

# Cell Structure & Function – Quick Handwritten Style Notes

Based on NCERT Biology + Previous Year NEET Questions

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## CELL THEORY

- Proposed by Schleiden & Schwann
- Modified by Virchow
- “All cells arise from pre-existing cells”

### Important PYQ Point

❖ Virchow → Omnis cellula e cellula

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## TYPES OF CELLS

<b>Prokaryotic</b>	<b>Eukaryotic</b>
No true nucleus	True nucleus present
No membrane-bound organelles	Organelles present
Small size	Larger size
Example: Bacteria	Plants & Animals

### Easy Trick

“Pro = Primitive”

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## PLASMA MEMBRANE

- Made of phospholipid bilayer
- Selectively permeable
- Fluid mosaic model → Singer & Nicolson

## **Functions**

- ✓ Transport
- ✓ Protection
- ✓ Cell signaling

## **NEET Point**

- ❖ Fluidity increases due to cholesterol
- 

# **CELL WALL**

- Present in plant cells
- Made of cellulose
- Gives rigidity & shape

## **Functions**

- ✓ Protection
  - ✓ Prevents bursting
- 

# **NUCLEUS**

- Control center of cell
- Contains chromosomes
- Nuclear membrane has pores

## **Nucleolus**

→ Ribosome synthesis

## **Important**

- ❖ Largest organelle in animal cell = nucleus
-

# MITOCHONDRIA

## “Powerhouse of cell”

- Site of ATP production
- Double membrane
- Has own DNA & ribosomes

### NEET PYQ Point

❖ Semi-autonomous organelle

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# ENDOPLASMIC RETICULUM

## Rough ER

- Ribosomes present
- Protein synthesis

## Smooth ER

- Lipid synthesis
- Detoxification

### Easy Trick

RER → Rough = Ribosomes

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# GOLGI APPARATUS

- Packaging & secretion
- Modifies proteins

### Important

❖ Discovered by Camillo Golgi

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# LYSOSOMES

## “Suicidal bags”

- Digestive enzymes present
- Intracellular digestion

### NEET Point

❖ Formed from Golgi body

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# RIBOSOMES

- Site of protein synthesis
- Non-membranous organelle

### Types

- 70S → Prokaryotes
  - 80S → Eukaryotes
- 

# PLASTIDS

## Chloroplast

- Photosynthesis
- Chlorophyll pigment

### Types of Plastids

1. Chloroplast
  2. Chromoplast
  3. Leucoplast
-

# VACUOLE

- Large in plant cells
- Stores cell sap

## Tonoplast

→ Membrane surrounding vacuole

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# CYTOSKELETON

- Microtubules
- Microfilaments

## Functions

- ✓ Shape
  - ✓ Movement
- 

# CILIA vs FLAGELLA

<b>Cilia</b>	<b>Flagella</b>
Short	Long
Numerous	Few
Movement	Movement

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# CELL ORGANELLES – PYQ REVISION TABLE

<b>Organelle</b>	<b>Function</b>
Mitochondria	ATP production
Ribosome	Protein synthesis
Golgi body	Packaging

<b>Organelle</b>	<b>Function</b>
Lysosome	Digestion
Chloroplast	Photosynthesis
Nucleus	Control center

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## **IMPORTANT NEET QUESTIONS**

**Q1. Which organelle is called powerhouse?**

→ Mitochondria

**Q2. Which organelle contains hydrolytic enzymes?**

→ Lysosome

**Q3. Fluid mosaic model proposed by?**

→ Singer & Nicolson

**Q4. Site of protein synthesis?**

→ Ribosome

**Q5. Cell wall is made of?**

→ Cellulose

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## **QUICK REVISION TRICKS**

### **Membranous Organelles**

**“GELM”**

- G → Golgi
  - E → ER
  - L → Lysosome
  - M → Mitochondria
-

# MOST IMPORTANT NCERT LINES

- ✓ Cell is structural & functional unit of life
  - ✓ Ribosomes are non-membranous
  - ✓ Mitochondria have circular DNA
  - ✓ Plasma membrane is selectively permeable
  - ✓ Chloroplast has grana & stroma
- 

## LAST MINUTE NEET REVISION

Focus on:

- Cell organelle functions
  - Differences between prokaryote & eukaryote
  - Membrane models
  - Ribosomes
  - Plastids
  - Mitochondria features
- 

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## PLANT PHYSIOLOGY – Detailed NEET Handwritten Style Notes

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### 1. TRANSPORT IN PLANTS

Plants transport:

- Water
- Minerals
- Food

through vascular tissues.

