

NEET Biology Complete Notes - Quick Revision Guide

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HUMAN PHYSIOLOGY

1. DIGESTIVE SYSTEM

Parts:

- Mouth → Esophagus → Stomach → Small Intestine → Large Intestine → Rectum

Enzymes and Functions:

Enzyme	Source	Substrate	Product
Salivary amylase	Salivary glands	Starch	Maltose
Pepsin	Gastric glands	Protein	Peptones
Trypsin	Pancreas	Protein	Peptides
Lipase	Pancreas	Fats	Fatty acids + Glycerol
Maltase	Intestinal glands	Maltose	Glucose

Important Points:

- pH of stomach: 1.5-2.5 (acidic)
- Bile: Emulsifies fats (no enzyme)
- Vitamin B12 absorption: Ileum
- Water absorption: Large intestine

2. RESPIRATORY SYSTEM

Parts:

- Nasal cavity → Pharynx → Larynx → Trachea → Bronchi → Bronchioles → Alveoli

Respiratory Volumes:

- Tidal Volume (TV): 500 mL
- Inspiratory Reserve Volume (IRV): 2500-3000 mL

- Expiratory Reserve Volume (ERV): 1000-1100 mL
- Residual Volume (RV): 1100-1200 mL
- Vital Capacity: TV + IRV + ERV = 4000 mL
- Total Lung Capacity: VC + RV = 5000-6000 mL

Gas Exchange:

- O₂: Alveoli → Blood (diffusion)
- CO₂: Blood → Alveoli (diffusion)
- Oxygen binding: Hb + 4O₂ → HbO₈ (oxyhemoglobin)

Regulation:

- Respiratory center: Medulla oblongata
- Main stimulus: CO₂ concentration

###3. CIRCULATORY SYSTEM

Heart Structure:

- 4 Chambers: Right Atrium, Right Ventricle, Left Atrium, Left Ventricle
- 4 Valves: Tricuspid, Bicuspid (Mitral), Pulmonary, Aortic
- Pacemaker: SAN (Sinoatrial Node)

Cardiac Cycle:

1. Joint Diastole (0.4 sec): All chambers relax
2. Atrial Systole (0.1 sec): Atria contract
3. Ventricular Systole (0.3 sec): Ventricles contract Total: 0.8 seconds (72 beats/min)

Blood Components:

- Plasma: 55% (water, proteins, nutrients)
- RBC: 40-45% (no nucleus in mammals, contains Hb)
- WBC: <1% (immune function)
- Platelets: <1% (blood clotting)

Blood Groups:

Group	Antigen	Antibody	Can Donate To	Can Receive From
A	A	Anti-B	A, AB	A, O
B	B	Anti-A	B, AB	B, O
AB	A, B	None	AB	All (Universal Recipient)

O	None	Anti-A, Anti-B	All (Universal Donor)	O
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4. EXCRETORY SYSTEM

Kidney Structure:

- Cortex: Outer region, contains Bowman's capsule
- Medulla: Inner region, contains Loop of Henle
- Pelvis: Collects urine

Nephron (Functional Unit):

1. Glomerulus: Filtration (blood to Bowman's capsule)
2. Proximal Convolved Tubule (PCT): Reabsorption (glucose, amino acids, Na⁺)
3. Loop of Henle: Water reabsorption
4. Distal Convolved Tubule (DCT): Ionic balance
5. Collecting Duct: Water reabsorption (ADH regulation)

Urine Formation:

- Filtration: 180 L/day filtered
- Reabsorption: 178-179 L reabsorbed
- Secretion: H⁺, K⁺, NH₃
- Final urine: 1-1.5 L/day

Hormones:

- ADH (Antidiuretic Hormone): Increases water reabsorption
- Aldosterone: Increases Na⁺ reabsorption
- ANF (Atrial Natriuretic Factor): Decreases Na⁺ reabsorption

5. NEURAL SYSTEM

Neuron Structure:

- Cell body (Soma)
- Dendrites (receive signals)
- Axon (transmit signals)
- Synapse (junction between neurons)

Nerve Impulse:

- Resting potential: -70 mV
- Action potential: +40 mV

- All-or-none principle

Brain Parts:

Part	Function
Cerebrum	Thinking, memory, voluntary actions
Cerebellum	Balance, posture, coordination
Medulla	Involuntary actions (breathing, heartbeat)
Hypothalamus	Thermoregulation, hunger, thirst
Pituitary	Master gland (hormone secretion)

Reflex Arc: Receptor → Sensory neuron → Spinal cord → Motor neuron → Effector

6. ENDOCRINE SYSTEM

Major Glands and Hormones:

