

Question n° 1 | Enzymology Exam Review

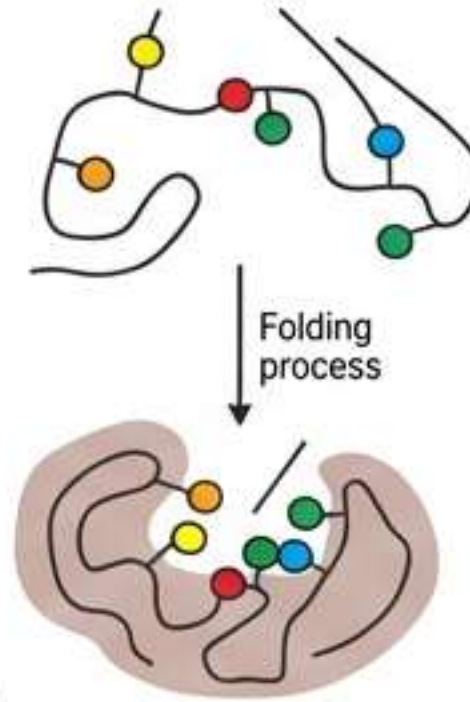
Question: Enzymes (check the true statement):

- A. Are all globular proteins
- B. Are thermosensitive
- C. Consist only of a protein part
- D. Regulatory activity appears at the tertiary structure
- E. Catalytic function appears starting from the tertiary structure

Correct Answer: E

Explanation: Primary and secondary structures act as the scaffold. The **catalytic activity** emerges only when the protein folds into its **Tertiary Structure**, creating a specific 3D cleft known as the **Active Site**. This cleft brings distant amino acids together to bind the substrate.

Mnemonic: "Three for Tea" (Tertiary structure = Tea-time/Catalysis begins).



Question n° 2 | Enzymology Exam Review

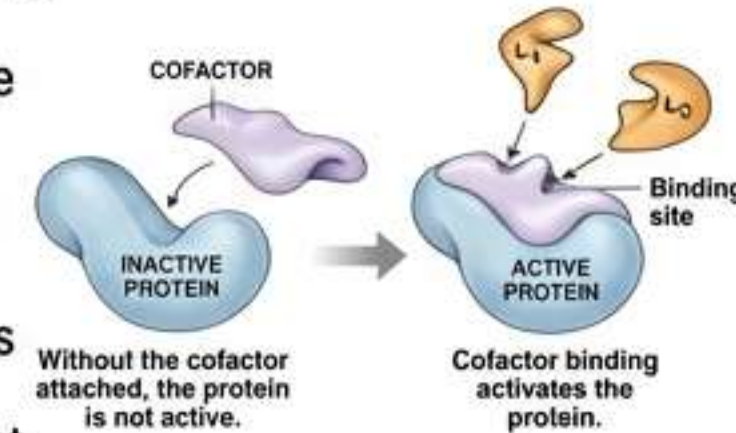
Question: Free Coenzymes (check the false statement):

- A. Form weak bonds with the enzyme
- B. Dissociate from the enzyme after each reaction
- C. Intervene in the reaction stoichiometrically
- D. Their concentration is of the same magnitude as the enzyme
- E. Answers A and C are correct

Correct Answer: D

Explanation: Free coenzymes (like NAD⁺) act as **co-substrates**. They bind, react, and leave to be recycled. Because they service many different enzymes in the cell, their concentration is generally **much higher** than that of any.

Mnemonic: "The Commuter" (Coenzymes travel between many enzymes; they don't live there).



Question n° 3 | Enzymology Exam Review

Question: Regarding enzyme properties (check the true statement):

- A. Catalysis increases reaction speed by increasing activation energy
- B. An enzyme catalyzes multiple different reactions for one substrate
- C. An enzyme can act on several substrates of the same class
- D. All enzymes are proteins
- E. Optimal temperature varies from one enzyme to another

Correct Answer: C

Explanation: While enzymes are specific, many exhibit **Group Specificity**. They recognize a specific chemical bond or functional group (e.g., peptide bonds) rather than just one unique molecule, allowing them to process a class of similar substrates.

Mnemonic: "Master Key" (Opens multiple locks of the same brand/class).

Substrate	Enzymes
Lipid	Lipase
Starch	Amylase
Protein	Protease

Question n° 4 | Enzymology Exam Review

Question: Regarding factors influencing enzymatic reaction (check the false statement):

- A. Each enzyme has an optimal T and pH
- B. Extreme pH causes denaturation
- C. Irreversible inhibitors act by denaturing the enzyme
- D. Optimal T varies between enzymes
- E. Enzyme solubility is maximal at high salt concentrations

Correct Answer: E

Explanation: This describes "**Salting Out**." At very high salt concentrations, water molecules are occupied solvating the salt ions, leaving protein molecules to interact with each other and **precipitate** out of solution. Solubility decreases.

Mnemonic: "Salty Precipitate" (Too much salt pushes the enzyme out of solution).



Question n° 5 | Enzymology Exam Review

Question: For an enzyme obeying Michaelis kinetics (check the true statement):

- A. Zero order when V is proportional to $[S]$
- B. V_{\max} is measured during pre-stationary phase
- C. K_m is the $[S]$ giving $2 \times V_{\max}$
- D. K_{cat} indicates specificity
- E. A perfect enzyme has a high K_{cat} and a low K_m

Correct Answer: E

A "kinetically perfect" enzyme is limited only by diffusion. It requires High K_{cat} (rapid turnover of substrate to product) and Low K_m (high affinity to grab the substrate). It grabs tight and works fast.

Mnemonic: "Grab Fast, Work Fast" (Low K_m , High K_{cat}).



