

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

Кафедра естественных наук

РАСМОТРЕНО

на заседании кафедры протокол № 10  
от «5» 09 2023 года

Зав. кафедрой [подпись] А.Ы.Курбаналиев



[подпись]  
Председатель УМС ММФ,  
К.Э.Н., доцент Базиева А.М.  
2023 г.

**ФОНД ТЕСТОВЫХ ЗАДАНИЙ**

для итогового контроля по дисциплине «Biochemistry»  
на 2023-2024 учебный год

Направление: 560001 – лечебное дело (GM)

курс – I, семестр – II

Наименование дисциплины	Всего	Кредит	Аудиторные занятия(60 ч)		СРС
			Лекции	Практические	
Общая биохимия <i>ия</i>	120 ч	4 кр	24 ч	36 ч	60 ч
Кол-во тестовых вопросов			300		

Составитель:

доцент [подпись]

Тешебаева У.Т.

Эксперт-тестолог: [подпись]

Базиева А.М.

г. Ош - 2023 г.

**Выписка из протокола № 10**  
**Заседания кафедры Естественных наук и математика**  
**Международного медицинского факультета Ошского государственного университета**

от « 06 » 06 2023 г.

Всего членов: 17

Присутствовали: 15

Отсутствовали: 2

**ПОВЕСТКА ДНЯ:**

1. Утверждение экзаменационных тестовых вопросов по дисциплинам кафедры за II семестр 2022-2023 учебного года

Слушали: зав. кафедрой Курбаналиев А.Ы., который ознакомил присутствующих количеством, структурой и содержанием экзаменационных тестовых вопросов за весенний семестр текущего учебного года.

Подробно остановился на каждый предмет по каждой специальности отдельно:

- 1.1. Об утверждении экзаменационных тестов по общей биохимии:

**Сетка часов по учебному плану:**

Наименование дисциплины	Всего	Ауд. зан.	Аудиторные занятия		СРС	Отчетность	
			Лекции	Практические			
<i>Общая биохимия</i>	120 ч (4кр)	60 ч	24 ч	36 ч	60 ч	2 сем.	Экзамен
Количество экзаменационных тестов			(в т.ч. в формате ТФ)				
			<b>300</b>				

**Выступила:** Тешебаева У.Т., которые единогласно поддержали количество, структуру и содержание экзаменационных тестовых вопросов по биохимии.

**Решили:**

1. Утвердить экзаменационных тестовых вопросов по дисциплинам кафедры за весенний семестр 2022-2023 учебного года;

**Поставновили:**

1. Принять к сведению выступление зав. Кафедрой Курбаналиев А.Ы.
2. Рекомендовать обращение кафедры на рассмотрения УМС факультета.
3. Ходатайствовать перед Учебно-методическим Советом факультета об утверждении экзаменационных тестовых вопросов по дисциплинам за весенний семестр 2022-2023 учебного года.

Председатель \_\_\_\_\_ А.Ы. Курбаналиев

Секретарь: \_\_\_\_\_ Дилмурат к. Кызбурак

## ЭКСПЕРТНОЕ ЗАКЛЮЧЕНИЕ БАНКА ТЕСТОВЫХ ЗАДАНИЙ

кафедры « Естественных наук и математики »

от « 28 » май 2023 г.

на разработанные тестовые задания по дисциплине  
« Biochemistry »  
наименование дисциплины

к. х. н., доцент Тешбаева Ч.Т.

/указать должность, ученую степень, Ф.И.О. автора (авторов)/

Тестовые задания проверены членом экспертной группы тестологов

доцент, к. ф. н. Базиева А.М.

/указать должность, ученую степень, Ф.И.О./

### Направления проведения оценки структуры и содержания тестового задания

№	Направление экспертизы	Оценка экспертов	
		Соответствует	Не соответствует
1	Соответствие задания программам и стандартам обучения	✓	
2	Включение в тесты только наиболее важных, базовых знаний	✓	
3	Ясность смысла тестовой ситуации и представления ТЗ	ясно ✓	Не ясно
4	Правильность ответа на вопрос ТЗ	Соответствует ✓	Не соответствует
5	Значимость содержания тестового задания (0-сомнительный, 1-допустимый, 2-важный, 3-существенный)	<u>3</u> балл(ов)	
6	Соответствие необходимому числу заданий по каждому разделу дисциплины исходя из его важности и числа часов, отведенных на его изучение в программе.	Соответствует ✓	Не соответствует

Членом экспертной группы выявлены следующие недостатки в тестовом задании грамматические ошибки в англ. варианте

Членом экспертной группы внесены следующие исправления (корректировки) в тестовое задание грам. ошибки исправлены

На основании представления тестовых заданий автором (авторами) и проведенной проверки сделала следующее заключение:

1) Содержание тестовых заданий соответствует (не соответствует) содержанию УМКД (нужное подчеркнуть)

2) Представленные тестовые задания в следующем объеме 300 вопросов: соответствуют (не соответствуют) требованиям, предъявляемым к количеству, уровням сложности и формам заданий для составления тестов. (нужное подчеркнуть)

Тестолог Базиева А.М.

 06.06.23  
подпись                      дата

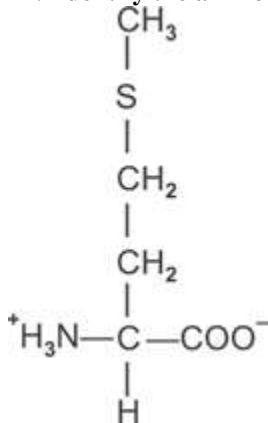
1 Ознакомлен зав. кафедрой Курбанов А.

 05.06.23  
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## CLASSIFICATION OF AMINO ACIDS

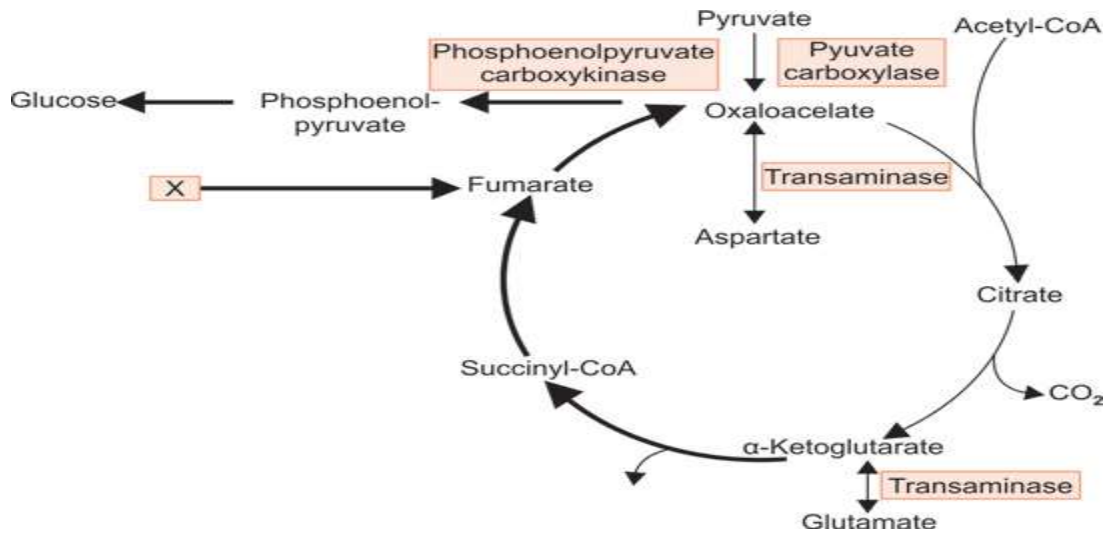
- 1. All proteins contain the**
  - a) Same 20 amino acids
  - b) Different amino acids
  - c) 300 Amino acids occurring in nature
  - d) Only a few amino acids
- 2. Proteins contain**
  - a) Only L-  $\alpha$  - amino acids
  - b) Only D-amino acids
  - c) DL-Amino acids
  - d) Both (A) and (B)
- 3. The optically inactive amino acid is**
  - a) Glycine
  - b) Serine
  - c) Threonine
  - d) Valine
- 4. At neutral pH, a mixture of amino acids in solution would be predominantly:**
  - a) Dipolar ions
  - b) Nonpolar molecules
  - c) Positive and monovalent
  - d) Hydrophobic
- 5. Sulphur containing amino acid is**
  - a) Methionine
  - b) Leucine
  - c) Valine
  - d) Asparagine
- 6. Selenocysteine is coded by:**
  - a) UAG
  - c) UAA
  - b) UGA
  - d) GUA
- 7. All of the following are essential amino acids**
  - a) Methionine
  - c) Alanine
  - b) Lysine
  - d) Leucine
- 8. Biuret reaction is specific for**
  - a)  $-\text{CONH}$ -linkages
  - b)  $-\text{CSNH}_2$  group
  - c)  $-(\text{NH})\text{NH}_2$  group
  - d) All of these
- 9. Which of the following is a tripeptide?**
  - a) Anserine
  - b) Oxytocin
  - c) Glutathione
  - d) Kallidin
- 10. Which bond is present in the primary structure of protein?**
  - a) Ester
  - b) Hydrogen
  - c) Ionic bond
  - d) Peptide
- 11. Which of the following is not an aromatic amino acid?**
  - a) Phenylalanine
  - c) Tryptophan
  - b) Tyrosine
  - d) Valine
- 12. Which of the following group contains only nonessential amino acid?**
  - a) Acidic amino acid
  - c) Aromatic amino acid
  - b) Basic amino acid
  - d) Branched chain amino acid
- 13. Semiessential amino acids are:**
  - a) Arginine
  - c) Glycine
  - b) Methionine
  - d) Lysine

