Chapter 1

1. Which of the following is an example of qualitative data?
   a) The temperature decreased from 20^oC to 15^oC
   b) The plant's height is 25 centimeters
   c) The fish swam in a zigzag motion
   d) The six pairs of robins hatched an average of three chicks
   e) The contents of the stomach are mixed every 20 seconds

2. The difference between an experimental and an observational investigation is:
   a) An experimental investigation is an uncontrolled environment looking for patterns and trends, and an observational investigation is a controlled environment with concrete specific measurable outcomes.
   b) An experimental investigation is a controlled environment with concrete specific measurable outcomes, and an observational investigation is an uncontrolled environment looking for patterns and trends.
   c) An experimental investigation is an uncontrolled environment with concrete specific measurable outcomes, and an observation investigation is a control environment looking for patterns and trends.
   d) An experimental investigation in a controlled environment looking for patterns and trends, and an observation investigation is an uncontrolled environment with concrete specific measurable outcomes.

3. Which of the following best describes the logic of hypothesis-based science?
   a) If I generate a testable hypothesis, tests and observations will support it
   b) If my hypothesis is correct , it will lead to a testable hypothesis
   c) If my observations are accurate, they will support my hypothesis
   d) If my experiments are set up right, they will lead to a testable hypothesis
   e) If my hypothesis is correct, I can expect certain test results

Chapter 2

1. Covalent bonds are:
   a) Atoms of pure elements have identical electronegativity
   b) Highly electronegative atoms pull electrons closer to themselves
   c) Extremely different electronegative atoms take electrons from another atom.
   d) Two atoms share a pair of valence electrons

2. Nonpolar covalent bonds are:
   a) Atoms of pure elements have identical electronegativity
   b) Highly electronegative atoms pull electrons closer to themselves
   c) Extremely different electronegative atoms take electrons from another atom.
   d) Two atoms share a pair of valence electrons

3. Polar covalent bonds are:
   a) Atoms of pure elements have identical electronegativity
   b) Highly electronegative atoms pull electrons closer to themselves
   c) Extremely different electronegative atoms take electrons from another atom.
   d) Two atoms share a pair of valence electrons

4. Ionic bonds are:
   a) Atoms of pure elements have identical electronegativity
   b) Highly electronegative atoms pull electrons closer to themselves
   c) Extremely different electronegative atoms take electrons from another atom.
   d) Two atoms share a pair of valence electrons

5. What is a buffer?

6. Which of these is not a property of water?
   a) Liquid at room temperature
   b) Versatile solvent
   c) Cohesiveness
   d) Nonpolar solvent
   e) Slow heat transfer
   f) High heat of vaporization
   g) Less dense when frozen

Chapter 3

1. The bonds that are broken when water vaporizes are:
   a) Ionic bonds
   b) Hydrogen bonds between water molecules
   c) Covalent bonds between atom within water molecules
   d) Polar covalent bonds
   e) Nonpolar covalent bonds

2. What is the difference between hydrophobic and hydrophilic?

3. Which of the following is a hydrophobic material?
   a) Paper
   b) Table Salt
   c) Wax
   d) Sugar
   e) Pasta

4. How many grams of acetic acid (CH_3COOH or $C_2H_4O_2$) would you use to make 10L of a 0.1M aqueous solution of acetic acid? (Note: The atomic mass for acetic acid is 60g/1mole)
   a) 10.0 g
   b) 0.1 g
   c) 6.0 g
   d) 60.0 g
   e) 0.6 g

Chapter 4

1. Organic chemistry is currently defined as:
   a) The study of compounds made only by living cells
   b) The study of Carbon compounds
   c) The study of vital compounds
   d) The study of natural (as opposed to synthetic) compounds

2. Which chemical group is most likely to be responsible for an organic molecule behaving as a base?
   a) Hydroxyl
   b) Carbonyl
   c) Carboxyl
   d) Amino
   e) Phosphate

Chapter 5

1. What are polysaccharides, lipid, phospholipids, and proteins?

2. What are the types of structures for proteins?

3. Draw a picture of each structure

4. List the building blocks of carbohydrates, lipids, proteins, and DNA/RNA?

Chapter 6

1. Which of the following is/are not found in a prokaryotic cell?
   a) Ribosomes
   b) Plasma membrane
   c) Mitochondria
   d) a and c
   e) a, b, and c

