


Handwritten: 18/1/2014

	TANTA UNIVERSITY FACULTY OF PHARMACY DEPARTMENT OF BIOCHEMISTRY			
	EXAMINATION FOR SECOND YEAR STUDENTS			
	COURSE TITLE:	BIOCHEMISTRY		COURSE CODE:
DATE:	18/1/2014	TERM: ONE	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

Handwritten: "Model Answer"

INSTRUCTIONS:

- Check that the exam consists of (11) pages
- All questions are to be attempted
- Answers should be written in the specified spaces
- Blue pens should be used
- Oral exam will be immediately after the end of the written exam
- Each student should commit to his/her oral exam committee
- Each student should assign in the attendance sheet
- Mobile phones shouldn't be hold

Good Luck

EXAMINERS	DR. NAHLA ELASHMAWY
	DR. HODA ELBAHRAWY
	DR. EMAN GOUDA

55 - (No. of false answers) = Correct answers X 1.5 = total mark

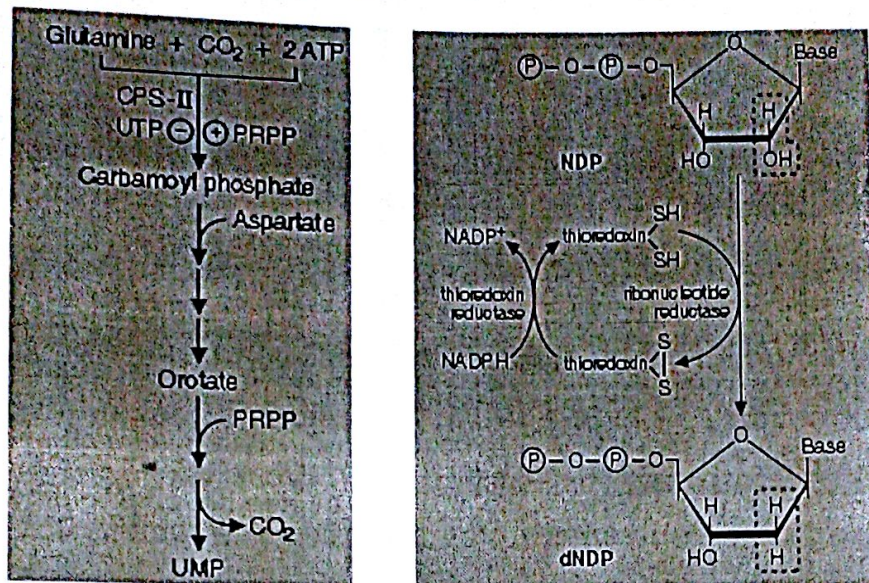
Answer Sheet for Question Two

No.	a	b	c	d	e	f	g	h	No.	a	b	c	d	e	f	g	h
1									29								
2									30								
3									31								
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GOOD LUCK

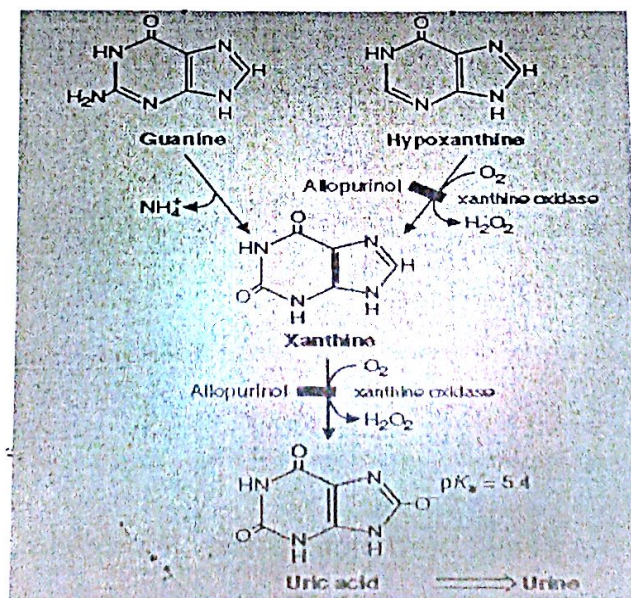
Question One: Illustrate each of the following using equations or diagrams whenever possible:
(5x4.5= 22.5 Marks, 25 min)