14. Identify the amino acid given in the diagram.



- a) Cysteine
- b) Cystine
- c) Methionine
- d) Homocysteine

15. Which of the following is the amino acid marked X, that enter at the level of Fumarate?



- a) Alanine
- b) Tryptophan
- c) Tyrosine
- d) Histidine

### PROPERTIES OF AMINO ACIDS:

- Replacing alanine by which amino acid will increase UV absorbance of protein at 280 nm wavelength:
  - a) Leucine
  - b) Proline
  - c) Arginine
  - d) Tryptophan
2. Which of the following proteins cannot be phosphorylated using protein kinase in prokaryotic organisms?
  - a) Threonine
  - b) Tyrosine
  - c) Serine
  - d) Asparagine
3. Carboxylation of clotting factors by vitamin K is required to be biologically active. Which of the following amino acid is carboxylated?
  - a) Histidine
  - b) Histamine
  - c) Glutamate
  - d) Aspartate
4. The property of proteins to absorb ultraviolet rays of light is due to:
  - a) Peptide bond
  - b) Imino group
  - c) Disulfide bond
  - d) Aromatic amino acid
5. All biologically active amino acids are:

- a) L-forms
- b) D-forms

- c) Mostly D-forms
- d) D- and L-forms

**6. Optically inactive amino acid is:**

- a) Proline
- b) Glycine

- c) Lysine
- d) Leucine

**7. 2-Amino 3-OH propanoic acid is**

- a) Glycine
- c) Valine

- b) Alanine
- d) Serine

**8. Amino acids excepting histidine are not good buffering agents in cell because**

- a) They exist as zwitter ions
- b) Their pK and not in the physiological pH of acell
- c) Only Histidine has pK of its R group at 6.0 unlike the others which have at a different pH
- d) None of these

**9. Isoelectric pH of an amino acid is that pH at which it has a**

- a) Positive charge
- b) Negative charge
- c) No net charge
- d) All of these

**10. The factor which does not affect pK<sub>a</sub> value of an amino acid is \_\_\_\_\_**

- a) The loss of charge in the  $\alpha$ -carboxyl and  $\alpha$ -amino groups
- b) The interactions with other peptide R groups
- c) Other environmental factors
- d) Molecular weight

**11. Which of the following is not the classified form of conjugated proteins?**

- a) Lipoproteins
- b) Glycoproteins
- c) Metalloproteins
- d) Complete proteins

**12. Which part of the amino acid gives it uniqueness?**

- a) Amino group
- b) Carboxyl group
- c) Side chain
- d) None of the mentioned

**13. Which of the following information is responsible to specify the three-dimensional shape of a protein?**

- a) The protein's peptide bond
- b) The protein's amino acid sequence
- c) The protein's interaction with other polypeptides
- d) The protein's interaction with molecular chaperons

**14. What are the following is not a factor responsible for the denaturation of proteins?**

- a) pH change
- b) Organic solvents
- c) Heat
- d) Charge

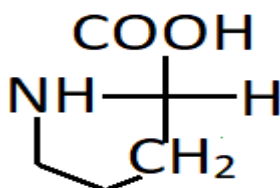
**15. If the basic formula of an  $\alpha$ -amino acid is R-CH(NH<sub>2</sub>)-COOH, where R is the side chain, what is the primary oint of distinction between any two proteins?**

- a) Number of amino groups
- b) Number of carboxyl groups
- c) The side chain R
- d) Relative positions of amino, carboxyl groups and R

**16. Cysteine is a/an \_\_\_\_\_ amino acid.**

- a) Acidic
- b) Essential
- c) Aromatic
- d) Sulphur containing

**17. The structure shown below is \_\_\_\_\_**



- a) Side chain of histidine

- b) Side chain of tryptophan

c) Side chain of proline

d) Proline

**18. Identify the amino acid with the formula  $\text{HOOC-CH}_2\text{-CH}_2\text{-CH(NH}_2\text{)-COOH}$**

a) Glutamic acid  
c) Glutamine

b) Aspartic acid  
d) Asparagine

**19. An example of chromoprotein is**

a) Hemoglobin  
c) Nuclein

b) Sturine  
d) Gliadin

## PEPTIDES AND PROTEINS

**1. Proteins are formed primarily from \_\_\_\_\_ bonds.**

a) Glycosidic  
c) Phosphodiester

b) Peptide  
d) Disulphide

**2. Alanylglycyl phenylalanine is an example of a \_\_\_\_\_**

a) Dipeptide  
c) Tetrapeptide

b) Tripeptide  
d) Polypeptide

**3. Which of the following bonds is not found in fibrous proteins?**

a) Phosphodiester  
c) Hydrogen bonds

b) Peptide  
d) Disulphide

**4. The sequence in which amino acids are arranged in a protein is called \_\_\_\_\_ structure.**

a) Primary  
c) Fibrous

b) Secondary  
d) Sheet

**5. Which type of bonds govern the secondary structure of proteins?**

a) Covalent  
c) Electrostatic

b) Hydrogen  
d) Peptide

**6. Which of the following is soluble in water?**

a) Insulin  
c) Fibroin

b) Elastin  
d) Collagen

**7. The structure in which all peptide chains are stretched out to full extension and laid side by side through intermolecular hydrogen bonds is called \_\_\_\_\_**

a)  $\alpha$ -helix  
c) Tertiary structure

b)  $\beta$ -pleated sheet  
d) Quaternary structure

## CHEMISTRY OF NUCLEOTIDES

**1. A nucleoside consists of**

a) Nitrogenous base  
c) Purine or pyrimidine base + phosphorous

b) Purine or pyrimidine base + sugar  
d) Purine + pyrimidine base + sugar + phosphorous

**2. The followings correctly arranged:**

a). GMP-Guanine monophosphate

b). UMP-Uracil monophosphate

- c). TMP-Thymine monophosphate  
d). CMP-Cytidine monophosphate

**3. Apart from occurring in nucleic acid, pyrimidines are also found in:**

- a). Theophylline  
b). Theobromine  
c). Flavin mononucleotide  
d). Thiamine

**4. Which of the following is not a nitrogenous base?**

- a). Adenine  
b). Guanosine  
c). Cytosine  
d). Thymine

**5. Which is not found in DNA:**

- a). Adenine  
b). Thymine  
c). Guanine  
d). Uracil

**6. At the physiological pH, the DNA molecules are:**

- a). Positively charged  
b). Negatively charged  
c). Neutral  
d). Amphipathic

**7. A nucleotide consists of**

- a) A nitrogenous base like choline  
b) Purine + pyrimidine base + sugar + phosphorous  
c) Purine or pyrimidine base + sugar  
d) Purine or pyrimidine base + phosphorous

**8. The pyrimidine nucleotide acting as the high energy intermediate is**

- a) ATP  
b) UTP  
c) UDPG  
d) CMP

**9. The size of small stable RNA ranges from**

- a) 0–40 nucleotides  
b) 40–80 nucleotides  
c) 90–300 nucleotides  
d) More than 320 nucleotides

**10. Methylated purines and pyrimidines are characteristically present in**

- a) mRNA  
b) hnRNA  
c) tRNA  
d) rRNA

**11. In tRNA molecule D arm is named for the presence of the base:**

- a) Uridine  
b) Pseudouridine  
c) Dihydrouridine  
d) Thymidine

**12. The acceptor arm in the tRNA molecule has**

- a) 5 Base pairs  
b) 7 Base pairs  
c) 10 Base pairs  
d) 20 Base pairs

**13. Double helical structure model of the DNA was proposed by**

- a) Pauling and Corey  
b) Peter Mitchell  
c) Watson and Crick  
d) King and Wooten

**14. A synthetic nucleotide analogue, 4-hydroxypyrazolopyrimidine is used in the treatment of:**

- a) Acute nephritis  
b) Gout  
c) Cystic fibrosis of lung  
d) Multiple myeloma

**15. A synthetic nucleotide analogue, used in the chemotherapy of cancer and viral infections is:**

- a) Arabinosyl cytosine  
b) 4-Hydroxypyrazolopyrimidine  
c) 6-Mercaptopurine  
d) 6-Thioguanine

**16. Intestinal nucleosidases act on nucleosides and produce**

- a) Purine base only  
b) Phosphate only  
c) Sugar only  
d) Purine or pyrimidine bases and sugars

**17. Identify the purine base of nucleic acids in the following.**

- a) Cytosine  
b) Thymine



c) Uracil d) Adenine

**18. Which of the following are not the components of RNA?**

- a) Thymine b) Adenine  
c) Guanine d) Cytosine

**19. Group of adjacent nucleotides are joined by \_\_\_\_\_**

- a) Phosphodiester bond b) Peptide bond  
c) Ionic bond d) Covalent bond

**20. Arrangement of nucleotides in DNA can be seen by \_\_\_\_\_**

- a) Ultracentrifuge b) X-Ray crystallography  
c) Light microscope d) Electron microscope

