Mansoura University **Faculty of Science** **Chemistry Department** **May 2015** **Date: 17/ 5/ 2015** **Code No.: Biochem. 275**		**Second Term Exam.** **Second Level Biochemistry** **Course Title: Metabolism of carbohydrates and lipids** **Time allowed: 2 Hours** **Full Mark: 60 Marks**

Note: Express your answers by formulae, equations, pathways, figures and diagrams as possible,

Answer the following questions

Question I [14 Marks]

A- Choose the correct answer: [Mark for each]

1- .....is the key enzyme in the biosynthesis of cholesterol.
a) HMG-CoA decarboxylase. b) HMG-CoA synthetase.
c) Mevalonate decarboxylase. d) HMG-CoA reductase.

2- Chyluria is abnormal condition characterized by:
a) Excess fat in stool. b) milky feces.
c) milky urine. d) fatty diarrhea.

3- Steatorrhea is caused by:
a) deficiency of bile salts. b) diseased epithelial wall.
c) deficiency of steapsin. d) All the above are correct.

4- Ketosis is caused by:
a) decrease of insulin secretion. b) decrease of anti-insuline hormones.
c) high dietary carbohydrates. d) high protein intake.

5- Pyruvate dehydrogenase is a multienzyme complex that catalyzes a series of reactions. Which of the following is *NOT* carried out by pyruvate dehydrogenase?
a) decarboxylation reaction. b) producing an acetyl group from pyruvate.
c) production of ATP. d) combining the acetyl group with a cofactor.

6- Type I Von Gierke's disease results from congenital deficiency of:
a) 6-Phosphogluconate dehydrogenase. b) Glucose 6-phosphatase.
c) Phosphogluco mutase. d) Glyceraldehydes 3-p-dehydrogenase.

7- Hereditary fructose intolerance is associated with these items *except:*
a) depletion of ATP levels. b) inhibition of glycogenolysis.
c) fructose and fructose-1-P accumulation. d) hypoglycemia and lactic acidosis.
f) stimulation of glycogen phosphorylase.

8- Fasting hypoglycemia is caused by:
a) Drugs specially insulin. b) Hereditary fructose intolrance.
c) Glycogen storage diseases. d) Alcohol consumiption.

9- McArdle's syndrome results from absence of:
a) Glycogen debranching enzyme. b) Muscle phosphorylase.
c) Protein kinase. d) Adenylate cyclase.

10- Cholesterol is changed to bile acids by:
a) 60-70 %. b) 30-40 %.
c) 10-20 %. d) 80-90 %.

11- In biosynthesis of cholesterol, the conversion of lanosterol to zymosterol occurs through.....
a) ring closure. b) saturation of the double bond in nucleus.
c) saturation of the double bond in side chain. d) demethylation.

12- Hereditary fructose intolerance results from mutations in.....
a) aldolase B. b) fructokinase.
c) fructose-1,6-diphosphatase. d) phosphofructokinase.

13- All are the similarities between anaerobic and aerobic cellular respiration, except one:
a) both can start with glucose. b) both produce the same amount of ATP.
b) both use glycolysis. c) both produce pyruvate.

