

Test Review – DNA, Protein Synthesis and Genetics

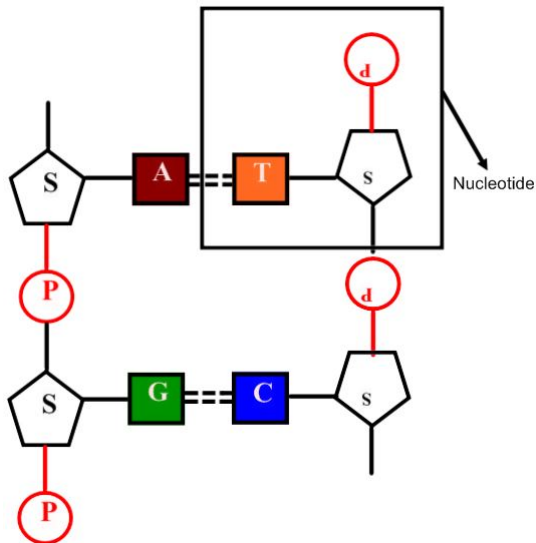
This review should only be used as a supplement to your notes, activities, and previous quizzes. For additional review and questions it may be beneficial to perform an internet search on topics you feel you need more practice with.

****If you do not pick up an answer key, one is available at my teacher website: <http://www.hamilton-local.k12.oh.us/AveryBiologyIS22014.aspx> Password: avery**

***(If you have trouble finding it go to: <http://www.hamilton-local.k12.oh.us/AveryJennifer.aspx>)**

DNA

1. Sketch a detailed illustration of a strand of DNA. Make sure to **label** each part. Also, circle one complete nucleotide.



2. What bases are complementary (pair with each other) on DNA?
 A pairs with T
 C pairs with G
3. DNA replicates in S-phase. DNA replication is considered semi-conservative. What does this mean?
 a. ~~Two strands are produced: the original strand and a completely new strand.~~
 b. ~~Two strands are produced: both completely new strands.~~
 c. Two strands are produced: Each strand is half original and half new.
4. In a molecule of DNA, if there is 21% adenine (A), how much thymine (T) is present? How much cytosine (C) is present?
 Since, A pairs with T $\rightarrow 21\% A = 21\% T \rightarrow 42\%$ total
 The rest will be C and G $\rightarrow 100\% - 42\% = 58\%$ of C and G
 Since there is equal C to G $\rightarrow 58\%$ divided by 2 = 34%
 29% C
5. Which is the most likely outcome for a substitution mutation?
 a. ~~The entire protein strand is changed and may not function properly.~~
 b. Only one amino acid is changed and the protein can still function.
6. Why are deletion and insertions called “frameshift” mutations.
 Because codons are read three at time, and a mutations causes the sets of three to “shift”

Protein Synthesis

7. Where in the cell does translation take place: **RIBOSOMES**
8. Where in the cell does transcription take place: **NUCLEUS**
9. What are the four differences between mRNA and DNA?
 - a. mRNA is small enough to leave the nucleus, DNA is too large to fit
 - b. DNA has T and mRNA has U
 - c. DNA has deoxyribose and mRNA has ribose
 - d. DNA is double stranded and mRNA is single stranded

For questions #10 and #11, do not worry about start and stop codons.

10. Translate the following mRNA strand:
C A U A C A G A G G U U
His – Thr – Glu – Val

11. Transcribe the following DNA strand:
C A T A T C G C C A G T
G U A U A G C G G U C A

12. Following start and stop codon rules, transcribe and translate the following.
C G T T A C G A T C G A T A G G C T A T C A G C

Transcribe: G C A AUG C U A G C U A U C C G A UAG U C G

Translate: Met – Leu – Ala – ile – Arg

Genetics

13. What is a gene?
A sequence of DNA that codes for a specific protein.
14. During meiosis, alleles for the same gene must be segregated. Why is it important that alleles segregate when producing gametes?
So that each gamete only gets one copy of each gene, because when it combines with another gamete they should have a total of two alleles.
15. When we set up a dihybrid cross each allele from one trait has an equal chance to be with either allele from the other trait (example a BbRr would produce BR, Br, bR, or br). What is this an example of?
Independent Assortment
16. What are the 3 possible genotypes in Mendelian genetics? Give an example of each.
 - a. Homozygous Dominant – RR
 - b. Homozygous Recessive – rr
 - c. Heterozygous - Rr

17. Define phenotype and give some examples.

The physical trait that you see. Examples – the cat has short hair. The girl has blue eyes. A person has a hitchhiker's thumb.

For questions 18 – 20 understand that short hair is dominant (*R*) to long hair (*r*).

18. A homozygous dominant individual is crossed with a long haired individual.

a. What are the genotypes of both parents? RR X rr

	R	R
r	Rr	Rr
r	Rr	Rr

b. What are the possible genotypes of their offspring and the **genotypic ratio**

0% RR: 100% Rr: 0% rr

c. What are the possible phenotypes of their offspring and the **phenotypic ratio**?

