Unit 1 · Biomolecules

WORKSHEET

Full marks 39

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 39

1 Key words [4]

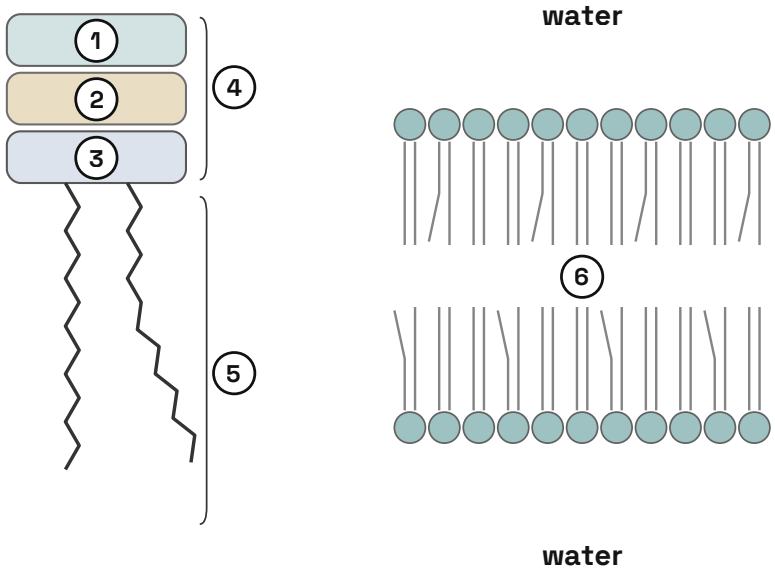
Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

activation energy	aldoses	condensation	denaturation	glycosidic	hydrolysis	ketoses
nucleoside	peptide	primary				

Sugars such as glucose, with an aldehyde group at carbon 1, are called _____. Two sugars are joined by a _____ bond, and two amino acids by a _____ bond; both form by _____, as a molecule of water is removed. A protein's order of amino acids is its _____ structure. Heat that unfolds a protein without breaking its peptide bonds causes _____. A base joined to a pentose sugar, without phosphate, is a _____. An enzyme speeds up a reaction by lowering its _____.

2 Label the diagram [3]

The diagram shows a phospholipid molecule and how such molecules lie in water. Write the names of the parts 1 to 6. Each carries 0.5 mark.



1. _____ 2. _____

3. _____ 4. _____

5. _____ 6. _____

3 Multiple choice [5]

Choose the correct option for each of the following questions.

i. Which group of amino acids must come from the diet, because the human body can't make them? [1]

a. alanine, arginine, asparagine
b. histidine, isoleucine, leucine
c. glutamic acid, glutamine, glycine
d. aspartic acid, cysteine, tyrosine

ii. Which complex lipid has sugars joined to it and is plentiful in the white matter of nerve tissue? [1]

a. glycolipids
b. phospholipids
c. lipoproteins
d. cholesterol

iii. Why is **sucrose** not a reducing sugar, while maltose is? [1]

a. sucrose has no glucose in it
b. its glycosidic bond uses the carbonyl carbons of both its sugars
c. it is too large to react with Cu^{2+}
d. it is a polysaccharide

iv. Hemoglobin is four polypeptide chains, each holding a heme group with iron. Which description fits it? [1]

a. a simple protein with no quaternary structure
b. a fibrous, derived protein
c. a conjugated (chromo-) protein with quaternary structure
d. a glycoprotein of one chain

v. Pepsin works best at pH 2. Why does it stop working when food passes into the small intestine? [1]

a. the small intestine is too warm
b. the pH there is about 8, far from its best pH, so its shape changes
c. there is no protein left in the food
d. pepsin is a carbohydrate and is digested there

4 Very short answers [3]

Write very short answers to the following questions.

a. Write the general formula of carbohydrates, and show that glucose fits it. [1]

b. Which amino acid is the precursor of the plant hormone indole-3-acetic acid (IAA)? [1]

c. Why does an α-helix count as secondary, not tertiary, structure? [1]

5 Short answers [9]

Write short answers to the following questions.

a. Write any four differences between DNA and RNA. [2]

b. Ghee goes solid on a cold winter morning, but mustard oil stays liquid. Explain. [2]

c. Dal bhat is said to give a better protein than rice or dal alone. Explain why, using the idea of essential amino acids. [2]

d. Name the three kinds of RNA and write the role of each in making a protein. [3]

6 Numerical problems [4]

Solve the following problems. Show your working.

A piece of double-stranded DNA has 2000 base pairs, and 30 % of its bases are adenine. i. Find the percentages of thymine, guanine and cytosine. ii. How many G–C pairs does it have? iii. How many hydrogen bonds hold its two strands together? iv. How long is the piece, in nanometers, and how many turns of the helix does it make (10 base pairs a turn)?

Answer: _____

7 Long answers [8]

Write long answers to the following questions.

a. Describe the four levels of protein structure, naming the bonds that hold each and giving an example. [4]

b. Starch, glycogen and cellulose are all made only of glucose. Explain how they differ in their bonds and shape, and how each suits its job. [4]

8 Think [3]

A student writes in a lab report: “The DNA sample was 28 % adenine, 24 % guanine, 20 % cytosine and 28 % thymine.” The teacher says the sample cannot be double-stranded DNA. Is the teacher right? What could the sample be, and how would you check?

9 Activity: Test foods for starch

(not marked)

You need a few drops of tincture of iodine (poisonous: don't taste it, and wash your hands after), a white plate, and small pieces of food: boiled rice, raw potato, bread, ripe and unripe banana, sugar dissolved in water, and a tuft of cotton wool. Add one drop of iodine to each and wait a minute.

Food	Color after iodine	Starch present?
boiled rice		
raw potato		
bread		
ripe banana		
unripe banana		
sugar water		
cotton wool		

Cotton wool is almost pure cellulose, made of glucose. Why doesn't it turn blue-black?