<b>Tissue</b>	<b>Function</b>
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Xylem	Water transport
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Phloem	Food transport
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# **XYLEM**

## **Components**

1. Tracheids
2. Vessels
3. Xylem parenchyma
4. Xylem fibers

## **Important Points**

- ✓ Tracheids & vessels → dead cells
- ✓ Main conducting elements

## **NEET PYQ Point**

- ❖ Vessels absent in gymnosperms (except Gnetum)
- 

# **PHLOEM**

## **Components**

1. Sieve tubes
2. Companion cells
3. Phloem parenchyma
4. Phloem fibers

## **Important**

- ✓ Sieve tubes lack nucleus
  - ✓ Companion cells help sieve tubes
- 

# **ABSORPTION OF WATER**

Occurs mainly through:

## **Root hairs**

### **Pathways of Water Movement**

1. Apoplast pathway
2. Symplast pathway

### **Easy Trick**

**Apo = Around walls**

**Sym = Through cytoplasm**

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# **PLASMOLYSIS**

Loss of water from cell causing shrinkage.

Occurs in:

## **Hypertonic solution**

### **Important**

- ❖ Cell membrane pulls away from cell wall.
- 

# **OSMOSIS**

Movement of water from:

**Higher water potential → Lower water potential**

through semipermeable membrane.

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# TRANSPIRATION

## Definition

Loss of water as vapor from aerial parts.

## Types

1. Stomatal transpiration
  2. Cuticular transpiration
  3. Lenticular transpiration
- 

# FUNCTIONS OF TRANSPIRATION

- ✓ Cooling effect
  - ✓ Mineral transport
  - ✓ Ascent of sap
  - ✓ Maintains water balance
- 

# FACTORS AFFECTING TRANSPIRATION

<b>Increase</b>	<b>Decrease</b>
High temperature	High humidity
Wind	Darkness
Low humidity	Low temperature

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# STOMATA

Guard cells regulate opening & closing.

### **In dicots**

→ Kidney shaped

### **In monocots**

→ Dumbbell shaped

### **NEET Point**

❖ Guard cells contain chloroplasts.

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## **ASCENT OF SAP**

Upward movement of water through xylem.

### **Theory**

#### **Cohesion-Tension Theory**

Proposed by:

#### **Dixon & Joly**

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## **MINERAL NUTRITION**

Plants need:

- Macronutrients
  - Micronutrients
- 

## **MACRONUTRIENTS**

<b>Nutrient</b>	<b>Function</b>
Nitrogen	Proteins
Phosphorus	ATP
Potassium	Stomatal opening
Calcium	Cell wall
Magnesium	Chlorophyll

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## **MICRONUTRIENTS**

- Iron
  - Zinc
  - Copper
  - Boron
  - Manganese
  - Molybdenum
  - Chlorine
  - Nickel
- 

## **HYDROPONICS**

Growing plants in nutrient solution without soil.

### **Important**

- ❖ Developed by Julius von Sachs
- 

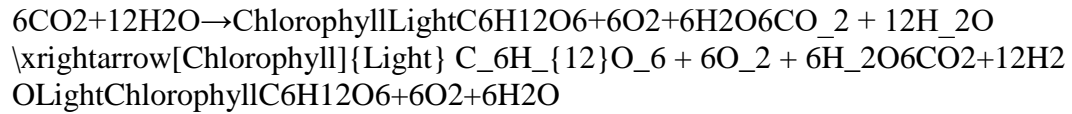
## **PHOTOSYNTHESIS**

### **Definition**

Conversion of light energy into chemical energy.

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## **PHOTOSYNTHESIS EQUATION**



## SITE OF PHOTOSYNTHESIS

### Chloroplast

#### Parts

1. Grana
  2. Stroma
- 

## PIGMENTS

Pigment	Color
Chlorophyll a	Blue green
Chlorophyll b	Yellow green
Carotenoids	Yellow/orange

#### Important

- ❖ Chlorophyll a = chief pigment
- 

## LIGHT REACTION

Occurs in:

### Grana

#### Products

- ✓ ATP
- ✓ NADPH
- ✓ O<sub>2</sub>

### **Photolysis**

Splitting of water molecule.

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## **DARK REACTION / CALVIN CYCLE**

Occurs in:

### **Stroma**

CO<sub>2</sub> fixation occurs.