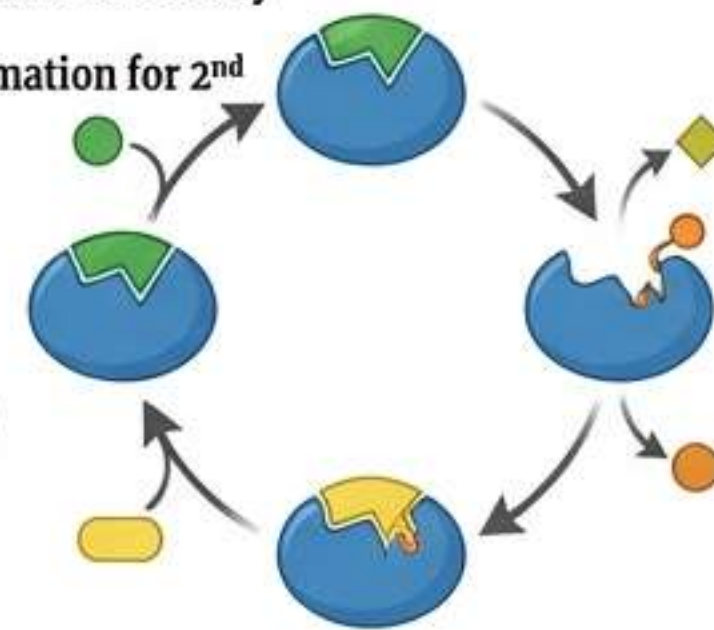
Question n° 6 | Enzymology Exam Review

Question: About 2-substrate kinetics (check the false statement):

- A. Sequential mechanism is simple transfer if both fix simultaneously
- B. In Random Bi-Bi, order is not imposed
- C. In Ordered Bi-Bi, 1st substrate binding alters conformation for 2nd
- D. In Ping-Pong reactions, the enzyme undergoes permanent modification
- E. Aspartate aminotransferase acts via Ping-Pong

Correct Answer: D

In a Ping-Pong (Double Displacement) mechanism, the enzyme is modified temporarily (e.g., accepting a group) to carry it to the second substrate. However, the enzyme must **regenerate** to its original form by the end. Permanent modification would mean it's not a catalyst.



Mnemonic: "Ping Pong Return" (The ball is passed, and the player resets).

Question n° 7 | Enzymology Exam Review

Question: Regarding enzymatic inhibitors (check the false statement):

- A. Enzymatic inhibition is always reversible
- B. Irreversible inhibitors cause loss of catalytic properties
- C. Reversible inhibitors are: competitive, non-competitive, uncompetitive
- D. Non-competitive reduces the number of active enzyme molecules
- E. Competitive inhibition is overcome by increasing $[S]$

Correct Answer: A

Inhibition is **not always reversible**. Suicide inhibitors or heavy metals can form strong covalent bonds with the active site, permanently destroying the enzyme's catalytic capability.

Mnemonic: "Never say Always" (Some poisons are forever).



Question n° 8 | Enzymology Exam Review

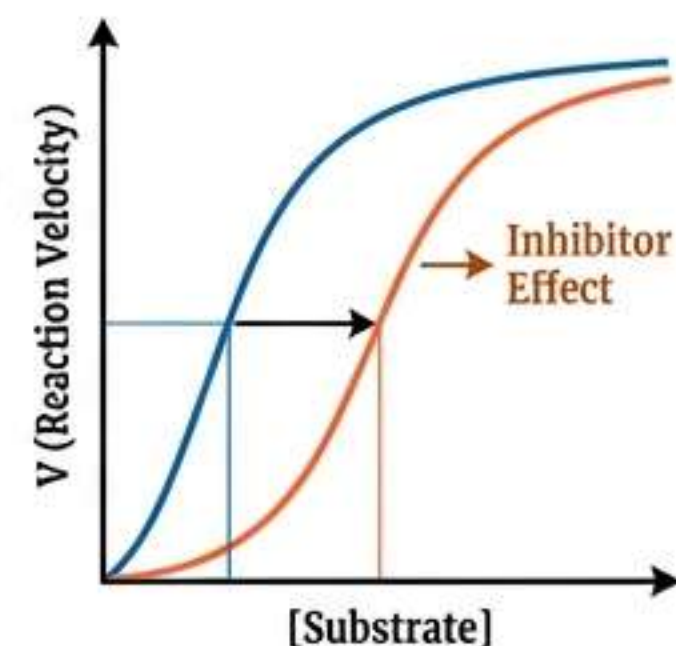
Question: Regarding allosteric enzymes (check the false statement):

- A. Possess multiple active and allosteric sites
- B. Concerted model: transition happens simultaneously for all subunits
- C. T to R transition by substrate is positive homotropic effect
- D. Allosteric activators favor substrate binding
- E. Negative heterotropic effect is defined by fixation of allosteric inhibitor on allosteric site

Correct Answer: E

The Negative Heterotropic Effect is the *consequence* (reduced affinity/stabilizing the T-state), not just the act of fixation. It shifts the saturation curve to the right, making the enzyme less sensitive to the substrate.

Mnemonic: "Right is Resist" (Right shift = Enzyme resists binding).



Question n° 9 | Enzymology Exam Review

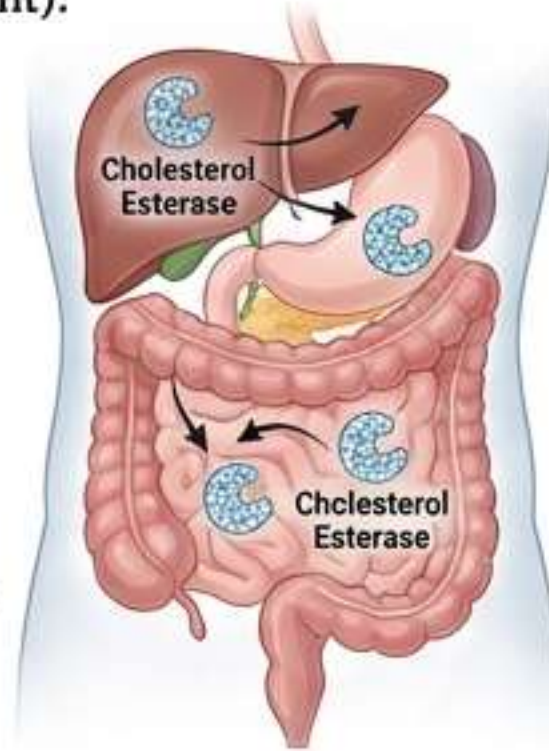
Question: Cholesterol Degradation (check the false statement):

- A. It is exclusively hepatic
- B. Results in bile acid formation
- C. Primary bile acids are cholyl-CoA and chenodeoxycholyl-CoA
- D. Cholesterol esterase allows hydrolysis of dietary cholesterol esters in intestinal lumen
- E. Cholesterol esterase hydrolyzes cholesterol esters brought to liver by lipoproteins

Correct Answer: D

Explanation: Statement D implies Cholesterol Esterase works only in the lumen. In reality, this enzyme is versatile: it works in the intestine for digestion AND in the liver (lysosomes) to process esters delivered by HDL/LDL particles.