100% short hair

19. A heterozygous cat for coat length is crossed with a heterozygous cat for coat length.

a. What are the **genotypes** of both parents? Rr X Rr

	R	r
R	RR	Rr
r	Rr	rr

b. What are the possible genotypes of their offspring and the **genotypic ratio**

Rr: 25% rr

25% RR: 50%

c. What are the possible phenotypes of their offspring and the **phenotypic ratio**?

75% - Short; 25% long

20. A heterozygous cat is crossed with a long haired cat.

a. What are the genotypes of both parents? Rr X rr

	R	r
r	Rr	rr
r	Rr	rr

b. What are the possible genotypes of their offspring and the **genotypic ratio**

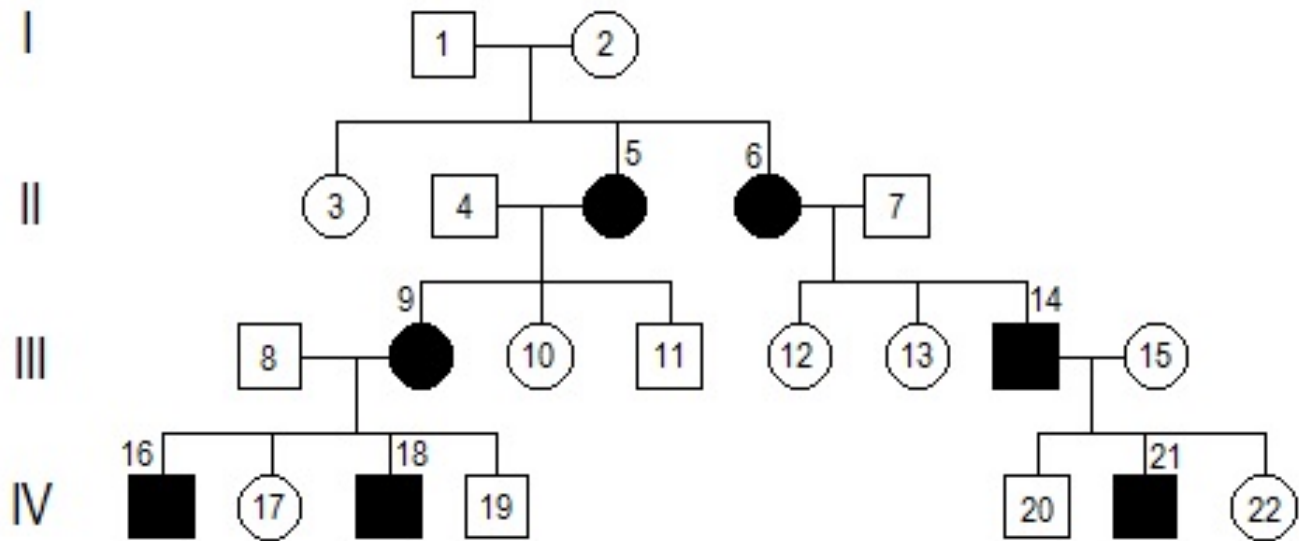
Rr: 50% rr

0% RR: 50%

c. What are the possible phenotypes of their offspring and the **phenotypic ratio**?

50% - Short; 50% - Long

21. Assume the shaded individuals have the recessive disorder cystic fibrosis. Determine the possible genotype of each individual. (If you can't determine a genotype completely, write this: R_ or something like it.)



22. In the above pedigree, how are individuals 1 and 10 related?

1 is 10's grandfather

23. In pedigrees, what does a shaded circle or square represent?

Square: MALE Circle: FEMALE

24. List all individuals you would consider to be "carriers" of this recessive trait.

1, 2, 4, 7, 8, 10, 11, 12, 13, 15, 17, 19, 20, 22

25. How does the percent chance individuals 8 and 9 would have a child with cystic fibrosis compare to the percentage actual children with fibrosis?

	R	r
r	Rr	rr
r	Rr	rr

Predicted – 50% would have CF
 Actual – 50% with CF
 Their actual children child with CF is the same as their predicted.

26. If a trait follows co-dominance rules and an individual is heterozygous, describe how their phenotype will compare to the homozygous individuals.

The heterozygous individual with show both phenotypes for the alleles. Example – a black chicken and a white chicken have a black and white spotted chick.

27. If a trait follows incomplete dominance rules and an individual is heterozygous, describe how their phenotype will compare to the homozygous individuals.

The individual with have a mixture of both alleles. Example – A black chicken and a white chicken have a grey chick.

28. A farmer is growing corn plants. Yellow, sweet corn sells the best. If he crosses a heterozygous plant with a plant that is homozygous recessive plant, what is the probability (percent chance) he'll get yellow, sweet corn?

B – purple; b – yellow; R – starchy; r – sweet

	BR	Br	bR	br
br	BbRr	Bbrr	bbRr	bbrr
br	BbRr	Bbrr	bbRr	bbrr
br	BbRr	Bbrr	bbRr	bbrr
br	BbRr	Bbrr	bbRr	bbrr

4/16 chance for yellow, sweet corn