

Genetics Plus Unit Test Review Packet

This is NOT everything on the unit test, but this is the big idea so far. The key to studying is to go over things early and often. The more times you see the information, over long periods of time, the better you will learn it. So this will help you *start* to study for the Unit test, and in the long run, the final. Follow these steps to complete this activity effectively:

1. Try to do as much of this FIRST from memory, so you can see what you already know.
2. Then, put a question mark next to the things you do not know from memory.
3. Then, use your notes to look over the things you do not know, and find the correct answers.
4. Then, look through your notes and *make sure* you have the right answers to ALL the questions (sometimes you think you know something, but really you may have mixed up some information)
5. Then, print this at home, and try it again to see if the number of question marks has decreased.
6. Then, I would do it again.
7. And again.
8. And again.

Do you see the idea here? Studying takes a lot of time and a lot of repetition. Looking at something once is not enough.

Compounds of Life

1. Complete the following chart for each compound of life:

Compound	Element	Monomer	Polymer	Function	Examples
Carbs	C H O	Monosaccharaides	Polysaccharides	Energy	Starches Grains
Lipids	C H O	Triglycerides	None	Cell membranes Chemical messengers Store energy	Waxes and oils and fats
Proteins	H O N C	Amino acids	Proteins (polypeptides)	Enzymes Movement Cell pumps	Meat Beans Muscles
Nucleic acid	P O N C H	Nucleotides	DNA/RNA	Store and transmit genetic info	DNA/RNA

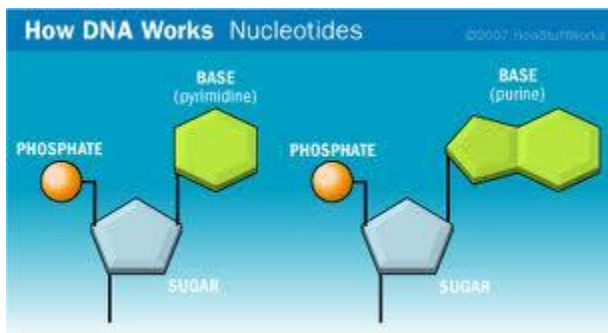
2. What is the difference between and organic and an inorganic compound?

Organic contains carbon and comes from living/once living things. Inorganic does not

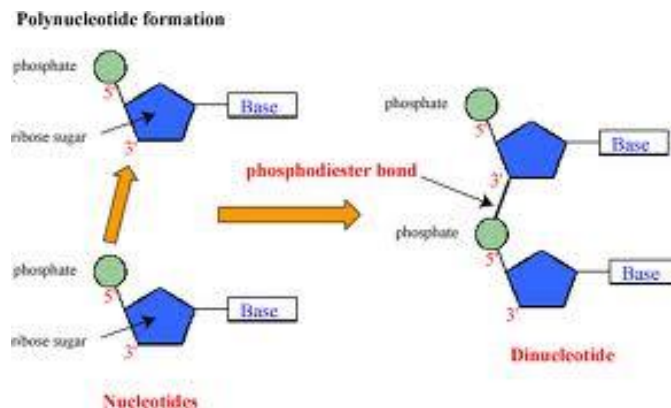
3. What is the relationship between monomers and polymers?
Monomers are identical subunits that make up polymers
4. What is polymerization?

The process of bonding monomers together to form polymers

5. What is dehydration synthesis? How does it relate to hydrolysis?
Dehydration synthesis is the bonding of monomers through the loss of water to make a polymer. Hydrolysis is the breaking of bonds between polymers by adding water.
6. What are the major discoveries of the following people
- Chargaff: **discovered A binds with T and C binds with G**
 - Watson & Crick: **discovered the overall structure of DNA**
 - Rosalind Franklin: **took a xray photo that showed DNA had a helical shape**
7. Draw and label a nucleotide.



8. Draw two nucleotides linking together. What is this bond called?



9. Which bases bond together? How many hydrogen bonds between them?
A binds to T with 2 bonds
C binds to G with 3 bonds
10. Describe the difference between a purine and pyrimidine. Which bases are which?

A/G are purines which have 2 rings
C/T are pyrimidine which have 1 ring

11. Why does our DNA replicate?

So every cells gets a copy of the genetic information

12. In which direction does DNA replicate?

Always 5 prime to 3 prime

13. What is the first step of DNA Replication? Include the name/function of the enzyme

Helicase will break hydrogen bonds to unzip and untwist DNA

14. What is the second step of DNA Replication? Include the name/function of the enzyme.

DNA polymerase copies both strands of DNA from 5prime of the new strand to 3prime but in opposite directions for each side by reading the original strand and adding the correct complementary nucleotide.

15. What is the third step of DNA Replication? Include the name/function of the enzyme.

Ligase fills in any gaps in the okazaki fragments

16. Explain how the two sides of DNA replicate differently. Use all 3 key terms.

One side, the leading strand, replicates a continuous piece because it replicates as it follows helicase up the strand of DNA. The other side, the lagging strand, replicates in okazaki fragments because the DNA polymerase cannot just follow the helicase and must reattach and continue replicating in chunks.

17. What is the outcome of DNA replication?

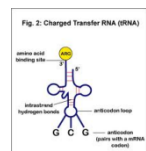
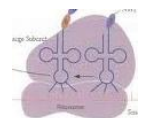
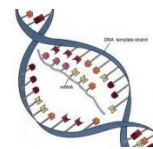
Two new strands of DNA. Each has an original strand and a new strand.

18. What are the differences between DNA and RNA?

DNA is double stranded, has deoxyribose, stays in the nucleus, has thymine
RNA is single stranded, has ribose, can leave the nucleus, has uracil

19. What are the three types of RNA? Name them, draw a picture, and explain the function in respects to transcription/translation?

