Name: KEY Ch. 02 Period: _____

Homework Chapter 2-Chemistry Comes Alive Date: _____

Using your textbook, Chapter 2 pp25-59 and other outside sources. **complete by** _____

1. What is the chemical symbol for each of these biologically important elements?

O Oxygen	I Iodine	Ca Calcium
Mg Magnesium	C Carbon	H Hydrogen
Na Sodium	Cl Chloride	K Potassium
N Nitrogen	P Phosphorus	Fe Iron

2. From the list of elements in question1, match the chemical symbol/s to the description below.

Ca 1. found as a salt in bones and teeth

C, H, O 2. Make up more than 96% of the mass of the cell

Fe 3. Essential for transport of oxygen in red blood cells

Ca, Na, K 4. Essential cations (+) in muscle contractions

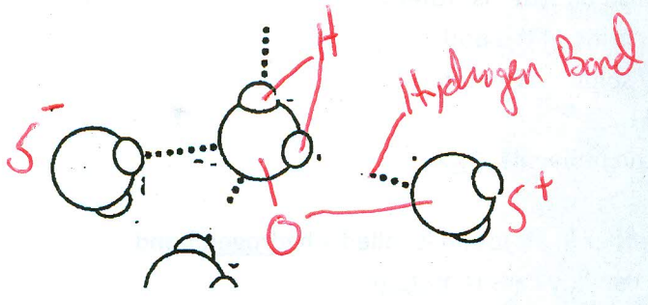
I 5. Essential for production of thyroid hormones

P 6. Present in nucleic acids (in addition to C, H, O, and N)

Cl 7. Most abundant negative ion in extracellular fluid.

What is the difference between polar and nonpolar molecules? (p34) Polar has a charge on opposite sides of Molecule Nonpolar has even charges

4. Refer to p37 to complete the diagram of five water molecules. Identify the Hydrogen atoms and the oxygen atoms. Identify the hydrogen bonds. Using the Greek letter sigma, ς, indicate which part of the molecule is slightly + and which slightly -.



5. Use the choices below to identify the substance described.

A. Acid B. Base C. Buffers D. Salts

A 1. B 2. D 3. Substances that ionize in water; good electrolytes.

B 4. Proton (H^+) acceptors

A 5. Dissociate in water releasing H^+ and a negative ion other than OH^-

D 6. Substance dissociate in water to release ions other than H^+ and OH^-

D, C 7. Formed when an acid and a base are combined

C 8. substance that prevents rapid or large swings in pH

6. Define pH: measure of H^+ ion present in a solution

7. What is the difference between a strong acid and a weak acid? strong acid all H^+ are Released. Weak acid only part H^+ ions released

Organic Compounds

8. Match the terms in column B with the descriptions in column A. *May have several answers*

G 1. Building blocks of carbohydrates
D 2. building blocks of fat
A 3. building blocks of proteins
B 4. single most important fuel source for body cells
C 5. Not soluble in water
B 6. Made of C, H and O where ratio of H to O is 2:1
H, F 7. contains Nitrogen
F 8. building block of nucleic acids
B 9. primary component of bread and pasta
H 10. includes collagen and hemoglobin

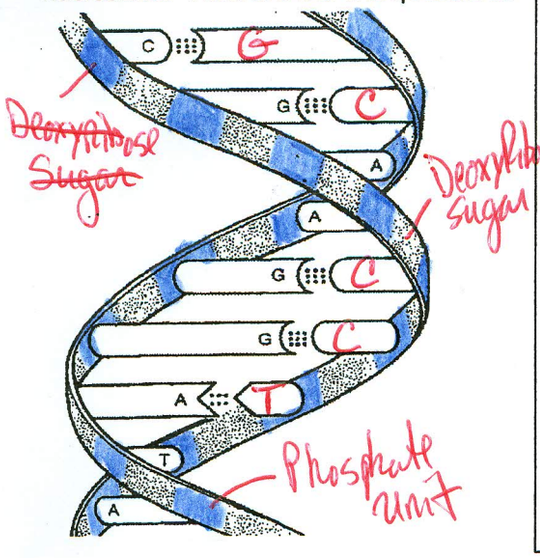
a. amino acids
b. carbohydrates
C. lipids
D. Fatty acids
E. Glycerol
F. Nucleotides
G. Monosaccharides
H. proteins

9. For each of the following statements that is true, write "true" in the blank. If the statement is false, correct the underlined word to make it true and put that word in the blank.