2. Which of the following is not a similarity among the nucleus, chloroplasts, and mitochondria?
   a) They contain DNA
   b) They are bounded by two phospholipid bilayer membranes
   c) They can divide to reproduce themselves
   d) They are derived from the endoplasmic reticulum system
   e) Their membranes are associated with specific proteins

3. Which of the following is incorrectly paired with its function?
   a) Peroxisome—contains enzymes that break down H_2O_2
   b) Nucleolus—produces ribosomal RNA, assembles ribosome subunits
   c) Golgi apparatus—processes, tags, and ships cellular products
   d) Lysosome—food sac formed by phagocytosis
   e) ECM (extracellular matrix)—supports and anchors cells, communicates information with inside of cell

4. Contractile elements of muscle cells are
   a) Intermediate filaments
   b) Centrioles
   c) Microtubules
   d) Actin filaments (microfilaments)
   e) Fibronectins

5. What are the three major components of the cytoskeleton?

Chapter 7

1. A single layer of phospholipid molecules coats the water in a beaker. Which part of the molecules will face the air?
   a) The phosphate groups
   b) The hydrocarbon tails
   c) Both head and tail because the molecules are amphipathic and will lie sideways
   d) The glycolipid regions
   e) The hydrocarbon heads
   f) The phospholipids would dissolve in the water and not form a membrane coat

2. List the active transports to cross the membrane. List the passive transports to cross the membrane. Which needs energy?

3. How does water cross the plasma membrane? How does O_2 cross the plasma membrane?

4. Which of the following is not true about osmosis?
   a) It is a passive process in cells without walls, but an active one in cells with walls
   b) Water moves from a hypotonic to a hypertonic solution
   c) Solute molecules bind to water and decrease the water available to move
   d) It can occur more rapidly through channel proteins known as aquaporins
   e) There is no net osmosis between isotonic solutions

5. Facilitated diffusion of ions across a cellular membrane requires _____ and the ions move _____.
   a) Energy and transport proteins. . . . against their electrochemical gradient
   b) Energy and transport proteins . . . against their concentration gradient
   c) Cotransport proteins . . . against their electrochemical gradient
   d) Transport proteins . . . down their electrochemical gradient
   e) Transport proteins . . . down their concentration gradient

6. An animal cell placed in a hypotonic environment will
   a) Plasmolysis
   b) Shrivel
   c) Become turgid
   d) Become flaccid
   e) Burst (lyse)

7. The proton pump in plant cells is the functional equivalent of an animal cell's
   a) Cotransport mechanism
   b) Sodium-potassium pump
   c) Contractile vacuole for osmoregulation
   d) Receptor-mediated endocytosis of cholesterol
   e) ATP pump

8. Pinocytosis involves
   a) The fusion of a newly formed food vacuole with a lysosome
   b) Receptor-mediated endocytosis that involves binding of a ligand
   c) The pinching in of the plasma membrane around small droplets of external fluid
   d) The secretion of cell fluid

9. When it says a phospholipid is amphipathic, what does that mean?

Chapter 8

1. Catabolic and anabolic pathways are often coupled in a cell because
   a) The intermediates of a catabolic pathway are used in the anabolic pathway
   b) Both pathways use the same enzymes
   c) The free energy released from one pathway is used to drive the other
   d) The activation energy of the catabolic pathway can be used in the anabolic pathway
   e) Their enzymes are controlled by the same activators and inhibitors

2. What does equilibrium cause to happen in the cells?

3. A negative ΔG means that
   a) The quantity G of energy is available to do work
   b) The reaction is spontaneous
   c) The reactants have more free energy than the products
   d) The reaction is exergonic
   e) All of the above are true

4. Enzymes work by____.
   a) Adding a phosphate group to a reactant.
   b) Decreasing the potential energy difference between reactant and product
   c) Adding energy to a reaction
   d) Increasing the potential energy difference between reactant and product
   e) Reducing E_A

