

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ КЫРГЫЗСКОЙ  
РЕСПУБЛИКИ  
ОШСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ  
МЕЖДУНАРОДНЫЙ МЕДИЦИНСКИЙ ФАКУЛЬТЕТ

Кафедра «Естественных наук и математика»



**ФОНД  
ОЦЕНОЧНЫХ СРЕДСТВ ПО УЧЕБНОЙ ДИСЦИПЛИНЕ**

**Дисциплине: Общая биохимия**

Направление подготовки (специальность): **560001– Лечебное дело**

Форма обучения: **очная**

Паспорт фонд средств по учебной дисциплине: **«Общая биохимия»**

**Код контролируемой компетенции:**

**ОК-1** - способен анализировать социально-значимые проблемы и процессы, использовать на практике методы гуманитарных, естественнонаучных, медико-биологических и клинических наук в различных видах профессиональной и социальной деятельности;

**СЛК-2** - способен и готов выявлять естественнонаучную сущность проблем, возникающих в ходе профессиональной деятельности врача.

**ПК-11** – способен и готов к постановке диагноза на основании результатов биохимических и клинических исследований с учетом течения патологии по органам, системам и организма в целом;

**ПК-12** - способен анализировать закономерности функционирования отдельных органов и систем, использовать знания анатомо-физиологических особенностей, основные методики клинико-лабораторного обследования и оценки функционального состояния организма взрослого человека и детей, для своевременной диагностики заболеваний и патологических процессов;

Ош -2025 г.

## 2. Результаты обучения (РО) и компетенции студента, формируемые в процессе изучения дисциплины «Общая и клиническая биохимия»

Код РО ООП и его формулировка	Компетенции	РО дисциплины и его формулировка
<b>РОооп-1:</b> способен использовать базовые положения математических, естественных, гуманитарных и экономических наук в профессиональной работе и самостоятельно приобретать новые знания, владеет навыками использования компьютерных программ для получения, хранения и переработки информации.	<b>ОК-1:</b> способен анализировать социально-значимые проблемы и процессы, использовать на практике методы гуманитарных, естественнонаучных, медико-биологических и клинических наук в различных видах профессиональной и социальной деятельности.	<b>РОд-1:</b> способен и готов анализировать основные биохимические явления и биохимические закономерности, лежащие в основе процессов, протекающих в организме человека, пользоваться базовыми технологиями преобразования информации для профессиональной деятельности
	<b>СЛК-2</b> - способен и готов выявлять естественнонаучную сущность проблем, возникающих в ходе профессиональной деятельности врача.	
<b>РОооп-5:</b> умеет применять фундаментальные знания при оценке морфофункциональных и физиологических состояний организма для своевременной диагностики заболеваний и выявления патологических процессов.	<b>ПК-12</b> – способен и готов к постановке диагноза на основании результатов биохимических и клинических исследований с учетом течения патологии по органам, системам и организма в целом.	<b>РОд-2:</b> способен и готов разбираться в вопросах структурно-функциональной и биохимической организации органов и систем, определении их биохимических особенностей метаболизма, с применением биохимических терминов, используемых в современной медицинской практике.
<b>РОооп-6:</b> способен интерпретировать результаты биохимических и клинических исследований при постановке диагноза.	<b>ПК-11</b> – способен и готов к постановке диагноза на основании результатов биохимических и клинических исследований с учетом течения патологии по органам, системам и организма в целом.	<b>РОд-3:</b> способен проводить биохимические и клинические исследования в биологических жидкостях, и готов интерпретировать результаты биохимических и клинических исследований, в постановке предварительного диагноза.

## Примерный перечень деятельности студентов

№	Вид деятельности	Определение	Примеч.
1	Конспектирование материала по вопросам теоретического задания.	Конспект – краткое изложение содержания учебного материала.	
2	Организация и выполнение лабораторной работы	Лабораторная работа- практическая часть самостоятельной работы студента, обеспечивающая способность и умение к практическим навыкам.	
2.	Организация работы в команде. Работа в малых группах.	Задание выполняется совместно. При методическом руководстве преподавателя, но без его непосредственного участия.	
3.	Решение ситуационных задач.	Ситуационные задачи близки к проблемным задачам и направлены на выявление и осознание способа деятельности.	
4.	Составление иллюстративной схемы или таблицы по определенной теме (поисковый метод)	Задания на развитие воображения и творчества. Составление иллюстративной схемы - это графический организатор, с помощью которого показано сходство и различие описываемых понятий.	
5.	Подготовка СРС (презентация)	Презентация – это практика показа и объяснения материала для аудитории или учащегося.	
6.	Подготовка СРС (реферат)	Самостоятельная работа студентов (СРС)- это планируемая работа студентов, выполняемая по заданию и при методическом руководстве преподавателя, но без его непосредственного участия.	
7.	Демонстрация видеофильмов. Просмотр и обсуждение видео материала	Просмотр – это осмысленное восприятие и понимание материала зрительно и на слух.	

### Критерии оценивания по дисциплине «Общая и клиническая биохимия»

№	Вид деятельности	Критерии оценивания	Баллы 50/50
1	Подготовка СРС (презентация)	1.Правильность оформления титульного листа 2.Последовательность содержания: -умение выделять главное -умение анализировать, систематизировать различные виды информации -умение абстрагировать, сравнивать, классифицировать 3.Готовность и продуманность презентации.	5
2	Организация работы в команде (работа в малых группах)	Организованность ролевых, интерактивных игр: 1. Выразительность игры, сосредоточенность внимания на главном, правильность оформления. 2. Активность в работе, подготовленность, логическое мышление и ловкость.	3,5
3	Составление иллюстративной схемы или таблицы по определенной теме(поисковый метод)	1. Правильность составления схем, таблиц. 2. Готовность по заданной теме (изучение схемы). 3. Должное исполнение изображений или обозначений, в виде графической организации.	5
4	Конспектирование материала по вопросам теоретического задания.	1.Конкретность изложения материала. 2.Достаточность материала.	5
5	Подготовка СРС (реферат)	1.Правильность оформления реферата 2.Последовательность содержания. 3.Готовность и новизна реферата.	5
6	Организация и выполнение лабораторной работы.	1. Клиническая значимость теоретического материала и практические навыки. 2.Содержательность практической части лабораторной работы. 3.Аргументированность и убедительность выводов по работе.	3,5
7	Демонстрация видеофильмов. Просмотр и обсуждение видео материала (интерактивный опрос)	1.Правильность понимания видео материала. 2.Готовность к обсуждению видео материала друг с другом. 3.Корректность ответов на дополнительные вопросы.	3,5
8	Решение ситуационных задач и тестовый контроль	1.Присутствует полный исчерпывающий ответ на все вопросы 2. Дан правильный ответ на все вопросы	4/4