True 1. Phospholipids are polarized molecules.
False 2. Steroids are the major form in which body fat is stored.
True 3. Water is the most abundant compound in the body.
False Polar 4. Nonpolar molecules are generally soluble in water.
False DNA 5. The bases in RNA are A, G, C, and U.
False Glucose 6. The energy "currency" in cells is the molecule, DNA.
True 7. RNA is single-stranded.
False peptide 8. The bond linking amino acids together in a protein is called a hydrogen bond.
False Glucose 9. The major external fuel of choice used by cells is protein.
True 10. The nucleotide base that compliments guanine is cytosine.

True 1. All enzymes are proteins.
False substrate 2. The substance upon which an enzyme acts is called the cofactor.
False -ases 3. The name of an enzyme usually ends in the suffix--ide.
False decreasing 4. Enzymes work by increasing the activation energy of a reaction.
True 5. The location of substrate attachment on an enzyme is called the active site.
True 6. Coenzymes are vitamins that assist the chemical action of enzymes.
False Secondary 7. Changes in pH or temperature decrease enzyme activity because bonds break and the enzyme returns to its tertiary structure.

12. The figure to the side shows the structure of DNA. Color and label the deoxyribose sugar, the phosphate unit, and the four bases. Complete the base pairing by inserting the correct letter on the right side of the diagram. Circle one nucleotide. Then answer the questions.



1) What are the four nitrogenous bases in DNA? And which ones pair with each other?

Adenine pairs with Thymine

Cytosine pairs with Guanine

2) What type of bond holds the bases in DNA together?

Hydrogen

3) What is the shape of the DNA molecule? double Helix

4) Where in the cell is DNA found? Nucleus

5) What is the purpose of DNA? store info - make protien

13. Use an "X" to designate the organic compounds.

____ carbon dioxide	X fats	X proteins	____ water
____ oxygen	____ KCl	X glucose	X DNA

14. The speed of a chemical reaction is influenced by what four factors?

a) Surface area Reactants

b) Temp.

c) Concentration of Reactants

d) Activation Energy

15. What four elements make up about 96% of the body? N, O, C, H

16. What is the difference between an isotope and an ion? istope is element w/ different # neutrons Ion element w/ different # electrons

17. What is the difference between glucose and glycogen? glucose is monomer glycogen is polysaccharides

18. What is the difference between dehydration synthesis and hydrolysis? dehydration → take out H_2O put monomers together Hydrolysis put H_2O in Break apart into monomers

19. What is the difference between a cation and an anion? cation = ⊕ anion = ⊖

20. Some antibiotics act by binding to certain enzymes in the target bacteria. How might these antibiotics influence the chemical reactions controlled by the enzyme? They would decrease activation energy

What would be the effect on the bacteria? would faster Reaction Rate would cause problem/death with bacteria

What is the effect on the person taking the antibiotic, hopefully? Person feels better

Chemistry you need to know Chapter 2

P 26: Know symbols for elements in table 2.1, oxygen to iron; know charge on ions: calcium, potassium, sodium, chlorine

P 29 isotope radioisotopes p 29-30

P 30-31 mixtures, solutions, concentration in percent and molarity (in most medical applications, concentration is in percent)

P 33-36 types of bonds, difference between ionic and covalent; polar and nonpolar; hydrogen bond

P 38 oxidation-reduction or redox reactions

Basis of all reactions in which food is catabolized (broken down)
Reactant losing electron = electron donor is oxidized
Reactant gaining electron = electron acceptor is reduced
Occur when ionic cmpds formed; NaCl;
sodium loses electron = positive ion
chlorine gains electron = negative ion
also occur when substances change patterns of sharing electrons
substance oxidized by losing H or combining with O
oxygen is very electronegative and so electrons spend more time around it
Cellular respiration: glucose oxidized and oxygen reduced

P 39 Chemical equilibrium; represented in a reaction by double arrow

Once equilibrium is reached..no *net change*
Many biological reactions are irreversible for all practical purposes
Cellular respiration; ATP is used immediately and carbon dioxide is removed

P 39 Collision Theory and factors influencing rates of reactions

P 40-41 Biochemistry: difference between organic and inorganic

Water: why is it so important?