Mnemonic: "Double Duty Esterase" (Digests food AND cleans blood lipids).



Question n° 10 | Enzymology Exam Review

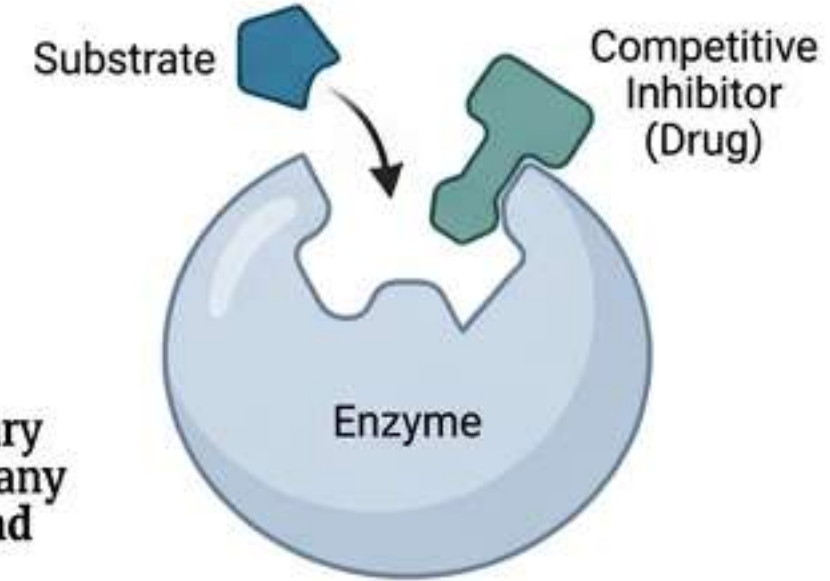
Question: About regulation of enzymatic activity (check the true answer):

- A. Non-competitive inhibitor
- B. Competitive inhibitor
- C. Uncompetitive inhibitor
- D. Positive allosteric effector
- E. Enzyme activator

Correct Answer: B

Explanation: While allostery is the biological regulator, **Competitive Inhibition** is the primary mechanism for *pharmacological* regulation. Many drugs function by mimicking the substrate and competing for the active site.

Mnemonic: "The Imposter" (Competitive inhibitor pretends to be the substrate).



Question n° 11 | Enzymology Exam Review

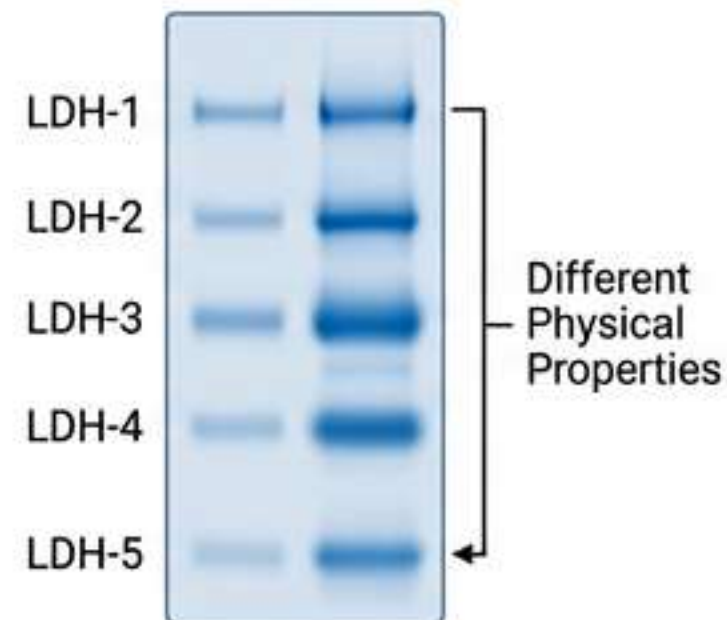
Question: Isoenzymes are enzymes that possess: (check the true answer):

- A. The same tissue origin
- B. A different substrate
- C. A different amino acid composition
- D. A different product
- E. The same amino acid composition

Correct Answer: C

Explanation: Isoenzymes catalyze the exact same reaction (Substrate → Product) but are encoded by different genes. This leads to different primary structures (amino acid sequences), resulting in unique physical properties.

Mnemonic: "Different Genes, Same Jeans" (Different origin/structure, same job).



Question n° 12 | Enzymology Exam Review

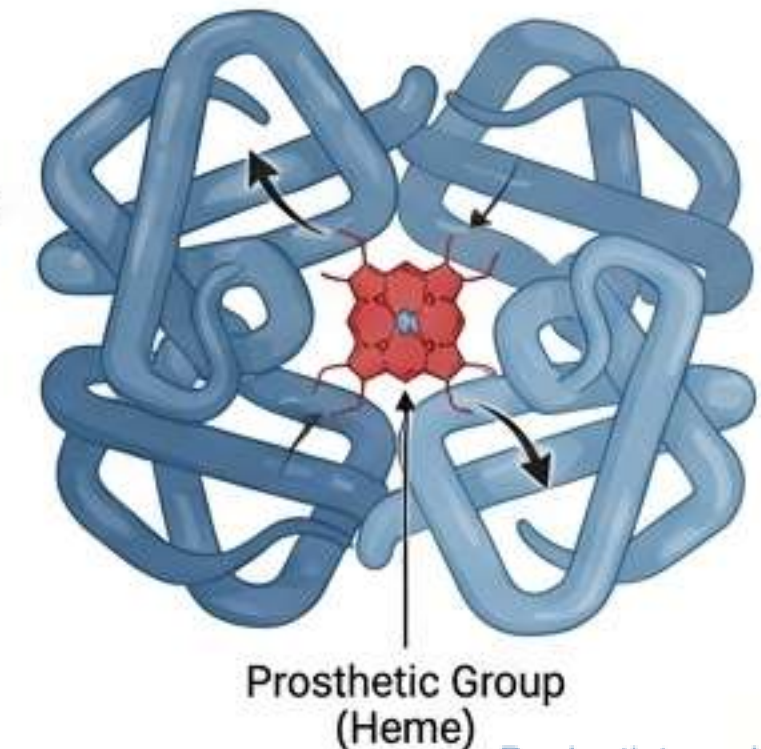
Question: Linked Coenzymes (check the false answer):

- A. Form strong bonds with the enzyme
- B. Do not dissociate from the enzyme
- C. Intervene in the reaction stoichiometrically
- D. Their concentration is of the same magnitude as the enzyme
- E. Answers A and C are true

Correct Answer: B

Explanation: Prosthetic Groups (Linked Coenzymes) like Heme or FAD are tightly, often covalently, bound to the enzyme. They do not leave. They are regenerated *in situ* during the reaction cycle, unlike free co-substrates.