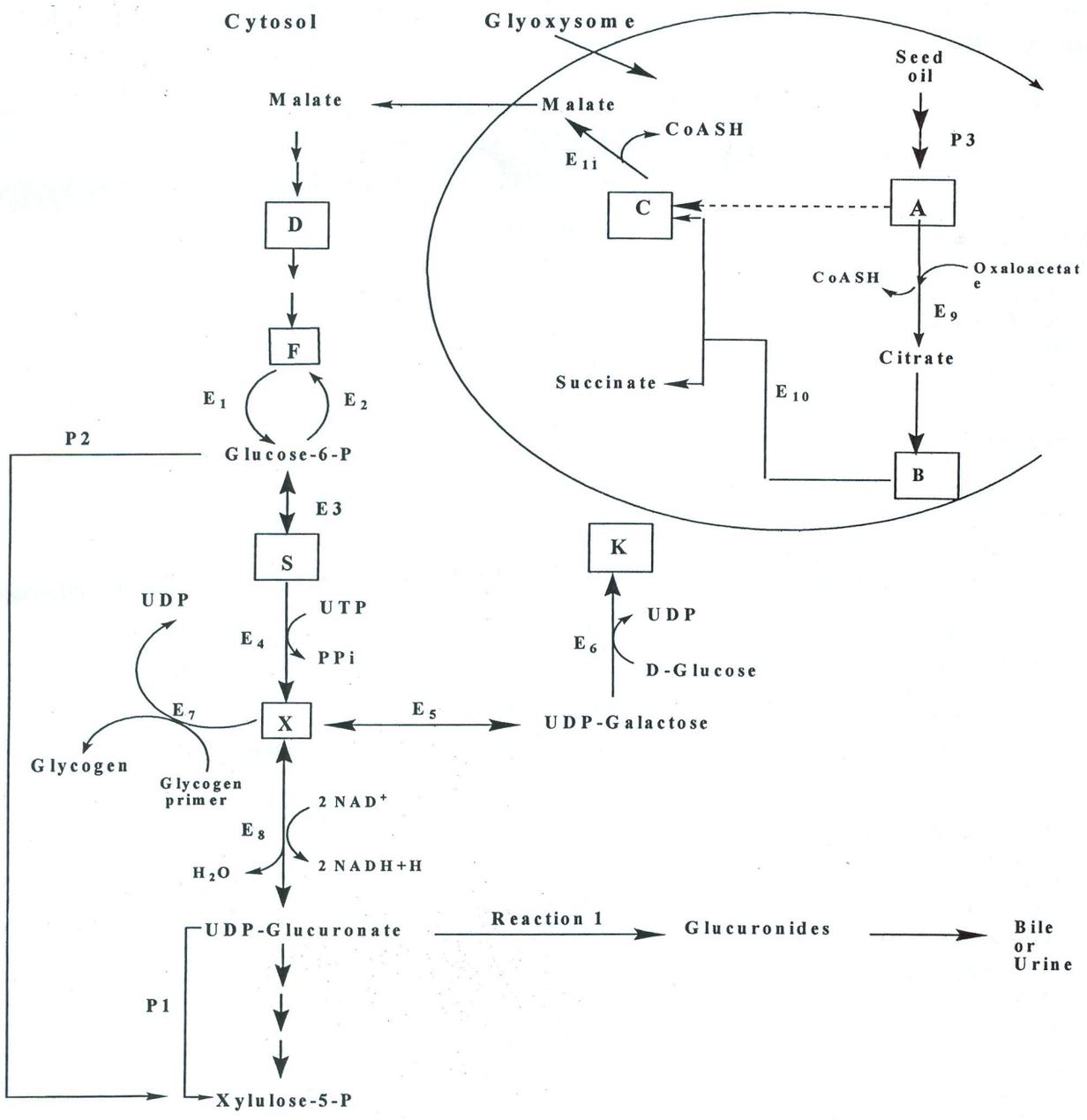
14- Which of the following substrates *derived from adipose tissues* contributes to net Gluconeogenesis in mammalian liver?
a) Alanine b) Glutamate.
c) Glycerol. d) Pyruvate.

Question II [10 Marks]

1- Briefly write on the biosynthetic pathways for ketone bodies formation.

2- What are the biochemical steps for the biosynthesis of triglycerides?

Question III [36 Marks]



i- Identify compounds: **A & B & C & D & F & S & X and K.** **[8 Marks]**
ii- What are the pathways or the processes**: P1 & P2** and **P3**? **[3 Marks]**
iii- Name the enzymes: $E_1 \rightarrow E_{11}$. **[11 Marks]**
iv- Illustrate the biochemical reactions of the pathways **P1 and P2.** **[6 Marks]**
v- Follow by equations the pathway **P3** for an example of palmitic acid, and calculate the total ATP gain resulting from this process. **[3 Marks]**
vii- Discuss the **reaction1** by structures. **[2 Marks]**
viii- Describe by equations the role of succinate in ketolysis. **[3 Marks]**