**Important Enzyme**

### **RuBisCO**

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## **C3 PLANTS**

- First stable product = 3C compound
- Calvin cycle present

Examples:

- Wheat
  - Rice
- 

## **C4 PLANTS**

- First product = Oxaloacetic acid (4C)

Examples:

- Maize
- Sugarcane

### **Advantages**

- ✓ Less photorespiration
  - ✓ High productivity
- 

## **CAM PLANTS**

Open stomata at night.

Examples:

- Cactus
  - Pineapple
- 

## **PHOTORESPIRATION**

Occurs due to oxygenase activity of RuBisCO.

**Highest in:**

**C3 plants**

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## **RESPIRATION IN PLANTS**

### **Glycolysis**

Occurs in:

**Cytoplasm**

## **End Product**

Pyruvate

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# **KREBS CYCLE**

Occurs in:

**Mitochondrial matrix**

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# **ELECTRON TRANSPORT CHAIN**

Occurs in:

**Inner mitochondrial membrane**

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# **ATP YIELD**

<b>Process</b>	<b>ATP</b>
Glycolysis	2 ATP
Krebs cycle	2 ATP
ETC	32–34 ATP

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# **FERMENTATION**

## **Alcoholic fermentation**

Yeast converts glucose  $\rightarrow$  ethanol + CO<sub>2</sub>

## **NEET Point**

❖ Yeast = *Saccharomyces cerevisiae*

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# PLANT GROWTH & DEVELOPMENT

Growth regions:

1. Meristematic
2. Elongation
3. Maturation

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## PLANT HORMONES

<b>Hormone</b>	<b>Function</b>
Auxin	Cell elongation
Gibberellin	Stem growth
Cytokinin	Cell division
ABA	Dormancy
Ethylene	Fruit ripening

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## AUXIN

### Functions

- ✓ Apical dominance
- ✓ Phototropism
- ✓ Root initiation

### Important

- ❖ IAA = natural auxin

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## GIBBERELLINS

- ✓ Stem elongation
  - ✓ Break seed dormancy
- 

## **CYTOKININS**

- ✓ Cell division
  - ✓ Delay senescence
- 

## **ABA (Abscisic Acid)**

### **Stress hormone**

- ✓ Stomatal closure
  - ✓ Dormancy
- 

## **ETHYLENE**

### **Gaseous hormone**

- ✓ Fruit ripening
  - ✓ Senescence
- 

## **PHOTOPERIODISM**

Response to duration of light.

### **Types**

1. Long day plants

2. Short day plants
  3. Day neutral plants
- 

## **VERNALIZATION**

Induction of flowering by low temperature.

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## **IMPORTANT NEET PYQs**

### **Q1. Powerhouse of plant cell?**

→ Mitochondria

### **Q2. Chief photosynthetic pigment?**

→ Chlorophyll a

### **Q3. Which hormone promotes fruit ripening?**

→ Ethylene

### **Q4. Site of Calvin cycle?**

→ Stroma

### **Q5. Cohesion tension theory proposed by?**

→ Dixon & Joly

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## **MOST IMPORTANT NCERT LINES**

- ✓ Water movement occurs through xylem
- ✓ RuBisCO is most abundant protein
- ✓ C4 plants minimize photorespiration

- ✓ ABA is stress hormone
  - ✓ Ethylene is gaseous hormone
- 

# LAST MINUTE NEET REVISION

Focus on:

- Plant hormones
  - Photosynthesis
  - C3 vs C4
  - Mineral nutrition
  - Transpiration
  - Respiration
  - Xylem & phloem
  - RuBisCO
  - Photoperiodism
- 

## QUICK MEMORY TRICKS

### Plant Hormones

**“A Good Child Always Excels”**

- A → Auxin
  - G → Gibberellin
  - C → Cytokinin
  - A → ABA
  - E → Ethylene
- 

### Photosynthesis

**“Light in Grana, Dark in Stroma”**

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# HUMAN PHYSIOLOGY – Detailed NEET Handwritten Style Notes

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## HUMAN PHYSIOLOGY – CHAPTER LIST

1. Digestion & Absorption
  2. Breathing & Exchange of Gases
  3. Body Fluids & Circulation
  4. Excretory Products & Elimination
  5. Locomotion & Movement
  6. Neural Control & Coordination
  7. Chemical Coordination & Integration
- 

## 1. DIGESTION & ABSORPTION

### HUMAN DIGESTIVE SYSTEM

Alimentary canal includes:

