

NAME: Answer Key

DATE: \_\_\_\_\_

Genetics Review Questions

Name: \_\_\_\_\_

1. Two people decide to have children. They get genetic testing done to see the likelihood that their child will have 'Trait X'. They find out that there is a 50% chance their offspring's genotype for the given trait is 'Xx' and a 50% chance their offspring's genotype for the given trait is 'xx'. What are the genotypes of the parents?

Xx and xx

2. If a disease runs in your family, and your brother has the inherited disease, does that influence the likelihood that you will have the disease?

No. You may be likely to get it if it runs in your family but the fact that your brother has it does not make it MORE likely that you will.

3. A homozygous dominant brown mouse has red eyes (red eyes is a recessive trait). Cross this mouse with a heterozygous brown mouse with heterozygous brown eyes. (tan is the recessive fur color). List the parent genotypes, draw and fill in a Punnett square, and then list the possible offspring genotypes and phenotypes. What is the probability that the offspring will be brown with brown eyes?

BBrr x BbRr

	Br	Br	Br	Br
BR	BBRr	BBRr	BBRr	BBRr
br	Bbrr	Bbrr	Bbrr	Bbrr
Bb	BBrr	BBrr	BBrr	BBrr
bB	BbRr	BbRr	BbRr	BbRr

$$\frac{8}{16} = \frac{1}{2}$$

AKA 50%  
Chance offspring  
will be brown  
w/ brown eyes

4. What is incomplete dominance?

Neither allele completely covers the other allele. An example of this is if you cross a red flower with a white flower and the offspring are pink. Neither red or white is fully dominant. You end up getting a blending of the two.

5. A cross between a blue blahblah bird & a white blahblah bird produces offspring that are silver. The color of blahblah birds is determined by just two alleles.

a) What are the genotypes of the parent blahblah birds in the original cross?

BB- blue and WW- white

b) What is/are the genotype(s) of the silver offspring?

BW

c) Complete a Punnett Square showing a cross between two silver blahblah birds.

BW x BW

	B	W
B	BB	BW
W	BW	WW

50% chance they have a silver offspring

25% chance offspring is white

25% chance offspring is blue

6. A cross between a black cat & a tan cat produces a tabby pattern (black & tan fur together).  
 a) What pattern of inheritance does this illustrate?

Co-Dominance. Both traits are dominant, and both end up being expressed in the phenotype. Example: if you cross a red flower and a white flower and all of the offspring are spotted red and white.

- b) What percent of kittens would have tan fur if a tabby cat is crossed with a black cat?

	B	T
B	BB	BT
B	BB	BT

tabby cat : BT      black cat : BB

0% of the kittens would be tan.

7. Hemophilia in humans is due to an X-chromosome mutation. What will be the results of mating between a normal (non-carrier) female and a hemophilic male?

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

Normal non-carrier female :  $X^H X^H$   
 hemophilic male :  $X^h Y$

50% chance to get a normal male son

50% chance to get a carrier female daughter

8. Can male traits be stronger than female traits? Why?

No. Dominant traits show up in a person's phenotype more than recessive traits, however that has nothing to do with whether you are male or female. Your sex does not make you more or less likely to get dominant traits.

9. If you look a lot like your mom, and nothing like your dad, does this mean you inherited more traits from her?

No. You got 50% of your DNA from each parent regardless. If you look more like your mom it's because you got more dominant alleles from her and more recessive alleles from your dad.

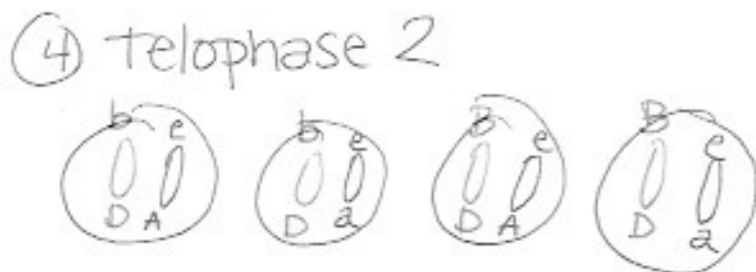
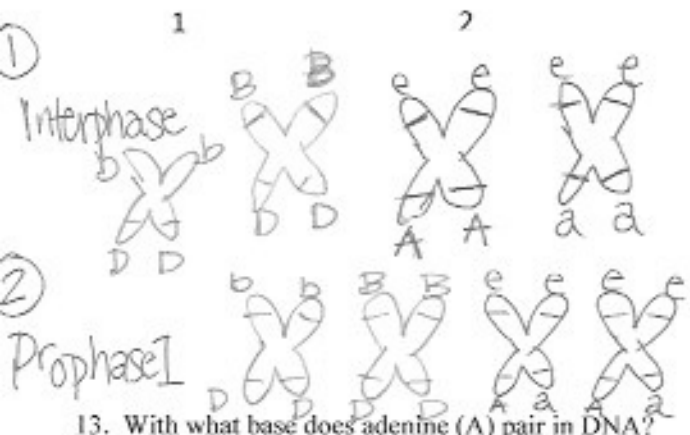
10. If a diploid mouse species has a total of 12 chromosomes, how many chromosomes will their haploid gametes have?

