition addresses 3 broad groups of conditions:

- Undernutrition, which includes wasting (low weight-for-height), stunting (low height-for-age) and underweight (low weight-for-age);
- Micronutrient-related malnutrition, which includes micronutrient deficiencies (a lack of important vitamins and minerals) or micronutrient excess; and
- Overweight, obesity and diet-related non-communicable diseases (such as heart disease, stroke, diabetes and some cancers).

Causes:

- A low intake of food
- Mental health conditions
- Social and mobility problems
- Digestive disorders and stomach conditions
- Alcohol use disorder

Some signs and symptoms of malnutrition include:

- Lack of appetite or interest in food or drink
- Tiredness and irritability
- Inability to concentrate
- Always feeling cold
- Depression
- Loss of fat, muscle mass, and body tissue
- Higher risk of getting sick and taking longer to heal
- Longer healing time for wounds
- Higher risk of complications after surgery

- Vitamin deficiency, Iron deficiency, scurvy, goiter, anemia, etc.
- Diet-related non-communicable diseases such as cardiovascular diseases, heart attacks, stroke, and often linked with high blood pressure, certain cancers, and diabetes.
- Around 45% of deaths among children under 5 years of age are linked to under nutrition. These mostly occur in developing countries. At the same time, in these same countries, rates of childhood overweight and obesity are also rising.

Remedies or Treatment:

If a doctor diagnoses malnutrition, they will make a treatment plan for the person. The person may also need to meet with a nutritionist and other healthcare providers.

Treatment will depend on the severity of the malnutrition and the presence of any other underlying conditions or complications.

- On-going screening and monitoring
- Making a dietary plan, which might include taking supplements
- Treating specific symptoms, such as nausea
- Treating any infections that may be present
- Checking for any mouth or swallowing problems
- Suggesting alternative eating utensils

In severe cases, a person may need to:

- Spend time in the hospital
- Gradually start taking in nutrients over a number of days
- Receive nutrients such as potassium and calcium intravenously

Continuous monitoring of healthcare team to ensure that they are getting the nutrition they need.

Health:

“Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.” Defined by WHO in 1948.

This means that health is a resource to support an individual’s function in wider society. A healthful lifestyle provides the means to lead a full life.

Sleep is an essential component to maintaining health. Essential sleep duration of different age,

Age and condition	Sleep Needs
Newborns (0–3 months)	14 to 17 hours
Infants (4–11 months)	12 to 15 hours
Toddlers (1–2 years)	11 to 14 hours
Preschoolers (3–5 years)	10 to 13 hours
School-age children (6–13 years)	9 to 11 hours
Teenagers (14–17 years)	8 to 10 hours

Mental and physical health is the two most commonly discussed types of health.

Physical Health: Physical wellbeing involves pursuing a healthful lifestyle to decrease the risk of disease.

Mental Health: Mental health refers to a person's emotional, social, and psychological wellbeing. Mental health is as important as physical health to a full, active lifestyle.

WHO suggests that the following factors may have a bigger impact on health than this as,

- a) where a person lives
- b) the state of the surrounding environment
- c) genetics
- d) income
- e) education level
- f) relationships with friends and family

It may not be possible to avoid disease completely, but doing as much as we can to develop spirit and prepare the body and mind to deal with problems as they arise is a step we can all take.

HYGIENE:

Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases." Personal hygiene refers to maintaining the body's cleanliness.

Personal hygiene is how you care for your body. The practices include bathing, washing your hands, brushing your teeth, and more.

Each person's idea of personal hygiene differs. These main categories are a useful place to start for building good hygiene habits:

Toilet Hygiene: Wash your hands after you use the restroom. Scrub with soap for 20 to 30 seconds, and be sure to clean between your fingers, on the back of your hands, and under your nails.

Shower Hygiene: Personal preference may dictate how often you wish to shower, but most people will benefit from a rinse at least every other day. Showering with soap helps rinse away dead skin cells, bacteria, and oils. You should also wash your hair at least twice a week.

Nail Hygiene: Trim your nails regularly to keep them short and clean.

Teeth Hygiene: Brush at least twice a day for 2 minutes. Aim to brush after you wake up and before bed. If you can, brush after every meal, too. Caring for your teeth and gums is a smart way to prevent gum diseases and cavities.

Hands Hygiene: Germs on your hands can easily enter your body through your mouth, nose, eyes, or ears. Wash your hands:

- when you handle food
- before you eat
- if you handle garbage
- when you sneeze and any time you touch an animal

Sickness Hygiene: If you are not feeling well, you should take steps to keep from spreading germs to others. This includes covering your mouth and nose when sneezing, wiping down shared surfaces with an antibacterial wipe, and not sharing any utensils or electronics.

Some regular hygiene practices may be considered good habits by the society, while the neglect of hygiene can be considered disgusting, disrespectful, or threatening.

SANITATION:

Definition: (WHO) "Sanitation generally refers to the provision of facilities and services for the safe disposal of human urine and feces. The word 'sanitation' also refers to the maintenance of hygienic conditions, through services such as garbage collection and wastewater disposal."