Mnemonic: "Permanent Resident" (Prosthetic groups never move out).



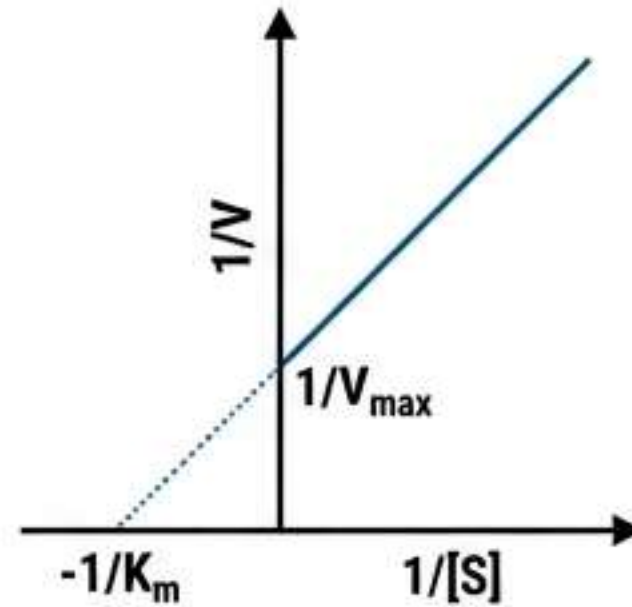
Question n° 13 | Enzymology Exam Review

Question: The Lineweaver-Burk graphical representation (check the true answer):

- A. Is a hyperbolic curve
- B. Crosses the Y-axis at $1/K_m$
- C. Crosses the X-axis at $1/V_{max}$
- D. Has a slope of V_{max}/K_m
- E. Illustrates the variation of $1/V$ on ordinates and $1/[S]$ on abscissas

Correct Answer: E

Explanation: The Lineweaver-Burk plot is a **linear transformation** of the Michaelis-Menten equation. By plotting the reciprocal of velocity ($1/V$) against the reciprocal of substrate ($1/[S]$), we turn the hyperbola into a straight line.



Mnemonic: "Double Flip" (Flip V and Flip S to get a straight line).

Question n° 15 | Enzymology Exam Review

Question: The K_m (Michaelis constant) (check the false answer):

- A. Is the dissociation constant of the ES complex
- B. Decrease means affinity is increased
- C. Is the $[S]$ when enzyme is 50% saturated
- D. Increases in presence of competitive inhibitor
- E. Is equal to the ratio $[E][S]/[ES]$

Correct Answer: E

Explanation: The ratio $[E][S]/[ES]$ is the dissociation constant (K_S). K_m is a kinetic constant defined as $(k_{-1} + k_2) / k_1$. It includes the rate of product formation (k_2). It approximates affinity but is mathematically distinct.

$$K_m = \frac{k_{\text{-breakdown}}}{k_{\text{formation}}}$$

Mnemonic: " K_m is Kinetic" (It's about motion/breakdown, not just binding).

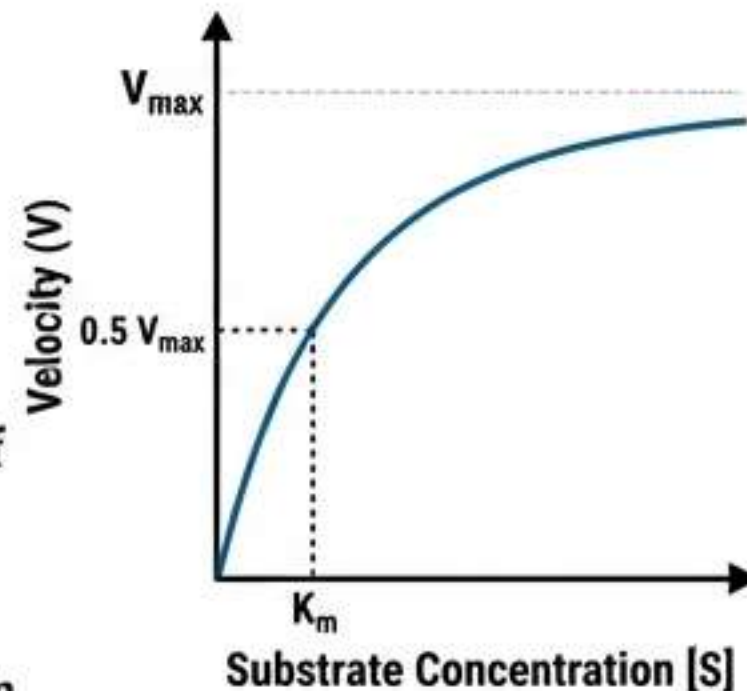
Question n° 16 | Enzymology Exam Review

Question: When $[S] = K_m$, the velocity is: (check the true answer):

- A. $0.1 V_{max}$
- B. $0.2 V_{max}$
- C. $0.5 V_{max}$
- D. $0.8 V_{max}$
- E. $2 V_{max}$

Correct Answer: C

Explanation: This is the **operational definition** of K_m . K_m is the specific Substrate Concentration required to drive the reaction at exactly half its maximum speed ($V_{max}/2$).



Mnemonic: "Meet me Halfway" (K_m is the location of half-speed).

Question n° 17 | Enzymology Exam Review

Question: The V_{max} of the enzymatic reaction (check the true answer):

- A. Does not change in non-competitive inhibition
- B. Does not change in uncompetitive inhibition
- C. Increases with increasing substrate concentration
- D. Is the velocity when $K_m = [S]$
- E. Is the velocity when all enzyme is in ES complex form

Correct Answer: E

Explanation: V_{max} represents **Saturation**. It is the theoretical limit reached when every single enzyme molecule is occupied as an Enzyme-Substrate complex (ES). Adding more substrate cannot increase the rate further.

Mnemonic: "Full House" (Every seat is taken).

