1. (20) Select (by circling) the best answer to each question below. No credit for more than one answer.

a. Why is it that not all prescription drugs are available as less expensive generic drugs?
   a. Drug companies seek to maximize profits by withholding the exact composition of the drug.
   b. The FDA will not let generic drugs into the market due to concerns about safety, efficacy, and need.
   c. Drugs about to be reclassified as over-the-counter make a generic form unnecessary.
   d. The prescribed drug may still be under the 20-year patent-protection period.

b. Which statement best describes the mechanism of a steroid-based contraceptive?
   a. Birth-control steroids stimulate the release of progesterone, essential for implantation of an embryo in the uterus.
   b. Birth-control steroids block the formation of estradiol, the female sex hormone, making pregnancy impossible.
   c. Birth-control steroids mimic the action of progesterone in true pregnancy, which is to inhibit ovulation.
   d. Birth-control steroids work by releasing norethynodrel from its binding site, allowing ovulation to occur.

c. The diagram shows a cartoon describing the lock and key model of biological interactions. What do A and B represent?
   a. A represents an enzyme and B represents a drug or hormone.
   b. A represents a drug or hormone and B represents an enzyme.
   c. A represents a drug or hormone and B represents a cell membrane receptor site.
   d. A represents a cell membrane receptor site and B represents a drug or hormone.

d. Molecules as diverse as cholesterol, sex hormones, and cortisone all contain common structural elements associated with steroids. Indicate the structural formula of the common structure by circling it.

![Diagram]

e. What was the original purpose of "anabolic steroids"?
   a. create a performance enhancing drug for athletes
   b. enable synergistic effects with other drugs
   c. help patients suffering from wasting illnesses to regain muscle tissue.
   d. produce a safe and efficient birth control pill

d. The three components of DNA are (in no order):
   a. a sulfur backbone, amino acids, sugars
   b. a sulfur backbone, DNA bases, sugars
   c. a sulfur backbone, DNA bases, amino acids
   d. a phosphorous backbone, DNA bases, sugars
   e. a phosphorous backbone, DNA bases, amino acids

g. Ibuprofen is generally sold as a racemic mixture. What does that term mean?
   a. This formulation for ibuprofen is a mixture of natural compounds.
   b. This formulation for ibuprofen is a mixture of prescription and over-the-counter forms.
   c. This formulation for ibuprofen is a mixture of compounds with different molecular formulas.
   d. This formulation for ibuprofen is mixture of two enantiomers.

h. Which statement concerning drug activity is the best generalization?
   a. The drug that has the most polar and nonpolar functional groups will be the most effective.
   b. The drug that best fits the receptor site has the potential to have the highest therapeutic activity.
   c. Any drug isolated from natural products is always more active than its synthetic equivalent.
   d. The larger the molecular mass of the drug, the more effective it will be in drug therapy.
i. Complementary base pairs on the DNA double helix are held together with:
   a. ionic bonds.
   b. covalent bonds.
   c. peptide bonds.
   d. hydrogen bonds.

j. What is the function of a DNA codon?
   a. to duplicate the nitrogen-containing bases during DNA replication
   b. to provide a common identity for all species containing DNA
   c. to encode for a specific amino acid during protein synthesis
   d. to produce the tertiary structure of DNA, responsible for the double helix

2. (9) Shown below are three chemical structures. For each:
   - Give the chemical formula directly under the structure.
   - Put a square around any β-phenylethylamines.
   - Put a star next the formula of any molecule that could be an alkaloid.

3. (6) Explain the challenge in developing a drug that inhibits COX-2 but not COX-1, and the medical implications of this.

lığı "locks" (COX-2 + COX-1) have same shape: most keys will fit both

4. (9) Fill in the blanks with the appropriate word or phrase.

Because it is extracted from coca leaves with acid, street cocaine is a salt, which contains very strong ionic intermolecular forces (imfs). Because of this it has a very high b.p. and thus cannot be smoked. When it is free-based, an acidic proton (H+) is removed from the N-atom in cocaine with baking soda. The product, called crack, is non-polar. It has a lower boiling point than street cocaine and is administered through the lungs. It quickly crosses the BBB due to a match in polarity and gives a rapid "high".
5. (6) Use your understanding of chemistry to explain why:

a. DNA always contains an equal percentage of bases A and T, regardless of the organism it came from or the magnitude of the percentage.

They pair up the the double helix

b. You can become addicted to strenuous exercise.

Your body responds by producing endorphins.

6. (6) Clearly explain how Viagra works. Note—we all know the final effect. Don’t tell me that, I am talking about an explanation on a molecular level.

It inhibits the enzyme that destroys a vasodilator

(Note: NO, produced by nitroglycerin, turns on the enzyme that makes the vasodilator)

7. (6) Define:

PCR (polymerase chain reaction)- makes, adds nucleotides

Off-label use- using a drug for something it wasn’t approved for.

8. (13) In response to a recent scandal involving a US athlete testing positive for an anabolic steroid at the Olympics, a US senator has introduced a bill to congress that would make all steroids controlled substances. Possession of a steroid would carry the same penalty as possession of narcotics such as heroine and opium. Draft a letter to the senator expressing your support, or lack of support, for this bill. *This essay should be written in standard business letter format.