Sanitation refers to public health conditions related to clean drinking water and adequate treatment and disposal of human excreta and sewage. Sanitation systems aim to protect human health by providing a clean environment that will stop the transmission of disease.

Unit- II

DRUGS

A drug is any substance that causes a change in an organism's physiology or psychology when consumed, which, when administered to a living organism, produces a biological effect.

Drugs are typically distinguished from food and substances that provide nutritional support. Consumption of drugs can be via inhalation, injection, smoking, absorption via a patch on the skin, or dissolution under the tongue.

There are seven different drug types, and each has its own set of effects and risks:

- Stimulants
- Depressants
- Hallucinogens
- Dissociatives
- Opioids
- Inhalants
- Cannabis

Depressants

Depressants slow down the messages between the brain and the body - they don't necessarily make you feel depressed. The slower messages affect:

- concentration and coordination
- ability to respond to what's happening around you

Small doses of depressants can make you feel relaxed, calm and less inhibited.

Larger doses can cause sleepiness, vomiting and nausea, unconsciousness and even death.

Examples include:

- alcohol
- benzodiazepines (minor tranquillisers such as Valium)
- cannabis
- ketamine
- opioids (heroin, morphine, codeine)

Anticonvulsant:

- The term "anticonvulsant" is a drug used for the treatment of epileptic seizures.
- Anticonvulsants are also being used in the treatment of neuropathic pain and as mood stabilizers in the treatment bipolar disorder.
- Used as antiepileptics.

Antibiotics:

- Antibiotics, also known as antibacterials, are medications that destroy or slow down the growth of bacteria.
- They include a range of powerful drugs and are used to treat diseases caused by bacteria.
- Antibiotics cannot treat viral infections, such as cold, flu, and most coughs.
- Alexander Fleming discovered penicillin, the first natural antibiotic, in 1928.

Antipyretics:

Something that reduces fever or quells it, pyrexia, a medical term for fever.

There are 3 classes of antipyretic medications are sold OTC (over-the-counter) without prescription:

- Salicylates -- aspirin (acetylsalicylic acid), choline salicylate (Arthropan), magnesium salicylate (Arthriten), and sodium salicylate (Scot-Tussin Original);
- Acetaminophen (Tylenol)
- Nonsteroidal anti-inflammatory drugs (NSAIDs)
- Ibuprofen (Advil), naproxen (Naprosyn, Aleve), and ketoprofen.

Antiseptics:

- Antiseptics are antimicrobial substances that are applied to living tissue/skin to reduce the possibility of infection, sepsis, or disintegration.
- Antiseptics are generally distinguished from *antibiotics* by the latter's ability to safely destroy bacteria within the body, and from *disinfectants*.
- Which destroy microorganisms found on non-living objects.
- Alcohols, including ethanol, 2-propanol/isopropanol are sometimes referred to as *surgical spirit*.
- They are used to disinfect the skin before injections are given, among other uses.
- Iodine is usually used in an alcohol solution (called tincture of iodine)
- Lugol's iodine solution as a pre- and postoperative antiseptic.

Analgesics:

Analgesics are medicines that are used to relieve pain. They are also known as **painkillers or pain relievers**. Technically, the term analgesic refers to a medication that provides relief from pain without putting you to sleep or making you lose consciousness.

Many different types of medicines have pain-relieving properties, and experts tend to group together those medicines that work in a similar way. Two of the most common groups of pain killers are

- **nonsteroidal anti-inflammatory drugs (NSAIDs)**
- **Opioids** (narcotics), but there are many more.

Narcotics:

A substance used to treat moderate to severe pain. Narcotics are like opiates such as morphine and codeine, but are not made from opium. Originally referred medically to any psychoactive compound with sleep-inducing properties.

Commonly morphine and heroin, as well as derivatives of many of the compounds found within raw opium latex. The primary three are morphine, codeine, and thebaine.

Muscle Relaxants:

- Skeletal muscle relaxants are drugs that are used to relax and reduce tension in muscles. They are more simply referred to as muscle relaxants.
- Some work in the brain or spinal cord to block or dampen down excessively stimulated nerve pathways. These are called centrally acting muscle relaxants and examples include baclofen, methocarbamol, and tizanidine.

- Dantrolene acts directly on the muscle itself, it also appears to indirectly act on the central nervous system and can cause drowsiness.

Steroids:

Steroid is a biologically active organic compound with four rings arranged in a specific molecular configuration.

- Steroids are chemicals, often hormones that your body makes naturally.
- They help your organs, tissues, and cells do their jobs.
- You need a healthy balance of them to grow and even to make babies. "Steroids" can also refer to man-made medicines.
- The two main types are corticosteroids and anabolic-androgenic steroids.

Corticosteroids: They're medicines that quickly fight inflammation in your body. They help treat conditions that cause irritation and swelling.

Anabolic-androgenic steroids: They are man-made versions of testosterone, a male sex hormone that helps build bigger muscles. You take them by mouth or get a shot into a muscle.

It was prescribed to men with low testosterone and people who lose muscle mass because of cancer, AIDS, and other health conditions.