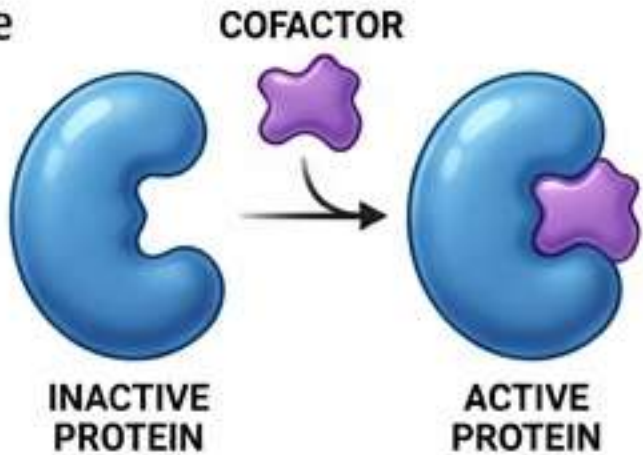


Question n° 18 | Enzymology Exam Review

Question: The enzyme (check the true answer):
A. Is a chemical catalyst
B. Decreases reaction speed
C. Increases free energy of activation
D. Is associated with a cofactor in the holoenzyme
E. Presents multiple active sites on its surface

Correct Answer: D
Explanation: A functional enzyme system is called a **Holoenzyme**. It consists of the protein scaffold (**Apoenzyme**), which provides specificity, and the non-protein **Cofactor** (metal ion or coenzyme), which often performs the chemical work.

Mnemonic: “Holo = Whole” (Apo + Cofactor = The Whole Enchilada).



Question n° 19 | Enzymology Exam Review

Question: Which proposition concerning enzymes is true?
A. To be efficient, enzymes require a cofactor
B. If $V/V_{max} < 1$, the enzyme is running at reduced speed
C. Enzymes modify the equilibrium of reactions they catalyze

Correct Answer: B

Explanation: If the ratio V/V_{max} is less than 1, the enzyme is operating below its capacity (non-saturated). It implies substrate limitation. (Note: Enzymes never modify equilibrium constants, they only hasten the arrival at equilibrium).

Mnemonic: “Cruising Speed” (Not yet at full throttle).

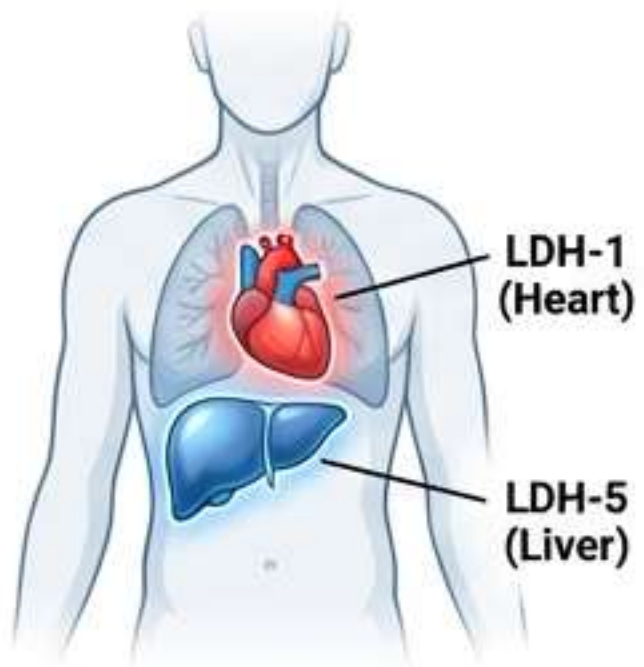


Question n° 20 | Enzymology Exam Review

Question: Isoenzymes (check the true answer):
A. They act on different substrates
B. They present tissue-dependent expression
C. They catalyze different reactions

Correct Answer: B
Explanation: This property makes isoenzymes powerful diagnostic tools. Since LDH-1 is abundant in the heart and LDH-5 in the liver, finding LDH-1 in the blood specifically indicates heart tissue damage. The location defines the marker.

Mnemonic: “Tissue Tracker” (Isoenzymes tell you WHERE the damage is).



Question n° 21 | Enzymology Exam Review

Question: Which proposition is false?
A. Enzymes decrease activation energy
B. Each enzyme catalyzes a single type of reaction
C. Isoenzymes possess the same activity and physico-chemical properties

Correct Answer: C
Explanation: Isoenzymes are *different* proteins. Therefore, they must have different physico-chemical properties (Isoelectric point, Heat Stability) and kinetic properties (K_m , V_{max}). They are distinct molecules doing the same job.

Mnemonic: “Identical Twins vs Fraternal Twins” (Isoenzymes are fraternal; different personalities).

Isoenzyme A		Isoenzyme B
Property	Value	Value
Affinity	High	Low
Heat Stability	Stable	Labile

Question n° 23 | Enzymology Exam Review

Question: Concerning coenzymes (check the false answer):

- A. They intervene obligatorily in an enzymatic reaction
- B. Co-substrates intervene in a catalytic manner
- C. They are organic molecules of non-protein nature

Correct Answer: B

Explanation: **Co-substrates** (like NAD⁺) intervene in a **stoichiometric** manner, not catalytic. They are consumed/transformed (NAD⁺ becomes NADH) and must be replaced. True catalysts are **regenerated** instantly by the reaction itself.

Mnemonic: "Batteries are Consumables" (Co-substrates get used up).



Question n° 25 | Enzymology Exam Review

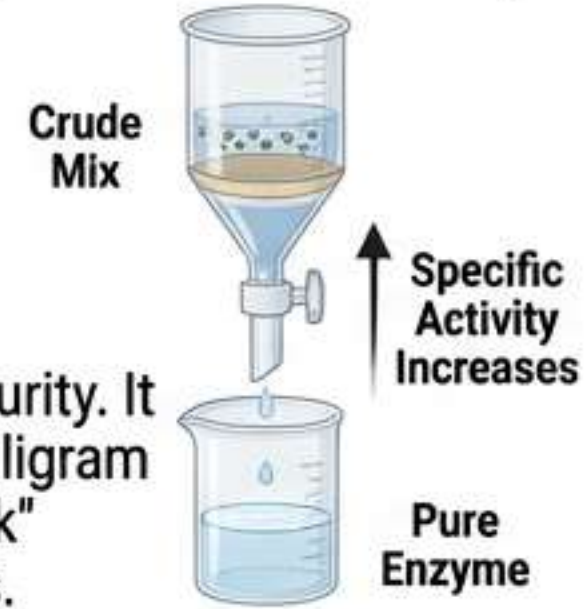
Question: When measuring enzymatic activity (check the true answer):

- A. We must be in Order 1 (low [S])
- B. Temperature and pH have no influence
- E. Specific enzymatic activity is expressed in $\mu\text{mol}/\text{min}/\text{mg}$ protein

Correct Answer: E

Explanation: **Specific Activity** is a measure of purity. It calculates the enzymatic "power" (Units) per milligram of total protein. As you purify a sample, the "junk" protein is removed, so the Specific Activity rises.