1. Polar - ~~suck~~ surface tension
2. cohesion
3. Adhesion
4. solvent
5.

Salt: ~~Reacts~~ breaks into ions in H_2O not H^+ & OH^-

Disassociate: Break apart into ions
Electrolyte: disassociates in H_2O
Common in body are: NaCl, KCl, $CaCO_3$
Proper ionic balance is job of urinary system

P 41-42 Acids and bases: electrolytes; disassociate in water

Acids: release H^+ ions; proton donors; biological acids include: hydrochloric, acetic, carbonic

Bases: release OH^- ions called hydroxyl ions; protons acceptors; biological bases include bicarbonate and ammonia

P 42-43: pH Acid-Base concentration

pH is a measure of hydrogen ions in solution in moles per liter or molarity
pH goes from 0-14 and is logarithmic or based on exponents
pH negative log of hydrogen ion concentration in moles per liter or $-\log[H^+]$
pH of 0-6 is acidic with 0,1,2 being strong 5,6 weak
pH of 7 is neutral
pH 8-14 is basic or alkaline with 8,9 weak bases, 12,13,14 strong bases
neutralization: acids and bases combined in proper proportions yield water and a salt

p 43 Buffers

Living cells are **very** sensitive to slight changes in pH; strong acids and bases are very damaging to tissues; acid-base balance is regulated by kidneys, lungs and by buffers
Buffers: chemicals that resist large or abrupt changes in pH by acting as acids when pH rises and act as bases when pH drops
Strong acids disassociate completely;
weak acids do not $100\ HAc \longrightarrow 90\ HAc + 10\ H^+ + 10\ Ac^-$

if we add more H^+ ions, the H^+ and Ac^- combine to form HAc; equilibrium shifts to the left
if we add a base, OH^-, then more HAc disassociates releasing more H^+ ions which combine with the hydroxyl ions to form water

strong bases disassociate easily and combine with H^+ ions
Weak bases like sodium bicarbonate ionize incompletely and can shift left or right
Blood pH- see other paper

P 43 Organic cmpds; carbon, small, electroneutral, can form chains, rings, and other structures

P 44-46 Carbohydrates include sugars and starches; carbon, hydrogen, oxygen with H and O in 2:1 ratio as in water (carbon and hydrate (water)

Classified by size and solubility; larger are usually less soluble
Mono
Di
Poly

Sugars end in *-ose*
Disaccharides formed by **dehydration synthesis**
Broken by **hydrolysis**
Starch, glycogen
Major function= energy
Structural formulas and short version
Know glucose and ribose

P 46-48 Lipids: fats and oils, insoluble in water, carbon, hydrogen and oxygen(less oxygen)
Triglycerides: 3 fatty acids and a glycerol; stored fuel

Saturated all single bonds
Mono or poly unsaturated contain one or more double bonds

Phospholipids- polar "head" and nonpolar "tail"; form cell membranes
Steroids-four interlocking hydrocarbon rings; cholesterol-structural formula

P 48-54 Proteins: Structural material and enzymes; carbon, hydrogen, oxygen, and nitrogen; some contain phosphorous or sulfur
Made of amino acids; generalized structure of an amino acid: amine group, acid group, R group
Amino acids joined by dehydration synthesis; resulting bond called a **peptide bond**
Dipeptide, polypeptide; proteins—usually hundreds of amino acids
Structural levels in proteins: *see Fig 2.18 p 51*
Primary-"strand" of amino acids strung together
Secondary-for or twist, helix or pleat, because of hydrogen bonds, like a coiled telephone cord
Tertiary- helix or pleat folds in on itself to form a "glob" with a certain 3-D shape
Quaternary- two or more polypeptide chains folded with each other
Fibrous and globular proteins
Fibrous—like a fiber; collagen, keratin, actin and myosin in muscles; structural
Globular—compact, spherical; enzymes, hemoglobin, antibodies; functional
Molecular chaperons—globular proteins that help other proteins fold properly
Characteristics of Enzymes: globular proteins that act as biological catalysts to regulate or accelerate reaction but are not used up during reaction
Coenzyme: vitamin or metallic ions necessary for proper protein function
End in *–ase*; Example: lact*ase* is an enzyme that helps break down the sugar lactose
Mechanism of enzyme activity: recall collision theory and activation energy (see fig 2.20 p54)
1. enzyme binds with substrate (substance upon which enzyme acts); there is an **active site** which is an area on enzyme where substrate fits (lock and key or induced fit model)
2. enzyme-substrate complex rearranges
3. enzyme releases product