- **mRNA – messenger RNA**
 - carries copy of genetic instructions to the rest of the cell
 - the instructions tell the cell how to assemble the amino acids for making proteins
- **rRNA – ribosomal RNA**
 - makes up a part of ribosomes (which are the site for protein synthesis)
- **tRNA – transfer RNA**
 - transfers each amino acid to the ribosome as it is specified by the mRNA



20. What are the two steps of protein synthesis? Where does each take place?

Transcription-nucleus
Translation-cytoplasm

21. Explain what happens in transcription. What enzyme completes this process?

- **RNA polymerase (an enzyme) – binds to DNA and separates the 2 strands**
- **RNA polymerase then uses one strand of DNA as a template for assembling an mRNA complementary strand**
- **This creates a strand of mRNA which can carry the genetic code out of the nucleus to complete the second step of protein synthesis.**

22. Explain the steps to translation. Make sure to include the following key terms: mRNA, tRNA, rRNA/ribosome, codon, anticodon, amino acid, peptide bond.

1. mRNA leaves nucleus and enters cytoplasm
2. ribosomes (rRNA) binds to start sequence (AUG) on mRNA
3. mRNA is read by ribosome 3 nucleotides at a time (called codons)
4. Each codon codes for a specific amino acid
5. Each codon on mRNA is read and a tRNA with the matching anti-codon carries the correct amino acid to the ribosome
6. There, the tRNA binds to the ribosome and the amino acid is linked to the previous one by a peptide bond
7. Process continues, amino acids are linked, and the polypeptide chain grows until the ribosome reaches the “stop” codon
8. Protein is completed and folds into its structure

23. What is the point of protein synthesis?

To express your genes and help you look/function the way you do

24. What is a codon? What is an anticodon? How do they relate?

A codon is a sequence of 3 nucleotides on mRNA. And anticodon is a sequence of 3 nucleotides on tRNA. They are complementary to each other so that tRNA adds the correct amino acid to the protein chain

25. Use the following strand of DNA to complete the rest of the questions.

ATGCTACACTGGCTACGAACT

a. create the complementary strand of DNA

TACGATGTGACCGATGCTTGA

b. create the complementary strand of mRNA
 (from the strand above)

AUGC UACACUGGCUACGAA CU

	U	C	A	G
U	UUU = phe UUC = phe UUA = leu UUG = leu	UCU = ser UCC = ser UCA = ser UCG = ser	UAU = tyr UAC = tyr UAA = stop UAG = stop	UGU = cys UGC = cys UGA = stop UGG = trp
C	CUU = leu CUC = leu CUA = leu CUG = leu	CCU = pro CCC = pro CCA = pro CCG = pro	CAU = his CAC = his CAA = gln CAG = gln	CGU = arg CGC = arg CGA = arg CGG = arg
A	AUU = ile AUC = ile AUA = ile AUG = met	ACU = thr ACC = thr ACA = thr ACG = thr	AAU = asn AAC = asn AAA = lys AAG = lys	AGU = ser AGC = ser AGA = arg AGG = arg
G	GUU = val GUC = val GUA = val GUG = val	GCU = ala GCC = ala GCA = ala GCG = ala	GAU = asp GAC = asp GAA = glu GAG = glu	GGU = gly GGC = gly GGA = gly GGG = gly

- c. Use the codon chart below to complete translation from the above strand of mRNA

met (start) – leu – his – trp – leu – arg – thr (oh no, m spender didn't make it a stop codon)

26. What is the end product of mitosis? In which cells does it occur?

2 identical cells with a copy of the entire DNA. Body cells (somatic)

27. What is the end product of meiosis? In which cells does it occur?

2 cells with half the genetic information. Sex cells (gametes)

28. Define the following terms:

- a. Homozygous: **both alleles the same. BB or bb**
- b. Heterozygous: **both alleles are different Bb**
- c. Dominant: **the allele/trait that will be expressed no matter what the other allele is**
- d. Recessive: **the allele/trait that will only show when both alleles are the recessive**
- e. Genotype: **your genetic makeup**
- f. Phenotype: **your physical characteristics**

29. What is incomplete dominance? Give an example.

Incomplete dominance is when neither allele is dominant to the other. The result of the heterozygote will be a blend of both traits.

Example. Red flowers (RR) and white flowers (WW) make a pink hybrid (RW)

30. What is codominance? Give an example.

In codominance, both alleles are dominant and both will be expressed in different cells.

Example, a black and white cat. Human blood type

31. Long Hair (H) is dominant over short hair (h) in cats. Cross 2 homozygous cats, one with long hair and one with short-hair.

	H	H
h	Hh	Hh
h	Hh	Hh

Genotype percents:

100% Hh

Phenotype percents:

100% Long hair

32. In pea plants, tall (T) is dominant over short (t). Purple flowers (P) are dominant over white flowers (p). Cross a heterozygous purple, heterozygous tall pea plant with a heterozygous purple, homozygous tall pea plant.

Cross: PpTt with PpTT

	PT	Pt	pT	pt
PT	PPTT	PPTt	PpTT	PpTt
Pt	PPTT	PPTt	PpTT	PpTt
pT	PpTT	PpTt	ppTT	ppTt
pt	PpTT	PpTt	ppTT	ppTt

Genotype percents:

PPTT 2/16 = 12.5%

PpTT 4/16 = 25%

PPTt 2/16 = 12.5%

PpTt 4/16 = 25%

ppTT 2/16 = 12.5%

ppTt 2/16 = 12.5%

Phenotype percents:

Purple tall = 12/16 = 75%

Purple short = 0/16 = 0%

White tall = 4/16 = 25%

White short = 0/16 = 0%