5. According to the first law of thermodynamics,
   a) For every action there is an equal and opposite reaction
   b) Every energy transfer results in an increase in disorder or entropy
   c) The total energy in the universe is conserved or constant
   d) Energy can be transferred or transformed, but disorder always increases
   e) Potential energy is converted to kinetic energy, and the kinetic energy is converted to heat

6. The formation of ATP from ADP and inorganic phosphate
   a) Is an exergonic process
   b) Transfers the phosphate to another intermediate that becomes more reactive
   c) Produces an unstable energy compound that can drive cellular work
   d) Has a ΔG of -7.3 kcal/mol under standard conditions
   e) Involves the hydrolysis of a phosphate bond

7. An endergonic reaction could be described as one that will
   a) Proceed spontaneously with the addition of activation energy
   b) Produce products with more free energy than the reactants
   c) Not be able to be catalyzed by enzymes
   d) Release energy
   e) Produce ATP for energy coupling

8. A reaction that is spontaneous
   a) Has a $+\Delta G$
   b) Occurs very rapidly
   c) Does not require enzyme catalysis in a cell
   d) Will decrease the entropy of a system
   e) Is exergonic

Chapter 9

1. What is the difference between substrate phosphorylation and oxidative phosphorylation? What stages of cellular respiration are substrate phosphorylation and oxidative phosphorylation?

2. Which metabolic pathway is common to both fermentation and cellular respiration of a glucose molecule?
   a) The citric acid cycle
   b) The electron transport chain
   c) Glycolysis
   d) Synthesis of acetyl CoA from pyruvate
   e) Reduction of pyruvate to lactate

3. In the reaction $NAD^+ + e^-$ and H source → $NADH + H^+$, what is being reduced?

4. What are the names of the different steps of the Citric Acid Cycle (Kreb Cycle), how many carbon atoms is there is each, and what is lost or gained between the steps?

5. Where do glycolysis, citric acid cycle, and electron transport/chemiosis take place?

6. The final electron acceptor of the electron chain that functions in aerobic oxidative phosphorylation is:
   a) Oxygen
   b) Water
   c) NAD^+
   d) Pyruvate
   e) ADP

7. Most CO_2 from catabolism is released during:
   a) Glycolysis
   b) The citric acid cycle
   c) Lactate fermentation
   d) Electron transport
   e) Oxidative phosphorylation

Chapter 10

1. The light reactions of photosynthesis supply the Calvin cycle with:
   a) light energy
   b) CO_2 and ATP
   c) H_2O and NADPH
   d) ATP and NADPH
   e) sugar and O_2

2. In the equation, $CO_2 + H_2O$ + light energy→ $C_6H_{12}O_6$, what is being oxidized and what is being reduced? Also, what is the oxidizing agent, and what is the reducing agent?

3. Where do the light reactions and the Calvin cycle take place?

4. What is the difference between Chloroplasts and Mitochondria?

5. How is the photosynthesis similar in C4 plants and CAM plants?
   a) In both cases, only photosystem I is used
   b) Both types of plants make sugar without the Calvin cycle.
   c) In both cases, rubisco is not used to fix carbon initially
   d) Both types of plants make most of their sugar in the dark.
   e) In both cases, thylakoids are not involved in the photosynthesis

6. Which of the following statements is a correct distinction between autotrophs and heterotrophs?
   a) Only heterotrophs require chemical compounds from the environment.
   b) Cellular respiration is unique to heterotrophs.
   c) Only heterotrophs have mitochondria.
   d) Autotrophs, but not heterotrophs, can nourish themselves beginning with CO2 and other nutrients that are inorganic.
   e) Only heterotrophs require oxygen.

7. Which of the following does not occur during the Calvin cycle?
   a) carbon fixation
   b) oxidation of NADPH
   c) release of oxygen
   d) regeneration of the CO_2, acceptor
   e) consumption of ATP

Chapter 12

1. What is the go-ahead signal for a cell to pass the G_2 phase checkpoint and enter mitosis?

2. A particular cell has half as much DNA as some other cells in a mitotically active tissue. The cell in question is most likely in
   a) G_1
   b) G_2
   c) Prophase
   d) Metaphase
   e) anaphase

3. Which of the following does not occur during mitosis?
   a) Condensation of the chromosomes
   b) replication of the DNA
   c) separation of sister chromatids
   d) spindle formation
   e) separation of the spindle poles

