Name: _____Date: _____ Period: _____ Assign#: _____

Unit 4 Test Review Sheet

12-1: Deoxyribonucleic Acid

1. What type of macromolecule is DNA? Nucleic acid What does DNA stand for? Deoxyribonucleic Acid
2. What are the building blocks on DNA called? Nucleotides What are the three parts of those building blocks? Sugar (deoxiribose), Phosphate, Nitrogen Base
3. The structure of DNA was discovered by James Watson and Francis Crick in the year 1953. The discovery would have been nearly impossible without the help of Roslin Franklin and Maurice Wilkins who provided x-ray crystallography pictures of DNA.
4. What are Chargaff's rules? In a molecule of DNA there is always the same number of A's and T's. And the same number of C's and G's.
5. Using Chargaff;s rules determine the approximate percentage of thymine, adenine and guanine in a DNA molecule if 28% of the nucleotides contain cytosine. a. Thymine: 22% b. Adenine: 22% c. Guanine: 28%
6. Explain how Chargaff's rules helped Watson and Crick model DNA. Helped them realize that A's are bonded to T's and C's are bonded to G's
7. What is base pairing? In a DNA molecule A always matches with T and C always matches with G.
8. How are the bases of the double helix in DNA held together? Hydrogen Bonds
9. How is the sugar phosphate backbone held together? Covalent bonds

12-2: Chromosomes and DNA Replication

1. Where is DNA found in prokaryotic cells? In the cytoplasm Eukaryotic cells? nucleus
2. DNA wraps around proteins called histones to form a substance called Chromatin. At the beginning of cell division, the DNA and proteins pack together even tighter to form individual structures called Chromosomes.
3. DNA copies itself during a process called DNA replication, which occurs during the S phase during Interphase of the cell cycle.
4. Describe the steps of DNA replication:
   a. The two strands of DNA are separated by Helicase.
   b. DNA Polymerase then adds new complementary bases to each strand of DNA. This process is said to be semi- conservative because one half of the original DNA double helix is conserved in each of the new strands.
   c. Ligase is the enzyme that helps glue the phosphate and sugar together on the lagging strand of DNA
5. A gene is segment of DNA that codes for a protein.

12-3: RNA and Protein Synthesis

1. How are DNA and RNA different?
   a. DNA=Double Strand, RNA=Single strand
   b. DNA=Deoxiribose vs. RNA=Ribose
   c. DNA=Thymine, RNA= Uracil
2. What are the different types of RNA and what is their function:

Type of RNA		Function
Abbreviation	Full Name	
mRNA	Messenger	Is a copy of DNA that can leave the nucleus for translation
tRNA	Transfer	Brings the Amino Acid to the ribosome during translation
rRNA	Ribosomal	Is part of the structure of the ribosome

3. Copying part of a sequence of DNA into a complementary strand of RNA is called: Transcription. During this process the enzyme that binds to DNA is called RNA Polymerase. Where does this process take place in the cell? Nucleus.
4. What kind of macromolecule is DNA polymerase? Protein. More specifically it is a catalyst in living things so it is called a(n) Enzyme.
5. Before mRNA leaves the nucleus, segments called Introns are cut out in a process called RNA editing.. After this process only the exons are left, which make up mRNA that is ready to travel into the cytoplasm.
6. A group of 3 nucleotides that code for a specific amino acid is called a codon.
7. The universal start codon is AUG which codes for the amino acid Methionine.

8. The 3 stop codons are UAG, UAA, UGA. What amino acid do these stop codons code for? They don't have any amino acid. That's why the ribosome knows how to stop: There are no more A.A's to make peptide bonds with.
9. What amino acid will be coded for by each of the following mRNA codons:
    a. UCA Serine b. CAC Proline c. AUU Isoleucine
10. What are the possible codons for the amino acid Isoleucine? AUA, AUC, AUU
11. During Translation the information carried by the mRNA is used to produce a protein.
12. The monomer of a protein is a(n): amino acid.
13. A polypeptide chain is a Protein. It is sometimes called a polypeptide chain because the nucleotides are held together by peptide bonds. A chain of amino acids is called a Protein
14. Where does translation take place in the cell? Cytoplasm
15. The three bases on a tRNA molecule are called anticodons
16. What is the amino acid sequence that is coded for by the following DNA sequence?
    a. DNA: C T T A T A C T C C G C T A T G C C C A T C
    b. RNA: G AA U AU G A G G C G A UA C G G G UA G
    c. Amino Acid Sequence: Don't be lazy, use your A.A. chart ☺
17. What does protein synthesis mean? To make a protein.
18. DNA is the genetic material found in each cell in your body. One segment of this molecule is called a gene. Every gene expresses itself as a Proteins. Many proteins put together make up all of your body's physical structure.

12-4: Mutations

1. A mutation is Any change in the DNA sequence.
2. Mutations that affect a single nucleotide are called Point mutations. Mutations that shift the reading frames (codons) are called: frameshift mutations.
3. Substituting one nucleotide in a codon for another nucleotide would cause a substitutions mutation.
4. Inserting a nucleotide into a sequence would cause a Insertion or Frameshift mutation.
5. Deleting a nucleotide from a codon would cause a Deletion or Frameshift mutation.
6. Compare the following two sequences of DNA to determine what type of mutation has occurred:
    a. Original DNA: GCACCGAGA
    b. Mutant DNA: GCACACGAG
    c. Circle the mutant DNA where it is different from the Original What kind of mutations has occurred? Insertion (frameshift)
    d. How do you know? All the DNA moved right one base
7. A change in the location of or number of genes on a chromosome is called a Chromosomal Mutation.
8. Will a point mutation always affect the amino acid sequence of a protein? No, because there is more than one codon that can code for the same amino acid.

12-5: Gene Regulation

1. What is an operon? a group of genes that operate together to regulate the production of a certain protein. The lac operon for example works to make proteins (lactase) to break down lactose. The promoter region of DNA is first and is the place where RNA polymerase binds on to the gene to start transcription. If there is an active repressor protein on the operator, transcription cannot happen. If there is lactose present, the active repressor protein becomes inactive when lactose fits into the active site of the repressor protein, the repressor will let go of the DNA so that RNA polymerase can transcribe the gene to make mRNA.
2. How does a repressor protein work? Regulates gene production
3. What does the TATA box do? A sequence of DNA found in Eukaryotes –marks the spot right before RNA polymerase will transcribe the desired gene
4. What is the importance of the HOX gene? Determines organism's basic body plan.