LUSAKA APEX MEDICAL UNIVERSITY

BS1001 CELLS AND BIOMOLECULES

TEST 2 APRIL 2024

Duration: 1hr 30 minutes

Examiner: Ms. K. Malisa and Ms. A. Chawe

SECTION A : Mark the correct answer with an X in the provided answer sheet at the back of this paper.

1. Sugars are technically called carbohydrates, referring to the fact that their formulae are only multiples of $C(H_2O)n$. Hexoses therefore have six carbons, twelve hydrogens and six oxygen atoms. Glucose is a hexose. Choose from among the following another hexose.

A. Fructose **B.** Erythrose **C.** Dihydroxyacetone **D.** Ribulose

2. The arrangement of atoms in a molecule of alpha glucose means that it can be broken down completely in a series of reactions to produce carbon dioxide, ATP and other gaseous wastes given that one of the following is available:

A. Hydrogen **B.** Nitrogen **C.** Water **D.** Oxygen

3. The most complex carbohydrates are the polysaccharides. They are made of many monosaccharide units joined by condensation reactions that create glycosidic bonds. A key difference between polysaccharide and monosaccharide units is:

A. Polysaccharides are made out of a single sugar unit **B.** Polysaccharides are formed by the addition of water to sugar units during condensation reactions **C.** Polysaccharides are not sweet **D.** Polysaccharides are molecules with 3-10 repeating units

4. Chemically, glycogen is very similar to the amylopectin molecules in starch, and it also has many alpha glucose units. It is the only carbohydrate energy store found in animals as well as_____.

A. Plants **B.** Protozoa **C.** Bacteria **D.** Fungi

5. In what form are carbohydrates transported in a plant?

A. As a disaccharide **B.** As a monosaccharide **C.** As amylase **D.** As amylopectin

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6. Keratin is a structural protein found in

A. Nails **B.** Bacterial cell wall **C.** Arthropods **D.** Spider webs

7. Which of the following carbohydrates is made up of beta linked N-Acetylglucosamine residues?

A. Cellulose **B.** Chitin **C.** Peptidoglycan **D.** Amylose

8. Which of the following is not a function of carbohydrates in animal cells?

A. Molecular recognition **B.** Cell to cell communication **C.** Osmotic pressure regulation in bacterial cells **D.** Energy source

9. The pleated shape of a protein molecule is called its?

A. Primary structure. **B.** Secondary structure. **C.** Tertiary structure. **D.** Quaternary structure

10. Two intrinsic factors that affect the function of a protein are:

A. Content and sequence of amino acids **B.** High Temperature and pH **C.** The size and location

D. Inhibitors and Apoenzymes

11. Amino acids, have both an amino group and a carboxyl group in their structure. Which one of the following is an amino acid?

A. Formic acid **B.** Glycerol **C.** Glycolic acid **D.** Aspartic acid

12. Proteins are polymers of amino acids joined by peptide bonds formed between the:

A. R groups **B.** R group and the amino group **C.** R group and the carboxyl group **D.** carboxyl group and the amino group.

13. The three-dimensional arrangement of more than one tertiary polypeptide is only found in proteins consisting of:

A. One polypeptide chain **B.** Two polypeptide chains **C.** Two or more polypeptide chains

D. amino acid chains including alpha helices and beta pleated sheets

14. Enzymes that differ in amino acid sequence but catalyze the same reaction are called

A. Co-factors **B.** Co-enzymes **C.** Apoenzymes **D.** Isoenzymes

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15. Inhibitor molecules that bind at the active site are _____.

A. competitive inhibitors **B.** noncompetitive inhibitors **C.** active inhibitors **D.** passive inhibitors

16. An organic cofactor, such as a vitamin or mineral, is called _____

A. an organic-factor **B.** an organic enzyme **C.** a coenzyme **D.** a supplement

17. Succinic acid dehydrogenase is the enzyme which catalyzes the oxidation of succinic acid during cell respiration. If malonic acid is added to the system, the rate of reaction is reduced. With an increase in the substrate concentration, succinic acid, increases the rate of reaction again. Using this information what might be deduced about the action of malonic acid.