**21. Which of the following leads to disruption of nucleosomal structure?**

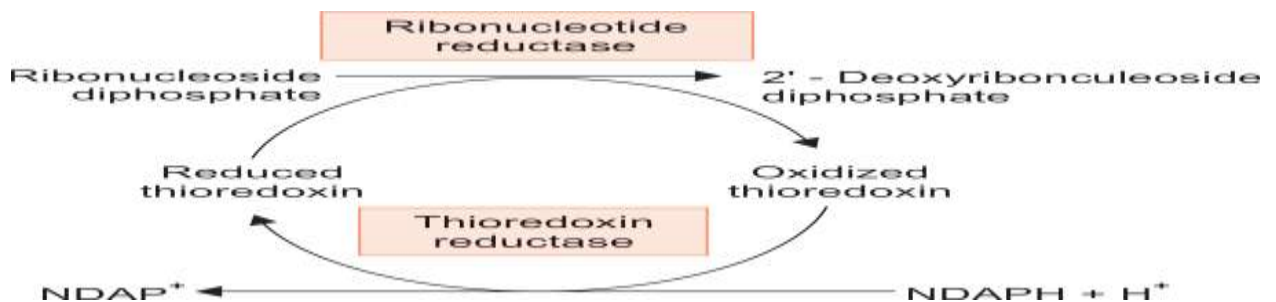
- a) Acetylation b) Carboxylation  
c) Phosphorylation d) Methylation

## METABOLISM OF PURINES AND PYRIMIDINES

**1. End product of purine metabolism in non-primate mammals is:**

- a). Uric acid b). Ammonia  
c). Urea d). Allantoin

**2. Deoxyribonucleic acid is formed from:**



- a). Ribonuclease b). Ribonucleotide monophosphate  
c). Ribonucleotidediphosphate d). Rubonucleotide triphosphate

**3. What is involved in formation of d-TMP from d-UMP?**

- a). N<sup>5</sup>, N<sup>10</sup>-methylene tetrahydrofolate b). From iminofolate  
c). N<sup>5</sup>formylfolate d). Dihydrofolate

**4. Inosinic acid is biological precursor:**

- a). Uracil and thymine b). Purines and thymine  
c). Adenylic acid and guanylic acid d). Orotic acid and uridylic acid

**5. False regarding gout is:**

- a). Due to increased metabolism of pyrimidines b). Due to increased metabolism of purines  
c). Uric acid levels may not be elevated d). Has a predilection for the great toe

**6. The enzyme deficient in Lesch-Nyhan syndrome is:**

- a). GTRT b). Glutaminase  
c). Transcarboxylase d). HGPRTase

**7. A 10-year-old child presents with history of rashes self mutilation family history positive which of the following investigations do you think may be suggestive of valuable for diagnosis:**

- a). Lead
- b). Alkaline phosphatase
- c). L D H
- d). Uric acid

**8. A ten-year-old child with aggressive behavior and poor concentration is brought with presenting complaints of joint pain and reduced urinary output. Mother gives history of self-mutilate his finger. Which of the following enzymes is likely to be deficient in this child:**

- a). HGPRTase
- b). Adenosine deaminase
- c). APRTase
- d). Acid maltase

**9. Choose the incorrect statement. Lesch-Nyhan Syndrome:**

- a). Affects young boys
- b). Presents with gouty arthritis
- c). The enzyme defect enhances the reutilization of purine bases
- d). Bizarre behavior of self-mutilation

**10. Hyperuricemia is not found in:**

- a). Cancer
- b). Psoriasis
- c). Von Gierke's disease
- d). Xanthinuria

### METABOLISM OF PURINES AND PYRIMIDINES

**1. Inosinic acid is biological precursor:**

- a). Uracil and thymine
- b). Purines and thymine
- c). Adenylic acid and guanylic acid
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**2. False regarding gout is: (AI 2001)**

- a). Due to increased metabolism of pyrimidines
- b). Due to increased metabolism of purines
- c). Uric acid levels may not be elevated
- d). Has a predilection for the great toe

**6. Conversion of inosine monophosphate to xanthine monophosphate is catalysed by**

- a). IMP dehydrogenase
- b). Formyltransferase
- c). Xanthine-guanine phosphoribosyltransferase
- d). Adenine phosphoribosyltransferase

**7. Pyrimidine biosynthesis begins with the formation from glutamine, ATP and CO<sub>2</sub>, of**

- a). Carbamoyl aspartate
- b). Orotate
- c). Carbamoyl phosphate
- d). Dihydroorotate

**8. The two nitrogen of the pyrimidine ring are contributed by**

- a). Ammonia and glycine
- b). Aspartate and carbamoyl phosphate
- c). Glutamine and ammonia
- d). Aspartate and ammonia

**9. A substrate for enzymes of pyrimidine nucleotide biosynthesis is**

- a). Allopurinol
- b). Tetracylin
- c). Chloramphenicol
- d). Puromycin

### STRUCTURE OF DNA

**1. True about DNA structure:**

- a). Purines are adenine and guanine and pyrimidines are uracil and cytosine
- b). Watson and Crick discovered structure in 1973
- c). Deoxyribose-phosphate backbone with bases stacked inside
- d). Mainly consists of left-handed helix

**2. Immunoglobulin molecule is synthesized by in mixed or separate due to:**

- a). Co-dominance
- b). Gene switching
- c). Allele exclusion
- d). Differential RNA processing

**3. The sigma (σ) subunit of prokaryotic RNA polymerase:**

- a). Binds the antibiotic rifampicin
- b). Is inhibited by α-amanitin
- c). Specifically recognizes the promoter site
- d). Is part of the core enzyme

**4. DNA dependent RNA polymerase is seen in:**

- a). Primase
- b). DNA polymerase I
- c). DNA polymerase III
- d). DNA gyrase

**5. In conversion of DNA to RNA, enzyme required:**

- a). DNA-polymerase
- b). DNA Ligase
- c). Primase
- d). RNA polymerase

**6. What is the most likely effect of a 2 bp insertion in the middle of the intron?**

- a). Normal transcription, altered translation
- b). Defective termination of transcription, normal translation
- c). Normal transcription, defective mRNA splicing
- d). Normal transcription, Normal translation

**7. In a DNA, the coding region reads 5'-CGT-3'. This would code in the RNA as:**

- a). 5'-CGU-3'
- b). 5'-GCA-3'
- c). 5'-ACG-3'
- d). 5'-UGC-3'

**8. Cytoplasmic process during processing is:**

- a). 5' capping
- b). Poly A tailing
- c). Methylation of tRNA
- d). Attachment of CCA in tRNA

**9. All are the processing reaction in tRNA, except:**

- a). CCA tailing
- b). Methylation of bases
- c). Poly A tailing
- d). Trimming of 5' end

**10. A segment of eukaryotic gene that is not represented in the mature mRNA is known as:**

- a). Intron
- b). Exon
- c). Plasmid
- d). TATA box

**11. An enzyme that makes a double stranded DNA copy from a single stranded RNA template molecule is known as:**

- a). DNA polymerase
- b). RNA polymerase
- c). Reverse transcriptase
- d). Phosphokinase

**12. Function of Pseudouridine arm of tRNA**

- a). Helps in initiation of translation
- b). Serves as the recognition site of amino acyl tRNA synthetase
- c). Recognises the triple nucleotide codon present in the mRNA
- d). Helps in initiation of transcription

**13. Which is a reverse transcriptase:**

- a). Topoisomerase
- b). Telomerase
- c). RNA polymerase II
- d). DNA polymerase alpha

**14. Which of the following is true regarding transcription except:**

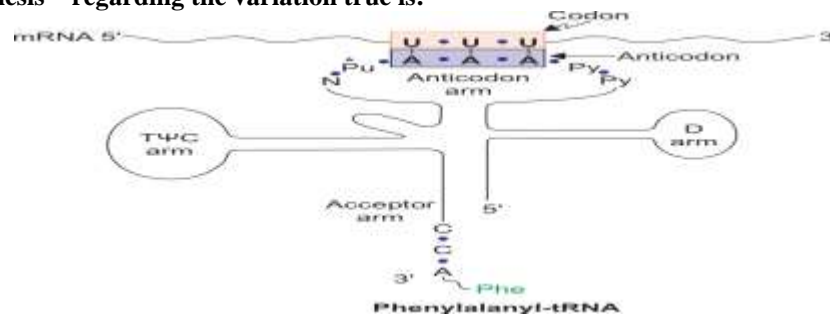
- a). mRNA formed
- b). DNA polymerase enzyme is used
- c). RNA polymerase enzyme is used
- d). Eukaryotes possess 3 different types of RNA polymerase

**TRANSLATION**

**1. A codon consists of:** (AIIMS 90, UP 99, WB 02)

- a). One molecule of aminoacyl-Trna
- b). Two complementary base pairs
- c). 3 consecutive nucleotide units
- d). 4 individual nucleotides

**2. Wobble hypothesis – regarding the variation true is:**



- a). 3-end of anticodon
- b). 5-end of anticodon
- c). mRNA
- d). tRNA

**3. There are 20 amino acids with three codons in spite of the number of amino acids could be formed is 64 leading to that an amino acid is represented by more than one codon is called:**

- a). Transcription
- b). Degeneracy
- c). Mutation
- d). Frame shift

**4. If constitutive sequence of 4 nucleotide codes for 1 amino acid, how many amino acids can be theoretically formed?**

- a). 4
- b). 64
- c). 16
- d). 256

**3. Genetic code has triplet of nucleotides each for one amino acid. When an amino acid is specified by more than one codon, it is called:**

- a). Transcription
- b). Degeneracy
- c). Mutation
- d). Frameshift

**4. Termination process of protein synthesis is performed by all except:**

- a). Releasing factor
- b). Stop codon
- c). Peptidyltransferase
- d). AUG codon

**5. True about Ribozyme:**

- a). Peptidyltransferase activity
- b). Cuts DNA at specific site
- c). Participate in DNA synthesis
- d). GTPase activity

**6. Stop codons are:**

- a). UAA, UAG, UGA
- b). UAC, GUA, GAC
- c). UCA, AUG, UGA
- d). UAC, GCA, UAA

**7. Met-tRNA would recognize:**

- a). AUG
- b). GCA
- c). GUA
- d). UAC

**8. Which of the following statement is true?**

- a). N-formylmethionine is the precursor of eukaryotic polypeptide synthesis
- b). Eukaryotic ribosomes are smaller than prokaryotic
- c). Identification of 5' cap of mRNA by IF4E is the rate limiting step
- d). Elongation factor 2 shuttles between ADP and ATP

**9. The cellular component for protein synthesis is:**

- a). Smooth endoplasmic reticulum
- b). Rough endoplasmic reticulum
- c). Ribosomes
- d). Mitochondria

**10. Amber codon refers to:**

- a). Mutant codon
- b). Stop codon

- c). Initiating codon  
d). Codon for more than one amino acids.

