Biol 1406 Practice Exam 1

1. **Atoms of element A and element B interact and form a bond. Element A has one valence electron and an electronegativity of 0.9, while element B has seven valence electrons and an electronegativity of 2.2. What kind of bond will form between the atoms of these two elements?**
   a) Ionic
   b) Polar Covalent
   c) Non-polar Covalent
   d) Hydrogen
   e) None of the above

A: $1e^-$ $\quad \varepsilon = 0.9$

B: $7e^-$ $\quad \varepsilon = 2.2$

$\Delta\varepsilon = |2.2 - 0.9|$

$\Delta\varepsilon = 1.3$

$\Delta\varepsilon < 0.5 \rightarrow$ NON-POLAR COVALENT

$0.5 \leq \Delta\varepsilon \leq 1.6 \rightarrow$ POLAR COVALENT

$\Delta\varepsilon > 1.6 \rightarrow$ IONIC

Biol 1406 Practice Exam 1

2. **How would you categorize Fluorine in regards to the three groupings of elements that we learned about in class?**
   a) It is an element belonging to the "Big 4"
   b) It is an element belonging to the "Other 4%"
   c) It is a trace element
   d) Both A & B are correct
   e) None of the above are correct

BIG 4

C
N
H
O

OTHER 4%

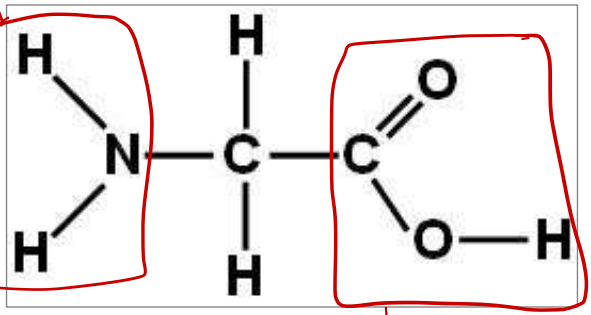
Cl
P
K
Na
S
Mg
Ca

EVERYTHING ELSE IS A TRACE ELEMENT!

Biol 1406 Practice Exam 1

3. Which functional groups are found in the molecule below? (Circle all that apply)

a) Amino



ONLY A CARBOXYL GROUP!

b) Hydroxyl
c) Carbonyl
d) Carboxyl
e) Methyl
f) Phosphate
g) Sulfhydryl

CARBOXYL GROUPS CANNOT BE BROKEN APART AND CLASSIFIED AS CARBONYL & HYDROXYL!

Biol 1406 Practice Exam 1

4. **If you have two of the molecules shown from question 3, and you were to link them together, the linkage that would exist between them would be classified as a/an:**
   a) Glycosidic linkage
   b) Ester linkage
   c) Peptide bond
   d) Phosphodiester Linkage
   e) None of the above

IT IS AN AMINO ACID.

AMINO ACID + AMINO ACID

DIPEPTIDE HELD TOGETHER BY PEPTIDE BOND!