- Mouth
  - Buccal cavity
  - Pharynx
  - Oesophagus
  - Stomach
  - Small intestine
  - Large intestine
  - Rectum
  - Anus
-

# DIGESTIVE GLANDS

1. Salivary glands
  2. Liver
  3. Pancreas
- 

## SALIVA

Contains:

### Salivary amylase (ptyalin)

#### Function

Converts:  
Starch → Maltose

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## STOMACH

### Gastric glands produce:

- HCl
- Pepsinogen
- Mucus

#### Important

❖ HCl activates pepsinogen → pepsin

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## SMALL INTESTINE

### Major site of digestion & absorption

#### Parts

1. Duodenum
  2. Jejunum
  3. Ileum
- 

## **BILE JUICE**

Produced by:

**Liver**

Stored in:

**Gall bladder**

**Function**

- ✓ Emulsification of fats

**Important**

- ❖ No digestive enzymes in bile.
- 

## **PANCREATIC JUICE**

Contains:

- Trypsin
- Lipase
- Amylase

**NEET Point**

- ❖ Trypsin digests proteins.
-

# VILLI

Finger-like projections in small intestine.

## Function

- ✓ Increase surface area for absorption
- 

# IMPORTANT DIGESTIVE ENZYMES

Enzyme	Function
Amylase	Carbohydrate digestion
Pepsin	Protein digestion
Trypsin	Protein digestion
Lipase	Fat digestion

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# COMMON NEET PYQs

**Q1. Largest gland in human body?**

→ Liver

**Q2. Functional unit of liver?**

→ Hepatic lobule

**Q3. Site of maximum absorption?**

→ Small intestine

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# 2. BREATHING & EXCHANGE OF GASES

## HUMAN RESPIRATORY SYSTEM

Includes:

- Nostrils
  - Nasal chamber
  - Pharynx
  - Larynx
  - Trachea
  - Bronchi
  - Lungs
- 

## LUNGS

Right lung → 3 lobes

Left lung → 2 lobes

### Important

❖ Left lung smaller due to heart.

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## ALVEOLI

Site of gaseous exchange.

### Features

- ✓ Thin walls
  - ✓ Rich blood supply
- 

## BREATHING MECHANISM

### Inspiration

- Diaphragm contracts
- Thoracic cavity volume increases

## Expiration

- Diaphragm relaxes
- 

## RESPIRATORY VOLUMES

Volume	Approx Value
Tidal Volume	500 mL
Inspiratory Reserve Volume	2500–3000 mL
Expiratory Reserve Volume	1000–1100 mL
Residual Volume	1100–1200 mL

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## OXYGEN TRANSPORT

Transported mainly by:

### Haemoglobin

**Oxyhaemoglobin formed in lungs.**

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## CO<sub>2</sub> TRANSPORT

Mostly transported as:

### Bicarbonate ions

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## COMMON DISEASES

Disease	Cause
Asthma	Allergy
Emphysema	Smoking

**Disease**    **Cause**  
Pneumonia    Infection

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## **IMPORTANT PYQ**

❖ Smoking damages alveolar walls → emphysema

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## **3. BODY FLUIDS & CIRCULATION**

### **BLOOD**

#### **Components**

1. Plasma
  2. RBCs
  3. WBCs
  4. Platelets
- 

### **RBCs**

Contain:

#### **Haemoglobin**

#### **Function**

✓ Oxygen transport

#### **Lifespan**

**120 days**

#### **Important**

❖ No nucleus in mammalian RBCs

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## **WBCs**

### **Body defense**

#### **Types**

- Granulocytes
  - Agranulocytes
- 

## **PLATELETS**

Function:

### **Blood clotting**

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## **BLOOD GROUPS**

### **ABO System**

Based on:

- Antigen A
- Antigen B

#### **Universal Donor**

#### **O blood group**

#### **Universal Recipient**

#### **AB blood group**

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# **RH FACTOR**

Discovered by:

**Landsteiner & Wiener**

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# **HUMAN HEART**

**Four chambers:**

- Right atrium
  - Right ventricle
  - Left atrium
  - Left ventricle
- 

# **HEART VALVES**

- ✓ Tricuspid valve
  - ✓ Bicuspid/Mitral valve
  - ✓ Semilunar valves
- 

# **CARDIAC CYCLE**

One complete heartbeat.

**Normal heart rate:**

**72 beats/min**

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# ECG

Electrocardiogram records electrical activity of heart.

