

Mnemonics

Biology

Anterior Pituitary Hormones

"FLAGTOP"

- F: Follicle Stimulating Hormone
- L: Luteinizing Hormone
- A: ACTH
- G: Growth Hormone
- T: Thyroid Stimulating Hormone
- O: MSH - melanocyte stimulating hormone
- P: Prolactin

FSH in males

directly stimulates spermatogenesis - sperm look like "FiSH." In females, FSH obviously stimulates ovarian follicles (which secrete estrogens, which stimulate endometrial proliferation).

LH in males

stimulates androgen secretion so males become "Like Hairy Apes" (LH → A). Androgens also stimulate spermatogenesis, so LH also indirectly stimulates spermatogenesis. In females, LH stimulates the corpus luteum (which secretes estrogens and progesterone, which stimulate the endometrium).

Autonomic Nervous System

- Sympathetic: fight or flight
- Parasympathetic: rest and digest

Causes of Deviations from Hardy-Weinberg Equilibrium

"Maggie May Does Not Smoke"

Mutations, Migration, genetic Drift, Non-random mating, Selection.

Cell Cycle

"Go Sally Go! Make Children!"

G₁, S, G₂, M, C

Growth phase 1, DNA Synthesis (replication), Growth phase 2, Mitosis, Cytokinesis.

Mitosis

"People Meet And Talk", or
"PMAT"

Prophase, Metaphase, Anaphase, Telophase.

Meiosis

"PMAT x2"

Prophase I, Metaphase I, Anaphase I, Telophase I,
Prophase II, Metaphase II, Anaphase II, Telophase II,
(Note: 4 haploid daughter cells instead of 2 diploid daughter cells)



Chordate Features

"Do Not Pinch People"

Dorsal, hollow nerve cord

Notochord

Pharyngeal slits

Postanal tail

Developmental Stages

"Must Be Good"

Morula, Blastula, Gastrula

Fat-soluble Vitamins

"ADEK"

Vitamins A,D,E, and K

Gastrointestinal Hormones

(i.e. ones that originate from the GI tract)

"Garlic Cloves Smell Exquisite"

Hormone	Source	Target	Triggers	Effects
Gastrin	Gastric mucosa	Stomach	Food in stomach, psychic factors	Increased HCl secretion & gastric emptying
Cholecystokinin (CCK)	Duodenal mucosa	Gallbladder & pancreas	Amino acids, peptides, fatty acids in duodenum	Contraction of gallbladder & secretion of pancreatic juice
Secretin	Gastric mucosa	Pancreas	Acid in duodenum	Increased bicarbonate secretion
Enterogastrone (gastric inhibitory peptide)	Duodenal mucosa	Stomach	Fat digestion products in duodenum	Decreases gastric emptying

Hormones that Increase Blood Glucose

"STENGG"

Somatotropin (growth hormone)

Thyroid hormones (thyroxine and triiodothyronine)



Epinephrine
Norepinephrine
Glucagon
Glucocorticosteroids

Immunoglobulins

"MADGE"
IgM, IgA, IgD, IgG, IgE

Kingdoms

"My Poor Friend Picks Apples"
Monera, Protista, Fungi, Plants, Animals

Male Reproductive Tract (path of sperm)

"SEVEN UP"
Seminiferous tubules
Epididymis
Vas deferens
Ejaculatory duct
(Nothing)
Urethra
Penis

Menstrual Cycle

"FOL(d) M(a)PS"
Ovarian cycle: Follicular phase, Ovulatory phase, Luteal phase
Menstrual cycle: Menstrual flow, Proliferative phase, Secretory phase
The ovarian cycle controls the menstrual cycle. The cycles begin (day 0) when menstrual flow starts. At day 14, the luteal and secretory phases begin and last until day 28, after which the cycles begin again.

Molecular Genetics

"EXons EXpressed, INtrons IN the trash"
DNA expression into mature mRNA

"CUT the PY"

Cytosine, Uracil, and Thiamine are **PY**rimidines (one-ring structures)

"GAPur"

Guanine and Adenine are **PUR**ines (two-ring structures)

"All Tigers Can Growl"

Adenine bonds to Thymine; Cytosine bonds to Guanine



Or, "Pure Silver Taxi"

Purines, A and G, bond to pyrimidines, T and C, respectively

Oxyhemoglobin Dissociation Curve

Think of an exercising muscle for a rightward shift:

Exercising muscle is:

hot,
acidic (lactic acid),
hypercarbic,
and has increased 2,3-DPG.