**11. In translation process, proofreading of mRNA is done by:**

- a). RNA polymerase  
b). Aminoacyl tRNA synthetase  
c). Leucine zipper  
d). DNA

**CLASSIFICATION OF ENZYMES, ENZYME KINETICS**

**1. Suicidal Enzyme is:**

- a). Lipoxygenase  
b). Cyclooxygenase  
c). Thromboxane Synthase  
d). 5' Nucleotidase

**2. Which of the following is a Lyase?**

- a). Aldolase B  
b). Acetyl Co A Synthetase  
c). Fatty Acyl CoA Dehydrogenase  
d). Acetyl CoA Carboxylase

**3. All are true about oxygenases, except:**

- a). Can incorporate 2 atoms of O<sub>2</sub> in a substance  
b). Can incorporate 1 atom of O<sub>2</sub> in a substance  
c). Important in hydroxylation of steroids  
d). Catalyse carboxylation of drugs

**4. All of the following enzymes are involved in oxidation-reduction, except:**

- a). Dehydrogenases  
b). Hydrolases  
c). Oxygenases  
d). Peroxidases

**5. Enzyme which cleave C-C bond:**

- a). Lyase  
b). Oxidoreductase  
c). Ligase  
d). Isomerase

**6. Velocity at K<sub>m</sub> is:**

- a). Half the substrate concentration  
b). Same as V<sub>max</sub>  
c). Quarter the V<sub>max</sub>  
d). Half the V<sub>max</sub>

**7. Coenzyme in decarboxylation reaction:**

- a). Niacin  
b). Biotin  
c). Pyridoxine  
d). Riboflavin

**8. The type of enzyme inhibition in which Succinate dehydrogenase reaction is inhibited by malonate is an example of:**

- a). Noncompetitive  
b). Uncompetitive  
c). Competitive  
d). Allosteric

**9. K<sub>m</sub> changes and V<sub>max</sub> remains the same. What is the type of Enzyme inhibition?**

- a). Competitive Inhibition  
b). Noncompetitive Inhibition  
c). Uncompetitive inhibition  
d). Suicide Inhibition

**10. All of the covalent modification regulate enzyme kinetics except:**

- a). Phosphorylation  
b). Acetylation  
c). ADP Ribosylation  
d). Glycosylation

**11. The following affect enzyme activity except:**

- a). Methylation  
b). Acetylation  
c). Induction  
d). Phosphorylation

**12. Marker enzyme for Golgi apparatus:**

- a). Galactosyltransferase  
b). Glucose 6 Phosphatase  
c). 5' Nucleotidase  
d). Catalase

**13. True about isoenzymes is:**

- a). Catalyse the same reaction  
b). Same quaternary structure  
c). Same distribution in different organs  
d). Same enzyme classification with same number and name

**14. Which of the following estimates blood creatinine level most accurately:**

- a). Jaffe method
- b). Kinetic Jaffe method
- c). Technicon method
- d). Enzyme assay

**15. LDH-5 level elevated in which cell injury:**

- a). Liver
- b). Heart
- c). Muscle
- d). RBC

**16. Which of the following LDH is having fastest electrophoretic mobility?**

- a). LDH-1
- b). LDH-2
- c). LDH-3
- d). LDH-5

**17. Example of an extracellular enzyme is**

- a) Lactate dehydrogenase
- b) Cytochrome oxidase
- c) Pancreatic lipase
- d) Hexokinase

**18. An example of ligases is**

- a) Succinate thiokinase
- b) Alanine racemase
- c) Fumarase
- d) Aldolase

**19. In reversible non-competitive enzyme activity inhibition**

- a)  $V_{max}$  is increased
- b)  $K_m$  is increased
- c)  $K_m$  is decreased
- d) Concentration of active enzyme is reduced

**20. The pH optima of most of the enzymes is**

- a) Between 2 and 4
- b) Between 5 and 9
- c) Between 8 and 12
- d) Above 12

**21. Coenzymes are**

- a) Heat stable, dialyzable, non protein organic molecules
- b) Soluble, colloidal, protein molecules
- c) Structural analogue of enzymes
- d) Different forms of enzymes

**22. An example of group transferring coenzyme is**

- a) NAD<sup>+</sup>
- b) NADP<sup>+</sup>
- c) FAD
- d) CoA

**23. The normal serum acid phosphatase activity ranges from**

- a) 5.0–13.0 KA units/100 ml
- b) 1.0–5.0 KA units/100 ml
- c) 13.0–18.0 KA units/100 ml
- d) 0.2–0.8 KA units/100 ml

**24. Isoenzymes can be characterized by**

- a) Proteins lacking enzymatic activity that are necessary for the activation of enzymes
- b) Proteolytic enzymes activated by hydrolysis
- c) Enzymes with identical primary structure
- d) Similar enzymes that catalyse different reaction

**25. The isoenzymes of LDH**

- a) Differ only in a single amino acid
- b) Differ in catalytic activity
- c) Exist in 5 forms depending on M and H monomer contents
- d) Occur as monomers

## VITAMINS

**1. The composition pyridine dependents dehydrogenases include:**

- a) Vitamin B<sub>2</sub>;
- c) Vitamin PP;
- b) Vitamin B<sub>1</sub>;
- d) Pantothenic acid and cytochromes;

**2. The composition of flavin dependent dehydrogenases include:**

- a) Inositol; c) Coenzyme A (CoA).  
b) Ubiquinone; d) Vitamin B<sub>2</sub>;

**3. The structure of rhodopsin-retinal receptor protein includes:**

- a) Riboflavin; c) Retinal;  
b) Calciferol; d) Tocopherol;

**4. The structure of the FAD-dependent oxidoreductases include vitamin:**

- a) B<sub>3</sub> c) B<sub>5</sub>  
b) B<sub>2</sub> d) A

**5. What vitamins are deposited in the animal organism:**

- a) A, B<sub>2</sub>, C, D c) D, E, K, A  
b) B<sub>1</sub>, H, P, E d) A, E, D, H

**6. S. Funk established structure of vitamin:**

- a) PP c) Retinol  
b) Pyridoxine d) Thiamine

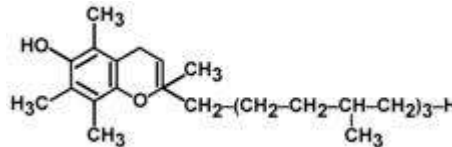
**7. The sulfur atoms included in the composition of vitamins:**

- a) B<sub>6</sub> and B<sub>1</sub> c) H and B<sub>3</sub>  
b) B<sub>1</sub> and H d) S and K

**8. Vitamins are classified into:**

- a) Fat-soluble, water-soluble c) Water-soluble, nonfat-vitamins  
b) Antivitamins d) Hormone

**9. Indicate any vitamin formula shown below?**



- a) Vitamin C c) Vitamin E  
b) Vitamin PP d) Vitamin B<sub>12</sub>

**10. Which substance is a member of folic acid?**

- a) Ascorbic acid b) Paraaminobenzoic acid  
c) Pantothenic acid d) Isoalloxazine

**11. Vitamin B<sub>6</sub> is involved in the reactions:**

- a) Carboxylation c) Transamination  
b) Phosphorylation d) Deamination

**12. Vitamin D regulates the body content:**

- a) Sodium c) Potassium  
b) Calcium d) Magnesium

**13. When thiamine vitamin deficiency disease develops:**

- a) Rickets c) "Beri-Beri"  
b) Anemia d) Dermatitis

**14. A deficiency of vitamin B<sub>12</sub> causes**

- a) Beri-Beri c) Scurvy  
b) Pernicious anemia d) Iron

**15. A provitamin D synthesized in human beings is**

- a) Ergosterol c) 7-Dehydrocholesterol  
b) 25-Hydroxycholecalciferol d) Cholecalciferol

**16. Anti-egg white injury factor is:**

- a) Pyridoxine
- b) Biotin

- c) Liponic acid
- d) Thiamin

**17. Deficiency of vitamin D causes**

- a) Tuberculosis of bone
- b) Rickets and osteomalacia
- c) Hypothyroidism
- d) Skin cancer