### Карта накопления баллов

№	Форма контроля знаний	Модуль 1/ Модуль 2 (306/306)													Зачет/экзамен
		ТК-1 практические занятия max=106					ТК-2 практические занятия max=106					Лекция Max 106	СРС Max 106	РК Max 106	
	Занятие №	1	2	3	4	ТК-1	5	6	7	8	ТК-2				
1	Устный опрос													5,0	
2	Контрольная работа	0,5	0,5	0,5	0,5		0,5	0,5	0,5					3,0	
3	Тестовый контроль	0,5	0,5	0,5	0,5	1,0					1,0	5,0			
4	Ситуационные задачи					1,0					1,0			2,0	
5	Реферат, иллюстративная схема, презентация												5,0		
6	Интерактивный опрос или работа в группах	0,5	0,5	0,5	0,5		0,5	0,5	0,5						
7	Лабораторная работа	0,5	0,5	0,5	0,5		0,5	0,5	0,5						
8	Конспект лекций и практических. занятий												5,0		
9	Поощрительный балл									2,0					
9	Итого:	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	4,0		10	106	10 6	
10	Итого	106					106					56	56	206	306/306

# QUESTION'S AND ASSIGNMENTS CURRENT

## CONTROL №1

**Theme: Biochemistry of amino acids peptides and proteins.**

**Purpose of the lesson:** Checking the mastery of the material on the topics covered.

**Written survey** – carried out on tests and situational tasks in which questions are given.

**Number of points:**

**Situational tasks** – 1.0 point

**MCQ** – 1,0 point

**Assessment of students' knowledge in tests is carried out according to the following criteria:**

**Up to 50% correct answers** – 0 point

**Up to 50-60% correct answers** – 0,2 point

**Up to 60-70% correct answers** – 0,3 point

**Up to 70-80% correct answers** – 0,5 point

**Up to 90-100% correct answers** – 1 point

**Each question has one correct answer.**

**Методы компетенции на данном занятии включают:**

Оценку компетенции «Знания»: проводится по ответам на тестовые вопросы ситуационные задачи при письменном опросе.

Преподаватель вместе со студентами делает выводы по результатам ТК №1, выставляет оценки и оглашает их.

**Question's current control №1**  
**(time – 20 min)**

**Basic questions to prepare for tests and situational tasks:**

**1. The structure and function of amino acids, peptides and proteins. Structural organization of proteins in the body. Peptides. Peptide bond formation**

**I. INTRODUCTION**

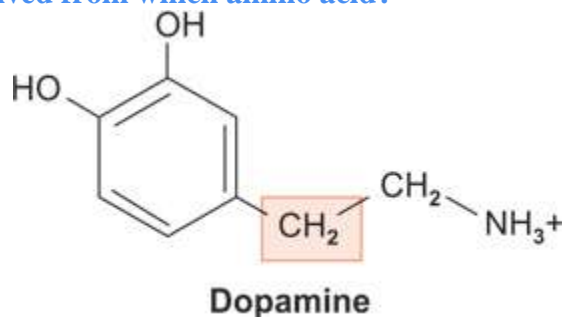
1. Major objectives of biochemistry. Role of biochemistry in medical education. Objects and methods of biochemistry. Medical biochemistry.
2. History of biochemistry. Branches and research trends of biochemistry.

**II. STRUCTURE AND FUNCTION OF PROTEINS**

3. History of protein study. Functions of proteins. Protein content of the organs and tissues
4. Hydrolysis of proteins. Amino acids: structure and classification.
5. Colour reactions of amino acids and proteins. Methods for the quantitative determination of proteins in a solution.
6. Physico-chemical properties of proteins and protein solutions.
7. Methods for separation and purification of protein: ultracentrifugation, chromatography, electrophoresis, dialysis.
8. Biologically important peptides: classification, representatives, biological functions.
9. Primary structure of proteins. Determination of primary structure, bonds which stabilize primary structure.
10. Secondary structure of proteins: types, bonds which stabilize secondary structure. Determination of secondary structure. Supersecondary structure.
11. Tertiary structure of proteins. Factors which stabilize tertiary structure. Determination of three-dimensional structure.
12. Denaturation of proteins, factors, practical use.
13. Quaternary structure of proteins. Factors which stabilize quaternary structure.
14. Proteins of organs and tissues. Changes of proteins in ontogenesis and disease.
15. Simple proteins; representatives, characteristics, biological functions.
16. Conjugated proteins; representatives, characteristics, biological functions.

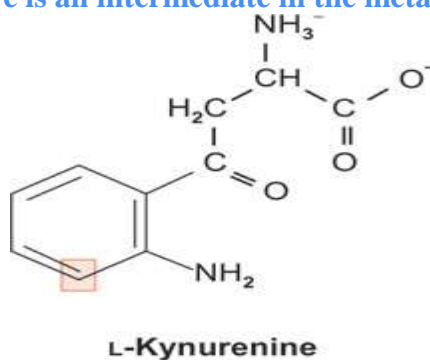
**Questions MCQ :**

1. What is Branched chain amino acids?
2. What is hydroxyl amino acids?
3. Give the name of aromatic amino acids?
4. This compound is derived from which amino acid?



- |               |              |
|---------------|--------------|
| a) Tyrosine   | b) Histidine |
| c) Tryptophan | d) Leucine   |

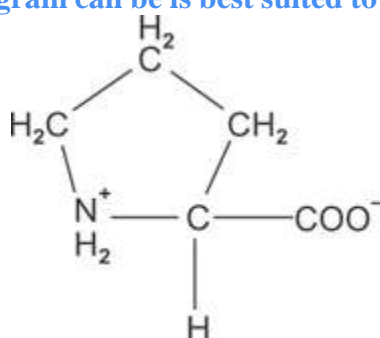
5. The compound in the figure is an intermediate in the metabolism of which amino acid?



6.

- |               |                  |
|---------------|------------------|
| a) Tyrosine   | b) Histidine     |
| c) Tryptophan | d) Phenylalanine |