(1) The scheme of biosynthesis of UMP



(2) The chemical reaction for conversion of ribonucleotides to deoxyribonucleotides

(3) The reaction for biosynthesis of uric acid from hypoxanthine



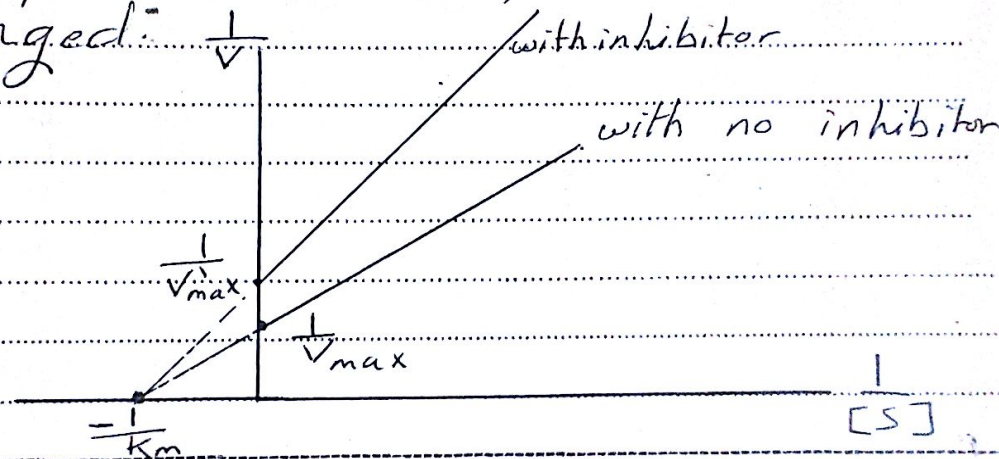
(4) Creatine kinase (CK) isoenzymes

- * Myocardial muscle is the only tissue that contains 75% of total CK as CK₂ (MB).
 - * Following an acute MI, CK₂ appears 4 to 8 hrs following onset of chest pain, reaches a peak of activity at 24 hrs, and returns to baseline after 48 to 72 hrs.
- CK is composed of 2 polypeptide chains, M & B, in 3 forms:

CK-MM (in skeletal muscle), CK-MB (in the heart) and CK-BB (in brain)

(5) Effect of Lineweaver-Burk Plot on noncompetitive inhibition

V_{max} decreases in the presence of non-competitive inhibitor, whereas K_m is unchanged.



Question Two: Select the ONE correct answer and write the selected letter in the provided answer sheet on page 1:

(55x1.5= 82.5 Marks, 60 min)

(1) In the beta-pleated sheets, the R-groups lie in between the sheets.

a. True

(b) False

(2) In sickle cell anemia, the amino acid glutamate in the β -globin gene is replaced by:

a. Alanine

(b) Valine

c. Aspartate

d. leucine

- (3) Accumulation of amyloid in the brain results in:
- ☒ a. Alzheimer disease
 - b. Parkinson's disease
 - c. Diabetes mellitus
 - d. Osteoporosis
- (4) Prion protein becomes infectious when:
- a. A mutation occurs in the gene
 - b. It undergoes abnormal proteolytic cleavage
 - ☒ c. It undergoes changes in the three-dimensional conformation
 - d. None of the above
- (5) Fibrous proteins include all of the following EXCEPT:
- ☒ a. Ribonuclease
 - b. Elastin
 - c. Collagen
 - d. Keratin
- (6) Hydroxylation of proline residues in collagen requires all of the following EXCEPT:
- a. Molecular oxygen
 - b. Ascorbic acid
 - c. Alpha-ketoglutarate
 - ☒ d. glutathione
- (7) All of the following enzymes act as endopeptidases EXCEPT:
- ☒ a. Ribonuclease
 - b. Chymotrypsin
 - c. Pepsin
 - d. Elastase
- (8) Phosphoacylglycerols are:
- a. Non-polar lipids
 - b. ☒ Amphipathic lipids
 - c. Carried in blood by albumin
 - d. Stored in adipose tissue
- (9) Oleic acid is:
- a. An even-carbon saturated fatty acid
 - b. Odd-carbon saturated fatty acid
 - c. C18 polyunsaturated fatty acid
 - ☒ d. Nonessential fatty acid
- (10) Arachidonic acid is:
- a. An essential fatty acid
 - b. ☒ One of PUFA
 - c. A component of plasma lipoproteins
 - d. An odd-carbon fatty acid
- (11) Which of the following statements is correct regarding the comparison between olive oil and butter?
- ☒ a. Olive oil has a lower melting point
 - b. Olive oil contains less amount of unsaturated fatty acids
 - c. Olive oil is less susceptible to oxidation and rancidity
 - d. Olive oil contains higher amount of saturated fatty acids
- (12) Chylomicrons:
- a. Are synthesized in the liver
 - b. ☒ Contain apo-B 48
 - c. Its major component is cholesteryl esters
 - d. Are more dense than VLDL

(13) Hydrolysis of chylomicrons by lipoprotein lipase produces:

- a. Chylomicron remnants
b. Glycerol
c. Fatty acids
d. All of the above

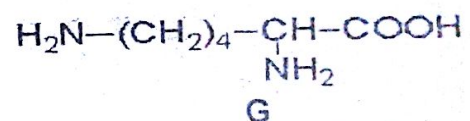
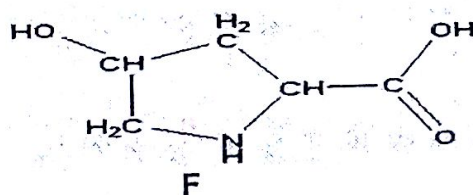
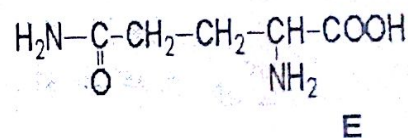
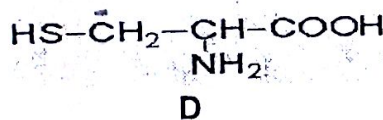
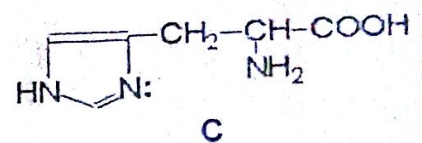
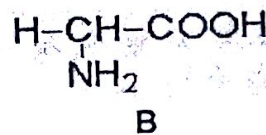
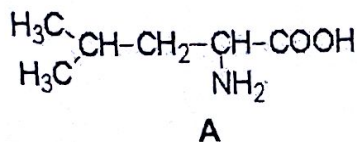
(14) Cytosine can be spontaneously deaminated to give:

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

(15) Nucleases act as:

- a. Esterases
b. Oxidases
c. Phosphodiesterases
d. Reductases

Select the amino acid (A-G) corresponding to each of the descriptions (16-25) and write the selected letter in the provided answer sheet on page 1:



(16) A semi-essential amino acid — C

(17) Hydrophobic amino acid — A

(18) An amino acid without optical activity — B

(19) Basic and aromatic amino acid — C

(20) Constitutes about one third of collagen — B

(21) Formed by post-translational modification — F

(22) Forms covalent cross links in collagen — G

(23) Having no genetic code — F

(24) Can form the amino acid cystine — D

(25) The smallest amino acid — B

Select the lipid substance (A-H) corresponding to each of the properties (26-35) and write the selected letter in the provided answer sheet on page 1:

- | | |
|----------------------|-------------------------|
| A. Arachidonic acid | B. Dipalmitoyl lecithin |
| C. Cardiolipin | D. Phosphatidylinositol |
| E. Cholesterol ester | F. 2-Monoacyl glycerol |
| G. Choline phosphate | H. Phosphatidic acid |

- (26) Is produced from the hydrolysis of lecithin by phospholipase C — G
- (27) Is the product of pancreatic lipase reaction — F
- (28) Is 1,2-diacylglycerol-3-P — H
- (29) Is termed the lung surfactant — B
- (30) Is diphosphatidyl glycerol — C
- (31) Is a phospholipid containing sugar — D
- (32) Is the precursor for synthesis of prostaglandins — A
- (33) Can act in signal transduction — D
- (34) Is the precursor for synthesis of triacylglycerols in the intestinal mucosal cells — F
- (35) Its deficiency causes respiratory distress syndrome — B

(36) The general formula of monosaccharides is:

- (a) $C_n H_{2n} O_n$ b. $C_{2n} H_{2n} O_n$ c. $C_n H_{2n} O_{2n}$ d. $C_n H_{2n} O_{2n}$

(37) The general formula of polysaccharides is:

- a. $(C_6H_{10}O_5)_n$ b. $(C_6H_{12}O_5)_n$ (c) $(C_6H_{12}O_6)_n$ d. $(C_6H_{10}O_6)_n$

(38) Compounds having the same structural formula but differing in spatial configuration are known as:

- (a) Stereoisomers b. Anomers
c. Optical isomers d. Epimers

(39) The number of epimers of glucose is:

- (a) 2 b. 4 c. 8 d. 16

(40) Hyaluronic acid is found in:

- (a) Joints b. Brain c. Abdomen d. Mouth

(41) Sucrose consists of:

- a. Glucose + Glucose (b) Glucose + Fructose
c. Glucose + Galactose d. Glucose + Mannose

(42) A carbohydrate found only in milk is:

- a. Glucose b. Galactose ☒ c. Lactose d. Maltose

(43) In the Michaelis-Menten equation:

- a. K_m is the amount of substrate which gives maximum catalytic activity
b. V_m is the half maximum rate of reaction
c. V_m is the amount of enzyme required to achieve maximum velocity
☒ d. K_m is the substrate concentration that will give $1/2V_{max}$

(44) Dependence of reaction velocity on substrate concentration is described as:

- a. Equal to K_m
b. Independent of enzyme concentration
☒ c. Proportional to the amount of ES complex
d. Zero order with respect to substrate

(45) Which of the following describes a characteristic of most allosteric enzymes?

- a. They are composed of single subunits.
b. They generally follow Michaelis-Menten kinetics.
☒ c. They show cooperativity in substrate binding.
d. They have irreversible allosteric inhibitors that bind at allosteric sites.

(46) Urease catalyzes the hydrolysis of urea but not of diethylurea, because:

- a. It has relative specificity
☒ b. It has absolute specificity
c. It has broad specificity
d. None of the above

(47) Which one of the following statements is FALSE for the allosteric enzyme?

- a. The binding of a positive allosteric effector
☒ b. They frequently catalyze a committed step in increases K_m a metabolic pathway
c. They are often composed of more than one subunit
d. They do not follow Michaelis-Menten kinetics

(48) The presence of a non competitive inhibitor leads to:

- a. An increase in the V_{max} & K_m
☒ b. A decrease in the V_{max} without affecting K_m
c. A decrease in K_m & V_{max}
d. An increase in K_m without affecting V_{max}

(49) In the presence of the allosteric activator, the V_{max} for the enzyme would:

- ☒ a. Increase b. Decrease

(50) Which of the following pairs cannot be distinguished on the basis of Lineweaver-Burk plot?

