

Instructions (shown before students start the test)

Welcome to the January Workshop Heredity event! Remember this is a noncompetitive workshop, and no places will be awarded.

This test should provide a good glimpse into the various types of topics and questions you can expect to see at future invitationals and Tournaments.

Introduction (shown after students start the test)

This test consists of a mix of topics and questions. The nature of the questions should be pretty straightforward.

These test questions are based on a test from Centerville Invitational 2020.

For the first 5 questions (1-5), use the information in the paragraph below to answer the questions.

In Siyonaland, your number of fingers on each hand is a polygenic trait. You have one finger on each hand for each dominant allele of either the A gene or the B gene. Two individuals with the genotypes AaBb have offspring.

1. (1.00 pts) What ratio of the offspring will have zero fingers? (answer should be in the form of a simplified fraction)

2. (1.00 pts) What ratio of the offspring will have one finger? (answer should be in the form of a simplified fraction)

3. (1.00 pts) What ratio of the offspring will have two fingers? (answer should be in the form of a simplified fraction)

4. (1.00 pts) What ratio of the offspring will have three fingers? (answer should be in the form of a simplified fraction)

5. (1.00 pts) What ratio of the offspring will have four fingers? (answer should be in the form of a simplified fraction)

6. (1.00 pts) The following statements describe differences between mitosis and meiosis.

Which of the statements are true? Select all that apply.

(Mark ALL correct answers)

- A) Crossing over only occurs in meiosis
- B) Microtubules, microfilaments, and intermediate filaments are all broken and reformed in meiosis, but at least one type is not used in mitosis
- C) The diploid state in most fungi uses meiosis, but not mitosis
- D) Nondisjunction occurs in meiosis, but not mitosis

The next set of questions will be to incrementally fill in the blanks for a Punnett square.

A short green pea plant that is true-breeding for both traits is crossed with a tall yellow pea plant that is true-breeding for both traits. Fill out the Punnett square (Use T and G to represent alleles)

	tG			
Tg				

7. (1.00 pts) For the three highlighted blocks, fill in the blanks for the appropriate headers.

	tG			
Tg				

8. (1.00 pts) For the three highlighted blocks, fill in the blanks for the appropriate headers.

	tG			
Tg				

9. (1.00 pts) For the three highlighted blocks, fill in the blanks for the appropriate pairings.

	tG			
Tg	TtGg			

10. (1.00 pts) Which of the following nucleotides increase in content during gene conversion?

(Mark ALL correct answers)

- A) A
- B) T
- C) G
- D) C

11. (1.00 pts) How many base sequences are in one twist of a DNA strand in its relaxed state? Round to the nearest whole number?

- A) 6
- B) 8
- C) 10
- D) 12

12. (1.00 pts) Choose ALL of the choices below that represent a method of generating new genes.

(Mark ALL correct answers)

- A) Silent Mutation
- B) Gene Duplication
- C) Post-Replicational Modification
- D) Vertical Transfer

13. (1.00 pts) Isolated RNA molecules are generally less stable than DNA at physiological pH because:

- A) RNA has Ribose
- B) RNU is always linear
- C) RNA is usually single stranded
- D) There are many more RNase enzymes

14. (1.00 pts) Which of the following would promote allopatric speciation?

- A) An error in cell division that generates diploid gametes
- B) An even that splits one population into two that cannot interact
- C) The permanent migration of a segment of a population to a new location
- D) Only B and C above would promote allopatric speciation

15. (1.00 pts) Which of the following terms most accurately describe the chromosomes in an individual with Down syndrome?

- A) Polyploidy
- B) Endoploidy
- C) Aneuploidy
- D) Exoploidy

16. (1.00 pts)

In a population of wild pikachus that are isolated from any other pikachus, 64 percent of them show the recessive trait of liking ketchup, what is the allele frequency of the dominant allele?

- A) 0.64
- B) 0.20
- C) 0.32
- D) 0.80

17. (1.00 pts) The mother is a carrier for the hemophilia trait and the father is completely normal, what is the chance of their first child having the hemophilia condition?

- A) 0%
- B) 25%
- C) 50%
- D) 75%

18. (1.00 pts) At the cellular level, what type of inheritance does sickle cell anemia display?

- A) Simple Dominance
- B) Codominance
- C) Incomplete Dominance
- D) It is not a dominant trait

19. (1.00 pts) After splicing, the primary transcript is known as the:

- A) Final Transcript
- B) Spliceosome
- C) Mature Transcript
- D) Splicing Product

20. (1.00 pts) Which of the following would not be found on a Barr Body belonging to a human?

- A) Xist Gene
- B) Tsix Gene
- C) SRY Gene
- D) Lac Operon
- E) All of these are found on Barr bodies

21. (1.00 pts) If 30% of a RNA strand is Uracil, what percentage of the complementary DNA strand is Guanine?

- A) 30%
- B) 20%
- C) 40%
- D) 60%
- E) 70%

22. (1.00 pts) Name the three theories for the replication of DNA and circle the current model that we have accepted.

23. (1.00 pts) At what point during normal DNA replication is genetic material lost from the telomeres?

- A) Enzymatic action of telomerase
- B) Unzipping by DNA helicase
- C) Attachment of DNA polymerase to the leading strand
- D) Joining of adjacent Okazaki fragments

24. (1.00 pts) Which bond has the highest energy?

- A) A:U
- B) A:T
- C) G:C
- D) All are the same

All done! Congratulations and good luck on your other events today. Remember to join the virtual meeting to meet with some of your supervisors!