6. The amino acid given in the diagram can be best suited to which of the following description?



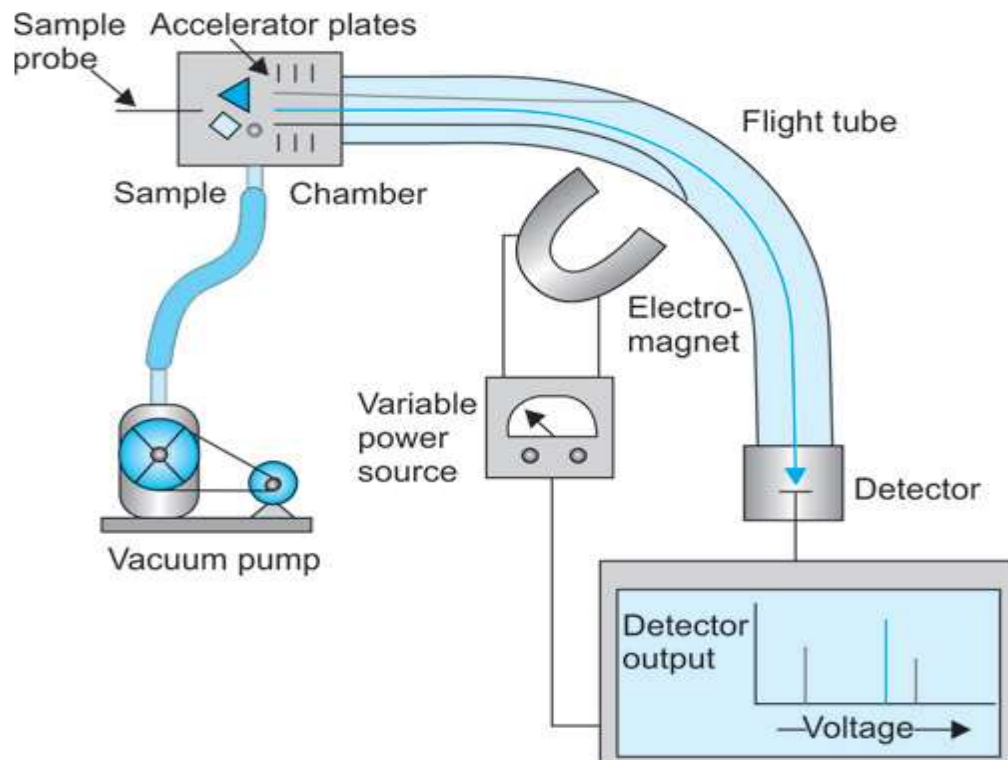
- |   |
|---|
| a) Answer Ninhydrin test with purple coloured complex |
| b) Alpha amino acid with polar side chain             |
| c) Nonpolar imino acid                                |
| d) Aromatic essential amino acid                      |

7. The compound marked X, that contribute to the Nitrogen in the given ring structure is





10. All the following description about the given technique is true *except*:



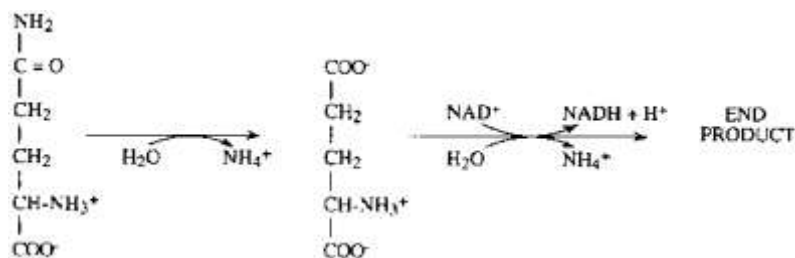
- a) Help to sequence the polypeptide
- b) Gold standard screening method of metabolic disorders
- c) Differentiate biological compounds based on mass to charge ratio
- d) Can also be used to study the secondary and tertiary structures of Proteins.

### Classification of proteins.

#### Questions:

1. Now are proteins classified?
2. Which amino acid has maximum buffering capacity at physiological pH?
3. What is pseudopeptide?
4. What are the of isoelectric point?
5. What does *tertiary structure of protein* mean? Characterize the bonds stabilizing the tertiary structure.
6. Which of the following bonds are not involved in tertiary type of protein structure?
  - a) Disulfide bond
  - b) Hydrogen bonding
  - c) Salt bridges
  - d) \*Hydrophilic interactions
7. The second and final enzymatic step in the reaction pathway shown is most correctly described as:
 

<ul style="list-style-type: none"> <li>a) Amination</li> <li>b) Aminotrasfer</li> <li>*e) Oxidative deamination</li> </ul>	<ul style="list-style-type: none"> <li>c) Transamination</li> <li>d) Amidation</li> </ul>
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8. **Clinical case study:** A 36-year-old woman reported with a dull pain in the left flank which was radiating towards left leg. She reports fever and inability to pass urine for the last few days. Similar history of illness was reported in the last 6 months. She was anemic and abdomen was tender. Routine urinalysis revealed presence of RBC, pus cells, WBC casts, characteristic hexagonal crystals and amino acids. What is the probable cause? What is the pathogenesis of the condition?
9. **Clinical case study:** An adolescent girl presents with subluxation of lens and mental retardation. On examination, she is tall and thin with elongated limbs. Mild scoliosis was present with pectus excavatum and genu valgum. One of her sisters had similar complaints. What is the likely disorder? What is the basis of the disease?

### Question's current control №2 (time – 20 min)

#### Basic questions to prepare for tests and situational tasks:

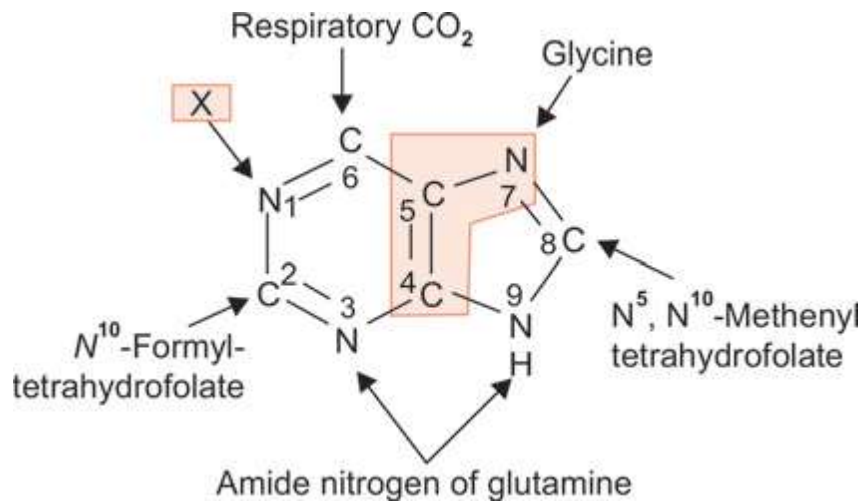
#### II. Structure and function of nucleic acids. Biosynthesis of nucleic acids and protein. Molecular biology

1. DNA: composition, structure, cell localization, biological role. Denaturation and hybridization of nucleic acids.
2. RNA: types, composition, structures, cell localization, biological role.
3. Nucleoproteins: role of protein in higher structural organization of nucleic acids. Structure of chromatin.
4. Biosynthesis of DNA in eukaryotic cells: scheme, enzymes, regulation.
5. Reverse transcription, biological role.
6. Biosynthesis of RNA in eukaryotic cells: steps, enzymes. Regulation of transcription. Processing of RNA.
7. The genetic code: its characteristic features.
8. Activation of amino acids. Adaptor function of tRNA. Formation and structure of aminoacyl-tRNA.
9. Structure of eukaryotic ribosomes, their function in protein synthesis.
10. Biosynthesis of protein in eukaryotic cells: steps, scheme. Posttranslational processing of proteins.
11. Regulation of protein synthesis. Antibiotics as inhibitors of protein synthesis.
12. DNA fingerprint.
13. Polymerase chain reaction: stages and practical applications.
14. The blot-analysis of DNA and RNA. Western blot analysis.
15. Sequencing of DNA by the Sanger's method