4. What are the two methods of cell division?

5. What are the phases of the cell cycle?

6. At which phase in the cell cycle are chromosomes duplicated?

7. Which phase accounts for 90% of the cell cycle?

8. Which phase can be the most variable between cells?

9. Can you see DNA in the S-phase?

10. What is the difference between a centrosome and centromere?

11. Cells are in which phase when they are in a no dividing state?
    a) G_0
    b) G_1
    c) G_2
    d) S
    e) M

12. The phase in which DNA is replicated is the?
    a) G_0
    b) G_1
    c) G_2
    d) S
    e) M

13. The genome of a cell is?
    a) An arraignment of chromosomes from smaller to larger.
    b) Specific sets of polysaccharides within a cell
    c) The complete genetic information of a cell
    d) Specific genes found only in fungi

14. What is the definition of a chromatid?
    a) The area which connects two centromere
    b) A chromosome in G_2 phase
    c) A title used to refer to chromosomes in the field of biochemistry
    d) A portion of a chromosome preceding the anaphase of mitosis
    e) A separate gene within the G_0 phase

15. The process of a cell plate forming indicates the cell is probably?
    a) Animal in cytokinesis
    b) Plant cell towards the end of mitosis
    c) Bacteria at the end of binary fission

16. At which mitotic phase do chromosomes first become visible?
    a) Interphase
    b) Telophase
    c) Metaphase
    d) Prometaphase
    e) Prophase
    f) Anaphase

17. Which phases contain chromosomes consisting of two sister chromatids?
    a) G_1 through telophase
    b) Anaphase through interphase
    c) Anaphase to telophase
    d) Cytokinesis through G_2
    e) S phase to metaphase

18. During mitosis the following processes occur except for?
    a) Centrosomes move poleward
    b) Mitotic spindle forms
    c) Nuclear envelope disintegrates
    d) Chromosomes condense and become visible
    e) DNA is replicated

Chapter 13

1. What is a locus?

2. What are autosomes?

3. If the diploid number is 80, how many chromosomes are there and how many sets of chromosomes are there? ($2n = 80$)

4. What is a cleavage furrow, in what stage does the cleavage furrow form, and what type of cells form it?

Chapter 14

1. What is an allele?

2. A man with hemophilia (a recessive X-linked disorder) married a woman who neither had the disease nor was a carrier; they wanted to know the probability that their son had the disorder? They also wanted know the probability that their daughter was a carrier and the probability that their daughter had the disease

3. What is the difference between genotype and phenotype?

4. What is a test-cross?

5. What is the law of segregation and independent assortment?

Chapter 15

1. What happens when these alterations occur in chromosomes: deletion, duplication, inversion, and translocation?

2. Red-green color blindness is caused by is caused by a sex-linked recessive allele. A color blind man marries a woman with normal vision whose father was color-blind. What is the probability that they will have a color-blind daughter? What is the probability that their first son will be color-blind? Explain why this disorder is almost never seen in girls.

Chapter 16

1. What did Chargaff discover?

2. What nitrogenous bases pair up together in DNA?

3. What were the different models of DNA, and which one was found to be correct?

4. What protein unwinds parental double helix at replication forks?

5. What are the Okazaki fragments?

6. In a nucleosome, the DNA is wrapped around?
   a) polymerase molecules
   b) ribosomes
   c) histones
   d) a thymine dimer

7. In his work with pneumonia-causing bacteria and mice, Griffith found?

    a) The protein coat from pathogenic cell was able to transform nonpathogenic cells.
    b) Heat-killed pathogenic cells caused pneumonia.
    c) Some substances from pathogenic cells was transferred to nonpathogenic cells, making them pathogenic
    d) The polysaccharide coat of bacteria caused pneumonia.
    e) Bacteriophages injected DNA into bacteria.

Chapter 17

1. What is the difference between transcription and translation?

2. What are the start and stop codons?

3. How is the genetic code redundant but not ambiguous?

4. Which of the following is not true of a codon?
    a) It consists of three nucleotides.
    b) It may code for the same amino acid as another codon.
    c) It never codes for more than one amino acid.
    d) It extends from one end of a tRNA molecule.
    e) It is the base unit of the genetic code.