Examiner: Dr. Nivin A. S. Islam

Mansoura University
Faculty of Science
Chemistry Department
Subject: Chemistry
Course(s):Nucleic acids Metabolism

2nd Level Biochemistry Students
Date : May 2015
Time Allowed : 2 hours
Full Mark: 80 Marks

ANSWER THE FOLLOWING QUESTIONS

I. **[30 Marks]**

a) **Draw the chemical structure of a trinucleotide of adenine, cytosine and guanine bases. Describe the Phosphodiester bond and determine the function and number of the phosphodiester bonds involved in the structure. [20 Marks]**

b) **A variety of drugs are used in the management of gout, state examples of these drugs and compare between different types of gout. [10 Marks]**

II. **[30 Marks]**

a) **Describe the biosynthetic route of the de novo synthesis of purine nucleotides. [20 Marks]**

b) **Give an account on the different sources of ribose 5-phosphate required for purine nucleotides synthesis. [10 Marks]**

III. **Compare between the following pairs: [20 Marks]**

a) **Hereditary orotic aciduria and Lesch-Nyhan Syndrome. [10 Marks]**

b) **Regulation of *de Novo* Pyrimidine Biosynthesis in prokaryotic and eukaryotic cells. [10 Marks]**

Best wishes for our dear students,

Dr. Amr Negm

Mansoura University
Faculty of Science
Zoology Department
Date: 27th May 2015
Time: 2 hrs.

Program: Biophysics

Z 225, Blood & Endocrine

Full Mark: 60 Marks

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Answer All the following questions:

Endocrinology

Question (I): Choose the correct answer. (20 Marks)

1. Insulin and glucagon are antagonistic hormones because they increase and decrease:
(a) calcium; (b) potassium; (c) glucose; (d) cell metabolism.

2. Which of the following is produced in the adrenal cortex?
(a) Male sex hormones; (b) aldosterone; (c) cortisol; (d) all of the preceding; (e) none of the preceding.

3. Too much GH in an adult results in:
(a) gigantism; (b) acromegaly; (c) Simmond's disease; (d) diabetes insipidus

4. Cyclic AMP is best matched with:
(a) steroid hormones; (b) protein hormones; (c) muscle cells; (d) the male hormone, testosterone.

5. The primary effect of T3 and T4 is to: (a) decrease blood glucose; (b) promote the release of calcitonin; (c) promote heat-generating (metabolic) reactions; (d) stimulate the uptake of iodine by the thyroid.

6. The primary effect of calcitonin is to:
(a) increase blood glucose; (b) decrease blood glucose; (c) increase excretion of calcium ions in urine; (d) increase blood calcium; (e) decrease blood calcium by blocking release from the bone

7. An increase in blood glucose and an anti-inflammatory effect are important effects of:
(a) epinephrine; (b) glucagon; (c) cortisol; (d) insulin; (e) ADH

8. The primary target for glucagon is the:
(a) liver; (b) hypothalamus; (c) adrenal cortex; (d) pancreas; (e) kidney

9. The only hormone that promotes the anabolism (building up) of glycogen, fats, and proteins is:
(a) GH; (b) insulin; (c) epinephrine; (d) aldosterone; (e) cortisol

10. Most hormones that use a second messenger (cyclic AMP) are:
(a) proteins; (b) enzymes; (c) steroids; (d) nucleic acids

11. Blood glucose is raised by *all* of the following *EXCEPT*:
(a) glucagon; (b) GH; (c) epinephrine; (d) cortisol; (e) insulin

12. Thyroglobulin is:
(a) the major component of colloid inside follicles; (b) another name for thyroid hormone; (c) the major stimulus for release of thyroid hormones; (d) the protein that transports TSH to the thyroid gland

13. Diabetes insipidus results from: (a) hyposecretion of insulin; (b) hypersecretion of insulin; (c) hyposecretion of aldosterone; (d) hypersecretion of ADH; (e) hyposecretion of ADH

14. If levels of PTH are high, one would expect to see: (a) increased osteoblast activity; (b) increased excretion of calcium ions in urine; (c) increased excretion of phosphate ions in urine; (d) decreased calcium concentration of the blood; (e) c and d are both correct.

