

Biology Basics

Physiology · Nutrition · Human Diseases

This study guide covers:

- Human body systems — digestion, respiration, circulation, skeletal-muscular system
- Nutrients — protein, carbohydrates, fat, vitamins, minerals
- Deficiency diseases — vitamin and mineral deficiency disorders
- Human diseases — infectious diseases, their causes and prevention methods
- Exam-important points and quick-revision facts

Chapter 1 — Human Physiology

1.1 Digestive System

The system that breaks down food into simpler forms that the body can absorb is called the digestive system. It is arranged in the order: mouth → oesophagus → stomach → small intestine → large intestine → anus.

Organ	Function
Mouth	Chews food and mixes it with saliva (salivary amylase begins breaking down starch)
Stomach	Digests protein using hydrochloric acid and the enzyme pepsin
Small Intestine	Completes digestion with bile from the liver and pancreatic enzymes; nutrients are absorbed here
Large Intestine	Absorbs water and minerals; solidifies waste
Liver	Secretes bile; the largest gland in the body
Pancreas	Secretes insulin and digestive enzymes

Exam Tip: "The largest gland in the body — the liver", "The organ that secretes insulin — the pancreas" are frequently asked direct questions.

1.2 Respiratory System

The system that supplies the body with the oxygen it needs and removes carbon dioxide. It is arranged in the order: nose → trachea → bronchi → lungs → alveoli.

- Humans have **two lungs**; the right lung is slightly larger than the left.
- Gas exchange takes place in the alveoli (air sacs) of the lungs.
- Average resting breathing rate: 12–16 breaths per minute (in adults).

1.3 Circulatory System

The system that pumps blood throughout the body, carrying nutrients and oxygen. It consists of the heart, blood vessels, and blood.

Organ/Component	Detail
Heart	Has 4 chambers — 2 upper chambers (Atria), 2 lower chambers (Ventricles)

Artery	Carries blood from the heart to the body's organs
Vein	Carries blood from the body's organs back to the heart
Red Blood Cells (RBC)	Carry oxygen via haemoglobin
White Blood Cells (WBC)	Provide immunity; fight infections
Platelets	Help in blood clotting

Remember: Blood groups were discovered by **Karl Landsteiner** — there are four main blood groups: A, B, AB, and O. Type O is called the "Universal Donor".

1.4 Skeletal & Muscular System

- An adult human body has **206 bones**.
- The largest bone in the body: **the Femur (thigh bone)**
- The smallest bone in the body: **the Stapes**, in the ear
- The connective tissue joining bones to bones: **Ligament**
- The connective tissue joining muscles to bones: **Tendon**

Chapter 1 — Summary

- The liver is the body's largest gland; the pancreas secretes insulin.
- The heart has 4 chambers; arteries carry blood away from the heart, veins carry blood back to it.
- Blood groups A, B, AB, O — discovered by Karl Landsteiner.
- Adults have 206 bones; the femur is the largest, the stapes the smallest.

Chapter 2 — Nutrition

2.1 Types of Nutrients

Nutrient	Function	Sources
Carbohydrates	Provide energy to the body	Rice, wheat, potato
Protein	Builds and repairs body tissues	Pulses, eggs, milk, meat
Fat	Stores energy; insulates the body	Oil, ghee, butter
Vitamins	Needed for the body's metabolism and immunity	Fruits, vegetables
Minerals	Needed for bone/tooth growth, blood formation, and more	Milk, leafy vegetables, salt
Fibre	Aids digestion	Grains, vegetables
Water	Essential for all bodily functions	Drinking water

2.2 Vitamins — Types and Sources

Vitamin	Chemical Name	Sources	Deficiency Disease
Vitamin A	Retinol	Carrot, cheese, fish liver oil	Night Blindness
Vitamin B1	Thiamine	Grains, pulses	Beriberi
Vitamin B2	Riboflavin	Milk, eggs	Cheilosis (cracked lips)
Vitamin B3	Niacin	Meat, peanuts	Pellagra
Vitamin C	Ascorbic acid	Gooseberry (amla), citrus fruits	Scurvy
Vitamin D	Calciferol	Sunlight, eggs, fish	Rickets — in children
Vitamin E	Tocopherol	Vegetable oil, nuts	Infertility
Vitamin K	Phylloquinone	Leafy vegetables	Poor blood clotting

Exam Tip: "Disease caused by Vitamin C deficiency — Scurvy", "Disease caused by Vitamin D deficiency — Rickets" — vitamin-disease matching questions are very common in TNPSC. Also memorize the chemical names of the vitamins.