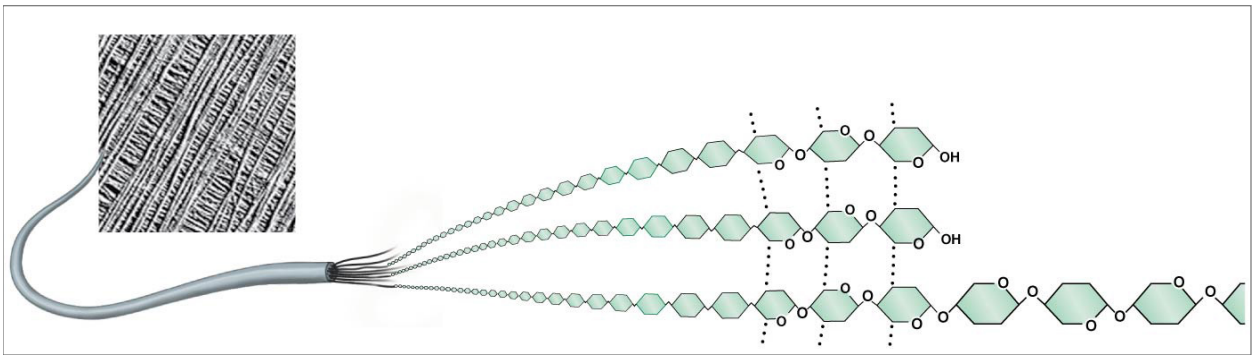
Biol 1406 Practice Exam 1

5. **A particular solute is placed into a bucket of water, and dissolves, which of the following properties can you deduce about the solute:**
   a) It is non-polar
   b) It must form hydrogen bonds with the water
   c) It must either be polar or have a charge
   d) It is most likely an oil molecule
   e) None of the above are correct

NOT ALL SOLUTES FORM HYDROGEN BONDS W/ H_2O, BUT FOR A SOLUTE TO BE SOLUBLE IN H_2O IT MUST HAVE A PARTIAL (POLAR) OR FULL CHARGE (ION)

Biol 1406 Practice Exam 1

6. A molecule of cellulose is shown below:



What kind of linkages join the individual monomers of this particular macromolecule?

a) Ester linkages
b) Peptide bonds
c) Phosphodiester Linkages
d) Glycosidic linkages
e) None of the above

CELLULOSE

BUILT FROM GLUCOSE } SUGARS
MONOMERS

GLYCO SIDIC
SUGAR

Biol 1406 Practice Exam 1

7. **Microbes in the gut of herbivores are able to break down the cellulose in question 6 by using which process?**
   a) Condemnation Reactions
   b) Dehydration reactions
   c) Hydrolysis reactions
   d) Hydration shell reactions
   e) None of the above

HYDROLYSIS: SPLIT H_2O TO BREAK LARGE POLYMERS INTO SMALLER UNITS

DEHYDRATION REACTIONS: REMOVE H_2O TO MAKE BIGGER MOLECULES FROM SMALLER ONES

Biol 1406 Practice Exam 1

8. **When Oxygen and Hydrogen form a bond, they share electrons, but they do so unevenly. This is because:**
   a) They have exactly the same electronegativity
   b) They have a difference of electronegativities that is < 0.5
   c) They have a difference of electronegativities that is ≥ 0.5, but ≤ 1.6
   d) They have a difference of electronegativities that is > 1.6
   e) None of the above are correct

UNEQUAL SHARING OF e^- MEANS POLAR COVALENT BOND

POLAR COVALENT = $0.5 \leq \Delta E \leq 1.6$

Biol 1406 Practice Exam 1

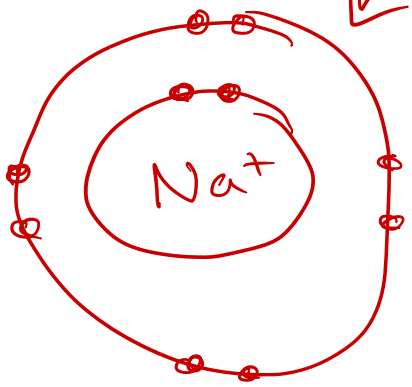
9. If a sodium atom lost one electron, such that it now contains a total of $10e^-$ and $11p^+$, how would you describe this sodium atom?

a) Cation
b) Inert
c) Ion
d) All of the above
e) None of the above

CATION = + ION

INERT = FULL VALENCE SHELL

10e⁻ =



Biol 1406 Practice Exam 1

10. A particular solution has a pH of 3. What is the [H^+] of this solution?

a) 10^{-1}
b) 10^{-3}
c) 10^{-7}
d) 10^{-11}
e) It cannot be determined

$$pH = -\log([H^+])$$

OR

$$[H^+] = 10^{-pH}$$

$$[H^+] = 10^{-(3)}$$

$$[H^+] = 10^{-3}$$

Biol 1406 Practice Exam 1

For 11-15, please choose the answer that <u>best</u> matches each term.