**18. Riboflavin deficiency symptoms are:**

- a) Glossitis
- b) Stomatitis
- c) Vomitting
- d) Glossitis and Stomatitis

**19. When kidney diseases are present, oral doses of vitamin D may not be effective in curing rickets, because:**

- a) Hydroxylation reaction is taking place in kidney which activates vitamin
- b) Dehydrogenation of vitamin D is taking place in kidney
- c) Hydroxylation of vitamin D is taking place in kidney which destroys vitamin
- d) Vitamin D is stored in liver

**20. Biochemical function of vitamin K is for:**

- a) Converting proline to hydroxyproline
- b) Conversion of prothrombin to thrombin
- c) Gamma carboxylation of clotting factors
- d) Inhibition of lipid peroxidation in biomembranes

**21. All are true about vitamin D metabolism, except:**

- a) 1-alpha hydroxylation occurs in kidney
- b) 25-alpha hydroxylation occurs in Liver
- c) In absence of sun light, the daily requirement is 400–600 IU per day
- d) Williams syndrome is associated with mental retardation, precocious puberty and obesity

**22. Vitamin A intoxication cause injury to:**

- a) Lysosomes
- b) Mitochondria
- c) Endoplasmic reticulum
- d) Microtubules

**23. Which of the following is true about vitamin K?**

- a) Vit K dependent factors undergo post-transcriptional modification
- b) Prothrombin is a vitamin K dependent factor
- c) Stuart-Prower factor is not vitamin K dependent
- d) Menadione is a natural water insoluble vitamin K used in clinical practice

**24. Pantothenate Kinase associated neurodegeneration is:**

- a) Wilson's Disease
- b) Hallervorden- Spatz syndrome
- c) McLeod Syndrome
- d) LeschNyhan Syndrome

**25. Severe thiamine deficiency is associated with:**

- a) Decreased RBC transketolase activity
- b) Increased clotting time
- c) Decreased RBC transaminase activity
- d) Increased xanthurenic acid excretion

**26. Identify the vitamin deficiency given in the picture:**



- a) Pellagra
- b) Scurvy
- c) Beriberi
- d) Burning foot syndrome



## TCA Cycle

1. Which of the following is not an intermediate of TCA Cycle?

- a) Acetyl CoA
- b) Citrate
- c) Succinyl CoA
- d) Alpha Ketoglutarate

2. Which of the following is true about Krebs Cycle?

- a) Pyruvate condenses with Oxaloacetate to form Citrate
- b) Alpha ketoglutarate is a five Carbon compound
- c) Oxidative Phosphorylation occurs in the cytoplasm only
- d) Krebs cycle can operate in anaerobic condition

3. Which of the following substance binds to CoA and condenses oxaloacetate to inhibit the TCA cycle:

- a) Malonate
- b) Arsenite
- c) Fluoroacetate
- d) Fumarate

4. First substrate of Krebs cycle is:

- a) Pyruvate
- b) Glycine
- c) HCl
- d) Lipoprotein

5. Hyperammonemia inhibits TCA cycle by depleting:

- a) Oxaloacetate
- b) Alpha ketoglutarate
- c) Citrate
- d) Succinyl CoA

6. False about reducing equivalents is:

- a) They are NADH and NADPH
- b) Only produced during primary metabolic pathway
- c) Formed in TCA cycle
- d) Formed in mitochondria

7. All contain high energy bond, except:

- a) ATP
- b) Glucose-6-phosphate
- c) Acetyl-CoA
- d) Phosphoenolpyruvate

8. Coenzyme Q catalyzes electron transport between:

- a) FADH and cytochrome B
- b) It is the last member in the electron transport chain
- c) NADH and ubiquinone
- d) Cytochrome Q and cytochrome C

9. Death due to cyanide poisoning is a result of:

- a) Cyanide hemoglobin complex formation
- b) Cyanide inhibiting complex I of respiratory chain
- c) Cyanide inhibiting cytochrome oxidase
- d) Cyanide blocking oxygen transport in blood

10. Which is true with cytochrome reductase?

- a) It catalyzes the electron transport between FADH and cytochrome b
- b) It is the last member in the electron transport chain
- c) It catalyzes the electron transport between NADH and ubiquinone
- d) It catalyzes the electron transport between CoQ and cytochrome C

## CARBOHYDRATES AND CARBOHYDRATE METABOLISM

1. Glucose-6-phosphatase is not present in

- a) Liver and kidneys
- b) Kidneys and muscles

c) Kidneys and adipose tissue

d) Muscles and adipose tissue

**2. Glucose-6-phosphatase is absent or deficient in**

- a) Von Gierke's disease
- c) Cori's disease

- b) Pompe's disease
- d) McArdle's disease

**3. An amphibolic pathway among the following is**

- a) HMP shunt
- c) Citric acid cycle

- b) Glycolysis
- d) Gluconeogenesis

**4. Excessive intake of ethanol increases the ratio:**

- a) NADH : NAD<sup>+</sup>
- c) FADH<sub>2</sub> : FAD

- b) NAD<sup>+</sup> : NADH
- d) FAD : FADH<sub>2</sub>

**5. Which of the following enzyme catalyzes the first step of glycolysis?**

- a) Hexokinase
- c) Glucokinase

- b) Pyruvate kinase
- d) Phosphofructokinase-1

**6. The general test for detection of carbohydrates is**

- a) Iodine test
- c) Barfoed test

- b) Molisch test
- d) Osazone test

**7. Synthetase activity is depressed by**

- a) Glucose
- c) Cyclic AMP

- b) Insulin
- d) Fructokinase

**8. Cleavage of Fructose 1, 6-bisphosphate yields \_\_\_\_\_**

- a) Two aldoses
- c) An aldose and a ketose

- b) Two ketoses
- d) Only a ketose

**9. The reaction succinyl COA to succinate requires**

- a) CDP
- c) GDP

- b) ADP
- d) NADP<sup>+</sup>

**10. The carrier of the citric acid cycle is**

- a) Succinate
- c) Malate

- b) Fumarate
- d) Oxaloacetate

**11. What is the first step in the payoff phase of glycolysis?**

- a) Reduction of 1, 3-bisphosphoglycerate to glyceraldehyde 3-phosphate
- b) Oxidation of glyceraldehyde 3-phosphate to 1, 3-bisphosphoglycerate
- c) Reversible conversion of dihydroxyacetone phosphate to glyceraldehyde 3-phosphate
- d) Irreversible conversion of dihydroxyacetone phosphate to glyceraldehyde 3-phosphate

**12. Pyruvate dehydrogenase complex and  $\alpha$ -ketoglutarate dehydrogenase complex require the following for their oxidative decarboxylation:**

- a) CoASH and Lipoic acid
- c) CoASH and TPP

- b) NAD<sup>+</sup> and FAD
- d) CoASH, TPP, NAD<sup>+</sup>, FAD, Lipoate

**13. Oxidative decarboxylation of pyruvate requires**

- a) NADP<sup>+</sup>
- c) pyridoxal phosphate

- b) Cytichromes
- d) CoASH

**14. Conversion of Alanine to carbohydrate is termed:**

- a) Glycogenesis
- c) Glycogenolysis

- b) Gluconeogenesis
- d) Photosynthesis

**15. The following is an enzyme required for glycolysis:**

- a) Pyruvate kinase
- c) Glucose-6-phosphatase

- b) Pyruvate carboxylase
- d) Glycerokinase

- 16. Which substrate is used in the last step of glycolysis?**  
 a) Glyceraldehyde 3-phosphate  
 b) Pyruvate  
 c) Phosphoenolpyruvate  
 d) 1, 3-bisphosphoglycerate
- 17. Glycogen is converted to glucose-1-phosphate by**  
 a) UDPG transferase  
 b) Branching enzyme  
 c) Phosphorylase  
 d) Phosphatase
- 18. Which of the following is not an enzyme involved in glycolysis?**  
 a) Enolase  
 b) Aldolase  
 c) Hexokinase  
 d) Glucose oxidase
- 19. Tissues form lactic acid from glucose. This phenomenon is termed as**  
 a) Aerobic glycolysis  
 b) Oxidation  
 c) Oxidative phosphorylation  
 d) Anaerobic glycolysis
- 20. Fluoride inhibits \_\_\_\_\_ and arrests glycolysis.**  
 a) Glyceraldehyde-3-phosphate dehydrogenase  
 b) Aconitase  
 c) Enolase  
 d) Succinate dehydrogenase
- 21. High concentration of glucose 6-phosphate is inhibitory to \_\_\_\_\_**  
 a) Hexokinase  
 b) Pyruvate kinase  
 c) Glucokinase  
 d) Phosphofructokinase-1
- 22. The product formed in the first substrate level phosphorylation in glycolysis is \_\_\_\_\_**  
 a) Pyruvate  
 b) 3-phosphoglycerate  
 c) 1, 3-bisphosphoglycerate  
 d) 2-phosphoglycerate
- 23. Glycolysis converts \_\_\_\_\_**  
 a) Glucose into pyruvate  
 b) Glucose into phosphoenolpyruvate  
 c) Fructose into pyruvate  
 d) Fructose into phosphoenolpyruvate
- 24. Name the hormone that stimulates the process of glycolysis**  
 a) Growth hormone  
 b) Insulin  
 c) Glucagon  
 d) All of the above
- 25. A specific inhibitor for succinate dehydrogenase is**  
 a) Arsenite  
 b) Melouate  
 c) Citrate  
 d) Cyanide
- 26. Which of the following is not an important precursor of glucose in animals?**  
 a) Lactate  
 b) Pyruvate  
 c) Glycerol  
 d) Glucose 6-phosphate
- 27. An essential for converting Glucose to Glycogen in Liver is**  
 a) Lactic acid  
 b) GTP  
 c) CTP  
 d) UTP
- 28. Which of the following statements is false about gluconeogenesis?**  
 a) From the hydrolysis of tri-acyl-glycerol, fatty acids can be used as a carbon source  
 b) From red blood cells, lactate can be used as a carbon source  
 c) From the hydrolysis of tri-acyl-glycerol, glycerol is converted to glucose in gluconeogenesis  
 d) From muscle vigorous muscle activity, lactate can be used as a carbon source
- 29. The carbohydrate reserved in human body is**  
 a) Starch  
 b) Glucose  
 c) Glycogen  
 d) Inulin
- 30. The reaction catalysed by phosphofructokinase**  
 a) Is activated by high concentrations of ATP and citrate

