

UNIT 1
The Chemistry
of Life

REVIEW QUESTIONS

What elements are essential to Life?

C, H, N, O, P, S

What 4 elements make up 96% of living matter?

C, H, N, O

What does atomic number tell you
about an atom?

of protons in its nucleus

How is atomic mass calculated?

of protons + # of neutrons

What are valence electrons? Why are they important?

- ◆ Electrons in the outer most orbital
- ◆ They tell us whether or how an atom will react

List the 4 bond types in order from
strongest to weakest:

1. Covalent
2. Ionic
3. Hydrogen
4. Van der waals

How many electrons are shared in a single covalent bond?

2 electrons (1 pair)

Draw a hydrocarbon chain that contains 3 carbon atoms attached to each other with single bonds. How many H atoms will be present in the molecule?



8 H atoms

What type of bonds form within water molecules? Draw it!

Polar covalent bonds

What type of bonds form between water molecules? Draw it!

Hydrogen bonds

What is a non-polar covalent bond?

A bond in which electrons are shared equally due to equal electronegativities of atoms involved in the bond.

What two atom pairings are most likely to result in polar covalent bonding?

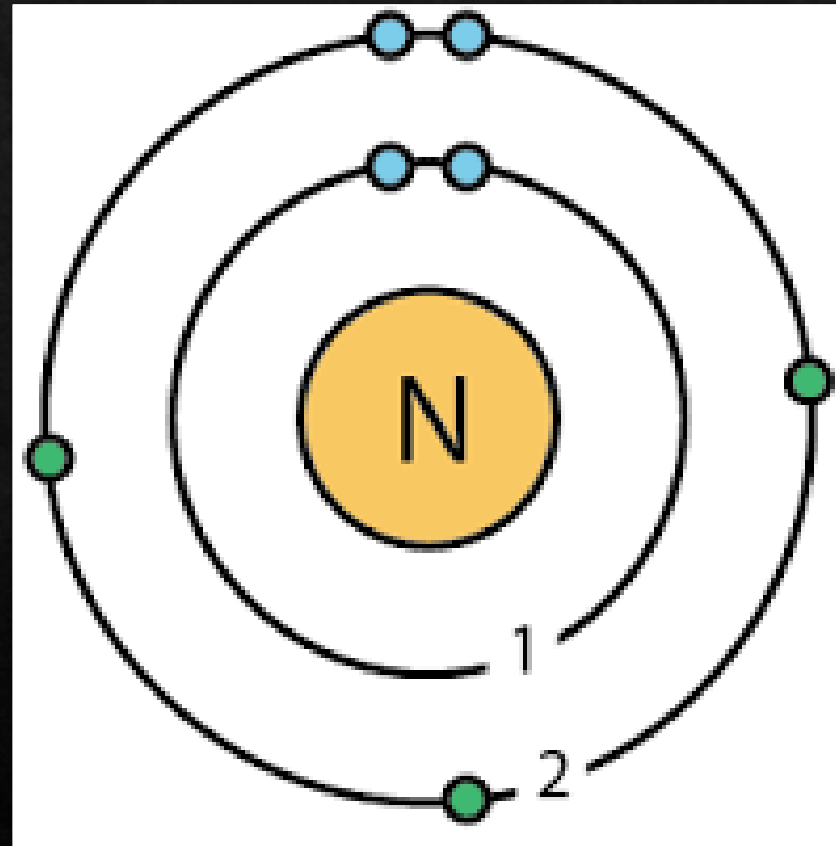
O with H

N with H

If the $[\text{OH}^-]$ is 10^{-10} , what is the pH of the solution?

$$\text{pH} = 4$$

Draw a Bohr diagram for Nitrogen!



What are enantiomers?

Molecules that are mirror
images of each other

What are structural isomers?

Molecules with the same chemical formula but position of atoms differ.

Draw a Carbonyl Group

Draw a Carboxyl Group

Draw a Hydroxyl Group

Draw a methyl group

Draw an amino group

Which of those functional groups is acidic when placed in an aqueous solution?

Carboxyl

Which of those functional groups is basic when placed in an aqueous solution?

Amino

Which of those functional groups is non polar
or hydrophobic?

Methyl

Draw a mechanism to explain
DEHYDRATION SYNTHESIS?

Draw a mechanism to explain
HYDROLYSIS?

When joining 8 monosaccharides together during dehydration synthesis, how many water molecules will need to be removed?

7 molecules of water.

Draw alpha glucose.

Draw an amino acid. Label the functional groups.

Draw a nucleotide. Number the carbon atoms
in the pentose.

What is the difference between starch and cellulose?

- ◆ Starch is a polysaccharide comprised of alpha glucose monomers
- ◆ Cellulose is a polysaccharide comprised of beta glucose monomers

List two polysaccharides used for storage?

◆ Starch (plants)

◆ Glycogen (animals)

List two polysaccharides used for structure?

◆ Cellulose (plants)

◆ Chitin (animals)

What are the monomers of protein?

Amino Acids!

What are the monomers of
carbohydrates?

Monosaccharides!

What are the monomers of
nucleic acids?

Nucleotides!

What are the building blocks of
triacylglycerols?

1 glycerol

3 fatty acids

What are the building blocks of
phospholipids?

1 glycerol

2 fatty acids

1 polar phosphate group

Of the 4 macromolecule types, which
are true polymers?

Proteins, Carbohydrates
and Nucleic Acids

What are the 4 levels of protein organization? What type of bonds determine each level?

- ◇ Primary - peptide bonds
- ◇ Secondary - Hydrogen bonds
- ◇ Tertiary - Ionic, Covalent, Disulfide bonds
- ◇ Quaternary - 2 or more polypeptide chains/ Ionic, Covalent, H, etc.

What happens when you heat a
protein?

Bonds that hold it in its 3D shape are
disrupted

Denaturation

What 4 bases are found in DNA?

ATCG

What 4 bases are found in RNA?

AUCG

If there's 17% Adenine in a sample of DNA, what percentage of Thymine will there be?

17%

What determine the 5' and 3' ends of a nucleic acid?

The position of the 5th and 3rd Carbon atoms in the pentose sugar!

What is the complementary sequence
to the following DNA strand:

5' – GGCTATCGG – 3'

3' – CCGATAGCG – 5'

How is a saturated fatty acid different from an unsaturated fatty acid?

- ◆ Saturated → single bonds between C atoms ∴ maximally bonded to H. Solids at room temp.
- ◆ Unsaturated → double bonds between C atoms ∴ not saturated with H. Liquid at room temp.

Name 5 functions of proteins (there are eight)

- ◇ Enzymatic
- ◇ Structural
- ◇ Hormonal / Cell signalling
- ◇ Receptors
- ◇ Transport
- ◇ Storage
- ◇ Defensive / Immune
- ◇ Motor / Contractile

Draw a dipeptide

Describe the structure of DNA

DNA is a double stranded, anti-parallel, alpha helix comprised of complementary nucleotides held together by hydrogen bonds

**“We are what we
repeatedly do.
Excellence, then, is not
an act, but a habit.”**

~ Aristotle