A. It decreases the pH of the system. **B.** It forms a permanent attachment to the active site of the enzyme. **C.** It has a similar molecular configuration to that of succinic acid. **D.** It acts as a coenzyme

18. If other conditions were to remain constant, which one of the following changes would explain a reduced rate of activity in an enzyme-controlled reaction

A. increase in concentration of end-product **B.** increase in substrate concentration **C.** increase in enzyme concentration **D.** increase in temperature towards the optimum

19. The action of an enzyme depends on the specific structure of its active site. Which of these bonds are not important in maintaining the shape of the active site?

A. Ionic **B.** Hydrogen **C.** Disulfide **D.** Phosphodiester

20. Metabolic reactions taking place in a bacterium involve the production of amino acids A, B, C and D respectively by the action of specific enzymes. When an excess of amino acid D is added to the bacterium the rate of the reaction reduces. The cause of this reduction is likely due to _____

A. Excess substrate inhibiting the enzyme **B.** Enzyme denaturation **C.** Positive feedback inhibition **D.** End product inhibition

21. Which of the following is false about lipids

A. Their either strongly hydrophobic or amphipathic **B.** They are more soluble in water

C. Extraction of lipids from tissues requires organic solvents **D.** They are insoluble in water

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22. Which of the following is false about fatty acids

A. The melting point of fatty acids decreases with an increase in level of saturation **B.** Lipids in tissues that are subjected to cooling are more unsaturated **C.** Animal fats usually comprise saturated fatty acids **D.** Membrane lipids comprise mostly unsaturated fatty acids

23. Nonessential fatty acids are fatty acids that can be made from the body from carbohydrates and proteins that are already present in body cells. All the fatty acids below are classified as non-essential except_____.

A. Linoleic acid **B.** Palmitic acid **C.** Oleic acid **D.** Stearic acid

24. Essential Amino Acids

A. Are the only amino acids that are found in a protein **B.** Are produced by the body

C. Are obtained from a diet **D.** Are not part of a primary protein structure

25. The function of myoglobin is to _____.

A. Transport oxygen throughout the body **B.** Provides muscles with oxygen

C. Proliferates muscle fibers **D.** Engages the lungs and makes them strong

26. Which of the following is a complex lipid?

A. Beeswax **B.** Cholesterol **C.** Olive oil **D.** Sunflower oil

27. Which of the following statements about lipids is false

A. The shorter the chain length of a fatty acid the more relatively soluble it is in water

B. Cholesterol is a component of sex hormones

C. Animal lipids are often unsaturated and occur as fats at room temperature

D. Unsaturated fatty acids have got lower melting points than saturated fatty acids

28. An industrial process that is carried out to prevent spoiling of polyunsaturated fats is known as_____

A. Hydrogenation **B.** Hydrolysis **C.** Condensation **D.** Glycolysis

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29. Good Cholesterol is also scientifically referred to as_____

A. Low density lipoprotein B. Plaque C. Scavenger cholesterol (D.) High density lipoprotein

30. Which one of the following is not a function of fat in the body

A. Energy source B. Protection of vital organs C. Insulation (D.) Aroma and flavor of food

SECTION B- Answer in the spaces provided

B1. Carbohydrates are one of the classes of biomolecules. During one of the practical sessions at Lusaka Apex medical University, the students were instructed to do the following:

- Take a clean test tube
- Add 5mls water
- Add a teaspoon 0f maltose
- Leave to stand for 25 minutes
- Add an oxidizing agent