Exercising muscle benefits from increased oxygen unloading from red blood cells.

Proteases in the Duodenum

"Eat Tender Chicken Chunks Elegantly"

Enterokinase
Trypsin
Chymotrypsin
Carboxypeptidase
Elastase

Note: The first enzyme is produced by intestinal mucosal cells, while the others are produced in inactive precursor forms by the pancreas.

Enterokinase converts trypsinogen into trypsin

Trypsin converts other trypsinogen molecules into trypsin

Trypsin converts chymotrypsinogen into chymotrypsin

Trypsin converts procarboxypeptidase into carboxypeptidase

Trypsin converts proelastase into elastase

Scientific Method

Inductive Reasoning

"IS GOHH"

Induction: Specific → General. Or, Observation → Hypothesis → Hypothesis-testing.

The inductive process proceeds from specific observations to a general hypothesis.

Deductive Reasoning

"D(o)GS"

Deduction: General → Specific

The deductive process proceeds from a general hypothesis to predictions about specific observations.

Sedimentation

Rate of SeDimentation is proportional to Size and Density

More precisely,

terminal velocity of particle $\propto$ radius² x (density - density of medium)

Sizes



"Bowel Movement" or "BM"

A **B**acterium is about 1 **M**icron ($1\ \mu\text{m}$)

A eukaryotic cell is about 10 times larger ($10\ \mu\text{m}$)

A virus is about 100 times smaller ($0.01\ \mu\text{m}$)

Note: these are very, very rough guides. The ranges of sizes are wide.

Striated Muscle

"ZIAH"

Z-line, I-band, A-band, H-zone

Taxonomy

"King Phillip Came Over From Great Spain"

Kingdom Phylum Class Order Family Genus Species

Vertebrate Features

"CEVASACK"

Cephalization

Endoskeleton

Vertebrae

Axial skeleton

Skull

Appendicular skeleton

Closed circulatory system

Kidneys

White Blood Cells

(In order of decreasing numbers.)

"Nobody Likes My Educational Background"

N Neutrophils

L Lymphocytes

M Monocytes

E Eosinophils

B Basophils

General Chemistry

Bonding

"HONC"

H requires 1 more electron in its outer shell to become stable.

O requires 2.

N requires 3.

C requires 4.

Cation



The "t" in cation looks like a plus sign: "ca⁺ion."

Electrochemistry

Reduction occurs at the Cathode; Oxidation at the Anode.

Remember that the terms beginning with consonants are together, and those beginning with vowels are together.

"LEO is A GERC (jerk)"

Loss of Electrons is Oxidation, which occurs at the Anode. Gain of Electrons is Reduction, which occurs at the Cathode.

Electrolysis

"MIT enough"

Moles deposited at an electrode = It/nF

Gibb's Free Energy

"Good Honey Tastes Sweet"

$$\Delta G = \Delta H - T\Delta S$$

"Gee! Plus Arty! Thank you!"

$$\Delta G = \Delta G^\circ + RT\ln Q$$

"Delicious Grapefruit - Not For Everyone"

$$\Delta G^\circ = -nFE^\circ$$

Henderson-Hasselbalch Equation

"HK + AHA"

or "Hong Kong + American Hospital Association"

$$\text{pH} = \text{pK}_a + \log_{10}(A^-/HA)$$

Hydrogen Bonding

"FON"

When a hydrogen atom is attached to either a fluorine, oxygen, or nitrogen atom, it can form a hydrogen bond between it and another fluorine, oxygen, or nitrogen atom.

Nernst Equation

"We minus Arty (is) enough, thank you."

$$E = E^\circ - (RT/nF)\ln Q$$

Paramagnetism



If a compound has at least one **un**paired electron,
it is **P**aramagnetic,
and will be **P**ulled toward a magnetic field.

If not, it is diamagnetic, and is weakly repelled by a magnetic field. There is also a third type of magnetism: ferromagnetism, which is present in what we casually call "magnets," e.g. iron, nickel, cobalt.

Quantum Numbers

"National Library (of) Medicine Sizzles"
n, l, m, s

I Quantum Numbers

"Sensual People Do Foreplay"
s, p, d, f. Then it follows the alphabet: g, h, i, j, k, etc.