15. What hormone causes contraction of smooth muscle surrounding the fetus?
(a) oxytocin; (b) ADH; (c) TSH; (d) GH; (e) prolactin

16. What endocrine glands are stimulated by FSH and LH?
(a) thyroid; (b) testes/ovaries; (c) adrenal medulla; (d) alpha cells of the pancreas

17. A simple goiter results from:
(a) lack of TSH; (b) too much PTH; (c) lack of iodine; (d) lack of iron; (e) autoimmunity

18. Aldosterone acts primarily on two things :
(a) kidney & sweat glands ; (b) Carbohydrates and proteins; (c) uterus & mammary glands; (d) blood and immune system

19. What gland produces calcitonin?
(a) parathyroid; (b) thyroid; (c) adrenal cortex; (d) adenohypophysis

20. The function of adenyl cyclase is to:
(a) break down a protein hormone when it binds to its receptor; (b) turn on a G-protein; (c) cause the conversion of ATP to cAMP; (d) activate a protein kinase; inactivate cAMP.

Question (II) a- Fill in the spaces with a suitable words in the following :(5 Marks)

A. **A tumor in the adrenal zona glomerulosa can cause hypersecretion of hormones produced in that region. This leads to: _____ blood sodium level.**

B. **The condition called _____ occurs in adulthood resulted in hypersecretion of pituitary gland.**

C. **The hormone _____ causes the breast to increase its synthesis of milk.**

D. **Hypothyroidism in infants can result in _____.**

E. **The hormone _____, which is secreted by the adrenal _____, causes the kidney to conserve sodium and excrete potassium ions and indirectly helps to maintain systemic blood pressure.**

Question (II)b True or False in the following: (5 Marks)

1) **Oxytocin is a protein secreted by the posterior pituitary.(True/False)**

2) **The pituitary and adrenal gland can be controlled by the direct influence of the nervous system. .(True/False)**

3) **Cretinism is a condition of physical and mental retardation that is the result of a deficiency of Parathormone. .(True/False)**

4) **Male sex hormones can be produced by the testes or adrenal glands. .(True/False)**

5) **It is possible to find all the hormones in a blood sample taken from the arm. .(True/False)**

Blood

(III) Answer the following questions: .....(15 marks)

1. **Answer the following:**
   a. **Briefly illustrate the main composition of the blood. (4 marks)**
   b. **Type of anemia according to MCV and MCHC (4 marks)**
   c. **What is difference between serum and plasma? (2 marks)**

2. **Mention the main fractions and functions of plasma proteins. What is the significance of A/G ratio? (5 marks)**

(IV) Answer the following items: ..... (15marks)

(1): Answer the following questions:

a- Illustrate the main mechanism of a blood clot formation (5 marks)

b- Define Aquaporin, Leukopoiesis, Leukopenia, Thrombus. (5 marks)

(2) Define the main types of leucocytes. (5 marks)

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Best wishes

Prof. Dr. M. Amr El-Missiry & Prof. Dr. Maher Amer

Mansoura University
Faculty of Science
Chemistry Department
Subject: Thermodynamics
Course code: Chem241

Level: Second level
Major: Chemistry (General)
Time allowed: 2 hours
Full Mark: 60 Marks
Date: May 31, 2015

I- Choose the response that best fits each statement [20 Marks]

1. An adiabatic expansion of a gas is one in which
a) The pressure is kept constant
b) The volume is kept constant
c) The temperature is kept constant
d) The system neither loses nor gains heat

2. What is the name of a process in which pressure remains constant?
a) Adiabatic b) Isobaric c) Isochoric d) Isothermal

3. In a cyclic process,
a) The total change in temperature of the system must be positive
b) The total change in internal energy of the system must be negative
c) The total change in internal energy of the system must be zero