Gland	Hormone	Function
Pituitary (Anterior)	GH	Growth
	TSH	Stimulates thyroid
	ACTH	Stimulates adrenal cortex
	FSH, LH	Reproductive
Pituitary (Posterior)	ADH	Water reabsorption
	Oxytocin	Uterine contraction, milk ejection
Thyroid	T3, T4	Metabolism
	Calcitonin	Lowers blood Ca^{2+}
Parathyroid	PTH	Increases blood Ca^{2+}
Adrenal (Cortex)	Aldosterone	Na^+ reabsorption
	Cortisol	Stress response
Adrenal (Medulla)	Adrenaline	Fight or flight
Pancreas	Insulin	Lowers blood glucose
	Glucagon	Increases blood glucose
Thymus	Thymosin	T-cell maturation
Pineal	Melatonin	Sleep cycle

7. IMMUNE SYSTEM

Types of Immunity:

1. Innate (Non-specific): Physical barriers, phagocytes, NK cells
2. Acquired (Specific): B cells, T cells, antibodies

B Cells vs T Cells:

Feature	B Cells	T Cells
Origin	Bone marrow	Thymus
Function	Produce antibodies	Cell-mediated immunity
Types	Plasma cells, Memory cells	Helper T, Cytotoxic T, Suppressor T

Antibody Structure:

- Y-shaped protein (immunoglobulin)
- 4 chains: 2 heavy, 2 light
- Variable region: Antigen binding
- Constant region: Effector function

Types of Immunity:

- Active: Natural (infection), Artificial (vaccination)
- Passive: Natural (mother to child), Artificial (antibody injection)

PLANT PHYSIOLOGY

8. PHOTOSYNTHESIS

Overall Equation: $6\text{CO}_2 + 12\text{H}_2\text{O} + \text{Light} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 6\text{H}_2\text{O}$

Light Reaction (Thylakoid):

- Photolysis of water: $2\text{H}_2\text{O} \rightarrow 4\text{H}^+ + 4\text{e}^- + \text{O}_2$
- Products: ATP, NADPH, O_2

Dark Reaction (Stroma - C3 Pathway):

1. CO_2 fixation: $\text{CO}_2 + \text{RuBP} \rightarrow 2\text{PGA}$ (3-carbon)
2. Reduction: $\text{PGA} \rightarrow \text{G3P}$ (using ATP and NADPH)
3. Regeneration: $\text{G3P} \rightarrow \text{RuBP}$
4. Product: Glucose

C4 Pathway:

- CO₂ fixed as OAA (4-carbon) in mesophyll
- OAA → Malate → Bundle sheath → CO₂ released
- Higher efficiency, no photorespiration
- Examples: Maize, Sugarcane

CAM Pathway:

- CO₂ fixed at night, stored as malate
- Released during day for Calvin cycle
- Examples: Pineapple, Cactus

9. RESPIRATION

Overall Equation: $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 38 \text{ ATP}$

Steps:

1. Glycolysis (Cytoplasm):

- Glucose → 2 Pyruvate
- Net ATP: 2
- NADH: 2

2. Krebs Cycle (Mitochondrial matrix):

- 2 Pyruvate → 6CO₂
- ATP: 2
- NADH: 6
- FADH₂: 2

3. Electron Transport Chain (Inner mitochondrial membrane):

- NADH oxidation → ATP synthesis
- ATP from NADH: 3 ATP per NADH
- ATP from FADH₂: 2 ATP per FADH₂
- Total ATP: 34

Total ATP Yield:

- Glycolysis: 8 ATP (2 direct + 2 NADH × 3)
- Krebs: 30 ATP (2 direct + 6 NADH × 3 + 2 FADH₂ × 2)
- Total: 38 ATP

10. PLANT GROWTH REGULATORS

Auxins:

- Function: Cell elongation, apical dominance, root initiation
- Example: IAA (Indole-3-acetic acid)

Gibberellins:

- Function: Stem elongation, seed germination
- Example: GA₃

Cytokinins:

- Function: Cell division, delay senescence
- Example: Zeatin

Abscisic Acid (ABA):

- Function: Stomatal closure, seed dormancy (stress hormone)

Ethylene:

- Function: Fruit ripening, leaf abscission

GENETICS & EVOLUTION

11. MENDEL'S LAWS

Law of Dominance:

- In heterozygous, dominant allele expresses

Law of Segregation:

- Alleles separate during gamete formation
- F₂ ratio: 3:1 (phenotype), 1:2:1 (genotype)

Law of Independent Assortment:

- Genes for different traits assort independently
- Dihybrid F₂ ratio: 9:3:3:1

Deviations:

- Incomplete dominance: F2 = 1:2:1 (Red:Pink:White)
- Co-dominance: Both alleles express (AB blood group)
- Multiple alleles: >2 alleles in population (ABO blood)