## 2. Structure and function of nucleic acids. Nucleotides. Chemistry and metabolism (purines and pyrimidine's).

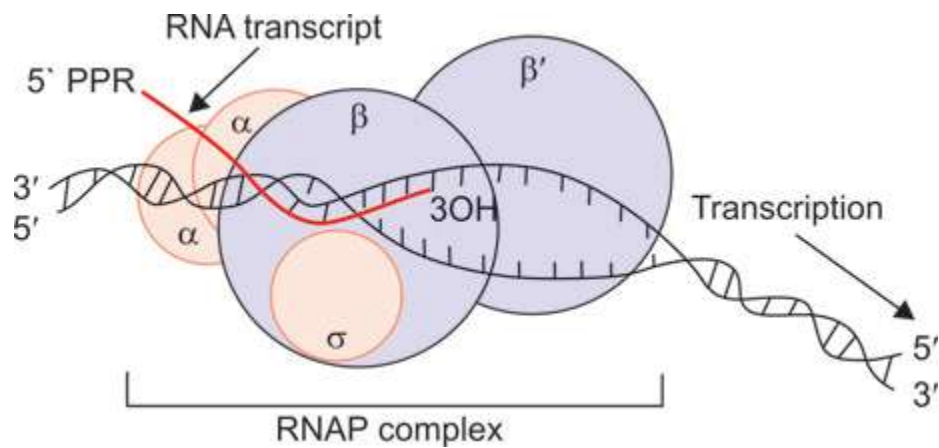
### Questions:

1. What is a nucleotide?
2. What is a nucleoside?
3. What is the bases present in nucleotides?
4. Which amino acid is required for both purine and pyrimidine synthesis?
5. Glycine donates what part of the purine ring?
6. The compound marked X, that contribute to the Nitrogen in the given ring structure is



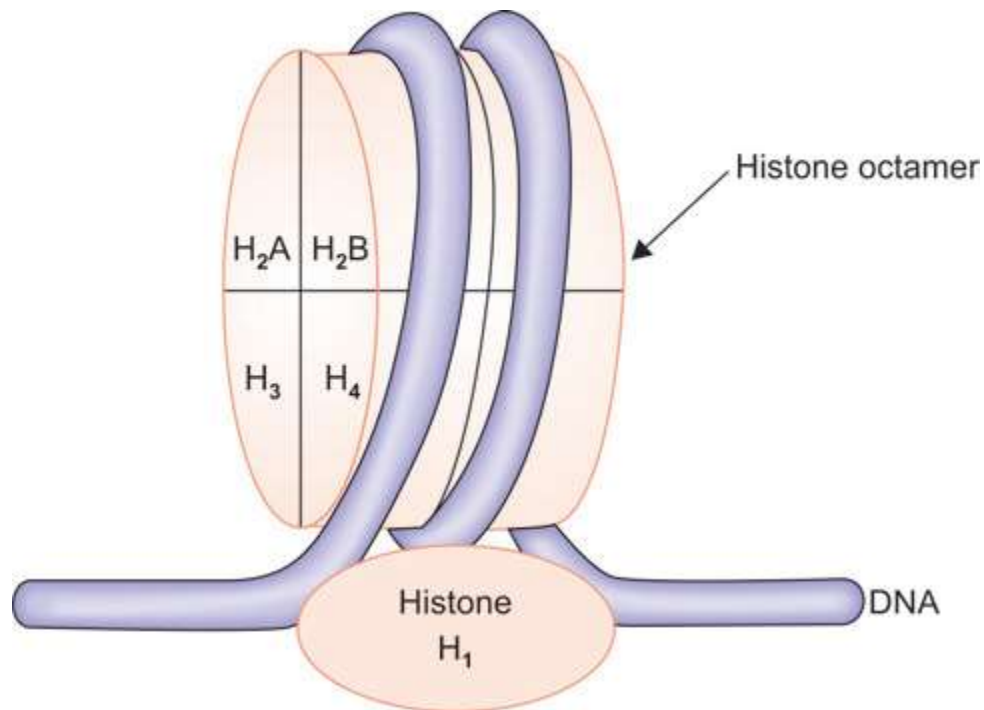
- a) Asparagine
- b) Glutamine
- c) asparatate
- d) Serine

7. The complex in the diagram specifically binds to binds to which regions of DNA?



- a). Enhancers
- b). Promoters
- c). Introns
- d). Exons

8. Which of the following is not true about the complex?



- a). Have beads on string appearance
- b). DNA complexed with histone octamer
- c). DNA is wound in right handed direction
- d). Has 146 bp in the DNA helix that wound on the histone octamer

**9. Clinical case study:** A 4-year- old boy presented with hypotonia, developmental delay, irritability and self mutilating behavior. On examination, there was testicular atrophy and hematuria. The serum uric acid level was 10.0 mg/dL. What is the likely diagnosis? What is the biochemical basis of the condition? (Lesch-Nyhan syndrome)

**10. Clinical case study:** A 4-year- old girl presented with megaloblastic anemia and failure to thrive. Obstetric history was uneventful. Anemia was present, which did not improve despite blood transfusions. There was no response to B<sub>12</sub>, folate and pyridoxine therapy. Urinalysis revealed presence of crystalline sediment, which was identified to be orotic acid. Very high levels of orotate (above 1.0 g/day, normal being < 1.4 mg/day) were excreted. Enzyme assays were done and showed deficiency of orotate phosphoribosyl transferase (OPRTase). What is the likely condition? What is the pathogenesis of the findings? (orotic aciduria)

**Questions for the module №1.**

**I. Proteins and aminoacids:**

1. Function of proteins.
2. Classification of amino acids.
3. Properties of amino acids: physical and chemical properties.
4. Non-standard amino acids.
5. Amino acids useful as drugs.
6. Structure of proteins: primary, secondary, tertiary, quaternary.
7. Peptide bonds, hydrogen bonds, disulfide bonds, covalent, non covalent, hydrophobic bonds, electrostatic bonds.
8. Properties of proteins.
9. Denaturation: agents, characteristics of denaturation.
10. Classification of proteins
11. Functional classification of proteins.
12. Protein classification based on chemical nature and solubility.
13. Globular proteins: albumins, globulins, glutelins, proamines, histones, globins, protamines, lectins.
14. Fibrous proteins: collagens, elastins, keratins.
15. Conjugated proteins: nucleoproteins, glycoproteins, lipoproteins, phosphoproteins, chromoproteins, metalloproteins.
16. Biologically important peptides.