- a. Competitive-Noncompetitive
- b. Competitive-Irreversible
- c. Noncompetitive-Irreversible
- d. Noncompetitive-Uncompetitive

(51) Metal cations may do all of the following in metallo-enzymes EXCEPT:

- a. Participate in oxidation-reduction processes
- b. Act as uncompetitive inhibitors
- c. Stabilize the active conformation of an enzyme
- d. Form chelates with the substrate

(52) A fixed amount of a chemical agent reduces the catalytic activity of lactate dehydrogenase, with a decrease in V_{max} . The K_m is unaffected. This inhibitor is:

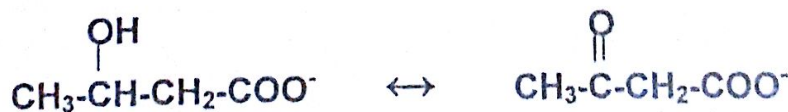
- a. Definitely a competitive inhibitor
- b. Definitely a non competitive inhibitor
- c. Definitely an irreversible inhibitor
- d. Either a competitive or an irreversible inhibitor

(53) Types of physiological regulation of enzyme activity do not include:

- a. Covalent modification
- b. Irreversible inhibition
- c. Competitive inhibition
- d. Allosteric activation

(54) How many different proteins are present in normal LDH?

- a. One
- b. Two
- c. Three
- d. Four
- e. Five



(55) Conversion of β -hydroxybutyrate to acetoacetate (shown above) occurs by:

- a. Oxidation
- b. Reduction
- c. Dehydration
- d. Dehydroxylation

Question Three: Mark (T) for true or (F) for false statements and correct the false ones:
(10 marks, 10 min)

1-Protoporphyrin IX contains vinyl, methyl and acetate in its side chain

Protoporphyrin IX contains vinyl, methyl and propionate (XF)

2-Vitamin D opposes the effect of parathyroid hormone in regulation of blood calcium level

Parathyroid hormone increase the level of Vitamin D to ↑ Ca²⁺ level (F)

3-Anticonvulsant drugs increase ALA synthase activity

(T)

4-Zinc is a trace element which is essential for the synthesis of vitamin A transport protein (RBP)

(T)

5-Thiamine deficiency results in a decreased production of ATP and thus impaired cellular function

(T)

6-The affinity of hemoglobin for the first oxygen bound is approximately 300 times greater than its affinity for the last oxygen bound

(F)

The affinity of Hb for the last O₂ bound is approximately 300 times than 1st O₂ bound

7-Sulfonamide is competitively inhibiting the synthesis of folic acid in microorganisms and human and thereby decreases the synthesis of nucleotide for replication

(F)

Folic acid is not synthesized in human only in microorganism

8-Calcitriol is a potent ligand of the vitamin D receptor which mediates most of actions of the vitamin

(T)

9-Retinol is the light-absorbing portion of rhodopsin and can be obtained from retinoic acid

(F)

Retinol can't be obtained from retinoic acid only from retinal

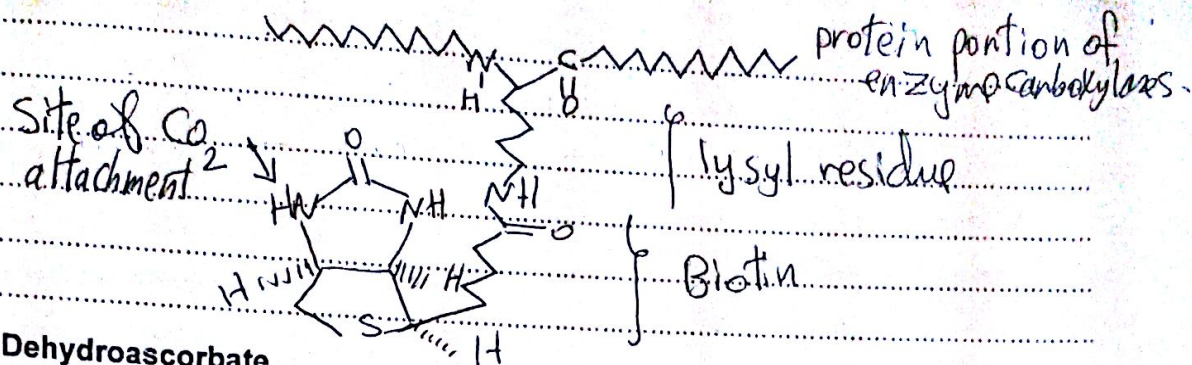
10-Cobalamin is required in humans for two essential enzymatic reactions the synthesis of methionine and isomerization of methyl malonyl CoA