- b) Uses fructose-1-phosphate as substrate
- c) Is the rate-limiting reaction of the glycolytic pathway
- d) Is inhibited by fructose 2, 6-bisphosphate

**31. Compared to the resting state, vigorously contracting muscle shows**

- a) An increased conversion of pyruvate to lactate
- b) Decreased oxidation of pyruvate of CO<sub>2</sub> and water
- c) A decreased NADH/NAD<sup>+</sup> ratio
- d) Decreased concentration of AMP

**32. The concentration of blood lactate is normal:**

- a) 4,4-6,6 mmol/l
- b) 1-2 mmol/l
- c) 3,3-5,5 mmol/l
- d) 4,4-5,5 mmol/l

**33. A basic role in digestion of carbohydrates in a digestive tract belongs following enzymes:**

- a) Alfa-amylase, hexokinase, lactase
- b) Maltase, sucrase, enterokinase
- c) Lactase, alfa-amylase, sucrase
- d) Sucrase, maltase, glycogen phosphorylase

**34. After a well-rounded breakfast, which of the following would be expected to occur?**

- a) Increased activity of pyruvate carboxylase
- b) Decreased activity of acetyl CoA carboxylase
- c) Decreased rate of glycogenolysis
- d) Decreased rate of protein synthesis

**35. Formation of one molecule of glucose from pyruvate requires \_\_\_\_\_**

- a) 4 ATP, 2 GTP and 2 NADH
- b) 3 ATP, 2 GTP and 2 NADH
- c) 4 ATP, 1 GTP and 2 NADH
- d) 2 ATP, 2 GTP and 2 NADH

**36. The key regulatory enzyme of the pentose phosphate pathway is positively regulated by**

- a) Reduced nicotinamide dinucleotide (NADH)
- b) Adenosine diphosphate (ADP)
- c) Guanosine triphosphate (GTP)
- d) Nicotinamide dinucleotide phosphate (NADP<sup>+</sup>)

**37. A Nigerian medical student studying in the United States develops hemolytic anemia after taking the oxidizing antimalarial drug pamaquine. This severe reaction is most likely due to:**

- a) Glucose-6-phosphate dehydrogenase deficiency
- b) Concomitant scurvy
- c) Vitamin C deficiency
- d) Diabetes

**38. Citrate has a positive allosteric effect on which one of the following enzymes?**

- a) Pyruvate kinase
- b) Acetyl CoA carboxylase
- c) Phosphofruktokinase
- d) Fatty acid synthetase

**39. A child has ingested cyanide from her parents' garage and is rushed to the emergency room. Which of the following components of the citric acid cycle will be depleted first in this child?**

- a) NAD<sup>+</sup> cofactor
- b) Citrate synthase
- c) Aconitase
- d) Citrate production

**40. Which of the following reactions generates ATP?**

- a) Glucose-6-phosphate to fructose-6-phosphate
- b) Glucose to glucose-6-phosphate
- c) Phosphoenolpyruvate to pyruvate
- d) Pyruvate to lactate

**41. The major metabolic product produced under normal circumstances by erythrocytes and by muscle cells during intense exercise is recycled through the liver in the Cori cycle. The metabolite is**

- a) Oxaloacetate
- b) Glycerol
- c) Alanine
- c) Lactate

**42. Given that the standard free energy change (ΔG° for the hydrolysis of ATP is -7.3 kcal/mol and that for the hydrolysis of glucose-6-phosphate is -3.3 kcal/mol, what is the ΔG° for the phosphorylation of glucose?**



- a) -10.6 kcal/mol
- b) -7.3 kcal/mol
- c) -4.0 kcal/mol
- d) +4.0 kcal/mol

**43. Keratansulphate is found in abundance in:**

- a) Heart muscle
- b) Liver
- c) Adrenal cortex
- d) Cornea

**44. Gluconeogenesis is decreased by**

- a) Glucagon
- b) Epinephrine
- c) Glucocorticoids
- d) Insulin

**45. During starvation, ketone bodies are used as a fuel by**

- a) Erythrocytes
- b) Brain
- c) Liver
- d) All of these

**46. Glucose is absorbed by gastrointestinal cells by:**

- a) Passive diffusion
- b) Carrier mediated co-transport system, along with sodium
- c) Carrier mediated antiport system, along with potassium
- d) Needs no ATP

**47. The product of glycolysis in erythrocytes is:**

- a) NADPH
- c) Pyruvate
- b) Lactate
- d) Carbon dioxide

**48. Glucokinase is more active after a meal, because:**

- a) It is an inducible enzyme
- c) It is present in all tissues
- b) It has more affinity to glucose than hexokinase
- d) Can act on all monosaccharides

**49. Which enzyme catalyzes an irreversible reaction?**

- a) Transketolase
- c) aldolase
- b) Phosphofructokinase
- d) Glyceraldehyde-3-phosphate dehydrogenase

**50. Complete oxidation of one molecule of glucose yields how many ATPs?**

- a) 12
- c) 32
- b) 24
- d) 129

**51. Catalytic activity of phosphofructokinase is increased by all the following, except:**

- a) AMP
- c) ATP
- b) Fructose-2,6-bisphosphate
- d) Fructose-6-phosphate

**52. All the following coenzymes are involved in the pyruvate dehydrogenase reaction, except:**

- a) Thiamine pyrophosphate (TPP)
- c) NAD<sup>+</sup>
- b) Biotin
- d) FAD

**53. Malate shuttle is necessary for:**

- a) Glucogen
- c) Insulin
- b) Growth hormone
- d) Glucocorticoids

**54. Blood glucose level can be raised by gluconeogenesis only by liver because:**

- a) Glucokinase is present exclusively in liver
- b) Glucose-6-phosphatase is active only in liver
- c) Transaminase are present in liver
- d) Liver is the site of storage of glucose as glycogen

**55. HMP pathway is essential for all, except:**

- a) Transparency of lens
- c) Reduce methemoglobin level
- b) Integrity of RBC membrane
- d) Provide 2,3-BPG for RBCs

**56. Which of the following drugs can precipitate GPD deficiency?**

- a) Primaquan
- c) Statin
- b) Aspirin
- d) Penicilin

**57. Lactate is the product of glycolysis in RBCs because:**

- a) RBC can convert lactate to glucose
- b) Formation of lactate produces more energy
- c)  $\text{NAD}^+$  is regenerated in the cytoplasm
- d) Accumulation of lactate activates glycolysis

**58. The normal fasting plasma glucose level is:**

- a) 40-60 mg/100 ml
- b) 70-110 mg/100 ml
- c) 120-150 mg/100 ml
- d) 60-180 mg/100 ml

**59. Glucose level in plasma is increased by:**

- a) Gluconeogenesis
- b) Glycolysis
- c) Glycogen synthesis
- d) Glycosuria

**60. Blood is collected in fluoride oxalate bottle to:**

- a) Prevent clotting
- b) Preserve glucose
- c) Preserve glucose and prevent clotting
- d) Get quick results

**61. Which of the following lab results indicate poor glycemic control?**

- a) PPBS of 180 mg/dl
- b) Glyconemoglobin of 10 %
- c) Serum cholesterol of 240 mg/dl
- d) Blood urea level of 35 mg/dl

**62. One of the following enzymes in glycolysis catalyses an irreversible action**

- a) Hexokinase
- b) Pyruvate kinase
- c) Phosphofructokinase
- d) All of them

**63. The hormone that lowers c-AMP concentration in liver cells is:**

- a) Glucagon
- b) Insulin
- c) Epinephrine
- d) Thyroxine

**64. The connecting link between HMP shunt and lipid synthesis**

- a) Ribose
- b) NADPH
- c) Sedoheptulose-7-phosphate
- d) NADH

**65. Glucose and Galactose are:**

- a) Anomers
- b) Constituents of sucrose
- c) Diastereoisomers
- d) Epimers

**66. D-mannose is:**

- a) The 4th epimer of glucose
- b) A keto sugar
- c) Is a component of maltose
- d) Is the 2nd epimer of glucose

**67. A pair of sugars differing from each other in the functional group is called:**

- a) Anomers
- b) epimers
- c) rasemers
- d) Stereoisomers

**68. Reducing sugars are differentiated from nonreducing sugars by:**

- a) Iodine test
- b) Molish's test
- c) Selwanoff's test
- d) Benedict's test

**69. In the of monosaccharides, all properties go hand in hand, except:**

- a) Reducing property
- b) Formation of furfural
- c) Formation of ozazone
- d) Mutarotation

**70. All the following are sugars alcohols, except:**

- a) Dulcitol
- b) Mannitol
- c) Xylose
- d) Sorbitol

**71. The glucosidic linkage seen in surrose is:**

- a) Alpha-1,4-linkage
- b)  $\beta$ -1,4-linkage
- c) alpha-1,6-linkade
- d) 1,2-linkage

**72. All the following have glycosidic bond, except**

- a) Maltose
- b) Sucrose

c) N-acetylglucosamine

d) Alpha methyl glucose

**73. The sugar found in milk is:**

a) Galactose

b) Glucose

c) Fructose

d) Lactose

**74. The glycosidic linkage seen in maltose is:**

a) Alpha-1,4-linkage

b)  $\beta$ -1,4-linkage

c) Alpha-1,6-linkade

d) Alpha-1,2-linkage

**75. Ethanol is oxidized to acetaldehyde in the liver cytoplasm by \_\_\_\_\_**

a) Alcohol dehydrogenase

b) Alcohol carboxylase

c) Pyruvate carboxylase

d) Pyruvate kinase.