11. b Cohesion

12. e Adhesion

13. a Van der Waals

14. d Hydrogen Bonds

15. c Ionic Bond

a) A weak interaction between two atoms based on the random position of electrons at any moment, and charges associated with them
b) An interaction/force between two of the same kind of molecule
c) An interaction between two fully charged atoms or molecules
d) A weak interaction between the hydrogen of one polar molecule and either an O, N, or F of another polar molecule
e) An interaction/force between two different molecules

Biol 1406 Practice Exam 1

16. Any molecule containing a carboxyl functional group is classified as an alcohol

a) True
b) False, any molecule containing a amino functional group is classified as an alcohol
c) False, any molecule containing a carbonyl functional group is classified as an alcohol
d) False, any molecule containing a hydroxyl functional group is classified as an alcohol
e) False, any molecule containing a sulfhydryl functional group is classified as an alcohol

CARBOXYL = ACID

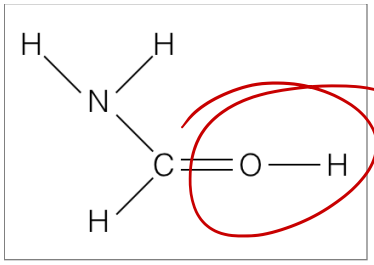
AMINO = AMINE

HYDROXYL = ALCOHOL

SULHYDRYL = THIOL

Biol 1406 Practice Exam 1

17. The molecule pictured below is possible.



a) True
b) False, the molecule is impossible because Carbon has a bond number exceeding its valence
c) False, the molecule is impossible because Oxygen has a bond number exceeding its valence
d) False, the molecule is impossible because Nitrogen has a bond number exceeding its valence
e) False, the molecule is impossible because Hydrogen has a bond number exceeding its valence

3 BONDS EXTENDING FROM OXYGEN

ATOM — VALENCE

C — 4 ✓
N — 3 ✓
O — 2 ✗
H — 1 ✓

Biol 1406 Practice Exam 1

18. The monomers of lipids are fatty acids.

a) True
b) False, the monomers of lipids are glycerol molecules
c) False the monomers of lipids are phospholipids
d) False the monomers of lipids are fats
e) False, lipids do not have distinct monomers

MACROMOLECULE	MONOMER
CARBOHYDRATES	MONOSACCHARIDES
PROTEINS	AMINO ACIDS
NUCLEIC ACIDS	NUCLEOTIDES

Biol 1406 Practice Exam 1

19. A substance that is capable of increasing the [OH^-] of a solution is classified as a base.

a) True
b) False a substance that increases the [OH^-] of a solution is classified as being neutral
c) False a substance that increases the [OH^-] of a solution is classified as an acid
d) False a substance that increases the [OH^-] of a solution is classified as a buffer
e) False a substance that increases the [OH^-] of a solution is classified as hydrophobic

BASE: ↑ OH^-, ↓ H^+

ACID: ↓ OH^-, ↑ H^+

Biol 1406 Practice Exam 1

20. An electron in the second shell of an atom will have a higher level of potential energy than an electron in the first shell, but a lower level of potential energy than an electron in the third shell.

a) True
b) False, an electron in the second shell of an atom will have a lower level of potential energy than an electron in the first shell, but a higher level of potential energy than an electron in the third shell.
c) False, an electron in the second shell of an atom will have the same level of potential energy as an electron in the first shell, but a lower level of potential energy than an electron in the third shell.
d) False, an electron in the second shell of an atom will have the same level of potential energy as an electron in the third shell, but a higher level of potential energy than an electron in the third shell.
e) False, an electron in the second shell of an atom will have the same level of potential energy as an electron in the first and third shells