Unit- III

BODY FLUIDS

Body fluids or biofluids are liquids within the human body. The total body water is about 60% (60–67%) of the total body weight; it is usually slightly lower in women. The exact percentage of fluid relative to body weight is inversely proportional to the percentage of body fat.

Blood: Blood is a body fluid in humans and other animals that delivers necessary substances such as nutrients and oxygen to the cells and transports metabolic waste products away from those cells. There is no substitute for blood. It cannot be made or manufactured. Generous blood donors are the only source of blood for patients in need of a blood transfusion.

Blood volume: Blood accounts for 7% of the human body weight, the average adult has a blood volume of roughly 5 litres which is composed of plasma and several kinds of cells. By volume, the red blood cells constitute about 45% of whole blood, the plasma about 54.3%, and white cells about 0.7%.

Blood Components

There are four basic components that comprise human blood: **Plasma, Red Blood Cells, White Blood Cells and Platelets.**

Red Blood Cells

Red blood cells represent 40%-45% of your blood volume. They are generated from your bone marrow at a rate of four to five billion per hour. They have a lifecycle of about 120 days in the body.

Platelets

Platelets are an amazing part of your blood. Platelets are the smallest of our blood cells and literally look like small plates in their non-active form. Platelets control flow of blood and also bleeding.

Plasma

Plasma is the liquid portion of your blood. Plasma is yellowish in colour and is made up mostly of water, but it also contains proteins, sugars, hormones and salts. It transports water and nutrients to your body's tissues.

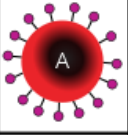
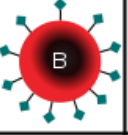
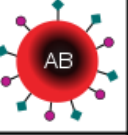




White Blood Cells

Although white blood cells (leukocytes) only account for about 1% of your blood, they are very important. White blood cells are essential for immunity, good health and protection against illness and disease. Like red blood cells, they are constantly being generated from your bone marrow.

BLOOD Groups:

Based on the presence and absence of antibodies and inherited antigenic substances on the surface of red blood cells (RBCs). The major classification of blood is A, B, AB, and O, with +, – ends.

The ABO blood group system involves two antigens and two antibodies found in human blood. The two antigens are antigen A and antigen B. The two antibodies are antibody A and antibody B. The antigens are present on the red blood cells and the antibodies in the serum. Regarding the antigen property of the blood all human beings can be classified into 4 groups, The antibodies present together with the antigens are found as follows:

	Group A	Group B	Group AB	Group O
Red blood cell type				
Antibodies in plasma	 Anti-B	 Anti-A	None	 Anti-A and Anti-B
Antigens in red blood cell	A antigen	B antigen	A and B antigens	None

1. Antigen A with antibody B is Blood group-A.
2. Antigen B with antibody A is Blood group-B.
3. Antigen AB has no antibodies is Blood group-AB.
4. Antigen nil (group O) with antibody A and B is Blood group-O.

Red blood cells sometimes have another antigen, a protein known as the RhD antigen. If this is present, your blood group is RhD positive. If it's absent, your blood group is RhD negative.

Red blood cell compatibility:

- **Blood group AB** individuals have both A and B antigens on the surface of their RBCs, and their blood plasma do not contain any antibodies against either A or B antigen. Therefore, an individual with AB blood can receive blood from any group (with AB being preferable), but cannot donate blood to any group other than AB. They are known as universal recipients.
- **Blood group A** individuals have the A antigen on the surface of their RBCs, and blood serum containing IgM antibodies against the B antigen. Therefore, a group A individual can receive blood only from individuals of groups A or O (with A being preferable), and can donate blood to individuals with type A or AB.
- **Blood group B** individuals have the B antigen on the surface of their RBCs, and blood serum containing IgM antibodies against the A antigen. Therefore, a group B individual can receive blood only from individuals of groups B or O (with B being preferable), and can donate blood to individuals with type B or AB.
- **Blood group O** (or blood group zero in some countries) individuals do not have either A or B antigens on the surface of their RBCs, and their blood serum contains IgM anti-A and anti-B antibodies. Therefore, a group O individual can receive blood only from a group O individual, but can donate blood to individuals of any ABO blood group (i.e., A, B, O or AB).

O negative blood can be issued. Because it is compatible with anyone, O negative blood is often overused and consequently is always in short supply.

Recipient	Donor							
	O-	O+	A-	A+	B-	B+	AB-	AB+
O-	✓	✗	✗	✗	✗	✗	✗	✗
O+	✓	✓	✗	✗	✗	✗	✗	✗
A-	✓	✗	✓	✗	✗	✗	✗	✗
A+	✓	✓	✓	✓	✗	✗	✗	✗
B-	✓	✗	✗	✗	✓	✗	✗	✗
B+	✓	✓	✗	✗	✓	✓	✗	✗
AB-	✓	✗	✓	✗	✓	✗	✓	✗
AB+	✓	✓	✓	✓	✓	✓	✓	✓

COAGULATION:

The ability of the body to control the flow of blood following vascular injury is paramount to continued survival. The process of blood clotting and then the subsequent dissolution of the clot, following repair of the injured tissue, is termed **hemostasis**. Hemostasis comprises four major events that occur in a set order following the loss of vascular integrity:

1. The initial phase of the process is vascular constriction. This limits the flow of blood to the area of injury.
2. Next, platelets become activated by **thrombin** and aggregate at the site of injury, forming a temporary, loose platelet plug. The protein fibrinogen is primarily responsible for stimulating platelet clumping.
3. To insure stability of the initially loose platelet plug, a fibrin mesh (also called the **clot**) forms and entraps the plug.
4. Finally, the clot must be dissolved in order for normal blood flow to resume following tissue repair. The dissolution of the clot occurs through the action of **plasmin**.