12. MOLECULAR BASIS

DNA Structure:

- Double helix (Watson & Crick)
- Sugar: Deoxyribose
- Bases: A-T (2 H-bonds), G-C (3 H-bonds)
- Antiparallel strands

Central Dogma: DNA → RNA → Protein (Replication) (Transcription) (Translation)

Genetic Code:

- Triplet code (3 bases = 1 amino acid)
- Degenerate (multiple codons for same amino acid)
- Universal (same in all organisms)
- Non-overlapping
- Start codon: AUG (Methionine)
- Stop codons: UAA, UAG, UGA

13. EVOLUTION

Theories:

- **Lamarckism:** Use and disuse, inheritance of acquired characters (Disproved)
- **Darwinism:** Natural selection, survival of fittest
- **Neo-Darwinism:** Darwin + Mutation theory

Hardy-Weinberg Principle:

- $p^2 + 2pq + q^2 = 1$
- $p + q = 1$
- Conditions: No mutation, random mating, no gene flow, large population, no selection

Evidence of Evolution:

- Homologous organs: Same structure, different function (divergent)
- Analogous organs: Different structure, same function (convergent)
- Vestigial organs: Lost function (appendix, coccyx)
- Fossils: Paleontological evidence

ECOLOGY

14. ECOSYSTEM

Components:

- Biotic: Producers, Consumers, Decomposers
- Abiotic: Light, Temperature, Water, Soil

Energy Flow:

- 10% Law: Only 10% energy transfers to next trophic level
- Unidirectional: Sun → Producers → Consumers

Food Chain:

- Grazing: Grass → Grasshopper → Frog → Snake
- Detritus: Dead matter → Decomposers

Biogeochemical Cycles:

1. **Carbon Cycle:** Atmosphere ↔ Plants (photosynthesis/respiration)
2. **Nitrogen Cycle:**
 - N₂ fixation: Rhizobium, Azotobacter
 - Nitrification: Nitrosomonas (NH₃ → NO₂⁻), Nitrobacter (NO₂⁻ → NO₃⁻)
 - Denitrification: Pseudomonas (NO₃⁻ → N₂)
3. **Phosphorus Cycle:** Rocks → Soil → Plants → Animals

15. BIODIVERSITY

Levels:

1. Genetic diversity
2. Species diversity
3. Ecosystem diversity

Hotspots in India:

- Western Ghats
- Eastern Himalayas
- Indo-Burma

- Sundaland

Threats:

- Habitat loss
- Over-exploitation
- Pollution
- Climate change

Conservation:

- In-situ: National parks, Wildlife sanctuaries
 - Ex-situ: Seed banks, Botanical gardens
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REPRODUCTION

16. HUMAN REPRODUCTION

Male Reproductive System:

- Testes: Produce sperm and testosterone
- Epididymis: Sperm maturation
- Vas deferens: Sperm transport
- Seminal vesicle, Prostate: Secrete seminal fluid

Female Reproductive System:

- Ovary: Produce egg and hormones
- Fallopian tube: Fertilization site
- Uterus: Fetal development
- Vagina: Birth canal

Menstrual Cycle (28 days):

1. Menstrual phase (Days 1-5): Shedding of endometrium
2. Follicular phase (Days 6-13): FSH → follicle development
3. Ovulation (Day 14): LH surge → egg release
4. Luteal phase (Days 15-28): Corpus luteum → progesterone

Hormones:

- FSH: Follicle development

- LH: Ovulation, corpus luteum formation
- Estrogen: Secondary sexual characters, endometrium development
- Progesterone: Maintains pregnancy

17. PLANT REPRODUCTION

Sexual Reproduction:

- Flower parts: Sepals, Petals, Stamens (male), Carpel (female)
- Pollination: Self (same flower) or Cross (different flower)
- Fertilization: Double fertilization in angiosperms
 - Sperm + Egg → Zygote (2n) → Embryo
 - Sperm + Polar nuclei → Endosperm (3n)

Seed Structure:

- Embryo: Future plant
 - Endosperm: Food storage
 - Seed coat: Protection
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BIOTECHNOLOGY

18. DNA TECHNOLOGY

Tools:

- Restriction enzymes: Cut DNA at specific sites (EcoRI, BamHI)
- DNA ligase: Join DNA fragments
- Vectors: Plasmids, bacteriophages (carry foreign DNA)

PCR (Polymerase Chain Reaction):

1. Denaturation: 94°C (DNA strands separate)
2. Annealing: 55°C (Primers bind)
3. Extension: 72°C (DNA polymerase synthesizes) Result: Amplifies specific DNA region

Applications:

- Gene therapy
- Insulin production
- Bt cotton (pest resistant)

- Golden rice (Vitamin A enriched)