Name: _____KEY_____
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Biochemistry Review Worksheet

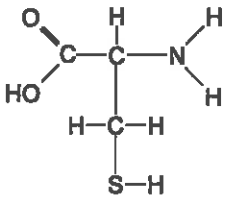
Part A: Write the correct letter of the word that best matches the following definition.

U	water-"loving"	a.	atom
P	water-"fearing"	b.	amino acid
EE	two or more polypeptide chains coming together and bonding with each other	c.	adenosine triphosphate
I	to permanently change the 3 dimensional structure of a protein	d.	buffer
Y	the subunit that makes up nucleic acids - 4 types in DNA are ACGT	e.	carbohydrate
A	the smallest unit of matter that cannot normally be broken into smaller particles	f.	cellulose
J	the process of breaking down large fat droplets into smaller fat droplets	g.	cholesterol
BB	the loose association of amino acids in a polypeptide chain with each other, usually through H-bonds. e.g. alpha helix, beta pleated sheet	h.	dehydration synthesis
DD	the linear sequence of amino acids in a protein, which ultimately determines its shape	i.	denature
B	the building block of protein -- there are 20 different kinds normally found in nature	j.	emulsification
AA	the bond that forms between two amino acids joined by dehydration synthesis	k.	enzymes
Q	the 3-D shape of a polypeptide chain due to it folding back on itself and forming bonds.	l.	glucose
II	three carbon that joins with fatty acids to produce triglycerides	m.	glycogen
D	a chemical that resists changes in pH	n.	hydrogen bond
H	creating a bond between two atoms by taking OH from one atom and H from the other	o.	hydrolysis
O	breaking a bond between two atoms by adding OH to one atom and H to the other	p.	hydrophobic
K	biological catalysts, composed of protein, that speed up chemical reactions	q.	tertiary structure
C	ATP - the molecule that carries energy in the cell	r.	lipid
E	any molecule with the molecular formula $C_n(H_2O)_n$	s.	starch
GG	an important component of cell membranes, has a hydrophilic head, hydrophobic tail	t.	unsaturated fatty acid
V	an enzyme that breaks down maltose to two glucose molecules	u.	hydrophilic
Z	molecules that store genetic information (e.g. DNA and RNA)	v.	maltase
N	a weak bond due to the attraction between partial charges on hydrogen, oxygen, and nitrogen atoms	w.	saturated fatty acid
F	a polymer of glucose, used as a structural component of plant cell walls	x.	neutral fat
M	a polymer of glucose, used as a storage form for glucose in animals	y.	nucleotide
S	a polymer of glucose, used as a storage form for glucose in plants	z.	nucleic acids
L	a 6 carbon sugar that forms a 6-membered ring -- used as energy source by cells	aa.	peptide bond
G	a lipid that is an important component of cell membranes and from which steroid hormones are made	bb.	secondary structure
X	a lipid composed of glycerol joined to 3 fatty acids	cc.	polymer
FF	a large organic molecule formed from a chain or chains of amino acids	dd.	primary structure
CC	a large molecule made by joining together smaller identical (or similar) molecules	ee.	quarternary structure
R	a class of molecules that includes neutral fats and steroids	ff.	protein

W	a fatty acid whose carbons are all joined to the maximum number of hydrogens	gg.	phospholipid
T	a fatty acid that has a "kink" in it due to a double bond between carbon atoms	hh.	maltose
NN	a disaccharide consisting of two glucose molecules	ii.	glycerol

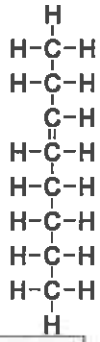
Part B: Fill in the blank with the correct word(s).

1. At pH of 7, [H+] = [OH-]. Below pH 7, which of these is greater? *H+*
   Bases have a pH that is *greater* than 7.
2. The primary structure of a protein is a polymer of *amino acids* the secondary structure is characterized by the alpha *helix* the tertiary structure is its *3D* shape, and the quarternary structure is the association of more than *one* polypeptide chains.
3. The molecule that cells "burn" during respiration to produce ATP is *glucose*
4. An unsaturated fatty acid contains less *hydrogen* than a saturated one.
5. The molecule on the right is what type of molecule? *amino acid.*
   What is the empirical formula of the "R" group? CH_2S. Which side, left or right is the amino group? *right* Which side, left or right is the acid group? *left*



6. What are the four most common atoms in organic molecules? *Carbon, Hydrogen, Oxygen, Nitrogen*
7. What are the four classes of organic compounds? *proteins, carbohydrates, lipids, nucleic acids*
8. The molecule to the right belongs to what class of molecule? *carbohydrates* The hydrolysis of this molecule would produce what molecule? *glucose*

9. Of the classes listed in question 7, which is:
   a. most concerned with energy transformations *carbohydrates*
   b. the class that forms enzymes *proteins*
   c. makes up genes *nucleic acids*
   d. the class that is capable of storing the most energy per gram *lipids*
10. What type of molecule is the molecule to the right? *monounsaturated fatty acid*. Molecules made of these molecules joined to glycerol would be at what state at room temperature? *liquid*



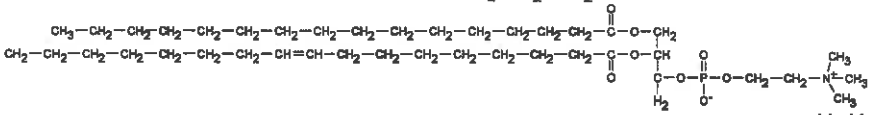
11. *Phospholipids* are lipids containing phosphorous that are particularly important in the formation of cell membranes.
12. *Emulsification* is the act of dispersing one liquid in another, as fat in water.
13. Inorganic compounds are compound that do not contain *carbon* atoms.
14. Which element is most characteristic of proteins? *nitrogen*
15. List 5 function of proteins, along with an example of each:

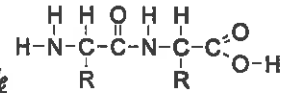
FUNCTION	EXAMPLE
TRANSPORT	*HEMOGLOBIN*
ENZYMES	*MALTASE, TRYPSIN, PEPSIN*
IMMUNE SYSTEM COMPONENTS	*ANTIBODIES*
STRUCTURAL COMPONENTS	*COLLAGEN, MUSCLE*
MOVEMENT	*MUSCLE (e.g. ACTIN & MYOSIN FIBRES)*
CHEMICAL MESSENGERS	*PEPTIDE HORMONES (e.g. INSULIN)*

16. There are, according to your textbook, *20* kinds of amino acids, which differ from each other only in their *R* groups.
17. There are a total of *8* amino acids that the human body can't manufacture, and so must be obtained from food. These are called *essential* amino acids.
18. Use the following words to describe the making of a protein (an expression *may* be used more than once):
    tertiary structure, hydrophobic interactions, water, -COOH, polypeptide chain, Dehydration synthesis, -NH_2, secondary structure, hydrogen bonding, covalent bonds, helix, primary structure, peptide bonds
    dehydration synthesis between amino acids joins *–NH_2* groups to *-COOH* groups (in the process *water* molecules are removed) to form a *polypeptide chain*. The bonds so formed are called *peptide bonds*. The

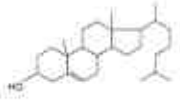
sequence of amino acids is called the ***primary structure***. The ***secondary structure*** is often in the form of an alpha helix, which is due to ***hydrogen bonding*** between amino acids in the chain. The ***tertiary structure*** is the three dimensional shape of the protein as it folds back on itself. This structure is held together by ***hydrogen bonding***, ***hydrophobic interactions***, and ***covalent bonds*** between R groups. The shape of the protein is determined by its ***primary structure*** . The function of the protein is determined by its ***primary structure***.

19. A protein that has lost its precise three dimensional shape has become ***denatured***. Three things that can cause a protein to become denatured are ***heat***, ***pH***, ***chemicals***
20. Two main functions of carbohydrates in living systems are in ***short***-term energy sources, and structural components of cell ***walls*** in plants.
21. ***Starch*** has few side branches of glucose chains, and is the storage form of glucose in plants. Since it contains many glucose molecules joined together, it is called a ***polysaccharide***.
22. ***Glycogen*** has many side branches of glucose chains, and is the storage form of glucose in ***animals***. The ***liver*** is the main organ that produces, breaks down, and stores this polysaccharide.
23. "Roughage" or "Fibre" in our diet is actually due to the presence of ***cellulose***, another polymer of glucose found only in ***plants***.
24. A pentose sugar contains ***5*** carbons, while a hexose sugar contains ***6***. An example of a pentose monosaccharide is ***ribose***. An example of a hexose is ***glucose***.
25. Table sugar is a ***disaccharide*** made of one molecule of glucose and one molecule of the hexose ***fructose***.
26. Lipids are organic compounds that are ***insoluble*** in water. In the body, they serve as ***long***-term energy storage molecules. Lipids include fats, ***oils***, and ***waxes***.
27. The 3 most important classes of lipids are neutral fats, ***phospholipids***, and ***steroids***.
28. Oil, fat, butter are all composed of lipid molecules called ***triglycerides*** (or ***neutral fats***). Neutral fats are composed of two types of molecules: ***glycerol*** and ***fatty acids***.
29. Most fatty acids contain about ***16-18*** carbon atoms in a long chain. Saturated fatty acids have no ***double*** bonds between carbon atoms, and tend to be solid at room temperature. Unsaturated fatty acids are most often found in vegetable oils, and account for the fact that they are liquid at room temperature.
30. Butter contains a large proportion of ***unsaturated*** fatty acids. Excess intake of this type of fatty acid is known to cause ***heart*** attacks and strokes.
31. Soap is a ***salt*** formed when a ***fatty acid*** is reacted with an inorganic base such as ***NaOH***. Soap allows oils to be mixed with water by ***emulsifying*** the oils.
32. A phospholipid is a lipid made of glycerol, 2 fatty acids, and a phosphate group. It is the primary component of membranes. The phosphate "head" is ***hydrophilic***, the tail is ***hydrophobic***.
33. ***Steroids*** are small lipids containing rings that are all derived from cholesterol. An important function of these compounds are sex ***hormones*** like progesterone.
34. ***DNA*** stores genetic information. ***RNA*** carries a copy of that information (e.g. a message to make insulin) to the ribosomes where ***proteins*** are assembled.
35. What type of molecule is the molecule drawn below? ***phospholipid***





36. What is the best one-word description for the molecule to the right? ***dipeptide***
Circle the bond that was created when this molecule was formed. What is the name of this type of bond? ***peptide***
37. a. To what class of molecules does the molecule to the right belong? ***steroid***



b. Why are these molecules grouped with lipids? ***because they are non-polar and insoluble in water***
38. What type of molecule is the one below? ***nucleotide***
What is its full name? ***adenosine triphosphate (ATP)***. Circle the bond that stores the most energy. *(Between the 2nd and the last phosphate*