4. Specific heat of a substance measures
a) The amount of energy required to raise the temperature of a substance one degree
b) The amount of heat required to reach the boiling point
c) The total thermal energy in a substance
d) The amount of energy required to raise the temperature of one gram of a substance one degree

5. Which process is accompanied by a decrease in entropy of the materials?
a) Expansion of a gas into vacuum
b) Dissolution of solid particles in a liquid
c) Precipitation of crystals form solution
d) Vaporization of a liquid

6. The condensation of any gas to a liquid is expected to have
a) Positive ΔH and positive ΔS
b) Positive ΔH and negative ΔS
c) Negative ΔH and negative ΔS
d) Negative ΔH and positive ΔS

7. The entropy of the universe
a) Is zero
b) Remains constant
c) Is always increasing
d) Is also decreasing

8. A reaction with a $\Delta G^{\circ} = -30\ kJ/mol$ at 25°C,
a) Has a $K = 0$
b) Has a positive K but $K < 1$
c) Has a negative K
d) Has a $K > 1$

9. According to the first law of thermodynamics, the total amount of energy in the universe is
a) Always increasing
b) Always decreasing
c) Varying up and down
d) Constant

10. Which of the following is true for the reaction, $H_2O\ (l) \leftrightarrow H_2O\ (g)$ at 100 °C and 1 atm?
a) $\Delta H = 0$ b) $\Delta S = 0$ c) $\Delta H = \Delta U$ d) $\Delta H = T\Delta S$

11. Which of the following is true about isothermal free expansion of a gas?
a) $\Delta U = 0$ b) $\Delta T = 0$ c) $P_{ext}\, dV = 0$ d) All

12. Which of the following reactions is spontaneous at relatively low temperatures?
a) $NH_4Br\ (s) + 188\ kJ \rightarrow NH_3\ (g) + Br_2\ (l)$
b) $NH_3\ (g) + HCl\ (g) \rightarrow NH_4Cl\ (s) + 176\ kJ$
c) $2\ H_2O_2\ (l) \rightarrow 2\ H_2O\ (l) + O_2\ (g) + 196\ kJ$

13. For an irreversible (spontaneous) process at constant pressure and temperature, the free energy change is
a) Positive b) Negative c) Zero d) Impossible to tell

14. The primary function of any heat engine is to
a) Convert work into heat
b) Create energy
c) Convert heat into work
d) Destroy energy

15. The following reaction is endothermic $3O_2\ (g) \rightarrow 2\ O_3\ (g)$, then the reaction is
a) Spontaneous at all temperatures
b) Non-spontaneous at all temperatures
c) Spontaneous at low temperatures
d) Spontaneous at high temperatures

16. All processes occurring in nature are
a) Reversible b) Irreversible c) Ideal d) Isothermal

17. An ideal gas is compressed adiabatically, the temperature will
a) Increase b) Decrease c) Stay the same d) Can't tell

18. Heat absorbed by the system at constant pressure equals to
a) ΔU b) ΔS c) ΔH d) w

19. Which of the following properties is NOT an extensive property of the system?
a) Volume b) Mass c) Internal energy d) Density

20. The internal energy of an ideal gas is dependent on
a) Temperature and pressure
b) Temperature and volume
c) Only Temperature
d) Only volume

II- Derive only three of the following: [18 Marks]

1. Vant Hoff's isotherm and isochore
2. Clausius-Clapeyron equation
3. The formulation of the third law of thermodynamics showing how standard entropy can be determined from it.
4. The relation $\Delta G_{sys} = -T\ \Delta S_{univ}$
5. The relation between C_P and C_V for an ideal gas

III- Answer the following questions: [22 Marks]

1. A perfect monoatomic gas ($C_P = \frac{5}{2}R$) is allowed to expand adiabatically from 25.0 L at 1.0 atm and 0 °C to a volume of 50.0 L. Calculate the final pressure and temperature. How much work is done?