BLOOD PRESSURE:

When your heart beats, it squeezes and pushes blood through your arteries to the rest of your body. This force creates pressure on those blood vessels, and that's your systolic blood pressure.

Ex. Blood Pressure: 120/80

The diastolic reading, or the bottom number, is the pressure in the arteries when the heart rests between beats. This is the time when the heart fills with blood and gets oxygen.

Doctors call them systolic (the top number) and diastolic (the bottom number) blood pressure. Knowing both is important and could save your life.

- A normal systolic pressure is below 120.
- A reading of 120-129 is elevated.
- 130-139 is stage 1 high blood pressure (also called hypertension).
- 140 or more is stage 2 hypertension.
- 180 or more is a hypertensive crisis. Call 911.

A normal diastolic blood pressure is lower than 80.

- But even if your diastolic number is lower than 80, you can have elevated blood pressure if the systolic reading is 120-129.
- 80-89 is stage 1 hypertension.
- 90 or more is stage 2 hypertension.
- 120 or more is a hypertensive crisis. Call 911

Blood Pressure Category	Systolic mm Hg (upper #)		Diastolic mm Hg (lower #)
Normal	less than 120	and	less than 80
Elevated	120-129	and	less than 80
High Blood Pressure (Hypertension) Stage 1	130-139	or	80-89
High Blood Pressure (Hypertension) Stage 2	140 or higher	or	90 or higher
Hypertensive Crisis (Seek Emergency Care)	higher than 180	and/or	higher than 120

Even if your blood pressure is high, you probably won't have symptoms. That's why it's often called the "silent killer." The first symptom of untreated high blood pressure may be a heart attack, stroke, or kidney damage.

The Blood pressure was always normal, when you are stress free, healthy food control with proper exercise regularly.

BLOOD SUGAR:

The blood sugar (blood glucose) levels should be maintained in correct level, otherwise this can damage your body and lead to many other problems.

Less than 100 mg/dL after not eating (fasting) for at least 8 hours. And they're less than 140 mg/dL 2 hours after eating.

During the day, levels tend to be at their lowest just before meals. For most people without diabetes, blood sugar levels before meals float around 70 to 80 mg/dL. For some people, 60 is normal; for others, 90.

Low sugar level: It varies widely, too. Many people's glucose won't ever fall below 60, even with prolonged fasting. When the diet or fast, the liver keeps the levels normal by turning fat and muscle into sugar.

Glucose is precious fuel for all the cells in your body when it's present at normal levels. But it can behave like a slow-acting poison.

- High sugar levels slowly erode the ability of cells in the pancreas to make insulin. The organ overcompensates and insulin levels stay too high. Over time, the pancreas is permanently damaged.
- High levels of blood sugar can cause changes that lead to a hardening of the blood vessels.

Damaged blood vessels cause problems such as:

Blood sugar level causes: Kidney disease or kidney failure (requiring dialysis), Strokes, Heart attacks, Vision loss or blindness, weakened immune system, with a greater risk of infections.

HAEMOGLOBIN:

Haemoglobin is the main protein in your red blood cells. It carries oxygen, and delivers it throughout your body.

Haemoglobin is made up of four protein molecules (globulin chains) that are connected together.

The normal adult haemoglobin (Hb) contains two alpha-globulin chains and two beta-globulin chains.

In fetuses and infants, beta chains are not common and the haemoglobin molecule is made up of two alpha chains and two gamma chains. As the infant grows, the gamma chains are gradually replaced by beta chains, forming the adult haemoglobin structure.

Each globulin chain contains an important iron-containing porphyrin compound termed heme. The iron contained in haemoglobin is also responsible for the red colour of blood.

Haemoglobin also plays an important role in maintaining the shape of the red blood cells. Abnormal haemoglobin structure can, therefore, disrupt the shape of red blood cells and impede their function and flow through blood vessels.

Haemoglobin is usually measured as a part of the routine complete blood count (CBC) test from a blood sample. The normal ranges for haemoglobin depend on the age and, beginning in adolescence, the gender of the person. The normal ranges are:

- Newborns: 17 to 22 gm/dL
- One (1) month of age: 11 to 15 gm/dL
- Children: 11 to 13 gm/dL
- Adult males: 14 to 18 gm/dL
- Adult women: 12 to 16 gm/dL
- Men after middle age: 12.4 to 14.9 gm/dL
- Women after middle age: 11.7 to 13.8 gm/dL

A low haemoglobin level is referred to as anemia or low red blood count.