5. What is a spliceosome?

6. What are the different types of mutations?

7. In eukaryotic cells, transcription cannot begin until?
    a) The two DNA strands have completely separated and exposed the promoter.
    b) Several transcription factors have bound to the promoter.
    c) The 5'caps are removed from the mRNA.
    d) The DNA introns are removed from the template.
    e) DNA nucleases have isolated the transcription unit.

Chapter 20

1. Plants are more readily manipulated by genetic engineering than are animals because
   a) Plant genes do not contain introns.
   b) More vectors are available for transferring recombinant DNA into plants cells.
   c) A somatic plant cell can often give rise to a complete plant.
   d) Genes can be inserted into plant cells by microinjection.
   e) Plant cells have larger nuclei.

2. A paleontologist has recovered a bit of tissue from the 400-year-old preserved skin of an extinct dodo (a bird). The researcher would like to compare a specific region of the DNA from the sample with DNA from living birds. Which of the following would be most useful for increasing the amount of dodo DNA available for testing?
   a) RFLP analysis
   b) polymerase chain reaction (PCR)
   c) electroporation
   d) gel electrophoresis
   e) restriction fragment ligation

3. What is a stem cell?

4. In recombinant DNA methods, the term "vector" can refer to
   a) The enzyme that cuts DNA into restriction fragments.
   b) The sticky end of a DNA fragment.
   c) A RFLP marker.
   d) A plasmid used to transfer DNA into a living cell.
   e) A DNA probe used to identify a particular gene.

Chapter 22

1. Which of the following is not an observation or inference on which natural selection is based?
   a) There is heritable variation among individuals.
   b) Poorly adapted individuals never produce offspring.
   c) Species produce more offspring than the environment can support.
   d) Individuals whose characteristics are best suited to the environment generally leave more offspring than those whose characteristics are less suited.
   e) Only a fraction of the offspring produced by an individual may survive.

2. The upper forelimbs of humans and bats have fairly similar skeletal structures, whereas the corresponding bones in whales have very different shapes and proportions. However, genetic data suggest that all three kinds of organisms diverged from a common ancestor at about the same time. Which of the following is the most likely explanation for this data?
   a) Humans and bats evolved by natural selection, and whales evolved by Lamarckian mechanisms.
   b) Forelimb evolution was adaptive in people and bats, but not in whales.
   c) Natural selection in an aquatic environment resulted in significant changes to whale forelimb anatomy.
   d) Genes mutate faster in whales than in humans or bats.
   e) Whales are not properly classified as mammals.

3. DNA sequences in many human genes are very similar to the sequences of corresponding genes in chimpanzees. The most likely explanation for this result is that
   a) Humans and chimpanzees share a relatively recent common ancestor.
   b) Humans evolved from chimpanzees.
   c) Chimpanzees evolved from humans.
   d) Convergent evolution led to the DNA similarities.
   e) Humans and chimpanzees are not closely related

Biology 1106 Final Review Answer Sheet

Chapter 1

1. C; Qualitative data is often in the form of recorded descriptions, while quantitative data is generally recorded as measurements.
2. B
3. D

Chapter 2

1. D
2. A
3. B
4. C
5. A buffer is a substance that resists changes in pH.
6. D

Chapter 3

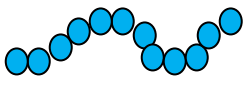
1. B
2. Hydrophobic substances are nonpolar substances that repel water, while hydrophilic are polar substances that have an affinity for water.
3. C
4. D

Chapter 4

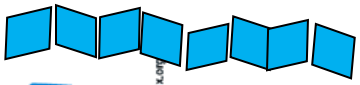
1. B
2. D

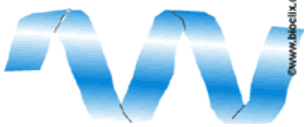
Chapter 5

1. Polysaccharides are part of the carbohydrate family composed of sugars, phospholipids are from the lipid family, which is a diverse group of hydrophobic molecules, and proteins are comprised of amino acids. Together these make up the large biological molecules.
2. The types of structure for proteins are primary, secondary, tertiary, and quaternary.