**II. Metabolism of nucleotides**

1. Biosynthesis of purine ribonucleotides
2. Inhibitors of purine ribonucleotides
3. Synthesis of AMP and GMP from IMP.
4. Formation of purine ribonucleotide diphosphate and triphosphates
5. Salvage pathway for purines.
6. Regulation of purine nucleotide biosynthesis.
7. Degradation of purine ribonucleotides.
8. Disorders of purine metabolism: hyperuricemia and gout
9. Lesch-Nyhan syndrome.
10. Biosynthesis of pyrimidine ribonucleotides
11. Regulation of pyrimidine nucleotide biosynthesis.
12. Degradation of pyrimidine ribonucleotides.
13. Disorders of pyrimidine metabolism

**III. Enzymes.**

1. Nomenclature and classification of enzymes.
2. Chemical nature and properties of enzymes.
3. Factors affecting enzyme activity.
4. Concentration of enzyme.
5. Concentration of substrate (Michaelis-Menten constant, Lineweaver-Burk double reciprocal plot).
6. Effect of temperature.
7. Effect of pH.
8. Effect of product concentration.
9. Effect of activators.
10. Effect of time.

11. Effect of light and radiation.
12. Active site.
13. Enzyme inhibition: reversible inhibition, irreversible inhibition.
14. Allosteric inhibition.
15. Enzyme specificity.
16. Coenzymes ( coenzymes of B-complex vitamins, non-vitamin coenzymes).
17. Mechanism of enzyme action.
18. Mechanism of enzyme catalysis.
19. Thermodynamics of enzymatic reactions.
20. Regulation of enzyme activity in the living system.
21. Isoenzymes (LDH,CPK).

### **III. Vitamins.**

1. Classification of vitamins.
2. Vitamin A (chemistry, absorption, transport and mobilization), biochemical functions, vitamin A deficiency, hypervitaminosis A.
3. Vitamin D (chemistry, absorption, transport and mobilization), metabolism and biochemical functions, vitamin D deficiency, hypervitaminosis D.
4. Vitamin E (chemistry, absorption, transport and mobilization), biochemical functions, vitamin E deficiency, toxicity of vitamin E.
5. Vitamin K (chemistry, absorption, transport and mobilization), biochemical functions, vitamin K deficiency, antagonists of vitamin K.
6. Vitamin C (ascorbic acid), chemistry, biosynthesis and metabolism, biological functions, deficiency symptoms.
7. Thiamine (vitamin B<sub>1</sub>). Chemistry, biological functions, recommended dietary allowance, deficiency symptoms.
8. Riboflavin (vitamin B<sub>2</sub>). Chemistry, coenzymes, biological functions, recommended dietary allowance, deficiency symptoms.
9. Niacin (vitamin B<sub>3</sub>) – Chemistry and synthesis of coenzymes. Biological functions, recommended dietary allowance, deficiency symptoms.
10. Pyridoxine (vitamin B<sub>6</sub>) - Chemistry and synthesis of coenzymes. Biological functions, recommended dietary allowance, deficiency symptoms.
11. Biotin - Chemistry and synthesis of coenzymes. Biological functions, recommended dietary allowance, deficiency symptoms.
12. Pantothenic acid - Chemistry and synthesis of coenzymes. Biological functions, recommended dietary allowance, deficiency symptoms.
13. Folic acid- Chemistry and synthesis of coenzymes. Biological functions, recommended dietary allowance, deficiency symptoms.
14. Cobalamin - Chemistry and synthesis of coenzymes. Biological functions, recommended dietary allowance, deficiency symptoms.

### **IV. Vitamin like compounds**

1. Choline- biochemical functions.
2. Inositol
3. Lipoic acid.
4. Para aminobenzoic acid.
5. Bioflavonoids.
6. Antivitamins.



**Questions for the module №2.**

**Hormones**

1. Classification of hormones
  - a) Based on the chemical nature
  - b) Based on the mechanism of action
  - c) Mechanism of action of I normohes
  - d) Mechanism of action of I normohes
2. Hypothalamic and pituitary hormones
3. Hypothalamic hormones
  - a) Thyrotropin-releasing hormone –TRH
  - b) Corticotropin-releasing hormone –CRH
  - c) Gonadotropin--releasing hormone –GnRH
  - d) Growth hormone--releasing hormone –GRH
  - e) Growth hormone-releasing-inhibiting hormone – GRIH
  - f) Prolactin - releasing-inhibiting hormone – PRIH
4. Anterior pituitary hormones
  - a) The growth hormone-prolactin group
  - b) The glycoprotein hormohes
  - c) The pro-opiomelanocortin (POMC) peptide family
5. Posterior pituitary hormones
  - a) Oxitocin
  - b) Antidiretic hormone (ADH)
6. Thyroid hormone (T3, T4)
7. Hormones of adrenal cortex
8. Hormones of adrenal medulla
9. Hormones of gonads: Androgens, estrogens
10. Gastrointestinal (or GUT) hormones

**Metabolism of carbohydrates**

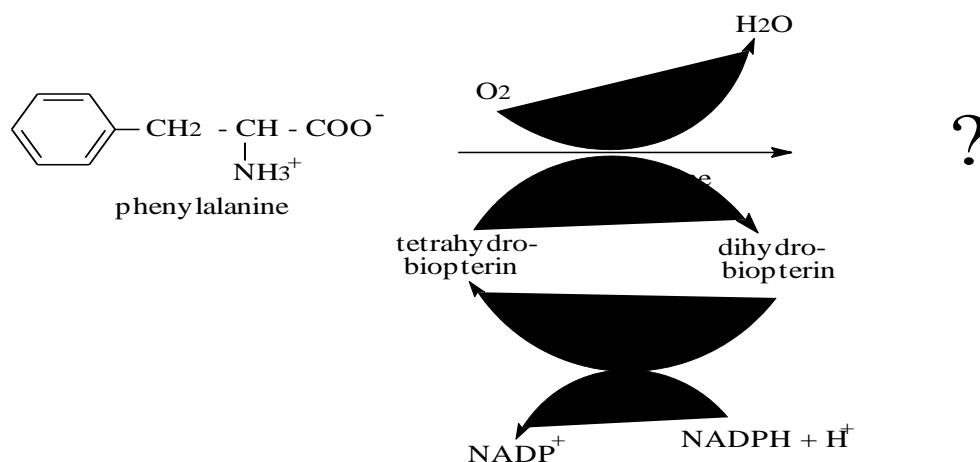
1. Major pathways of carbohydrate metabolism
2. Metabolism of carbohydrates. Glycogenolysis.
3. Gluconeogenesis. Importance of gluconeogenesis. Reactions of gluconeogenesis. Gluconeogenesis from amino acids. Gluconeogenesis from glycerol. Gluconeogenesis from propionate. Gluconeogenesis from lactate. Clucose-alanine cycle.
4. Glycolysis (Embden-Meyernot pathway): the oxidation og glucose to pyruvate and lactate.
5. Conversion of pyruvate to acetyl- CoA.
6. Citric acid cycle.
7. Uronic acid pathway. Metabolism of galactose.
8. Disorders of galactose metabolism.
9. Glycogenolysis. Action of glycogen phosphorylase. Action of debranching enzyme. Formation of glucose-6-phosphate
10. Inhibitors of Krebs cycle. Regulation of citric acid cycle.
11. Dlyconeogenesis.
12. Metabolism of fructose.
13. Synthesis of ATP.
14. Components and reaction of the electron transport chain.
15. Uronic acid pathway. Metabolism of galactose.
16. Hexose monophosphate snunt



17. Cori's cycle
18. Regulation of glycogen
19. Biological oxidation and electron transport chain
20. Enzymes and coenzymes
21. Organization of electron transport chain

#### Ticket №1

1. Write of the structure amino acids alanine, valine, histidine and threonine. Create dipeptide of leucine and cysteine.
2. Secondary structure of protein,  $\alpha$ -Helix and  $\beta$ -Plated sheet.
3. Functional classification of proteins.
4. Metabolism of phenylalanine and tyrosine.