(a) Write a word equation for each of the reactions that took place in the test tube. [1 mark]

maltose + water $\xrightarrow{\text{hydrolysis}}$ glucose + glucose

glucose + Copper Sulfate$_{(II)}$ → oxidized glucose + H_2O

0·5

(b) Name the reaction that was taking place in the test tube before an oxidizing agent was added [1mark]

hydrolysis

1

(c) Name the products of the reaction you have stated in (b) above [1mark]

glucose + glucose

∴ 2 (two) α glucose

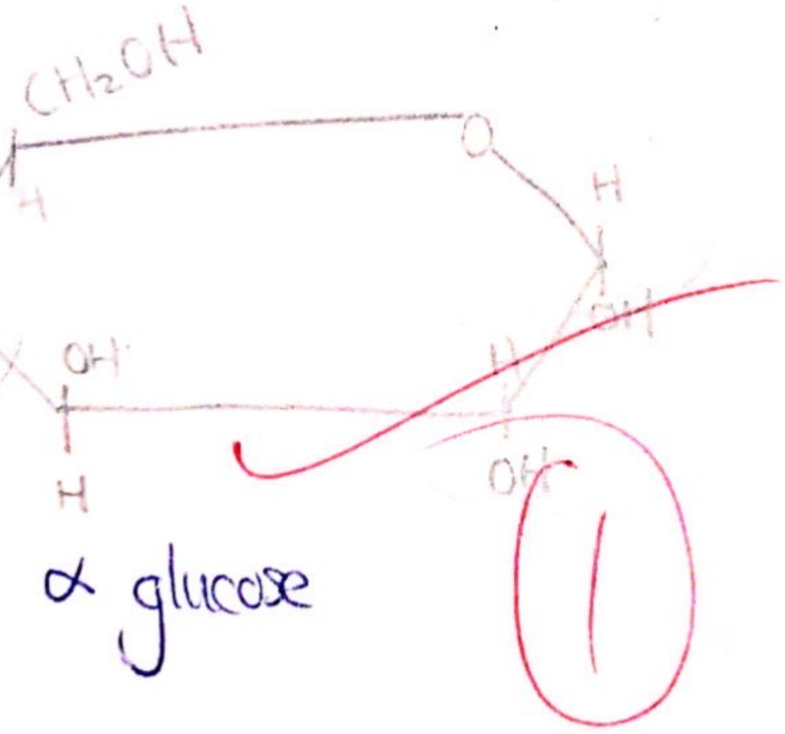
1

(d) Write the molecular formular of the products you have named in (c) above [1mark]

$C_6H_{12}O_6$

1

(e) Draw one of the products you have named in Q1C above [1mark]



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B2. There are two broad classes of proteins, fibrous and globular Proteins.

(a) State one example of a fibrous protein and one example of a globular protein [1mark]

Fibrous protein → keratin

globular protein → ~~haemoglobin~~ → myoglobin (1)

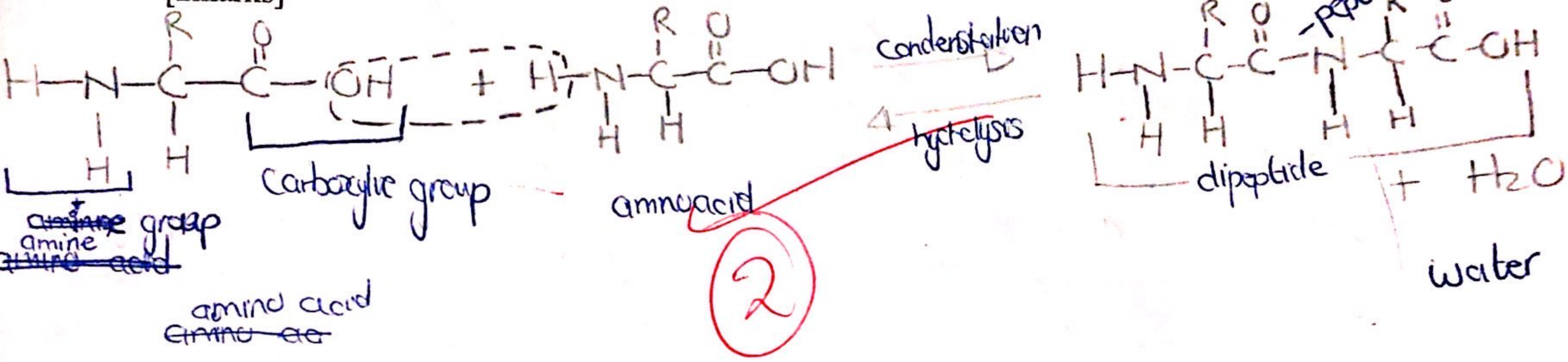
(b) Give the functions of each of the proteins you have stated above. [2mark]