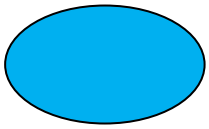
3. Primary

Secondary  (β pleated sheets)

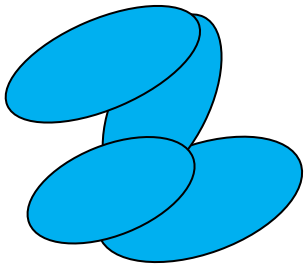


(α helix)

Tertiary



Quaternary



4. Carbohydrates are composed of saccharides, lipids are composed of fatty acids, proteins are composed of amino acids, and DNA/RNA is composed of nucleic acids.

Chapter 6

1. C
2. D
3. D
4. D
5. The three major components of the cytoskeleton are intermediate filaments, microfilaments and microtubules.

Chapter 7

1. B
2. The Passive transports are: diffusion, which is the passive transport of molecules, osmosis, which is the passive transport of water, and facilitated diffusion, which is for select molecules. Does not need energy.

   The Active transports are: active transport which move against concentration gradient, and ion pumps which generate voltage to fuel movement. Need energy.

3. Water crosses the plasma membrane through aquaporins. O_2 on the other hand is nonpolar molecule and can simply diffuse through the plasma membrane.
4. A; it is passive with or without walls.
5. D
6. E
7. B
8. C
9. A phospholipid is amphipathic because it has both a hydrophilic end and a hydrophobic end.

Chapter 8

1. C
2. Equilibrium leads to cell death, it is disequilibrium that causes a cell to do work.
3. E
4. E; E_A stands for the activation energy, and proteins work by lowering the activation energy
5. C
6. C
7. B
8. E

Chapter 9

1. Substrate phosphorylation is when there is a hand off of a phosphate for ATP, while oxidative phosphorylation involves oxidation reduction reactions which drive the phosphorylation.

   Glycolysis and citric acid cycle are substrate phosphorylation, and electron transport and chemiosis are oxidative phosphorylation.
2. C
3. NAD^+ is being reduced to NADH.
4. There are eight steps in the Citric Acid Cycle (Kreb Cycle):

   Citrate has six carbons which changes into isocitrate by a transfer of water

   Isocitrate also has six carbons, but it loses a carbon in the form of CO_2 and is oxidized when NAD^+ reduces into NADH turning it into α Ketoglutarate.

   α Ketoglutarate has five carbons, and it will also lose a carbon in the form of CO_2 and also becomes oxidized when NAD^+ is reduced into NADH becoming Succinyl CoA

   Succinyl CoA has four carbons and is displaced by a phosphate group forming Succinate; an ATP is formed.

Succinate has four carbons and gets oxidizes into Fumarate as FAD is reduced to $FADH_2$.

Fumarate has four carbons and turns into Malate with the addition of an H_2O molecule.

Malate also has four carbons and is oxidizes into Oxaloacetate while NAD^+ is reduced into NADH.

5. Glycolysis takes place in the cytosol, citric acid cycle takes place in the mitochondrial matrix and, electron transport/chemiosis takes place in the (**cristae**) inner mitochondrial membrane.
6. A
7. B

Chapter 10

1. D
2. CO_2 is being reduced because it is gaining electrons; likewise, H_2O is being oxidized because it is losing electrons. A way to remember this is **LEO** (**L**ose **E**lectrons **O**xidize) says **GER** (**G**ain **E**lectrons **R**educe). CO_2, which is being reduced, is the oxidizing agent because it is causing H_2O to be oxidized. H_2O, which is being oxidized, is the reducing agent because it is causing CO_2 to be reduced.
3. The light reactions are carried out by molecules in the thylakoid membrane, and the Calvin cycle takes place in the stroma.
4. Chloroplasts use light to power the process and use ATP to make food, while Mitochondria use food to power the process and make ATP.
5. C
6. D
7. C

Chapter 12

1. The accumulation of maturation-promoting factor (MPF) triggers the cell's passage past the G_2 checkpoint into the M phase.
2. A
3. B
4. Replication Division (Mitosis): Produces identical cells. When you need more cells this is the process that is used.
   Reduction Division (Meiosis): Produces sperm and egg. This process has an extra step.
5. G1 phase (first gap) –S phase (synthesis) – G2 phase (second gap) -- M phase (mitotic phase)—Interphase (growth phase)
6. S- phase (synthesis phase)
7. Interphase--- this is the regular time when cells are just doing regular cell things. It is the period of time when the cell is not dividing.
8. G1 Phase (Gap1 or Growth 1)