#### Ticket №2

1. Write of the structure amino acids asparagine, lysine, methionine and glutamate. Create tripeptide from valine, phenylalanine and serine.
2. Nomenclature and classification of proteins.
3. Fibrous proteins: collagens, elactins, keratins.

#### Ticket №3

1. Write of the structure amino acids phenylalanine, glutamine, lysine and glycine. Create dipeptide of threonine and methionine.
2. Nomenclature classification of nucleotides.
3. Conjugated proteins: nucleoproteins, glycoproteins, lipoproteins, phosphoproteins, chromoproteins, metalloproteins.

#### Ticket №4

1. Write of the structure amino acids tyrosine, proline, histidine and isoleucine. Create tripeptide alanine, and methionine cerina.
2. Protein classification based on chemical nature and solubility.

#### Ticket №5

1. Write of the structure amino acids alanine, valine, threonine, and histidine. Create dipeptide of tyrosine and lysine.
2. The tertiary structure of the protein. Bohds of tertiary structure.
3. Chromoproteins.

#### Ticket №6

1. Write of the structure amino acids asparagine, lysine, methionine, and glutamate. Create from the tripeptide leucine, glycine and tryptophan.
2. Properties of amino acids: physical and chemical properties.
5. Structure of AMP, GMP, TMP, CMP etc.

#### **Ticket №7**

1. Write of the structure amino acids phenylalanine, glutamine, lysine and glycine. Create dipeptide from valine and threonine.
2. Biosynthesis of purine ribonucleotides

#### **Ticket №8**

1. Write of the structure amino acids asparagine, lysine, methionine and glutamate. Create tripeptide of isoleucine, cysteine and tyrosine.
2. Globular proteins: albumins, globulins, glutelins, proamines, histones, clobins, protamines, lectins.
3. Metalloproteins. The structure and function.

#### **Ticket №9**

1. Write of the structure amino acids asparagine, lysine, methionine, and glutamate. Create tripeptide of isoleucine, cysteine and tyrosine.
2. Protein classification based on chemical nature and solubility.
3. Write of the structure amino acids alanine, valine, histidine and threonine. Create dipeptide of leucine and phenylalanine.

#### **Ticket №10**

1. Write of the structure amino acids asparagine, lysine, methionine, and glutamate. Create from the tripeptide leucine, glycine and tryptophan.
2. Fibrous proteins: collagens, elactins, keratins.
- 3.

#### **Ticket №12**

1. Write of the structure amino acids asparagine, lysine, methionine, and glutamate. Create from the tripeptide leucine, glycine and tryptophan.
2. Regylation of enzyme activity in the living system.
3. Degradation of purine ribonucleotides.

#### **Ticket №13**

1. Write of the structure amino acids phenylalanine, glutamine, lysine and glycine. Create dipeptide from valine and threonine.
2. Disorders of purine metabolism: hypericemia and gout
3. Conjugated proteins: nucleoproteins, glycoprotein's, lipoproteins, phosphproteins, chromoproteins, metalloproteins.

#### **Ticket №14**

1. Write of the structure amino acids asparagine, lysine, methionine and glutamate. Create tripeptide from valine, phenylalanine and serine.
- 2.
3. Peptide bonds, hydrogen bonds, disulfide bonds, covalent, non covalent, hydropholic bonds, electrostatic bonds.
4. Biosynthesis of purmidine ribonucleotides

#### **Ticket №15**

1. Pyridoxine (vitamin B<sub>6</sub>) - Chemistry and synthesis of coenzymes. Biological functions, recommended dietary allowance, deficiency symptoms.
2. Denaturation: adents, characteristics of denaturation.

#### Ticket №16

1. Write of the structure amino acids alanine, valine, histidine and threonine. Create dipeptide of leucine and phenylalanine.
2. Simple proteins albumin and globulins. Structure and function.
3. Isoenzymes of lactate dehydrodenase (LDH).

#### Ticket №18

1. Write of the structure amino acids asparagine, lysine, methionine and glutamate. Create tripeptide of isoleucine, cysteine and tyrosine.
2. Lipoproteins. Classification, structure and biological functions.
3. Write of the structure amino acids phenylalanine, glutamine, lysine and glycine. Create dipeptide from valine and threonine.

#### Ticket №1

1. Call this reaction the starting material:



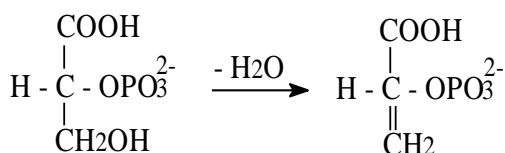
2. **Clinical case study:** A patient presented with acute chest pain of half hour duration. The biochemical analysis reports are as follows: blood Glucose -350 mg%, serum cholesterol -288 mg%, AST – 55 U/L. CPK and LDH were elevated. Give your provisional diagnosis. What are the other markers which can be estimated in this case?