Chemistry of Urine:

Urine is a liquid produced by the kidneys to remove waste products from the bloodstream. Human urine is yellowish in colour and variable in chemical composition, but here is a list of its primary components.

Primary Components

Human urine consists primarily of water (91-96%), with organic solutes including urea, creatinine, uric acid, and trace amounts of enzymes, carbohydrates and mucins, and inorganic ions such as sodium (Na^+), potassium (K^+), chloride (Cl^-), magnesium (Mg^{2+}), calcium (Ca^{2+}), ammonium (NH_4^+), sulfates (SO_4^{2-}), and phosphates (e.g., PO_4^{3-}).

Representative Chemical Composition of Urine

- Water: 95%
- Urea: 9.3 g/l to 23.3 g/l
- Chloride (Cl^-): 1.87 g/l to 8.4 g/l
- Sodium (Na^+): 1.17 g/l to 4.39 g/l
- Potassium (K^+): 0.750 g/l to 2.61 g/l
- Creatinine: 0.67 g/l to 2.15 g/l
- Inorganic sulfur (S): 0.16 to 1.80 g/l

ANEMIA:

Anemia is defined as a low number of red blood cells. In a routine blood test, anemia is reported as a low haemoglobin or hematocrit. If you have anemia, your haemoglobin level will be low too. If it is low enough, tissues or organs may not get enough oxygen.

It affects almost 6% of the population in USA. Women, young children, and people with long-term diseases are more likely to have anemia. Important things to remember are:

- Certain forms of anemia are passed down through the genes, and infants may have it from birth.
- Women are at risk of iron-deficiency anemia because of blood loss from their periods and higher blood supply demands during pregnancy.
- Older adults have a greater risk of anemia because they are more likely to have kidney disease or other chronic medical conditions.

Anemia Symptoms

Symptoms generally include:

- Dizziness, lightheadness, or feeling like you are about to pass out
- Fast or unusual heartbeat
- Headache
- Pain, including in your bones, chest, belly, and joints
- Problems with growth, for children and teens
- Shortness of breath
- Skin that's pale or yellow
- Cold hands and feet
- Tiredness or weakness

Anemia Types and Causes

There are more than 400 types of anemia, and they're divided into three groups:

- Anemia caused by blood loss
- Anemia caused by decreased or faulty red blood cell production
- Anemia caused by destruction of red blood cells

Anemia Treatment

Treatment will depend on your type of anemia.

Necessary to take medication that will hold back your immune system, probably need to take iron supplements and maintain diet of iron rich foods to improve the haemoglobin level.

Unit- IV

ENZYMES

ENZYMES

The human body is composed of different types of cells, tissues, and other complex organs. In order to function efficiently, there are certain chemicals released by our body to speed up the biological processes like digestion, respiration, excretion, and other metabolic activities in order to maintain a healthy life. Thus, enzymes play an important role in all living organisms by regulating all the biological processes.

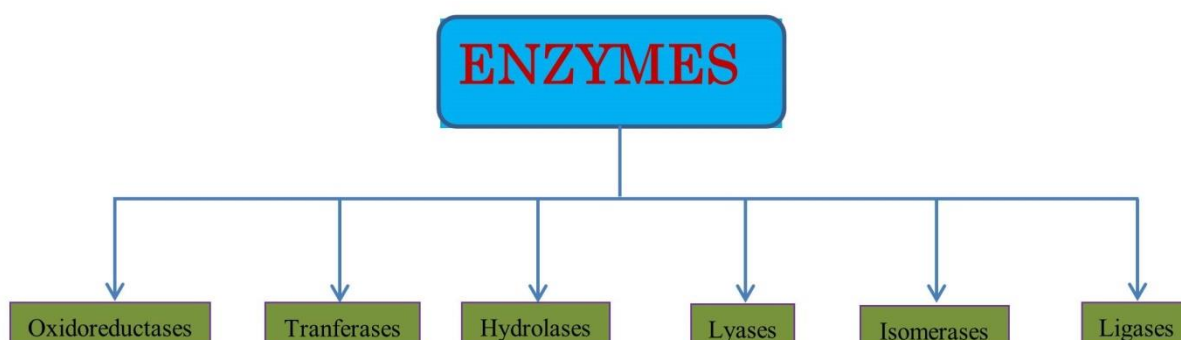
Definition: “Enzymes can be defined as biological polymers that catalyse biochemical reactions.”

The vast majority of enzymes are proteins with catalytic capabilities that are essential for maintaining various life processes.

The initial stage of metabolic process depends upon the enzymes, which react with a molecule and is called the substrate. Enzymes convert the substrates into other distinct molecules and are called the products.

Enzymes exist in all fluids and tissues of the body. Almost all the significant life processes are based on the enzyme functions.

Enzymes Classification (Types)



Enzymes classifications in detail:

Types	Biochemical Property
Oxidoreductases	The enzyme Oxidoreductase catalyzes the oxidation reaction where the electrons tend to travel from one form of a molecule to the other.
Transferases	The Transferases enzymes help in the transportation of the functional group among acceptors and donors molecules.
Hydrolases	Hydrolases are hydrolytic enzymes, which catalyze the hydrolysis reaction by adding water to cleave the bond and hydrolyze it.
Lyases	Adds water, carbon dioxide or ammonia across double bonds or eliminate these to create double bonds.
Isomerases	The Isomerases enzymes catalyze the structural shifts present in a molecule, thus causing the change in the shape of the molecule.
Ligases	The Ligases enzymes are known to charge the catalysis of a ligation process.