## Important

❖ P wave → atrial depolarization

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# BLOOD VESSELS

Vessel	Function
Artery	Away from heart
Vein	Towards heart
Capillary	Exchange

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# BLOOD PRESSURE

Normal:

**120/80 mm Hg**

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# DOUBLE CIRCULATION

Blood passes heart twice in one cycle.

**Present in:**

**Humans**

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# IMPORTANT PYQs

**Q1. Universal donor?**

→ O group

**Q2. Heartbeat initiated by?**

→ SA node

**Q3. Largest artery?**

→ Aorta

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## **4. EXCRETORY PRODUCTS & ELIMINATION**

### **EXCRETORY SYSTEM**

Includes:

- Kidneys
  - Ureters
  - Urinary bladder
  - Urethra
- 

### **KIDNEY**

Functional unit:

#### **Nephron**

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### **NEPHRON PARTS**

1. Bowman's capsule
2. PCT

3. Loop of Henle
  4. DCT
  5. Collecting duct
- 

## URINE FORMATION

### Steps

1. Ultrafiltration
  2. Reabsorption
  3. Secretion
- 

## HORMONES INVOLVED

Hormone	Function
ADH	Water reabsorption
Aldosterone	Na <sup>+</sup> reabsorption

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## KIDNEY DISORDERS

Disease	Description
Uremia	Urea accumulation
Renal failure	Kidney malfunction
Kidney stones	Salt deposition

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## DIALYSIS

Artificial purification of blood.

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## 5. LOCOMOTION & MOVEMENT

# TYPES OF MUSCLES

<b>Muscle</b>	<b>Nature</b>
Skeletal	Voluntary
Smooth	Involuntary
Cardiac	Heart muscle

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# SARCOMERE

Functional unit of muscle.

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# JOINTS

<b>Joint</b>	<b>Example</b>
Ball & socket	Shoulder
Hinge	Elbow
Pivot	Atlas-axis

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# DISORDERS

<b>Disorder</b>	<b>Cause</b>
Arthritis	Joint inflammation
Osteoporosis	Low bone density
Myasthenia gravis	Autoimmune disorder

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# 6. NEURAL CONTROL & COORDINATION

## NEURON

Structural & functional unit of nervous system.

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# TYPES OF NEURONS

1. Sensory
2. Motor
3. Interneuron

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# PARTS OF BRAIN

<b>Part</b>	<b>Function</b>
Cerebrum	Intelligence
Cerebellum	Balance
Medulla	Involuntary actions

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# REFLEX ACTION

Quick automatic response.

**Reflex arc involved.**

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# IMPORTANT

❖ Myelin sheath formed by Schwann cells.

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# 7. CHEMICAL COORDINATION & INTEGRATION

# ENDOCRINE GLANDS

<b>Gland</b>	<b>Hormone</b>
Pituitary	Growth hormone
Thyroid	Thyroxine
Pancreas	Insulin
Adrenal	Adrenaline

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## **PITUITARY GLAND**

**“Master gland”**

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## **THYROID GLAND**

Hormone:

**Thyroxine**

Requires:

**Iodine**

**Deficiency**

→ Goitre

---

## **PANCREAS**

**Insulin**

Lowers blood glucose.

**Deficiency**

→ Diabetes mellitus

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# ADRENAL GLAND

Hormone:

**Adrenaline**

**Emergency hormone**

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## IMPORTANT PYQs

**Q1. Master gland?**

→ Pituitary

**Q2. Hormone lowering blood glucose?**

→ Insulin

**Q3. Deficiency of iodine causes?**

→ Goitre

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## MOST IMPORTANT NCERT LINES

- ✓ Nephron = structural & functional unit of kidney
  - ✓ SA node = pacemaker
  - ✓ Alveoli = gaseous exchange site
  - ✓ Villi increase absorption surface area
  - ✓ Pituitary = master gland
- 

## LAST MINUTE NEET REVISION

Focus on:

- Digestive enzymes
  - Respiratory volumes
  - Blood groups
  - Cardiac cycle
  - Nephron
  - Hormones
  - Brain parts
  - Muscle types
- 

## **QUICK MEMORY TRICKS**

### **Cranial order of digestive tract**

**“My Sexy Sister Likes Spicy Large Red Apples”**

- Mouth
  - Stomach
  - Small intestine
  - Large intestine
  - Rectum
  - Anus
- 

### **Heart valves**

**“Try Pulling My Aorta”**

- Tricuspid
  - Pulmonary
  - Mitral
  - Aortic
- 

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