

ZOOLOGY MASTER CHEAT SHEET

Systematic Overview of Animal Kingdom, Physiology, and Evolution

1. Animal Kingdom (Phyla Overview)

Porifera (Sponges): Cellular level, ostia, osculum, choanocytes (collar cells).

Cnidaria (Coelenterates): Tissue level, radial symmetry, cnidoblasts (nematocysts), medusa and polyp forms (e.g., Hydra, Jellyfish).

Platyhelminthes (Flatworms): Acoelomate, bilateral, flame cells for excretion (e.g., Taenia, Fasciola).

Aschelminthes (Roundworms): Pseudocoelomate, circular/longitudinal muscles, complete alimentary canal (e.g., Ascaris).

Annelida (Segmented Worms): True coelom, metameric segmentation, nephridia, closed circulatory system (e.g., Earthworm, Leech).

Arthropoda (Insects, Crustaceans): Largest phylum, chitinous exoskeleton, open circulatory system, malpighian tubules / green glands.

Mollusca (Soft-bodied): Unsegmented, muscular foot, visceral hump, mantle, radula for feeding.

Echinodermata (Spiny-skinned): Water vascular system, tube feet, larval bilateral symmetry to adult radial symmetry.

Chordata: Presence of notochord, dorsal hollow nerve cord, pharyngeal gill slits.

2. Human Physiology: Nervous System

Neuron Structure: Dendrites receive signals, axon transmits impulses. Myelin sheath produced by Schwann cells (PNS) and oligodendrocytes (CNS).

Action Potential Mechanics: 1. *Resting Potential:* ~ -70 mV, maintained by $Na^+ - K^+$ ATPase pump (3 Na^+ out, 2 K^+ in). 2. *Depolarization:* Voltage-gated Na^+ channels open, membrane potential spikes

to $\sim +30$ mV. 3. *Repolarization:* Voltage-gated K^+ channels open, K^+ efflux restores negative interior. 4. *Hyperpolarization:* Transient overshoot before pump re-stabilization.

3. Human Physiology: Circulation

Cardiac Cycle: Lasts ~ 0.8 seconds.* **Atrial Systole (0.1 s):** Ventricles fill with remaining 30% blood.* **Ventricular Systole (0.3 s):** Closure of AV valves produces 'Lub' sound; semilunar valves open.* **Joint Diastole (0.4 s):** Closure of semilunar valves produces 'Dub' sound; passive filling of ventricles.

$$\text{Cardiac Output} = \text{Stroke Volume} \times \text{Heart Rate}$$

4. Human Physiology: Excretion

Nephron Functions:* **Glomerular Filtration:** Ultrafiltration driven by high hydrostatic pressure in glomerulus. $GFR \approx 125$ mL/min.* **Proximal Convoluted Tubule (PCT):** Reabsorbs 70 – 80% of electrolytes and water, brush border epithelium.* **Loop of Henle:** Counter-current mechanism creates medullary concentration gradient.* **Distal Convoluted Tubule (DCT):** Conditional reabsorption of Na^+ and water regulated by Aldosterone and ADH.

5. Genetics and Evolution

Hardy-Weinberg Equilibrium:

$$p^2 + 2pq + q^2 = 1$$

$$p + q = 1$$

p is the frequency of the dominant allele and q is the frequency of the recessive allele.

Forces disrupting equilibrium: Mutation, natural selection, genetic drift (founder effect, bottleneck effect), gene migration.

Speciation Types:* **Allopatric:** Geographic isolation.* **Sympatric:** Reproductive isolation without geographic barrier.

6. Animal Behavior & Ecology

Trophic Levels: Energy transfer follows the 10% Law (Lindeman's law), where only $\sim 10\%$ of energy is transferred to the next trophic level.

Ecological Interactions:* **Mutualism (+, +):** Both species benefit (e.g., Lichens, Mycorrhizae).*

Competition (–, –): Gause's Competitive Exclusion Principle.* **Predation / Parasitism (+, –):** One benefits, the other is harmed.* **Commensalism (+, 0):** One benefits, other unaffected.