Functions/Action of Enzymes

The enzymes perform a number of functions in our body. These include:

1. Enzymes help in signal transduction. The most common enzyme used in the process includes protein kinase that catalyzes the phosphorylation of proteins.
2. Enzymes breakdown large into smaller molecules that can be easily absorbed by the body.
3. It helps in generating energy in the body. ATP synthases are the enzymes involved in the synthesis of energy.
4. Enzymes are responsible for the movement of ions across the plasma membrane.
5. Enzymes perform a number of biochemical reactions, including oxidation, reduction, hydrolysis, etc. to eliminate the non-nutritive substances from the body.
6. To reorganize the internal structure of the cell to regulate cellular activities.

Examples of Enzymes

Following are some of the examples of enzymes:

Beverages: Alcoholic beverages generated by fermentation vary a lot based on many factors. Based on the type of the plant's product, which is to be used and the type of the enzyme applied, the fermented product varies. Beers, wines and other drinks are produced from plant fermentation.

Food Products: Bread can be considered as the finest example of fermentation in our everyday life.

Hormones:

Hormones are special chemicals that are released in the body that controls and regulate the activity of certain cells and organs. These hormones are secreted by the Endocrine glands.

They function in the regulation of physiological activities and in maintaining homeostasis in the body.

They are transported to the target cells/ tissue/organ via blood circulation. Their actions are species specific and mostly water soluble. They are low in molecular weight and chemically heterogeneous substances.

Characteristics of Hormones:

- Hormones are secreted by endocrine cells.
- Hormones are chemical messengers.
- They are chemical signals that circulate in the body fluids.
- The hormones regulate the behaviour of the target cells.
- Hormones, unlike enzymes do not catalyze any reaction.
- They are secreted only when needed, they are not stored prior to requirement.
- Hormones may be proteinaceous or non-proteinaceous in nature (aminoacids & steroids).
- The secretion of hormones is regulated by the nervous system through the feedback effect.
- Hormones usually cause long term effects like change in behaviour, growth, etc.
- Hormones function is to stimulate or inhibit the target organs.

Hormones are the chemical substances which coordinate the activities of living organisms and also their growth. They are secreted by special tissues in our body through endocrine glands. Different hormones have different effects on the shape of the body. Some of these hormones work quickly to start or stop a process and some will continually work over a long period of time to perform their functions.

Essential Hormones: The hormones which help body growth, development, metabolism, sexual function, reproduction are the essential hormones as follows.

1. Hormones of Thyroid: Thyroid gland basically releases two hormones Triiodothyronine (T3) and Thyroxine (T4), which helps in controlling the metabolism of our body. Further these hormones regulates weight, determines energy levels, internal body temperature, skin, hair etc.

2. Insulin: This hormone is released by pancreas, a leaf like gland located in the abdominal cavity behind the stomach. It allows the body to use glucose or sugar from carbohydrates in the food for energy or to store glucose for future use. It helps in keeping blood sugar level from getting too high i.e. hyperglycemia or too low i.e. hypoglycemia.

3. Estrogen: It is a female sex hormone released by the ovaries. It is responsible for the reproduction, menstruation and menopause. Excess of estrogen in the female body increases the risk of breast cancer, uterine cancer, depression, moodiness etc. If estrogen level is less in female body leads to acne, skin lesions, thinning skin, hair loss etc.

4. Serotonin: It is a mood-boosting effect hormone or also known as nature's feel-good chemical. It is associated with learning and memory, regulating sleep, digestion, regulates mood, some muscular functions etc. Due to the imbalance of serotonin in the body, brain does not produce enough of the hormone to regulate mood or stress level. Low level of serotonin causes depression, migraine, weight gain, insomnia, craving of carbohydrate etc. Excess level of serotonin in the body causes agitation, stage of confusion, sedation etc.

5. Cortisol: This hormone is produced by the adrenal gland. It helps you stay healthy and energetic. Its main role is to control physical and psychological stress. In danger condition it increases heart rate, blood pressure, respiration etc. At stressful times body secretes cortisol to cope up with the situation.

6. Adrenaline: Adrenaline hormone is secreted in the medulla in the adrenal gland as well as some of the central nervous system's neurons. It is also known as emergency hormone because it initiates the quick reaction which makes the individual to think and respond quickly to the stress. It increases the metabolic rate, dilation of blood vessels going to the heart and the brain. During stressful situation, adrenaline quickly releases in to the blood, send impulses to the organs to create a specific response.

7. Growth Hormone: It is also known as somatotropin hormone. It is basically a protein hormone having 190 amino acids which is synthesised and secreted by the cells called somatotrophs in the anterior pituitary. It stimulates growth, cell reproduction cell regeneration and in boosting metabolism. It is important in human development.