P54-57 Nucleic acids: made of carbon, hydrogen, oxygen, nitrogen, and phosphorous
Nucleiotides-monomer made of nitrogen base, 5 carbon sugar, and a phosphate group
Nitrogen bases: Purines are: adenine, guanine, Pyrimidines are: thymine, cytosine and uracil

DNA: deoxyribonucleic acid; found in nucleus of cell, genetic material, replicates, provides instructions for making proteins, double helix
RNA: ribonucleic acid; inside and outside nucleus; carries out instructions in DNA; single strand
See table 2.4 p 57

P57-59 Adenosine triphosphate—ATP; although we rightly say glucose is "fuel" for cells, glucose is broken down during cellular respiration into energy packets the cells can use for reactions; each glucose molecule produces 36 molecules of ATP
ADP or adenosine diphosphate is phosphorylated into ATP; wavy line means high energy bond
AP~P~P

Do Chapter 2 review packet

Do myaandp.com quizzes especially multiple choice level 1

Human blood normally has a pH between 7.35 and 7.45. By comparison, salvia has a pH of 6.6 and stomach juices have a pH from 1-3. A variety of factors affects the acidity or alkalinity(base) of blood such as what is ingested, vomiting, diarrhea, lung function, kidney function and infections.

One way the body controls the blood pH involves the release of carbon dioxide from the lungs. Carbon dioxide is a waste product of cellular respiration (a complex chemical reaction that releases chemical energy) and is constantly produced by the cells. In the bloodstream, carbon dioxide dissolves in the watery fluid inside the red blood cells forming carbonic acid (H_2CO_3)

CO_2 + H_2O ⟶ H_2CO_3

Waste From Cells — inside red blood cells — carbonic acid

As more carbon dioxide is produced by cells, more is dissolved in the blood making the blood more acidic. (lower pH)

In the blood, carbonic acid *dissociates*, or separates, into H^+ ions (hydrogen ions) and HCO_3^- ions (bicarbonate ions). In the blood, these ions are carried to the lungs. In the lung tissue the hydrogen ions and the bicarbonate ions interact (with the aid of an enzyme) to produce carbon dioxide and water, the reverse of the first equation.

H^+ + HCO_3^- ⟶ CO_2 + H_2O

The carbon dioxide passes from the blood to the lungs where it is exhaled. The more carbon dioxide a person exhales, the more CO_2 is removed from the blood. This makes the blood less acidic. (higher pH) The pH of the blood increases as breathing becomes faster and deeper. By adjusting the speed and depth of breathing, the brain and the lungs are able to regulate the blood pH from minute to minute.

Acidosis-blood is too acidic. Can be caused by ingestion of certain poisons including too much aspirin; advanced stages of shock or type 1 diabetes; kidney malfunction.

Alkalosis-blood is too basic. Can be caused by rapid, deep breathing (hyperventilating); prolonged vomiting (removes acid from stomach); use of diuretics or some steroids

Both conditions can be life threatening and may require medical attention.

1. Which ion is responsible for acid properties of carbonic acid? H^+
2. What does *dissociate* mean? break apart What happens when carbonic acid dissociates? H^+ HCO_3^- Blood gets more acidic
3. As you exercise, more CO_2 is produced. To rid your body of this your breathing rate increases
4. One cause of acidosis is advanced Diabetes, Posion
5. One cause of alkalosis is Hyperventalating - Vomiting (prolonged)
6. Blood must be kept in a range of pH from 7.35 to 7.45