Mnemonic: "Power per Gram" (How strong is the pure stuff?).



Question n° 26 | Enzymology Exam Review

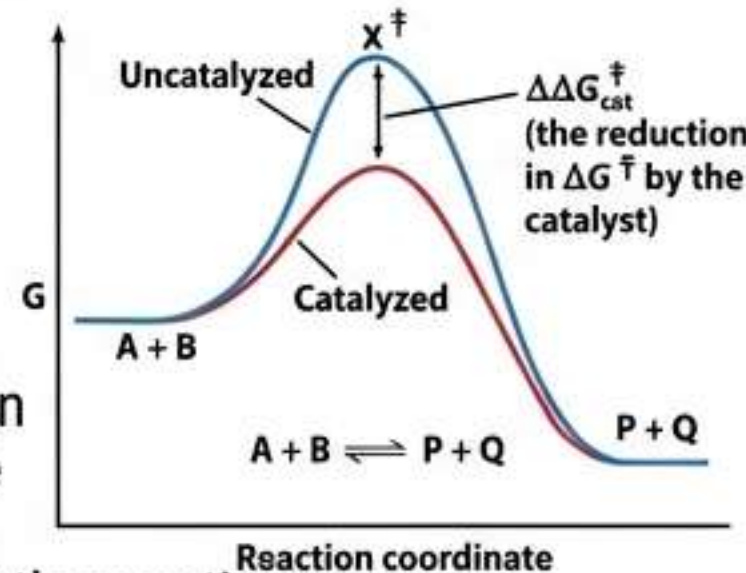
Question: In thermodynamics, enzymes: (check the exact answer):

- A. Increase activation energy
- B. Lower activation energy
- C. Shift reaction equilibrium

Correct Answer: B

Explanation: Enzymes do not change the destination (Equilibrium); they only shorten the journey. They do this by stabilizing the **Transition State**, effectively lowering the **Activation Energy** barrier required to start the reaction.

Mnemonic: "Tunnel through the Mountain" (Don't climb over, go through).



Question n° 27 | Enzymology Exam Review

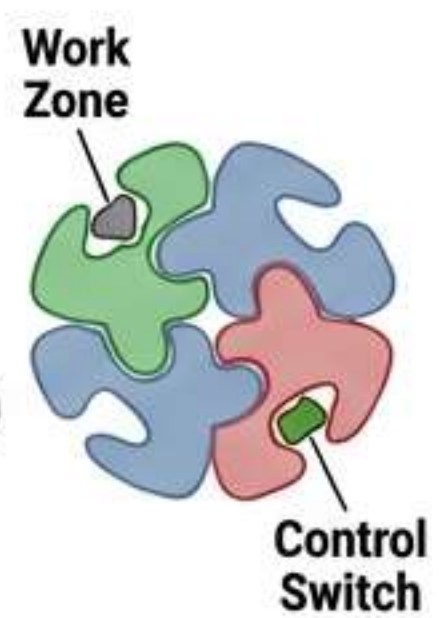
Question: Concerning allosteric enzymes (check the false answer):

- A. Present a quaternary structure
- B. The active site is called the allosteric site
- C. Sigmoidal shape is characteristic of cooperativity

Correct Answer: B

Explanation: The defining feature of Allosterism is the separation of function. The **Active Site** (catalysis) is physically distinct from the **Allosteric Site** (regulation). Signals at one site cause conformational changes at the other.

Mnemonic: "Two Doors" (Front door for work, back door for the boss).



Question n° 28 | Enzymology Exam Review

Question: During non-competitive inhibition: (check the exact answer):

- A. Inhibitor binds to active site
- C. V_{\max} is decreased
- D. K_m is increased

Correct Answer: C

Explanation: Non-competitive inhibitors disable the enzyme whether substrate is bound or not. This effectively removes functional enzymes from the pool, lowering V_{\max} . The remaining working enzymes have normal affinity, so K_m is unchanged.



Mnemonic: "Broken Machines" (Fewer working enzymes = Lower Max Speed).

Question n° 29 | Enzymology Exam Review

Question: Competitive inhibitors: (check the exact answer):

- E. Have varied applications in therapeutics

Correct Answer: E

Explanation: Competitive Inhibitors are the basis of many modern drugs. **Statins** (cholesterol), **ACE Inhibitors** (blood pressure), and **Methotrexate** (cancer) all work by mimicking the natural substrate and blocking the enzyme's active site.



Mnemonic: "Fake Key" (The drug jams the lock).

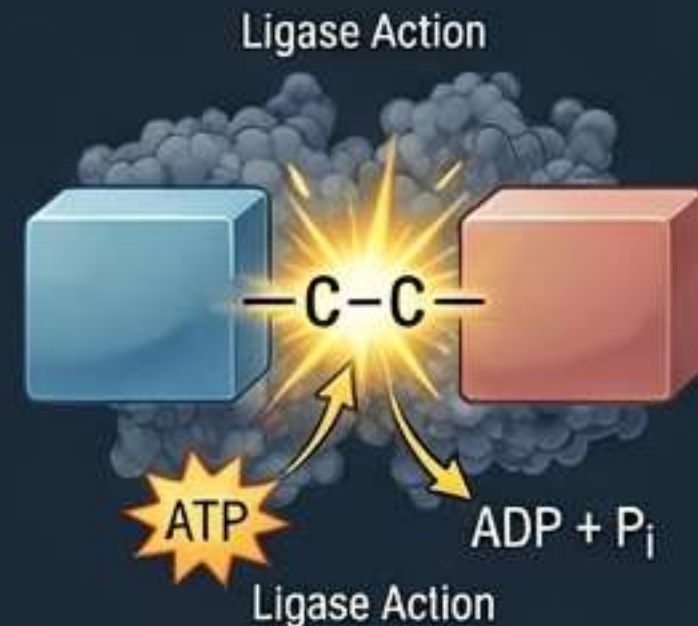
Question n° 32 | Enzymology Exam Review

Question: The bond C-C, C-S, C-O, or C-N is a characteristic of:

- A. Transferases
- B. Ligases

Correct Answer: B

Explanation: Ligases (Class 6) are the "builders." They catalyze the formation of new bonds between two large molecules, a process that is energetically expensive and typically requires the hydrolysis of ATP.