Unit- V

COMMON DISEASES

Common diseases: A disease is a particular abnormal condition that negatively affects the structure or function of all or part of an organism, and that is not due to any immediate external injury. Diseases are often known to be medical conditions that are associated with specific symptoms and signs.

In humans, disease is often used more broadly to refer to any condition that causes pain, dysfunction, distress, social problems, or death to the person affected, or similar problems for those in contact with the person.

Here we have some of the common disease and its causes and remedies to healthy life, Vomiting, Fever, Ulcer, Night blindness, Jaundice and diabetes.

NAUSEA/VOMITING:

Nausea is an uneasiness of the stomach that often comes before vomiting. Vomiting is the forcible voluntary or involuntary emptying ("throwing up") of stomach contents through the mouth.

Causes of Nausea or Vomiting

Nausea and vomiting are not diseases, but they are symptoms of many conditions such as,

- Motion sickness or seasickness
- Early stages of pregnancy (nausea occurs in approximately 50%-90% of all pregnancies; vomiting in 25%-55%)
- Intense pain
- Emotional stress (such as fear)
- Gallbladder disease
- Food poisoning
- Infections (such as the "stomach flu")
- Overeating
- A reaction to certain smells or odours
- Heart attack
- Concussion or brain injury

The timing of the nausea or vomiting can indicate the cause. When appearing shortly after a meal, nausea or vomiting may be caused by food poisoning, gastritis (inflammation of the stomach lining), and ulcer.

Remedies, Tips for Vomiting and Nausea:

Vomiting is often your body's way of purging a contaminated substance. It's also possible to feel queasy and not vomit. Although in some cases, nausea goes away after vomiting.

Try deep breathing, Eat bland crackers, Wrist acupressure, Drink more fluids, Try ginger, fennel, or cloves, Aromatherapy, Medications to stop vomiting.

Call your doctor if:

- Vomiting for more than two days.
- Child vomits for more than one day.

Get emergency medical help if vomiting is accompanied by:

- Chest Pain
- Severe Abdominal Pain
- Blurred Vision
- Dizziness or Fainting

- High Fever
- Stiff Neck
- Cold, Clammy, Pale Skin
- Severe Headache
- Unable to Keep Food or Liquids down for 12 Hours.

FEVER:

Fever is when a human's body temperature goes above the normal range of 36–37° C (98–100° F). As the body temperature goes up, the person may feel cold until it levels off and stops rising.

High body temperature, or fever, is one of the ways our immune system attempts to combat an infection. Usually, the rise in body temperature helps the individual resolve an infection. However, sometimes it may rise too high, in which case, the fever can be serious and lead to complications.

Symptoms

When somebody has a fever, signs and symptoms are linked to what is known as sickness behaviour, and may include as follows,

Temperature can be measured in the mouth, rectum (anus), under the arm, or inside the ear.

- Feeling Cold when nobody else does
- Shivering, Lack of appetite
- Dehydration — preventable if the person drinks plenty of fluids
- Depression
- Increased Sensitivity to pain
- Lethargy
- Sleepiness
- Sweating

If the fever is high, there may also be extreme irritability, confusion, delirium, and seizures.

Treatment

“Non-steroidal anti-inflammatory drugs” (NSAIDs) such as aspirin or ibuprofen can help bring a fever down. These are available to purchase over-the-counter or online. However, a mild fever may be helping combat the bacterium or virus that is causing the infection. It may not be ideal to bring it down.

If the fever has been caused by a bacterial infection, the doctor may prescribe an antibiotic.

If a fever has been caused by a cold, which is caused by a viral infection, NSAIDs may be used to relieve uncomfortable symptoms. Antibiotics have no effect against viruses and will not be prescribed by your doctor for a viral infection.

Fluid intake: Anyone with a fever should consume plenty of fluids to prevent dehydration. Dehydration will complicate any illness.

Heat stroke: NSAIDs will not be effective if the person's fever was caused by hot weather or sustained strenuous exercise. The patient needs to be cooled. If they are confused or unconscious, they should be treated by a doctor straight away.

ULCER:

An **ulcer** is a discontinuity or break in a bodily membrane that impedes normal function of the affected organ. Common forms of ulcers recognized in medicine includes as,

- **Ulcer** (dermatology), a discontinuity of the skin or a break in the skin.
- **Pressure ulcers**, also known as bedsores.
- **Genital ulcer**, an ulcer located on the genital area.
- **Diabetic foot ulcer**, a major complication of the diabetic foot.
- **Corneal ulcer**, an inflammatory or infective condition of the cornea.
- **Mouth ulcer**, an open sore inside the mouth.
- **Stress ulcer**, an ulcer located within the stomach and proximal duodenum.

Peptic/Stomach Ulcer:

Causes: Ulcers form when digestive juices damage the walls of the stomach or small intestine. If the mucus layer gets too thin or your stomach makes too much acid, your gut will feel it.

- Continuous intakes of drugs, long break of taking food.
- Lack of water level in the body.
- High fatty & spicy food in night, cause difficulties to digest may leads to stomach ulcer.
- Smoking cigarettes and drinking alcohol also can make you more likely to get ulcers.

