SOUTH CAROLINA CONNECTIONS ACADEMY

Biology A - Unit 4- GENETICS
Unit Study Guide

1. Explain how mutations can be both harmful AND helpful. In your explanation provide 2 examples of disorders resulting from genetic mutations.

2. Compare and contrast meiosis and mitosis.

3. White spotting, or piebald trait, characterized by an absence of hair pigment in specific places, is caused by mutant copies of a _____.

4. An unpredicted change occurs in the genetic material of two chromosomes. What do we call this unexpected/unpredicted change in DNA?

5. The codon chart shown below uses the three base sequence found on the mRNA molecule after the information is copied from DNA during transcription. If the mRNA message is AAC UAC UGC, what was the original DNA base sequence?

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

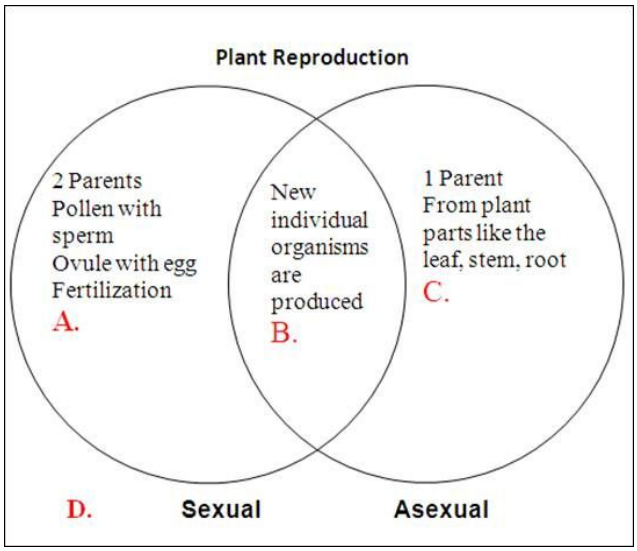
6. What are the 3 principles of the Cell Theory?

7. *Palo Verde Tree a Witness for the Prosecution!*
That could be the headline in a recent murder investigation. Detectives recently discovered pods from a Palo Verde tree in the truck of a suspect in an ongoing murder investigation. Detectives on the scene of the crime also found similar trees with pods at the crime scene. How did detectives nab the suspect based on the pod evidence?

   A) Detectives knew that Palo Verde trees grew in a limited area of the state.
   B) Detectives used DNA markers to match the pods from the truck to pods on the scene.
   C) Detectives constructed a pedigree chart of the trees in the area to determine genotypes.
   D) Detectives did test crosses in the lab to determine the relationship of the pods and trees.

8. What part of the cell contains the "blueprints" for proteins and polypeptide chains, such as insulin?

9. Review the Venn diagram below of sexual reproduction and asexual reproduction in plants. Where in the diagram would you add offspring different from parents?



   A) A
   B) B
   C) C

D) D

10. Scientists in North Carolina are developing a clone bank of disease and insect resistant Christmas trees. How would this be beneficial to Christmas tree growers?

11. DNA is able to make exact copies of itself during replication because the nitrogen bases pair up in very specific ways. Explain how the nitrogen bases ALWAYS pair up.

12. During which stage of Meiosis does the production of four haploid gametes occur?

13. How does radioactivity affect the rate and number of mutations in creatures that are exposed to it?

14. Describe/define fertilization.

15. Why is sexual reproduction important for the survival of a species?

16. Mitosis is responsible for growth, repair, and maintenance in an organism because
    A) it occurs at a faster rate than meiosis.
    B) the chromosome number is reduced by half.
    C) exact duplicates of each mother cell are produced.
    D) it is the only process that involves replication of genetic material.

17. In tulips, tall stems (T) is a dominant trait while short stems (t) is a recessive trait. In a field of 1000 tulips, 820 are tall plants and 180 are short. What is the genotypic percentage of the tulips in the field?

18. Transcribe the following DNA sequence into **RNA**: CGG TCG AGT GAT

19. The central dogma of molecular biology is centered upon the process of _____, in which the information from DNA is transcribed and translated, resulting in amino acids being joined into polypeptides.

20. A mutation in which type of cell can be passed along from parent to child?
    A. blood cell
    B. sex cell
    C. skin cell
    D. gland cell

21. Information about traits is stored in the cell nucleus in a molecule called _____.

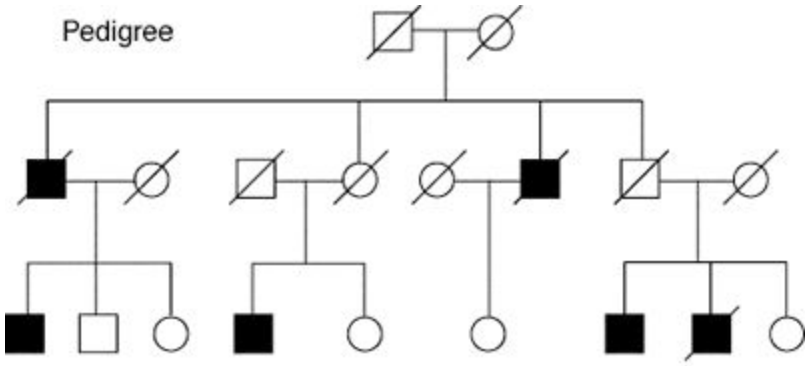
22. The process of evolution involves changes in the genetic makeup of a population over a period of time. Sexual reproduction enhances variability among offspring. The random alteration of DNA from parent to offspring, called mutations, also produces variable characteristics in offspring. Some mutations can be helpful, while others can be harmful and hinder survival. In the experiment described below, students mimicked random mutations and the ability to collect and eat food. Each experimental group was timed for both collection and eating of the food, and data was collected to determine if the mutations were helpful or harmful when trying to collect and eat food. Of all the mutations, which one would MOST LIKELY contribute to a rapid rate of extinction?

Group and Mutation	Time Taken to Collect Candy	Time Taken to Eat Candy
A Extra long nails	1 minute 3 seconds	8 minutes 12 seconds
B No digits; hands paddle-like	15 seconds	7 minutes 18 seconds
C Normal	22 seconds	2 minutes 44 seconds
D Hands fused in front of body; no range of motion	Did not collect 15 pieces. Collected 11 pieces	Ate 11 pieces; 4 minutes 12 seconds
E Webbing on hands and feet	11 minutes 45 seconds	17 minutes 12 seconds

F No peripheral	3 minutes 2 seconds	2 minutes 52 seconds
G Blind	Did not collect 15 pieces. Collected 4 pieces in 4 minutes	Ate only 4 pieces; 1 minute 16 seconds
H Short legs; normal number of digits on hands and feet	55 seconds	3 minutes 2 seconds

23. Colorblindness is a sex-linked trait. A mother with normal vision and a man who is colorblind have a colorblind daughter. What statement MUST be true about the parents?

    A) The mother is a heterozygous carrier.
    B) The father is a heterozygous carrier.
    C) The mother cannot have the colorblind gene.
    D) The mother is homozygous dominant for normal vision.



24. In pea plants, yellow seeds (Y) are dominant over green seeds (y), and rounded peas (R) are dominant over wrinkled peas (r). Cross a plant that is heterozygous for both traits with a plant that is homozygous recessive for both traits. Draw a Punnett square to show all possible offspring, and determine the genotypic and phenotypic ratios.

NOTE: IF YOU NEED/WANT THE ANSWER KEY TO CHECK YOUR WORK

(highly recommended), just webmail your teacher your completed study guide.