Mnemonic: "Ligase = Ligation" (To tie/bind together).

Question n° 34 | Enzymology Exam Review

Question: The stationary phase corresponds to: (check the exact answer):

- C. The period during which [ES] is constant

Correct Answer: C

Explanation: This is the **Steady State Assumption**. After an initial burst, the formation of the Enzyme-Substrate complex equals its breakdown. The concentration [ES] remains constant as long as substrate is abundant.



Mnemonic: "Flow In = Flow Out" (Steady Level).

Question n° 36 | Enzymology Exam Review

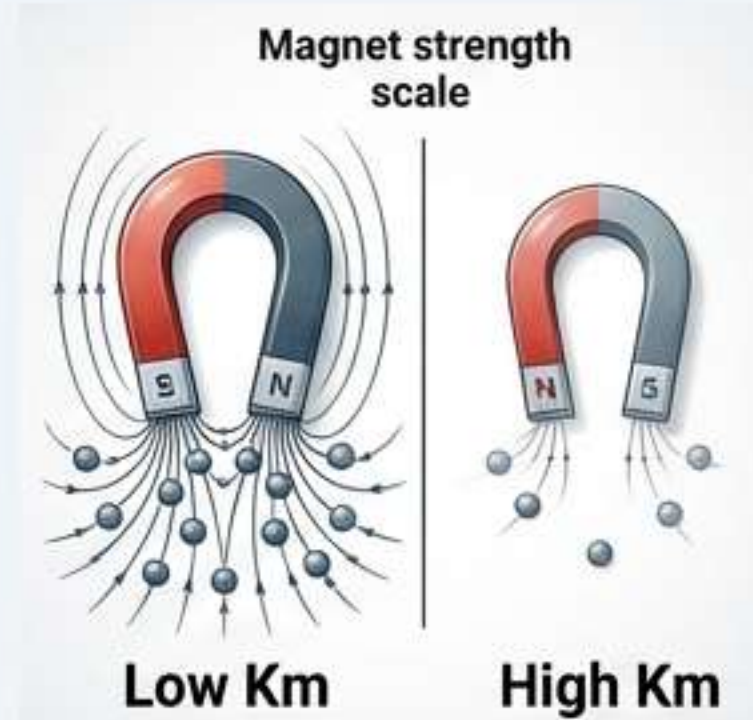
Question: The Michaelis constant (K_m):
(check the exact answer):

- A. Represents the affinity of the enzyme for its substrate

Correct Answer: A

Explanation: K_m is an inverse measure of affinity. A **Low K_m** means the enzyme is "sticky"—it needs very little substrate to work at half speed. A **High K_m** means low affinity—it needs a crowd of substrate to find one.

Mnemonic: "Low is Love" (Low K_m = High Affinity).



Question n° 41 | Enzymology Exam Review

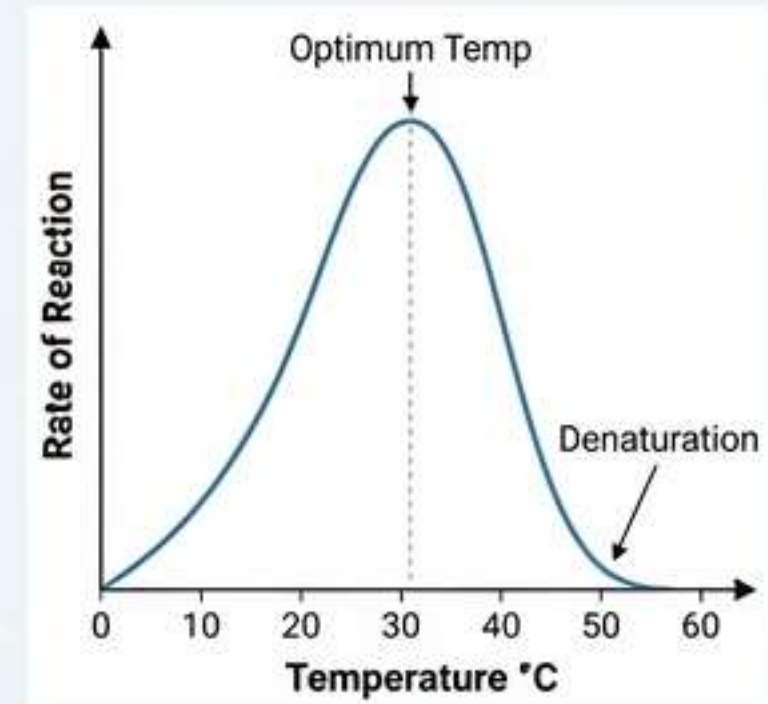
Question: An enzyme is characterized by
(correct propositions):

- A. Increases speed
B. Decreases activation energy
E. Acts at an optimal temperature dependent on its nature

Correct Answer: A, B, E

Explanation: This summarizes the **Biocatalyst Triad**: 1) Massive acceleration of rate, 2) Mechanism via lowering the energy barrier, and 3) Sensitivity to environment (Optimum Temperature) due to their protein nature.

Mnemonic: "Fast, Easy, Sensitive" (Speed, Energy, Environment).



Question n° 43 | Enzymology Exam Review

Question: Every enzymatic protein
(correct propositions):

- A. Acts at very low concentration
D. Does not affect the equilibrium of a reversible reaction

Correct Answer: A, D

Explanation: Enzymes are catalysts, meaning they are **not consumed**. A single enzyme molecule can process millions of substrate molecules per second. Therefore, they are effective at very low concentrations relative to the substrate.

Mnemonic: "The 1%" (A tiny amount does all the work).