Treatment:

- Some peptic ulcers heal on their own. But if you don't treat them, it tends to come back.
- Intake antacids to fight stomach acid, or get medicine to reduce the acid in your body.

NIGHT BLINDNESS:

Night blindness is a type of vision impairment. People with night blindness experience poor vision at night or in dimly lit environments.

- Although the term “night blindness” implies that you can't see at night, this isn't the case.
- You may just have more difficulty seeing or driving in darkness. Some types of night blindness are treatable while other types aren't.
- Based on cause of the problem, steps to taken for correct the vision.

A few eye conditions can cause night blindness, such as

- Near-sightedness or blurred vision when looking at faraway objects.
- Cataracts, or clouding of the eye's lens
- Usher syndrome, a genetic condition that affects both hearing and vision.
- Older adults more likely to have night blindness due to cataracts than children or young.

Treatment:

Detailed examination of doctor's advice diagnose the night blindness and treat,

- i. Night blindness by near-sightedness: Corrective lenses, such as eyeglasses can improve near-sighted vision.
- ii. By cataracts deficiency: Cataracts can be removed through surgery.
- iii. By vitamin A deficiency: Take vitamin supplements as directed by doctors suggestion.

JAUNDICE:

Jaundice is a term used to describe a yellowish tinge to the skin and the whites of the eye. Body fluids may also be yellow.

The colour of the skin and whites of the eyes will vary depending on levels of bilirubin. Bilirubin is a waste material found in the blood. Jaundice normally indicates a problem with the liver or bile duct.

- Jaundice is caused by a build-up of bilirubin, a waste material, in the blood.
- An inflamed liver or obstructed bile duct can lead to jaundice, as well as other underlying conditions.
- Symptoms include a yellow tinge to the skin and whites of the eyes, dark urine, and itchiness.
- Diagnosis of jaundice can involve a range of tests.

If there is too much bilirubin, it can leak into the surrounding tissues. This is known as hyperbilirubinemia, and it causes the yellow colour in the skin and eyes.

Causes to Jaundice:

Acute inflammation of the liver, inflammation of the bile duct, Gilbert's syndrome, Cholestasis: interrupts the flow of bile from the liver.

Treatment:

- Anemia-induced jaundice: Treated by boosting the amount of iron in the blood by either taking iron supplements or eating more iron-rich foods.
- Hepatitis-induced jaundice: Antiviral or steroid medications.
- Obstruction-induced jaundice: By surgically removing the obstruction.
- Jaundice by medication: Treatment involves changing to an alternative medication.

DIABETES:

Diabetes mellitus, commonly known as diabetes, is a metabolic disease that causes high blood sugar. The hormone insulin moves sugar from the blood into your cells to be stored or used for energy.

Diabetes causes may body either doesn't make enough insulin or can't effectively use the insulin it does make.

High blood sugar of diabetes can damage your nerves, eyes, kidneys, and other organs.

There are a few different types of diabetes:

- **Type 1 diabetes is an autoimmune disease:** The immune system attacks and destroys cells in the pancreas, where insulin is made.
- **Type 2 diabetes:** occurs when your body becomes resistant to insulin, and sugar builds up in your blood.
- **Prediabetes:** occurs when your blood sugar is higher than normal, but it's not high enough for a diagnosis of type 2 diabetes.
- **Gestational diabetes:** is high blood sugar during pregnancy. Insulin-blocking hormones produced by the placenta cause this type of diabetes.

General symptoms of diabetes include:

- increased hunger, increased thirst
- weight loss,
- frequent urination
- blurry vision
- extreme fatigue, sores that don't heal

Symptoms in men: In addition to the general symptoms of diabetes, men with diabetes may have a decreased sex drive, erectile dysfunction (ED), and poor muscle strength.

Symptoms in women: Women with diabetes can also have symptoms such as urinary tract infections, yeast infections, and dry, itchy skin.

Treatment:

- Healthy eating is a central part of managing diabetes. In some cases, changing the diet may be enough to control the disease.
- Insulin is the main treatment for type 1 diabetes. It replaces the hormone your body isn't able to produce.
- Diet and exercise can help some people manage type 2 diabetes. If lifestyle changes aren't enough to lower blood sugar, medication should be compulsory.
- For Gestational Diabetes: Need to monitor your blood sugar level several times a day during pregnancy. If it's high, dietary changes and exercise may be enough to bring it down.

Diabetes prevention

- ❖ Type 1 diabetes isn't preventable because it's caused by a problem with the immune system.
- ❖ Some causes of type 2 diabetes, such as your genes or age, aren't under your control either.
- ❖ Most diabetes prevention strategies involve making simple adjustments to your diet and fitness routine.

Here are a few things to delay or prevent type 2 diabetes:

- Get at least 150 minutes per week of aerobic exercise, such as walking or cycling.
- Avoid saturated and trans fats, along with refined carbohydrates, out of your diet.
- Eat more fruits, vegetables, fibrous materials and whole grains.
- Eat smaller portions, with free space in the stomach.
- Maintain body weight in the BMI range of 18-20.

These aren't the only ways to prevent diabetes. Discover more strategies that may help you avoid this chronic disease.

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