2.3 Key Minerals and Deficiencies

Mineral	Need	Deficiency Condition
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Calcium	Bone and tooth growth	Weak bones
Iron	Haemoglobin production	Anaemia
Iodine	Thyroid gland function	Goitre
Sodium	Nerve and muscle function	Muscle cramps, weakness

Chapter 2 — Summary

- Carbohydrates, protein, fat — the primary macronutrients.
- Vitamin C deficiency → Scurvy; Vitamin D deficiency → Rickets; Vitamin A deficiency → Night Blindness.
- Iron deficiency → Anaemia; Iodine deficiency → Goitre.

Chapter 3 — Human Diseases

3.1 Classification of Diseases

Type	Causative Agent	Examples
Bacterial diseases	Bacteria	Tuberculosis, cholera, typhoid
Viral diseases	Virus	Common cold, influenza, polio, chickenpox
Parasitic diseases	Parasites	Malaria, dengue
Fungal diseases	Fungi	Skin fungal infections
Deficiency diseases	Nutritional deficiency	Scurvy, rickets, beriberi

3.2 Major Infectious Diseases

Disease	Causative Agent	Mode of Transmission
Tuberculosis	Mycobacterium tuberculosis (bacterium)	Airborne (coughing, sneezing)
Cholera	Vibrio cholerae (bacterium)	Contaminated water and food
Typhoid	Salmonella typhi (bacterium)	Contaminated water and food
Malaria	Plasmodium (parasite)	Bite of the female Anopheles mosquito
Dengue	Dengue virus	Bite of the Aedes mosquito
Polio	Poliovirus	Contaminated water and food
Chickenpox	Varicella zoster virus	Airborne and direct contact
AIDS	HIV virus	Infected blood, sexual contact

Exam Tip: "Mosquito that transmits malaria — female Anopheles", "Mosquito that transmits dengue — Aedes" are questions repeatedly asked in TNPSC. Memorize the disease-cause-transmission triad together.

3.3 Vaccines

Disease	Vaccine Discovered By
Smallpox	Edward Jenner
Rabies	Louis Pasteur

Polio	Jonas Salk
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Note: The World Health Organization (WHO) declared smallpox completely eradicated in 1980 — it was the first disease to be completely eradicated through vaccination.

3.4 Non-Communicable Diseases

Disease	Detail
Diabetes	Caused by insulin deficiency or malfunction
Hypertension	Blood pressure higher than normal
Cancer	Uncontrolled growth of body cells

Chapter 3 — Summary

- Tuberculosis, cholera, typhoid — bacterial diseases.
- Malaria — spread by the female *Anopheles* mosquito; dengue — spread by the *Aedes* mosquito.
- Edward Jenner — smallpox vaccine; Louis Pasteur — rabies vaccine; Jonas Salk — polio vaccine.
- Diabetes, hypertension, cancer — non-communicable diseases.

Quick Revision — Key Facts

Fact	Detail
Bones in an adult human body	206
Largest bone	Femur (thigh bone)
Largest gland	Liver
Blood groups	A, B, AB, O (discovered by Karl Landsteiner)
Universal blood donor	Type O

Disease	Cause	Mode of Transmission
Malaria	Plasmodium	Female Anopheles mosquito
Dengue	Dengue virus	Aedes mosquito
Tuberculosis	Bacterium	Airborne
Cholera	Vibrio cholerae	Contaminated water/food