6

11. In what stage of meiosis does crossing over occur and what is the importance of crossing over?

Prophase 1. Crossing over is significant because it increases genetic variation. It allows new combinations of DNA in the gametes.

12. An alien has the following chromosomes. Show the process of meiosis to determine the possible gametes.



13. With what base does adenine (A) pair in DNA?

T (in RNA it pairs with U)

14. With what base does guanine (G) pair in DNA?

C

15. What is the smallest unit of DNA called?

Nucleotide

16. What is the shape of the DNA molecule?

Double helix

17. Why can't all of the nitrogenous bases (A,G,T,C) pair with each other?

They have different numbers of hydrogen bonds. A and T both have 2 hydrogen bonds, while C and G have 3. Think of this like the prongs on an electrical plug. You cannot plug a 3-pronged plug into a 2-pronged hole.

18. What is the name of the sugar in the DNA backbone?

deoxyribose

19. Proteins are made out of Amino Acids.

20. Suppose you know that the sequence of bases on one DNA strand is **AGCTCAG**. What is the sequence of bases on the opposite strand?

TCGAGTC

21. Assume that a 100-base pair DNA double helix contains 20 cytosines. How many adenines are there?

30 (explanation- if it has 20 cytosines it must also have 20 guanines. That's a total of 40. It tells you the DNA is 100 base pairs long. This means 60 are leftover. There must be equal amounts of As and Ts. So you should have 30 As and 30 Ts)

22. What are the differences between DNA and RNA?

DNA is double stranded while RNA is single stranded. DNA has T (thymine) RNA does not it has U (uracil). DNA has deoxyribose sugar, while RNA has ribose sugar).

23. What is the location and purpose of transcription?

Transcription occurs in the nucleus. The purpose is to make mRNA. Basically you are taking these huge pieces of DNA with tons of genes on them and just making a copy of the one gene that you want to make a protein for at the time. You should remember from the gene expression lesson that your need for certain proteins changes depending on the environment.

**24. What is the location and purpose of translation?**

Translation occurs on the ribosomes in the cytoplasm. The purpose is to make amino acids from the "message" contained in the mRNA. During translation, tRNA brings amino acids to match each codon on the mRNA strand.

**25. What does DNA code for?**

Protein.

**26. What is a codon?**

3 base pairs in a row. Each codon codes for one amino acid.

**27. What is the role of tRNA in protein synthesis?**

tRNA brings the amino acids to match the codons on the mRNA

**28. What is the role of mRNA in protein synthesis?**

mRNA carries the "message" out of the nucleus and to the ribosomes to be translated into protein.

**29. Why does protein synthesis consist of two processes in two different locations? Why can't DNA just make proteins directly?**

DNA is too big to fit out of the nucleus, so it cannot ever make it to the ribosomes (protein factories). Also, it would not be very efficient. By making mRNA first we can basically just make copies of the specific genes we need at the time.

**30. Using the following DNA sequence, transcribe a strand of mRNA, and then translate that mRNA into an amino acid chain.**

DNA → G T T T C C A T G T G A T T G A C G C G A

Transcribe → C A A A G G U A C A C U A A C U G C G C U \_\_\_\_\_

Translate → Gln Arg Tyr Thr \_\_\_\_\_

**31. Write the complimentary side of the DNA strand represented below.**

T A A G G G T T C A C C A A A G G C C C C A G T C

A T T C C C A A G T G G T T T C C G G G G T C A G \_\_\_\_\_

**32. What role does gene expression play in a cell's ability to perform its function and adapt to the body's internal environment AND how does this occur?**

Gene expression is the phenomena of cells turning on or off genes using transcription factors. This helps the cell perform its function because different cells need different proteins, and therefore different genes in order to do its job. For example, an intestinal cell needs to make digestive enzymes but it does not need to make hemoglobin which carries oxygen through your blood. These cells would use transcription repressors to keep unnecessary genes from being made. In addition to allowing the cells to do their specific job, gene expression allows them to respond dynamically to their environment. For example, if you are eating a lot of high fat meals, your cells will increase transcription and translation of the gene that codes for an enzyme to break down fat.