9. No, you can't see DNA at this point, only the nucleus. The DNA is still too diffuse to be seen.
10. The centrosome is a region in the cell containing materials that help organize the cell's microtubules.
    The centromere is a special region where the two sister chromatids are attached.
11. A
12. D
13. C
14. D
15. B
16. E
17. E
18. E

Chapter 13

1. A locus is a gene's specific location along of the chromosome.
2. Autosomes are chromosomes that are not sex-related.
3. For a diploid number of 80, there are 80 chromosomes and 40 sets of chromosomes.
4. A cleavage furrow is a shallow groove in the cell surface near the old metaphase plate. It occurs concurrently with telophase, and it occurs in animal cells opposed to plant cells.

Chapter 14

1. An allele is an alternate version of a gene.
2. The son would have a 0% chance of having the disease. The daughter would have a 0% chance of having the disease, but a 100% chance of being a carrier.

	X^h	X^h
X^H	$X^H X^h$	$X^H X^h$
Y	$Y X^h$	$Y X^h$

H – Hemophiliac

h – Non hemophiliac

3. A genotype is the genetic makeup of an organism, and a phenotype is an organism's appearance or observable trait.
4. A test-cross is a technique in which one breeds an organism of an unknown genotype with a recessive homozygote.
5. The law of segregation states that the two alleles for a heritable character segregates (separates) during gamete formation and end up in different gametes. The law of independent assortment states that each of the alleles for two different traits are distributed independent of one another during gamete formation. (ie. An organism with genotype AaBb for traits "A/a" and trait "B/b" can produce gametes with any combination of alleles—AB, Ab, aB, ab.) Note: Linked genes (genes on the same chromosome) may violate this law.

Chapter 15

1. A deletion removes a chromosomal segment, a duplication repeats a segment, an inversion reverses a segment within a chromosome, and a translocation moves a segment from one chromosome to a nonhomologous (different) chromosome.
2. ¼ (25% chance) for each daughter (½ chance that the child will be female X ½ chance of a homozygous recessive genotype); ½ (50% chance) for the first son.

Chapter 16

1. Chargaff discovered that the percentages of adenosine equaled the percentage of thymine, and that the percentage of guanine equaled the percentage of cytosine. A= 30.03% and T=30.3%, G= 19.5% and C= 19.3%.
2. In DNA, Guanine binds to Cytosine, and Thymine binds to Adenosine.
3. Conservative, semiconservative, dispersive. The correct one is the semiconservative model.
4. Helicase unwinds parental double helix at replication forks.
5. Okazaki fragments are segments of the lagging strand that synthesize discontinuously opposed to the leading strand that elongates continuously. (pg. 316)
6. C
7. C

Chapter 17

1. Transcription is the synthesis of RNA from DNA, and translation is the synthesis of proteins from RNA.
2. The start codon is AUG; this might also stand for the amino acid Met. The stop codons are UAA, UAG, or UGA.
3. The genetic code has two to four codon acid sequences for each amino acid; this makes it redundant. There is only one amino acid per codon; this is why it is not ambiguous.
4. D
5. Several different snRNPs joined together to cut the pre-mRNA releasing the introns and splicing the exons together.
6. There are two types of point mutations Base-pair substitution and Base-pair insertion or deletion.
   Subgroups within base-pair substitution are: Silent, there is no effect on amino acid sequence; Missence, substitution of one amino acid for another; Nonsence, a change in a codon that changes an amino acid into a stop codon.
   Subgroups with base-pair insertion or deletion are: a frameshift causing immediate nonsense, a frameshift causing extensive missense, or no frameshift, but one amino acid is added or taken away.
7. B

Chapter 20

1. C
2. B
3. A stem cell is a relatively unspecialized cell that can both reproduce itself indefinitely and, under appropriate conditions, differentiate into specialized cells of one or more types.
4. D

Chapter 22

1. D
2. C
3. A