~~Fibrous protein~~ →

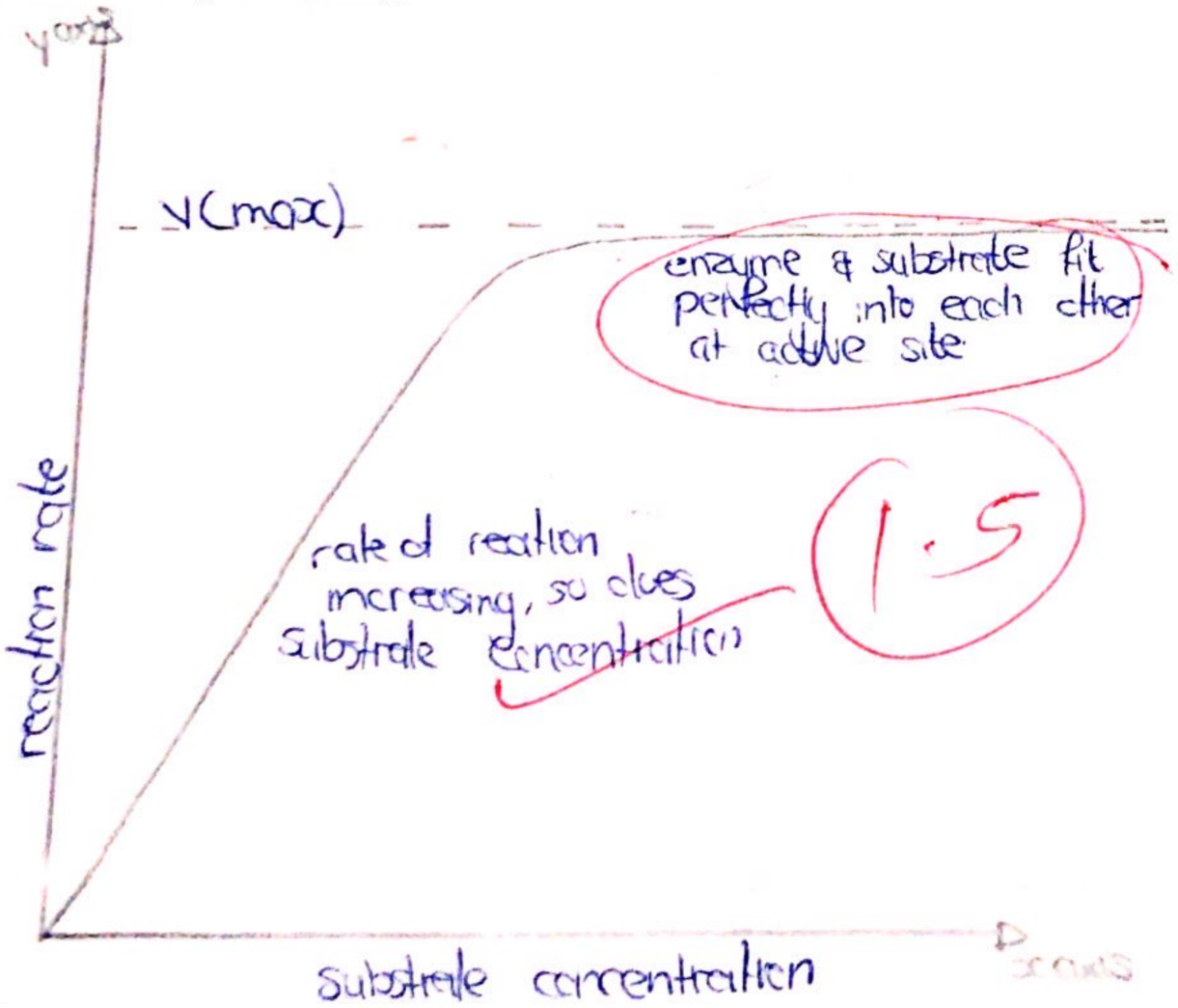
keratine → help with the formation of ~~hair and~~ nail | (2)