(T)

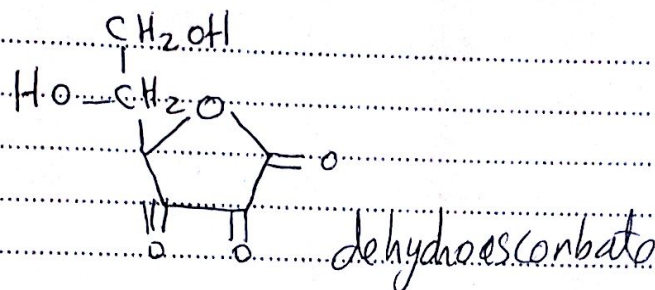
Question Four: Draw the following structure

(10 marks, 10 min)

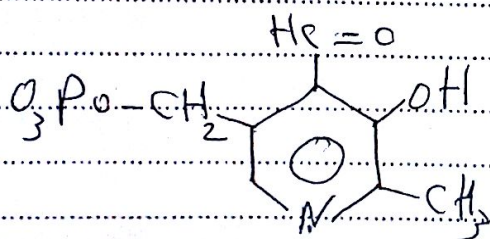
1- Biotin bound to an enzyme



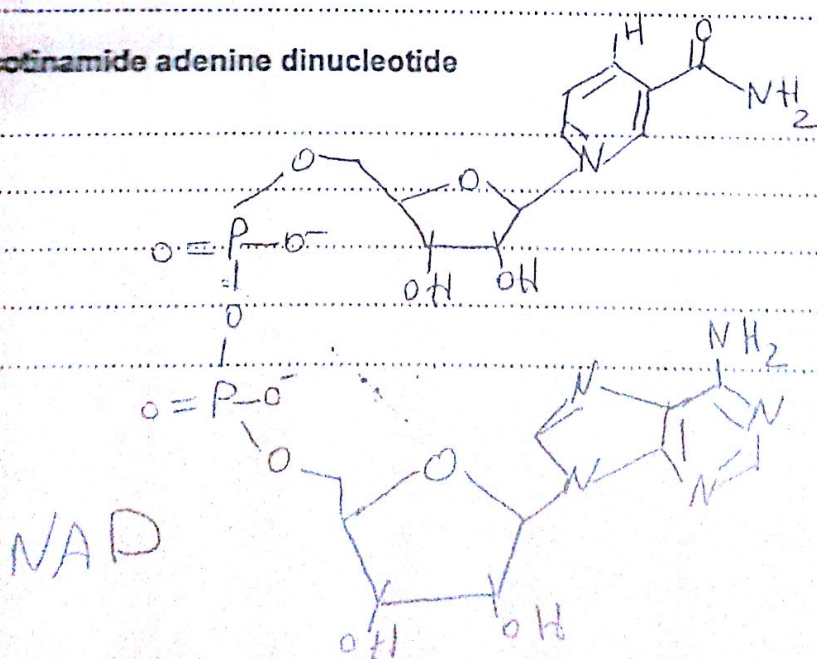
2- Dehydroascorbate



3- Pyridoxal phosphate



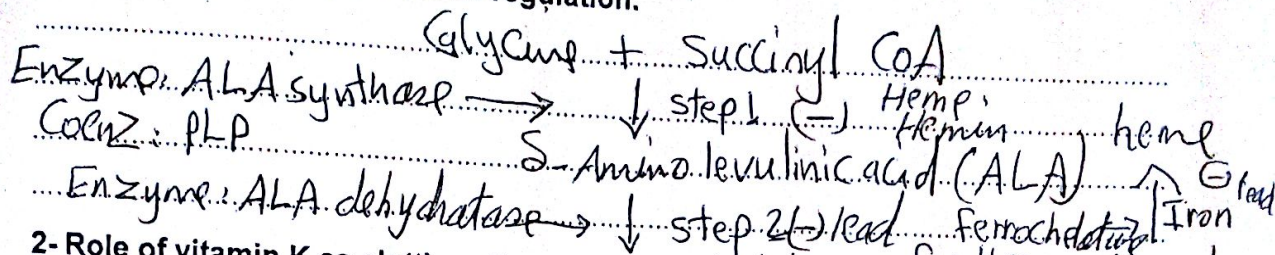
4- Nicotinamide adenine dinucleotide



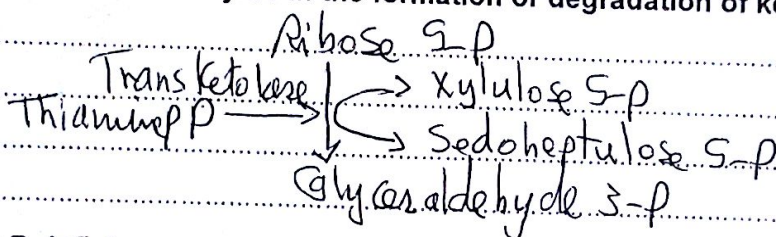
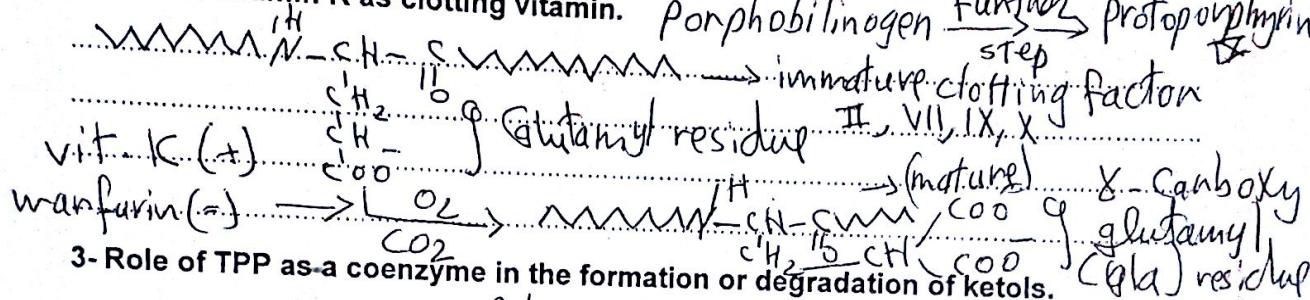
Question Five: Write briefly on each of the following using diagrams or figures whenever possible:

(5x5= 25 marks, 15 min)

1- Biosynthesis of heme and its regulation.



2- Role of vitamin K as clotting vitamin.



4- Vitamin D deficiency.

- (1) Nutritional Rickets: vitamin D deficiency causes rickets in children. Osteomalacia in adults characterized by soft, pliable bones & ↑ bones susceptibility to fracture in adults.
(2) Renal rickets: chronic renal failure ↓ ability to form the active form of vit. D.

5- Daily energy requirements.

estimated by measurement of energy Expenditure.
Daily energy Expenditure = Basal metabolic rate + specific dynamic action (SDA) + physical activity

$$BMR = \text{weight (kg)} \times 24 \text{ Kcal/day}$$

physical activity → sedentary 30% BMR GOOD LUCK
Moderate 40% BMR
Heavy 50% BMR