2. Given the following standard molar entropies, calculate ΔS° of the reaction at 298 K

	$4NH_3\ (g)$	+	$3O_2(g)$	→	$2N_2(g)$	+	$6\ H_2O\ (l)$
$S^\circ_{m,298}\ J/mol\ K$	192.45		205.138		191.61		69.91

3. Three moles of an ideal gas is expanded isothermally and irreversibly against a constant external pressure of 1.0 atm from 2.0 L to 10.0 L at a temperature of 20.0 °C. Calculate w, q and ΔS_{univ}.

4. A Carnot-cycle heat engine operates between 800 and 0 °C. What is the maximum efficiency of the engine? If q_H is 1000 J, find w and q_C.

(Ideal gas constant: $R = 8.314\ Jmol^{-1}K^{-1}$)

Best wishes

Prof. Dr. Abd Al-Aziz Fouda Prof. Dr. Awad Ibrahim

Dr. Hany El-Shinawi

Mansoura University
Faculty of Science
Chemistry Department
Subject: Chemistry
Course: Vitamins
Biochem 278

2nd Level Biochemistry Students
Date : May 2015
Time Allowed : 2 hours
Full Mark: 80 Marks

ANSWER THE FOLLOWING QUESTIONS

I. ***Complete the missing parts in the following statements*:** **[20 Marks]**

1) Vitamin C acts as an electron donor for different enzymes: such as .....[1]....., ...[2]....., ...[3].....
2) Vitamin B6 deficiency results in abnormalities of metabolism of amino acids such as ..[4]...,...[5]..
3) There are some chronic diseases whose risks are increased by a low vitamin C intake, including.....[6]....., ...[7]....., ...[8].....
4) Vitamin D itself is inactive, it requires modification to the active metabolite .....[9].....
5) .....[10]..... are chemically similar substances that have a qualitatively similar vitamin activity.
6) Riboflavin nutritional status is assessed by measurement of.....[11]... .
7) The breakdown of branched chain amino acids are dependent on vitamin.....[12].....
8) One way to differentiate between folate deficiency and vitamin B12 deficiency is by testing for .....[13].....
9) Thiamine deficiency can be assessed by measuring .....[14]..... .
10) The Nutritional Value of the vitamins can be lost by .....[15]....., ...[16]....., ...[17]....., ...[18].....
11) Vitamin B12 absorption requires two binding proteins: .....[19]....., ...[20].....

II. **Do as shown between the brackets:** **[30 Marks]**

1. The metabolism of vitamin D. (Draw the enzymatic equations).
2. Pantothenic acid absorption. (Illustrate the mechanism).
3. The biosynthesis of Niacin. (discuss with enzymatic steps)
4. Pernicious Anemia. (Define).
5. Retinoic Acid. (explain its role in the Regulation of Gene Expression).

III. **[30 Marks]**

a) Vitamin K plays an important role in the post-synthetic modification of Ca-binding proteins. Comment and describe the importance of vitamin K in biosynthesis of γ-carboxyglutamate. **[15 Marks]**

b) Vitamin A has a function in eye vision. Comment and discuss the role of retinaldehyde in vision. **[15 Marks]**

Best wishes for our dear students, **Dr. Amr Negm**

Second Level Biochemistry Course Title: Amino acids & Proteins Metabolism Code No.: Biochemistry 277	Mansoura University Faculty of Science Chemistry Department	Second Term May 2015 Date: 20/ 5/ 2015 Time allowed: 2 hours Full Mark: 80 Marks

Note: Express your answers by formulae, equations, pathways, figures and diagrams

Answer The Following Questions

Question I: ***(30 Marks)***

A- Choose the correct answer: (14 Marks) (mark for each)

Don't give more than one answer to a question. – Copy the table in your answer sheet.

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Answer														

1- One of these is NOT from the factors that stimulate the rate of urea cycle:

a) Animals fed protein-free diets. b) Dietary intake is primarily proteins.

c) Prolonged starvation. d) High rate of synthesis of urea cycle enzymes.

2- High levels of aminotransferases in serum indicate:

a) Brain damage. b) Hyperammonemia.

c) Liver damage. d) Hyperargininemia.

3- What is the only amino acid that undergoes rapid oxidative deamination:

a) Glutamine. b) Glutamate.

c) Asparagine. d) Aspartate.