~~myosine~~ ~~haemoglobin~~ myoglobin → to transport oxygen to muscle ~~cells~~ /

(c)Using the general structure of an amino acid, clearly illustrate how a dipeptide is formed. [2marks]



B3. Using an illustration, explain the effects of substrate concentration on an enzyme controlled reaction. [5 Marks]



- as the rate of reaction increases, the substrate concentration of enzyme also increases ~~this means +~~ (at constant substrate concentration)
V(max) is the optimum concentration of the enzyme. 0

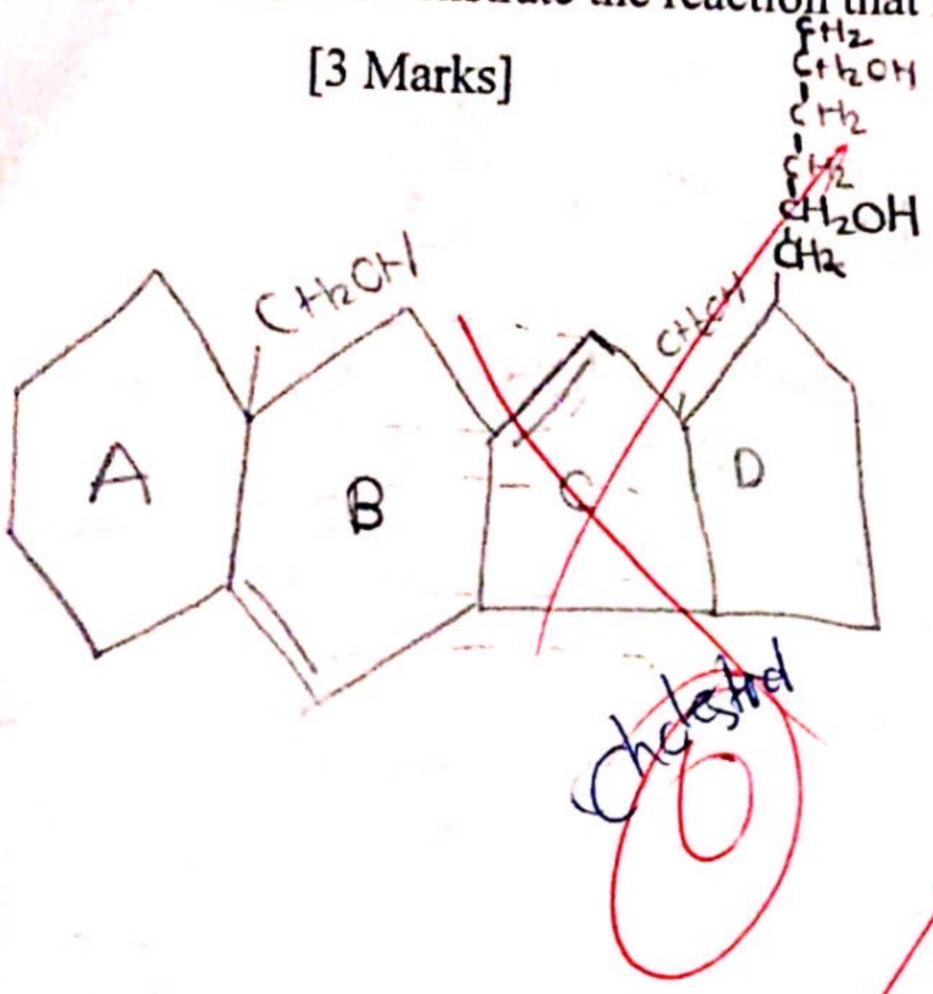
- as the substrate in

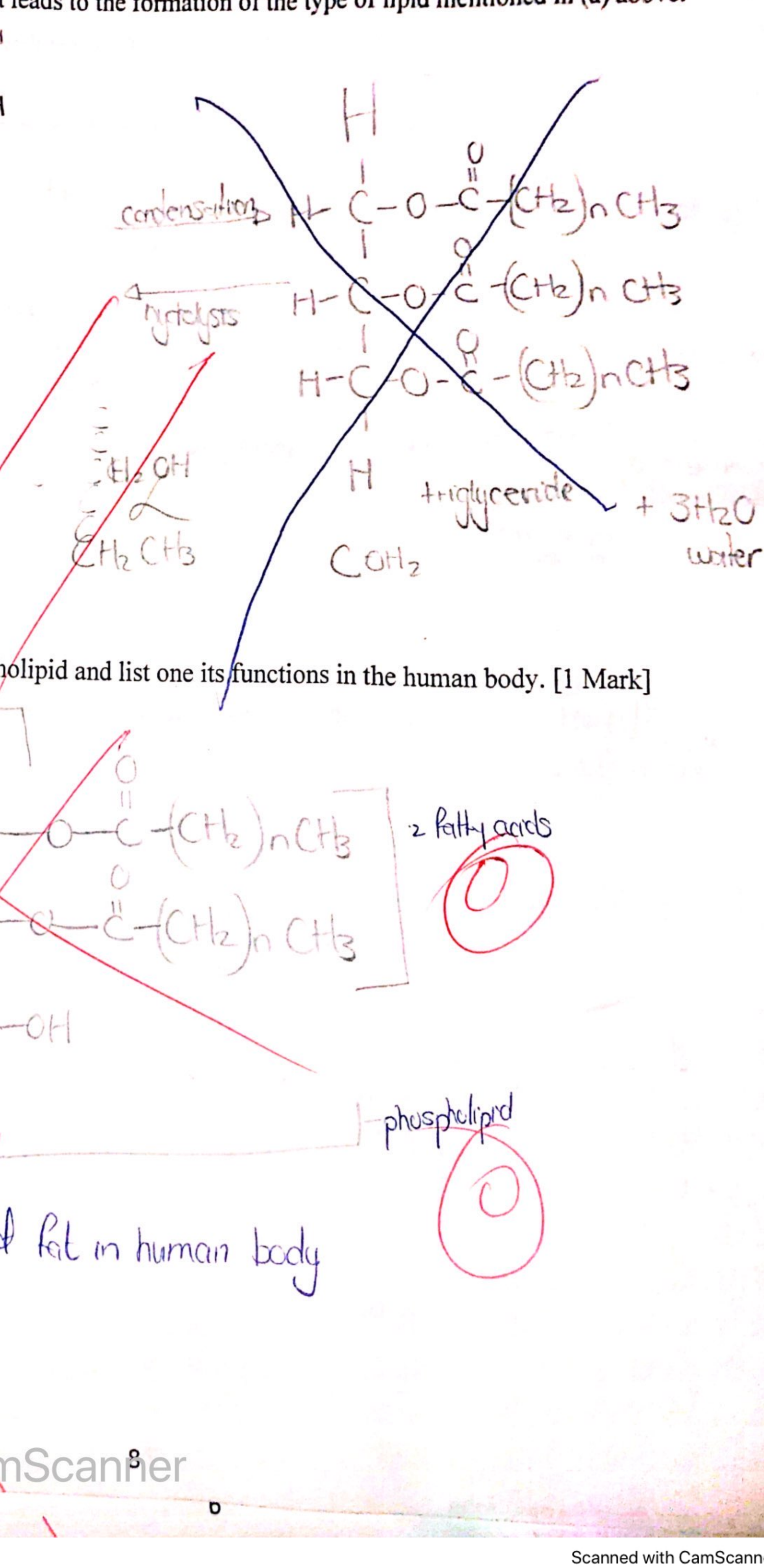
B4. Lipids are a heterogenous group of hydrophobic molecules that can be extracted from tissues by non-polar solvents.

(a) What type of lipids make up 95% of the dietary lipids? [1 Mark] ~~triglyceride~~

- Cholestrol ✗ ○

(b) Demonstrate the reaction that leads to the formation of the type of lipid mentioned in (a) above. [3 Marks]





(c) Draw the structure of a phospholipid and list one its functions in the human body. [1 Mark]

Function:
- emulsification of fat in human body

MCQ ANSWER SHEET :Mark the correct answer with an X using a pen.

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