**76. Which of the following statements about gluconeogenesis is correct?**

a) Pyruvate is first converted to phosphoenolpyruvate by phosphoenolpyruvate carboxykinase

b) Fructose 1, 6-biphosphatase converts fructose 1, 6-bisphosphate into fructose 1-phosphate

c) Glucose 6-phosphatase hydrolyzes glucose 6-phosphate to release glucose into the blood

d) Glucose 6-phosphatase hydrolyzes glucose 6-phosphate and is found in liver and muscle

**77. Which of the following enzyme is not involved in galactose metabolism?**

a) Glucokinase

b) Galactokinase

c) Galactose-1-Phosphate Uridyl transferase

d) UDP-Galactose 4- epimerase

**78. Which of the following enzyme is defective in galactosemia (type I) - a fatal genetic disorder in infants?**

a) Glucokinase

b) Galactokinase

c) Galactose-1-Phosphate Uridyl transferase

d) UDP-Galactose 4- epimerase

**79. In the liver, the accumulation of which of the following metabolite attenuates the inhibitory of ATP on phosphofructokinase?**

a) Glucose-6-Phosphate

b) Citrate

c) Fructose-1,6-Bisphosphate

d) Fructose-2,6-Bisphosphate

**80. Mutation in which of the following enzymes leads to a glycogen storage disease known as "Tarui's disease"?**

a) Glucokinase

b) Phosphofructokinase

c) Phosphoglucomutase

d) Pyruvate Kinase

**81. Erythrocytes undergo glycolysis for the production of ATP. The deficiency of ..... enzyme leads to hemolytic anemia.**

a) Glucokinase

b) Phosphofructokinase

c) Phosphoglucomutase

d) Pyruvate Kinase

**82. Cancer cells have high energy demands for replication and division. Increased flux of glucose into glycolysis replenishes the energy demand. Which of the following enzyme plays an important role in tumor metabolism?**

a) Glucokinase

b) Phosphofructokinase

c) Phosphoglucomutase

d) Pyruvate Kinase M2

**83. Which of the following glucose transporter (GLUT) is important in insulin-dependent glucose uptake?**

a) GLUT1

b) GLUT2

c) GLUT3

d) GLUT4

**84. Which of the following glucose transporter (GLUT) is present in the beta cells of the pancreas?**

a) GLUT1

b) GLUT2

c) GLUT3

d) GLUT4

**85. Which of the following glucose transporter (GLUT) is important in fructose transport in the intestine?**

a) GLUT1

b) GLUT3

c) GLUT5

d) GLUT7

**86. Which of the following metabolite negatively regulates pyruvate kinase?**

- a) Fructose-1,6-Bisphosphate
- b) Citrate
- c) Acetyl CoA
- d) Alanine

**87. In absence of oxygen, pyruvate is converted into lactate in muscle because**

- a) Lactate is the substrate from the downstream pathway
- b) Lactate acts as a substrate for the formation of amino acid
- c) During the product of lactate two ATP are produced
- d) During lactate formation, NADH is reconverted into NAD.

**88. Which of the following glycolytic enzyme is inhibited by the accumulation of long-chain fatty acid in the liver?**

- a) Hexokinase
- b) Glucokinase
- c) Phosphofructokinase
- d) Pyruvate kinase

**89. Which of the following statement about Phosphofructokinase-2 (PFK-2) is false?**

- a) PFK-2 is a bifunctional enzyme having a kinase domain, phosphatase domain, and a regulatory domain
- b) Activated protein kinase A phosphorylates PFK-2 and activates the phosphatase domain
- c) PFK-2 catalyzes the conversion of fructose-6-phosphate to fructose 2-6 bisphosphate
- d) PFK-2 phosphatase activity is activated by the insulin signaling pathway.

**90. Which of the following hormone helps in regulating blood sugar (glucose) levels and metabolism in the body, and promotes the uptake of glucose by cells, especially muscle, adipose (fat), and liver cells?**

- a) Glucagon
- b) Epinephrine
- c) Cortisol
- d) Insulin

**91. Which of the following statement is true regarding glycolysis pathway?**

- a) Glycolysis occurs only in mammalian cells
- b) Glycolysis occurs in mitochondria
- c) Glycolysis occurs in the presence and absence of oxygen
- d) Glycolysis occurs when ATP concentration is high.

**92. What is the rate-limiting enzyme in glycolysis?**

- a) Hexokinase
- b) Phosphohexose isomerase
- c) Glyceraldehyde-3-phosphate dehydrogenase
- d) Enolase

**93. The net gain of adenosine triphosphate (ATP) during the conversion of glucose to pyruvate is:**

- a) 1 ATP
- b) 2 ATP
- c) 1 ATP +1 GTP
- d) 4 ATP

**94. During the conversion of glucose to pyruvate, two NADH molecules are generated.**

**Which of the following steps generates NADH?**

- a) Conversion of fructose-6-phosphate to fructose-1,6-bisphosphate
- b) Conversion of glyceraldehydes-3-phosphate to 1,3-bisphosphoglycerate
- c) Conversion of 3-phosphoglycerate to 2-phosphoglycerate
- d) Conversion of phosphoenolpyruvate to pyruvate

**95. What is the committed step in glycolysis?**

- a) Conversion of glucose to glucose-6-phosphate
- b) Conversion of fructose-6-phosphate to fructose-1,6-bisphosphate
- c) Conversion of glyceraldehydes-3-phosphate to 1,3-bisphosphoglycerate
- d) Conversion of 3-phosphoglycerate to 2-phosphoglycerate

**96. Glycolysis consists of three irreversible steps.**

Which of the following enzyme-catalyzed reaction are not irreversible steps in glycolysis?

- a) Hexokinase
- b) Phosphofructokinase
- c) Glyceraldehyde-3-phosphate kinase
- d) Pyruvate kinase

**97. All of the following are the negative regulators of phosphofructokinase(PFK) and can inhibit it's activity, except?**

- a) Adenosine triphosphate (ATP)
- b) Adenosine monophosphate (AMP)
- c) Citrate
- d) pH



**98. Which of the following enzyme is inhibited by sodium fluoride that is used as anticoagulant during blood collection and transport?**

- a) Glyceraldehyde-3-phosphate dehydrogenase
- b) 3-phosphoglycerate mutase
- c) Enolase
- b) AMP

**99. During gluconeogenesis, the three irreversible steps of glycolysis have to be bypassed. The first step is the conversion of pyruvate to phosphoenolpyruvate.**

**Which of the following statement is false regarding the reaction step?**

- a) This reaction involves a two-step process catalyzed by pyruvate carboxylase and phosphoenolpyruvate carboxykinase
- b) Conversion of oxaloacetate from pyruvate occurs in mitochondria and shuttled into the cytosol.
- c) Formation of phosphoenolpyruvate requires both ATP and GTP as an energy source.
- d) Acetyl CoA is an activator of the enzyme pyruvate carboxylase.

**100) During gluconeogenesis, the three irreversible steps of glycolysis have to be bypassed. The final step is the conversion of glucose-6-P to glucose which is catalyzed by glucose-6-phosphatase.**

**Which of the following statement is true about the reaction step?**

- a) Conversion of glucose-6-phosphate to glucose releases one ATP molecule
- b) It is a highly active enzyme in skeletal muscle
- c) Defect in glucose-6-phosphatase leads to abnormal accumulation of glycogen in the liver
- d) The reaction occurs in mitochondria

**102. Which of the following statement is true about Cori Cycle?**

- a) The Cori cycle involves three tissues muscle, liver, and brain
- b) It involves the transport of lactate from the liver to skeletal tissue for gluconeogenesis
- c) It involves the transport of lactate from skeletal muscle to the liver for gluconeogenesis
- d) It is active during resting stages and in well-fed condition

**103. During prolong starvation, which of the following hormone is responsible for increasing gluconeogenesis in the liver?**

- a) Insulin
- b) Glucagon
- c) TSH
- d) Thyroxine

## Hormones

**1. The hormone epinephrine causes opposite effects in two populations of target cells because \_\_\_\_.**

- a) Epinephrine can only reach target cells in adipose tissue, as it is fat-soluble epinephrine activates biochemical pathways in one set of target cells but works only by changing gene expression in the other set of target cells
- b) The chemical form of epinephrine released by neurons is different from the epinephrine released by endocrine cells
- c) Epinephrine crosses the membrane on one set of target cells but binds to membrane-bound receptors in the other set of target cells
- d) Each set of target cells has different receptor-transduction mechanisms