4- When an amino acid transfers its α-amino group to α-ketoglutarate (which becomes glutamate), the product is.....(derived from the original AA).

a) α-keto acid. b) alanine.

c) α-ketoglutarate. d) glutamine.

5- The citric acid cycle and the urea cycle are "linked" through the substance:

a) malate. b) fumarate.

c) oxaloacetate. d) ornithine.

6- One of these amino acids does NOT undergo transamination:

a) Aspartate. b) Proline.

c) Glutamine. d) Arginine.

7- Nitric oxide and urea have in common the fact that they both have as an intermediate precursor the amino acid:

a) aspartate. b) arginine.

c) glutamate. d) phenylalanine.

8- The concentrations of these compounds affect the synthesis of serotonin, *except:*

a) 5-hydroxy tryptpphan. b) Tryptophan.

c) S-adenosyl methionine. d) 5-hydroxyindole acetate.

9- Depression levels in people with SAD can be regulated during the winter months by the following items, *except:*

a) Changing one's diet. b) Exercise regimen.

c) Stabilizing one's diet. d) Light therapy.

10- S-Adenosyl methionine is essential for the following biosynthesis, *except:*

a) Saccharopine b) Melatonin.

c) Epinephrine. d) Creatinine.

11- Which enzyme is essential for the polyamines biosynthesis from ornithine:

a) Ornithine decarboxylase. b) Methionine adenosyl transferase.

c) Ornithine carboxylase. d) SAM carboxylase.

12- The first propylamine conjugation to Putrescine yields:

a) Spermine. b) Sprmidine.
c) Squalene. d) Serotonine.

13- Nitric oxide in the circulatory system:

a) Serves as a vasoconstrictor. b) Is useless in gas exchange.
c) Released in response to low pressure. d) Serves as a vasodilator.

14- NO as a neurotransmitter, but it differs from other neurotransmitters commonly used in the body in the following, *except:*

a) Synthesized on demand versus constant synthesis.
b) Diffuses out of the cell and released by exocytosis.
c) Binds to surface receptors.
d) Enters target cell and binds with intracellular guanylyl cyclase.

B- Write (√) or (X): (10 Marks)

1- Hartnup disease is usually accompanied with pellagra-like symptoms.
2- A lot of light leads to the pineal gland releases little amount of mlatonin.
3- Polyamines are important participates in DNA synthesis and its regulation.
4- Histamine is formed from histidine by carboxylation.
5- If nitric oxide synthesis is inhibited, blood pressure is elevated.

C- Copy the table in your answer sheet and write the expected disorder or disease results from the corresponding metabolic defect or block: (20 Marks)

	Impairment or Block	Disorder
1-	Argininosuccinate synthase activity (reaction 3).	
2-	Fumarylacetoacetate hydroxylase (reaction 4).	
3-	Dihydrobiopterin biosynthesis.	
4-	Homogentisate oxidase (reaction 3) (in late stage of disease).	
5-	Branched-chain α–keto acid dehydrogenase.	
6-	*P*-hydroxyphenylpyruvate hydroxylase activity (reaction 2).	
7-	Glutamyl-γ-semialdehyde dehydrogenase	
8-	Proline dehydrogenase	
9-	Ornithine transcarbamoylase (OTC) (reaction 2)	
10-	Histidase	

Question II: *(16 Marks)*

Give a brief account on: (4 Mark each)

1- Synthesis of nitric oxide in human body and the different forms of NOS and their occurrence.
2- Biosynthesis of γ–Amino buterate from L-Glutamate and the corresponding metabolic disorder.
3- β-alanyl dipeotides structure and related disorders.
4- Catabolism of histidine.

Question III: *(20 Marks)*

Demonstrate the following biotransformations by chemical equations: (5 Mark each)

1- Glycerate-3-P to Glycine.
2- Tyrosine to Epinephrine.
3- Glycine to Creatinine (in muscle).
4- Tryptophan to Melatonin.

With My Best Wishs ***Examiner: Dr. Nivin A. Salah***