State Functions

"VG PHEST" (Very Good Festival)
The following are all state functions:
V for volume
G for Gibb's free energy
P for pressure
H for enthalpy
E for internal energy
S for entropy
T for temperature



Organic Chemistry

Addition of Amine to Carbonyl Group

"SE PI" (or "SEe PIe")

Secondary amine → Enamine

Primary amine → Imine

(Note: tertiary and quaternary amines do not react with the C=O group.)

Cis/trans (Geometric) Isomers

"Z: Zame Zide

E: Epposite"

Z for same side and E for opposite sides

Conformations

Gauche conformation: It's "gauche" (inappropriate) for one methyl group to stand too close to another group.

Cyclohexane ring: When you have low energy, you sit down in a "CHAIR" to rest. "BOATS" can be tippy, so they are less stable.

Isomers

"SS - ED - CC"

Isomers of a sugar: If the second lowest -OH is on the Left, the molecule is L.
If the -OH is on the Right, it's D.

Meso Compounds

"Meso compounds have a Mirror of Symmetry"

Thus, even though they may have stereogenic centers, they are achiral and so do not have enantiomers.

NMR

Downfield is Deshielded.

Meta-Directing Groups on a Benzene Ring

"Queen Elizabeth Second's Navy Commands, Controls, Communicates"

Q Quaternary amino -NR₃⁺

E Ester -COOR

S Sulfonic acid -SO₃H

N Nitro -NO₂

C Carbonyl -CHO

C Carboxyl -COOH

C Cyano -CN



Ortho- and Para- Directing Groups on a Benzene Ring

"AHA AHA P"

A Alkyl -R

H Halogen -X

A Alkoxyl -OR

A Amino -NH₂, -NHR, -NR₂ (not -NR₃⁺)

H Hydroxyl -OH

A Amide -NHCOR

P Phenyl -C₆H₅

Types of Reactions

"SEA MOuRNS CANned PEAs"

Substitution Electrophilic - Aromatic

Most Other Reactions - Nucleophilic Substitution

Carbonyl - Addition Nucleophilic

Pi bonds - Electrophilic Addition



Physics

Basic Physical Quantities

"Taking Luxurious Limos More Noxious Than Cycling"

Temperature (K)

Length (m)

Luminous intensity (Cd)

Mass (kg)

Number of particles (moles)

Time (s)

Charge (C)

Capacitors

"Quintessential Curriculum Vitae"

$$Q = CV$$

"England Hails Queen Victoria"

$$E \text{ (energy stored)} = \frac{1}{2}QV$$

Elastic Modulus

"Essay"

Elastic modulus = stress / strain

i.e. "es" / "ai" or "essay"

Stress is associated with the **forss** (force) applied.

Strain is the deformation produced.

Electromagnetic Spectrum

"RIVUXGa"

Electromagnetic waves in order of increasing frequency:

Radio waves

Infra red

Visible spectrum

Ultra violet

X-rays

Gamma rays

Force on a Charge Moving in a Magnetic Field

"Fast Quality Vitalizes Business"

$$F = QvB$$

$$(N = C \times m/s \times T)$$

i.e., if the direction of travel is perpendicular to the magnetic field

Heat Capacity

"MCAT"

$$q = mc\Delta T$$

where q is heat energy, m is mass, c is specific heat capacity, and ΔT is the change in temperature.



Optics

"D DUV"

For **D**iverging mirrors and lenses, the image is always **D**iminished, **U**pright, and **V**irtual, regardless of the distance of the object from the mirror or lens.

Prefixes in Units of Measurement

Multiples

Damned	Deka	da	$\times 10$
Hiccups	Hecto	h	$\times 10^2$
Killed	Kilo	k	$\times 10^3$
Meg's	Mega	M	$\times 10^6$
Gigantic	Giga	G	$\times 10^9$
Terrapin	Tera	T	$\times 10^{12}$

Fractions

Dextrous	Deci	d	$\times 10^{-1}$
Carpenters	Centi	c	$\times 10^{-2}$
Make	Milli	m	$\times 10^{-3}$
Many	Micro	μ	$\times 10^{-6}$
Nice	Nano	n	$\times 10^{-9}$
Picture	Pico	p	$\times 10^{-12}$
Frames	Femto	f	$\times 10^{-15}$

Visible Spectrum

In order of increasing frequency:

"Roy G. Biv"

"Richard Of York Gained Battles In Vain"

Red Orange Yellow Green Blue Indigo Violet