(Answer 1: Myocardial infarction, CK isoenzymes, Cardiac troponins, myoglobin)

3. Features of the chemical composition of living organisms: organic and bioorganic compounds.
4. Vitamins, vitamin-like substances - features of their structure, properties, biological significance

#### Ticket №2

1. By this response belongs to which phase of metabolism?

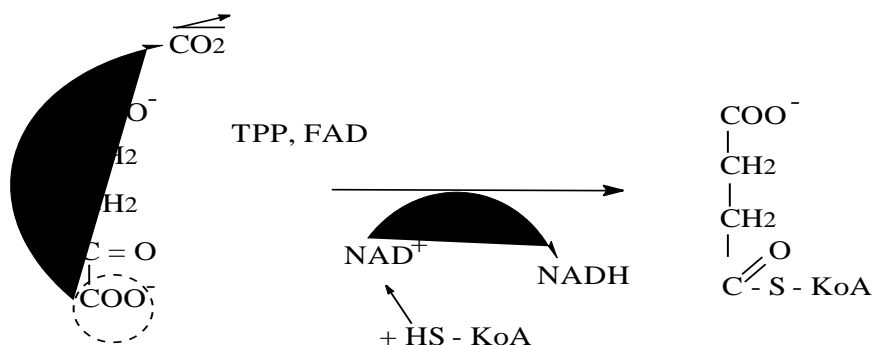


2. Concepts: metabolites, substrates, products, intermediate metabolites, xenobiotics.
3. The main sources of organic and inorganic substances in the body, the routes of their entry and removal from the body.
4. **Clinical case study:** A 40-year- old obese female presents to the emergency center with complaints of worsening nausea, vomiting and abdominal pain. Her pain is located in the midepigastic area and right upper quadrant. Her pain is presently constant and sharp in nature but previously was intermittent and cramping only after eating “geasy” foods. on examination, she has a temperature of 37,8 ° C with otherwise normal vital signs. She has significant mid-epigastric and right upper quanrant tenderness. Some guarding is present. Her abdomen is otherwise soft with no distention

and active bowel sounds. Liver function tests were abnormal, total leukocyte count and serum amylase level were raised. Ultrasound of the gallbladder revealed numerous gallstones and a thickening of the gallbladder wall. What is the most likely diagnosis? What is the role amylase in digestion?

### Ticket №3

1. Gluconeogenesis from glycerol. Gluconeogenesis from propionate. Gluconeogenesis from lactate. Glucose-alanine cycle.
2. It belongs to the reaction to what stage of metabolism?

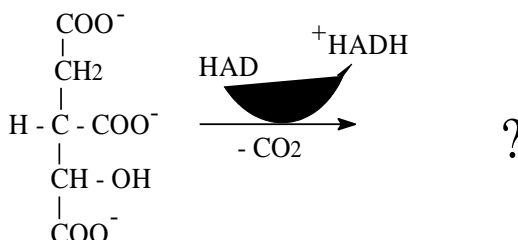


3. Vitamin B<sub>6</sub>, chemistry, biochemical functions, recommended dietary allowance (RDA), biochemical changes in B<sub>6</sub> deficiency;
4. **Clinical case 1.** A 59-year-old male is brought to the emergency department after a family member found him extremely confused and disoriented, with an unsteady gait. The patient has been known in the past to be a heavy drinker. He has no known medical problems. On examination, he is afebrile with a normal blood pressure. He is extremely disoriented and agitated. Horizontal rapid eye movement on lateral gaze is noted bilaterally. His gait is very unsteady. The urine drug screen was negative and he had a positive blood alcohol level. The emergency room physician administers thiamine. What is the most likely diagnosis?

(**Answer:** Wernicke-Korsakoff syndrome (thiamine deficiency) often associated with chronic alcoholics.)

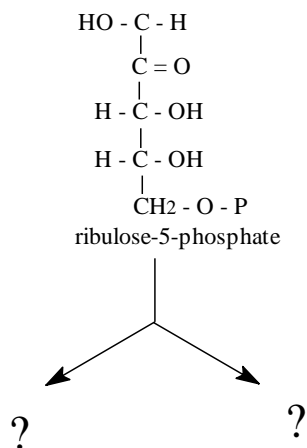
### Ticket №5

1. Metabolism of carbohydrates. Glycogenolysis.
2. Vitamin C, chemistry, biochemical functions, recommended dietary allowance (RDA), biochemical changes in C deficiency;
3. Energetics of oxidative phosphorylation. Mechanism of oxidative phosphorylation.
4. What are the starting material of the reaction.



### Ticket №4

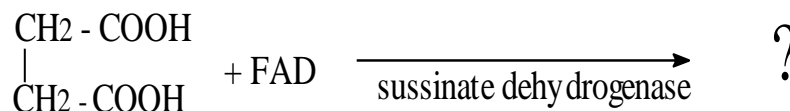
1. Components and reactions of the electron transport chain. Nicotinamide nucleotides.
2. Citric acid cycle.
3. Non-oxidative phase.



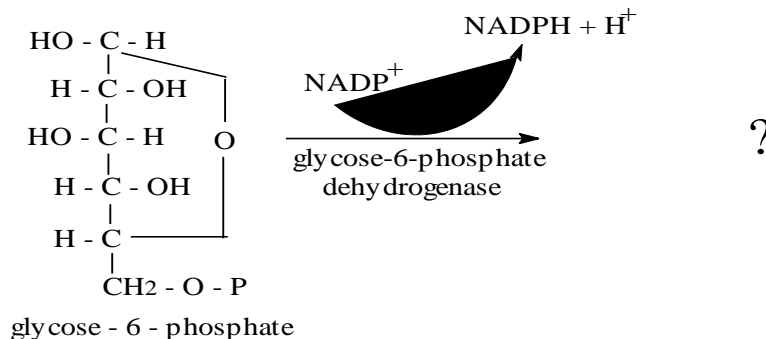
4. Vitamin B<sub>9</sub>, chemistry, biochemical functions, recommended dietary allowance (RDA), biochemical changes in B<sub>9</sub> deficiency;

### Ticket №6

1. Components and reactions of the electron transport chain. Flaploproteins.



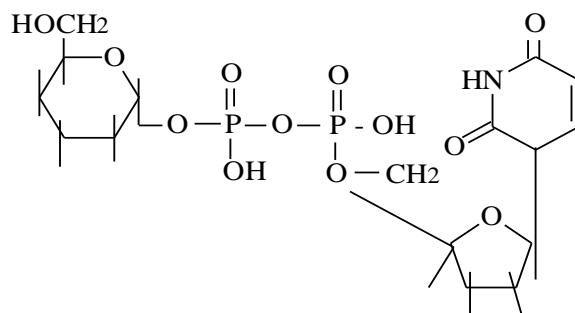
2. Vitamin B<sub>12</sub>, chemistry, biochemical functions, recommended dietary allowance (RDA), biochemical changes in B<sub>12</sub> deficiency;  
 3. Reactions of the pathway. Oxidative phase:



4. Vitamin A, absorption, transport and mobilization, biochemical functions, vitamin A deficiency;

### Ticket №7

1. Glycogenolysis. Action of glycogen phosphorylase. Action of debranching enzyme. Formation of glucose-6-phosphate  
 2. Vitamin D, metabolism and biochemical functions, vitamin D deficiency;  
 3. Call a chemical compound represented by the following:



4. Metabolism of fructose.

### Ticket №8

1. Check the summary description of anaerobic glycolysis

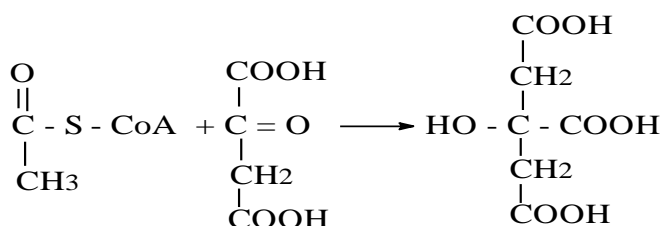
- a)  $C_6H_{12}O_6 + 2ADP + 2H_3PO_4 \longrightarrow 2C_2H_5OH + 2CO_2 + 2H_2O + 2ATP$
- b)  $C_6H_{12}O_6 + 2ADP + 2H_3PO_4 \longrightarrow 2CH_3CH(OH)COOH + 2H_2O + 2ATP$
- c)  $6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$
- d)  $C_6H_{12}O_6 + ATP \longrightarrow \text{glucose-6-p} + ADP + H_2O$

2. Vitamin E, metabolism and biochemical functions, vitamin D deficiency;

3. Inhibitors of Krebs cycle. Regulation of citric acid cycle.

### Ticket №9

1. To this reaction belongs to block metabolism?



2. Metabolism of fructose.

3. Vitamin K, metabolism and biochemical functions, vitamin D deficiency;

### Ticket №10

1. Regulation of glycogenesis and glycogenolysis (allosteric, hormonal, influence of calcium).

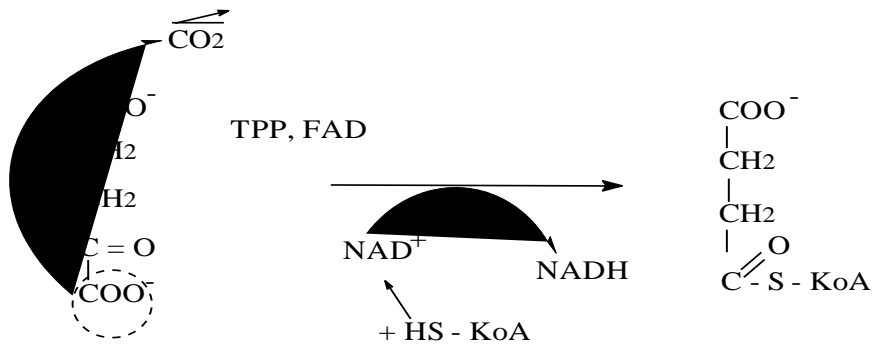
2. Call this reaction the starting material:



3. Vitamin B<sub>5</sub>, chemistry, biochemical functions, recommended dietary allowance (RDA), biochemical changes in B<sub>5</sub> deficiency;

### Ticket №11

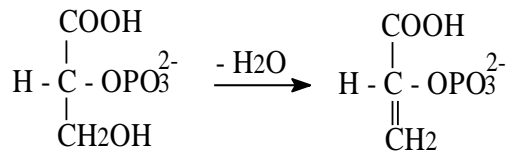
1. Transport of reducing equivalent –shuttle pathways: glycerol-phosphate shuttle and malate aspartate shuttle.
2. Gluconeogenesis from amino acids, Gluconeogenesis from glycerol, Gluconeogenesis from propionate, Gluconeogenesis from lactate (Cori cycle).
3. It belongs to the reaction to what stage of metabolism?



4. Vitamin B<sub>3</sub>, chemistry, biochemical functions, recommended dietary allowance (RDA), biochemical changes in B<sub>3</sub> deficiency;

### Ticket №12

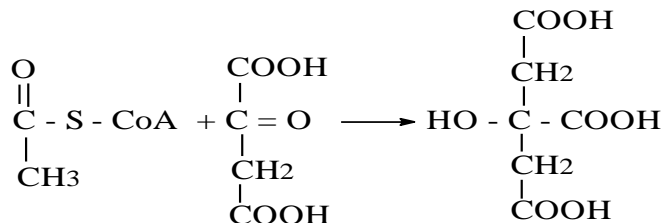
1. Alcohol inhibits gluconeogenesis. Glyconeogenesis from fat?
2. By this response belongs to which phase of metabolism?



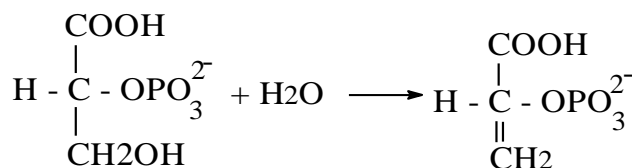
3. Vitamin B<sub>2</sub>, chemistry, biochemical functions, recommended dietary allowance (RDA), biochemical changes in B<sub>2</sub> deficiency;

### Ticket №13

1. Synthesis of ATP.
2. To this reaction belongs to block metabolism?

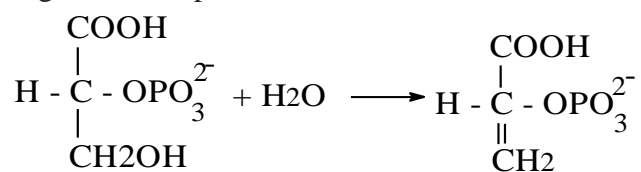


3. Vitamin C, chemistry, biochemical functions, recommended dietary allowance (RDA), biochemical changes in C deficiency;
4. By this response belongs to which phase of metabolism?



### Ticket №14

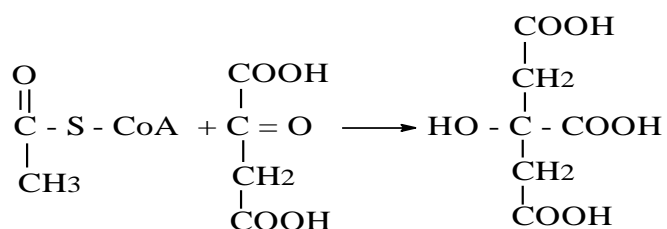
1. By this response belongs to which phase of metabolism?



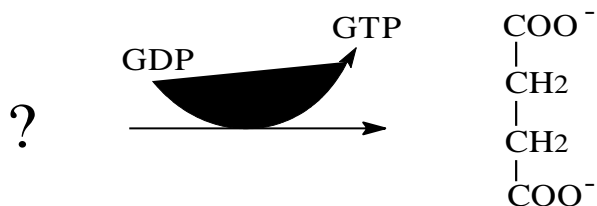
2. What is the allosteric inhibition of enzymes?
3. Uronic acid pathway. Metabolism of galactose.

### Ticket №15

1. To this reaction belongs to block metabolism?



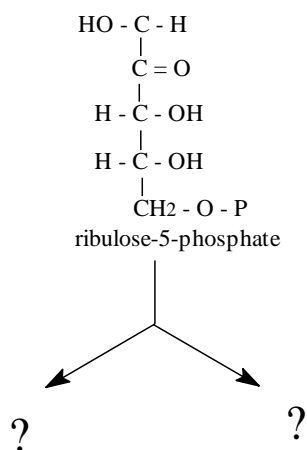
2. Glycolysis. Reaction of glycolysis.



3. Glycogenesis and glycogenolysis.

### Ticket №16

1. Non-oxidative phase.



2. Uronic acid pathway. Metabolism of galactose.