Question n° 45 | Enzymology Exam Review

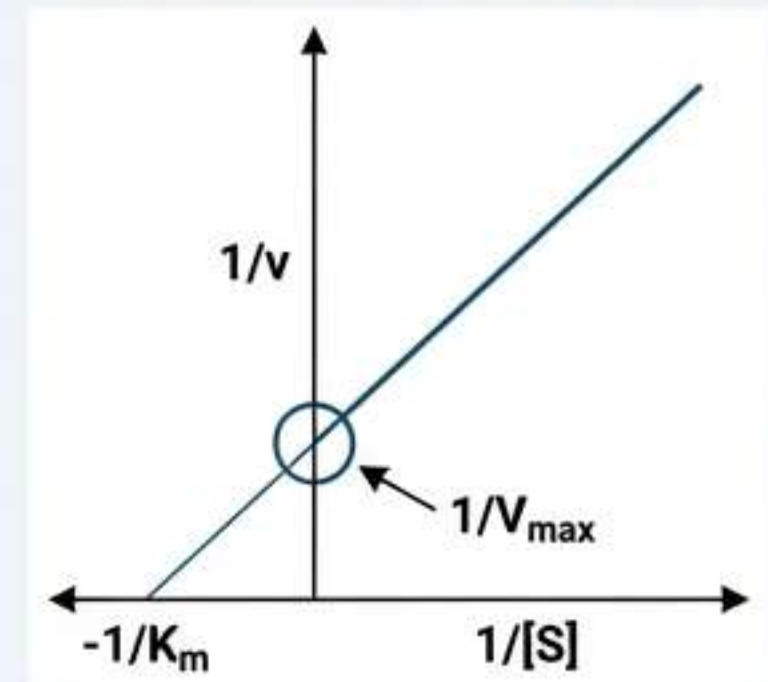
Question: During a Michaelian reaction
(correct answers):

- B. V_{max} is a constant
C. Y-intercept (Lineweaver-Burk) = $1/V_{max}$
E. K_m is an index of affinity

Correct Answer: B, C, E

Explanation: On a Lineweaver-Burk plot, the Y-intercept is $1/V_{max}$. Since the enzyme amount is fixed, V_{max} is a constant ceiling. The closer the line intersects to zero (lower intercept), the higher the V_{max} .

Mnemonic: "Y-Max" (The Y-axis tells you the Max).



Question n° 49 | Enzymology Exam Review

Question: $V_i = 50\%$ of V_{\max} when $[S] = 300 \mu\text{M}$. What is the value of K_m ? B. $300 \mu\text{M}$

Correct Answer: B

Explanation: This requires no math, only definition recall. K_m is *defined* as the substrate concentration $[S]$ where velocity is exactly half of max ($V_{\max}/2$). Since V_i is 50%, the given $[S]$ IS the K_m .

$$\text{If } V = V_{\max}/2, \text{ then } K_m = [S]$$

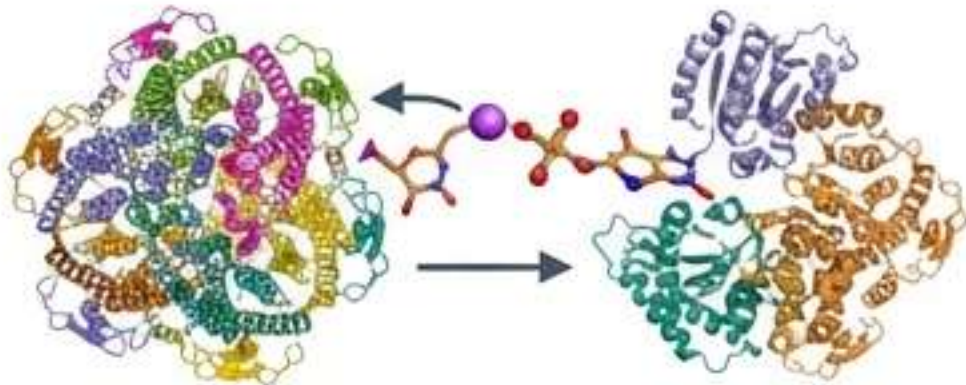
Mnemonic: "The 50/50 Rule" (At 50% speed, S equals K_m).

Question n° 59 | Enzymology Exam Review

Question: Kinases are of class: D. 2

Correct Answer: D

Explanation: **Kinases** are a subclass of **Transferases (Class 2)**. They transfer a phosphate group (usually from ATP) to an acceptor molecule. (Recall classes: 1=Oxido, 2=Transfer, 3=Hydro, 4=Lyase, 5=Iso, 6=Ligase).



Mnemonic: "OTHLIL - #2" (Oxido, Transfer, Hydro... Kinase moves things).

Question n° 53 | Enzymology Exam Review

Question: The enzymatic unit IU/L is: D. Quantity of enzyme catalyzing one micromole of substrate per minute

Correct Answer: D

Explanation: The **International Unit (IU)** is the medical standard for activity. It corresponds to the conversion of **1 μmol** of substrate **per minute**. (Contrast with the SI unit Katal, which is moles per second).



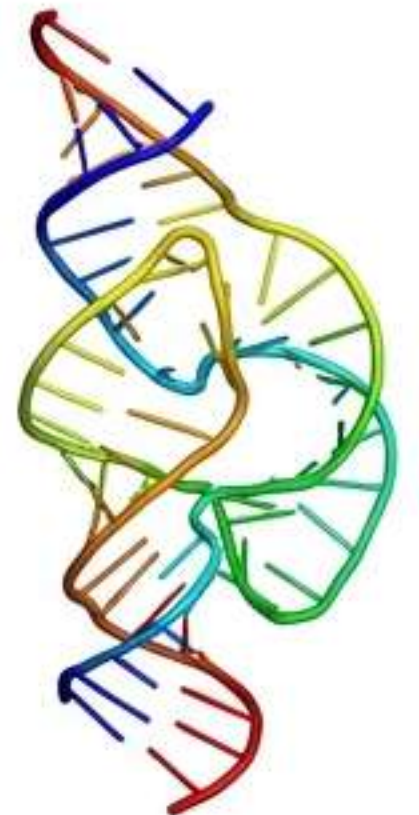
Mnemonic: "Micro-Minute" (The two M's of the IU).

Bonus Concept | Nucleic Acids

Question: Are all enzymes proteins?

Correct Answer: No (Ribozymes)

Explanation: While the vast majority of enzymes are proteins, **Ribozymes** are catalytic RNA molecules. They are crucial in removing introns from RNA (splicing) and in ribosome function, proving that nucleic acids can also fold into catalytic shapes.



Mnemonic: "RNA Rebel" (The exception to the protein rule). [By dentiste web](#)