**2. Steroid and peptide hormones typically have in common \_\_\_\_.**

- a) Their requirement for travel through the bloodstream
- b) The building blocks from which they are synthesized
- c) Their reliance on signal transduction in the cell
- d) Their solubility in cell membranes

**3. Receptors for nonsteroid hormones are located in \_\_\_\_\_.**

- a) The extracellular fluid
- b) The cytoplasm/the nucleus
- c) The cytosol
- d) Association with a cell's plasma membrane

**4. Which of these is a nonsteroid hormone?**

- a) Estrogen
- b) Testosterone
- c) Both estrogen and testosterone
- d) Epinephrine and oxytocin

**5. How do nonsteroid hormones differ from steroid hormones?**

- a) Nonsteroid hormones bind to a cell's DNA; steroid hormones do not bind to a cell's DNA
- b) Nonsteroid hormones act via signal transduction pathways; steroid hormones do not act via signal transduction pathways
- c) The action of nonsteroid hormones never affects gene expression; the action of steroid hormones always affects gene expression
- d) Nonsteroid hormones bind to cytoplasmic receptors; steroid hormones bind to plasma membrane receptors

**6. Which of these extracellular signal molecules could diffuse through a plasma membrane and bind to an intracellular receptor?**

- a) Estrogen
- b) Epinephrine
- c) Cellulose
- d) Oxytocin

**7. The primary reason steroid hormones usually act slowly is that \_\_\_\_\_.**

- a) They are produced at very low concentrations
- b) Acting via a signal transduction pathway makes for slower responses than does directly interacting with a cell's DNA
- c) They are too large to enter a cell and therefore must first bind to a plasma membrane receptor before having an effect on a cell
- d) They turn genes on or off and it takes time for gene products to build up or become depleted

**8. Steroid hormone-receptor complexes act in \_\_\_\_\_.**

- a) The nucleus
- b) Lysosomes
- c) Vesicles
- d) The cytoplasm

**9. What property of steroid hormones allows them to cross the phospholipid bilayer?**

- a) Steroid hormones can act in very small concentrations and very few molecules of steroids need to cross the lipid bilayer
- b) Steroid hormones are lipid soluble and easily cross the phospholipid bilayer
- c) Steroid hormones act on cells close to where they were produced and very few molecules are required to travel such a short distance to cross the lipid bilayer
- d) Steroid hormones act on the same cells in which they are produced and, therefore, are within the cell they are acting upon

**10. Growth factors are local regulators that \_\_\_\_\_.**

- a) Bind to cell-surface receptors and stimulate growth and development of target cells
- b) Convey messages between nerve cells
- c) Are found on the surface of cancer cells and stimulate abnormal cell division
- d) Are modified fatty acids that stimulate bone and cartilage growth

**11. When the beta cells of the pancreas release insulin into the blood, \_\_\_\_\_.**

- a) The skeletal muscles and the adipose cells take up glucose at a faster rate
- b) The kidneys begin gluconeogenesis
- c) The alpha cells of the pancreas release glucose into the blood
- d) The liver catabolizes glycogen

**12. Oxytocin secretion and milk release from the mammary glands of lactating female mammals are initiated by \_\_\_\_\_.**

- a) Estrogens from the ovaries
- b) A hormone released by the anterior pituitary gland in response to the smell of the baby
- c) The physical sensation of the baby sucking at the nipple
- d) The secretion of the pancreatic hormone called glucagon

**13. The anterior and posterior lobes of the pituitary differ in that \_\_\_\_\_.**

- a) The anterior lobe of the pituitary is nervous tissue that connects directly to the brain whereas the posterior pituitary is derived from non-neural tissues
- b) The posterior lobe of the pituitary operates independently of the brain whereas the anterior lobe is directly dependent on brain activity
- c) Many anterior pituitary hormones regulate other endocrine glands whereas posterior pituitary hormones regulate nonendocrine tissues
- d) The posterior pituitary gland synthesizes oxytocin and antidiuretic hormone whereas the anterior lobe receives all of its hormone products in the blood

**14. Hormones secreted by the posterior pituitary gland are made in the \_\_\_\_.**

- a) Hypothalamus
- b) Medulla oblongata
- c) Cerebellum
- d) Thalamus

**15. Injury localized to the hypothalamus would most likely disrupt \_\_\_\_.**

- a) Executive functions, such as decision making
- b) Short-term memory
- c) Coordination during locomotion
- d) Regulation of body temperature

**16. Portal blood vessels connect two capillary beds found in the \_\_\_\_.**

- a) Hypothalamus and thalamus
- b) Posterior pituitary and thyroid gland
- c) Anterior pituitary and posterior pituitary
- d) Hypothalamus and anterior pituitary

**17. The body's reaction to PTH (parathyroid hormone), raising plasma levels of calcium, can be opposed by \_\_\_\_.**

- a) Calcitonin
- b) Growth hormone
- c) Epinephrine
- d) Thyroxine

**18. DES is called an "endocrine disrupting chemical" because it structurally resembles, and interferes with, the endocrine secretions of the \_\_\_\_.**

- a) Hypothalamus
- b) Thyroid gland
- c) Adrenal medulla
- d) Ovaries

**19. Of the following types of molecules, which can function as both neurotransmitters and hormones?**

- a) Second messengers
- b) Glucocorticoids
- c) Adipocytes
- d) Catecholamines

**20. Which of these glands secretes releasing hormones?**

- a) Hypothalamus
- b) Adrenal cortex
- c) Thymus
- d) Ovaries

**21. Which of these hormones are responsible for the "fight or flight" response to danger?**

- a) Insulin and glucagon
- b) Thyroxine and calcitonin
- c) Androgens and estrogens
- d) Epinephrine and norepinephrine

**22. Adrenocorticotrophic hormone (ACTH) triggers the release of \_\_\_\_ in response to stress.**

- a) Melatonin
- b) Insulin
- c) Glucocorticoids
- d) Thymosin

**23. \_\_\_\_ are the main male hormones.**

- a) Progesterones
- b) Mineralocorticoids
- c) Androgens
- d) Luteinizing hormones

**24. What hormone promotes water retention by the kidneys?**

- a) Follicle-stimulating hormone (FSH)
- b) Prolactin
- c) Antidiuretic hormone (ADH)
- d) Melatonin

**25. Which hormone opposes the action of parathyroid hormone?**

- a) Calcitonin
- b) Insulin
- c) Thyroxine
- d) Thymosin

**26. Which hormone stimulates hormone production by the ovaries and testes?**

- a) Progesterone
- b) Estrogens
- c) Glucocorticoids
- d) Luteinizing hormone (LH)

**27. Which hormone stimulates milk production?**

- a) parathyroid hormone
- b) Mineralocorticoids
- c) Prolactin
- d) Thyroid-stimulating hormone (TSH)

**28. People with type II diabetes mellitus have defective insulin receptors that cannot respond to insulin properly. Relative to normal individuals, what would be the effect on blood glucose levels under conditions of chronic stress that kept blood cortisol levels high? There would be \_\_\_\_.**

- a) Less decrease in blood glucose levels in individuals with type II diabetes mellitus than in normal individuals
- b) A greater increase in blood glucose levels in individuals with type II diabetes mellitus than in normal individuals
- c) Be a greater decrease in blood glucose levels in individuals with type II diabetes mellitus than in normal individuals
- d) Less increase in blood glucose levels in individuals with type II diabetes mellitus than in normal individuals

**29. A disease that destroys the adrenal cortex should lead to an increase in the plasma levels of \_\_\_\_.**

- a) Glucocorticoid hormones
- b) Acetylcholine
- c) Adrenocorticotrophic hormone (ACTH)
- d) Epinephrine

**30. Vertebrates have two major communication and control systems: the endocrine system and the nervous system. Choose the correct statement describing the coordination of these systems.**

- a) Epinephrine functions as a hormone in the endocrine system and as a neurotransmitter in the nervous system
- b) The parathyroid gland is a fused endocrine and neuroendocrine gland.
- c) The adrenal cortex secretes hormones in response to nervous stimulation.
- d) The adrenal cortex secretes hormones

**32. Glucose homeostasis is maintained by two antagonistic hormones, insulin and glucagon. Select the correct statement about these hormones.**

- a) Each of these hormones operates in a simple neuroendocrine pathway.
- b) Each of these hormones operates in a simple endocrine pathway.
- c) The two hormones interact in a hormone cascade pathway
- d) The one hormone interact in a hormone cascade syndrome

**33. The hormone epinephrine causes opposite effects in two populations of target cells because \_\_\_\_.**

- a) Epinephrine can only reach target cells in adipose tissue, as it is fat-soluble epinephrine activates biochemical pathways in one set of target cells but works only by changing gene expression in the other set of target cells
- b) The chemical form of epinephrine released by neurons is different from the epinephrine released by endocrine cells
- c) Epinephrine crosses the membrane on one set of target cells but binds to membrane-bound receptors in the other set of target cells
- d) Each set of target cells has different receptor-transduction mechanisms

**33. A 75-year old man complains of increased urinary frequency, especially at night. He has difficulty starting to urinate and often dribbles urine when he finishes. His urologist suspects benign hyperplasia and places him on a 5- $\alpha$ -Reductase inhibitor. This would decrease which of the following?**

- a) Conversion of c-AMP to adenosine
- b) Release of calcium from the endoplasmic reticulum
- c) Conversion of testosterone to dihydrotestosterone (DHT)
- d) Prostaglandin synthesis