

amk578's SSSS Heredity Practice Test - 2019-2020: 100 points total

Directions: Answer each question completely, show work whenever necessary.

Section 1: Multiple Choice (1 point each)

- Which scientist identified the components that make up a DNA molecule?
 - Gregor Mendel
 - Frederick Griffith
 - Oswald Avery
 - Phoebus Levene
 - Torbjorn Caspersson
- Which scientist is developed DNA profiling (AKA DNA fingerprinting)?
 - Rosalind Franklin
 - Alec Jeffreys
 - Ian Wilmut
 - Frank Stahl
 - William Bateson
- In a human male, all of the genes on the X-chromosome are considered what?
 - Homozygous
 - Unizygous
 - Semizygous
 - Heterozygous
 - Hemizygous
- What is the complement strand of DNA for the template strand 3'-ACGTGATAC-5'?
 - 5'-UGCACUAUG-3'
 - 5'-GTAUCGAAC-3'
 - 5'-TGCACTATG-3'
 - 5'-UGCUCUATC-3'
 - 5'-GTATCACGT-3'
- In which stage of mitosis do the microtubules of the spindle apparatus shorten, resulting in the chromatids pulling apart?
 - Interphase
 - Prophase
 - Metaphase
 - Anaphase
 - Telophase

6. What is the name of the structure formed in Prophase I of meiosis that has 4 homologous chromatids?
 - a. Tetrad
 - b. Purine
 - c. Gametite
 - d. Nucleosome IV
 - e. cDNA

7. In the theorized Hardy Weinberg Equilibrium, a population will maintain the exact allele and genotype frequencies over each generation only under five conditions. Which of the following is NOT one of the five conditions?
 - a. No mutations
 - b. No gene flow
 - c. Very small population
 - d. No natural selection
 - e. Random mating

8. In which phase of interphase does semiconservative replication occur?
 - a. Gap 2
 - b. Synthesis
 - c. Gap 0
 - d. Gap 1
 - e. Mitosis

9. In DNA replication, which enzyme unwinds the helix?
 - a. Topoisomerase
 - b. DNA polymerase 3
 - c. DNA ligase
 - d. DNA polymerase
 - e. DNA helicase

10. A man has Bruton's agammaglobulinemia, which is an X-linked recessive disorder. He bears a child with a woman whose father also had this disorder but she doesn't. What is the possibility that the child is a boy and will have Bruton's agammaglobulinemia?
 - a. 0%
 - b. 25%
 - c. 50%
 - d. 75%
 - e. 100%

11. Purines are ___-carbon nitrogen ring bases while pyrimidines are ___-carbon nitrogen ring bases.
 - a. 2; 1
 - b. 3; 2
 - c. 2; 3
 - d. 1; 2
 - e. 5; 3

12. What is known as the “backbone” of DNA?
- Phosphate
 - Thymine
 - Deoxyribose
 - Cytosine
 - Ribose
13. Which type of RNA encodes the sequence of amino acids that creates a polypeptide chain?
- tRNA
 - snRNA
 - rRNA
 - mRNA
 - miRNA
14. In a nucleosome, how many times is DNA wrapped around the histone complex?
- 1
 - 2
 - 3
 - 4
 - 5
15. If alleles A, B, and C are all autosomal, then what is the probability that a child with AaBBcc will be produced from two parents with AaBbCc and AaBBcc?
- 1.5625%
 - 3.125%
 - 6.25%
 - 12.5%
 - 25%
16. In DNA replication, what enzyme works on the lagging strand and degrades RNA primer to replace it with DNA?
- DNA ligase
 - RNA polymerase 2
 - Topoisomerase
 - DNA helicase
 - DNA polymerase 1
17. Which of the following is NOT a difference between DNA and RNA?
- DNA is double stranded, RNA is not
 - DNA has thymine, RNA instead has uracil
 - DNA has phosphate, RNA has phosphite
 - DNA has deoxyribose sugar, RNA has ribose sugar
 - DNA is located in the mitochondria, RNA is not

18. On Planet Z, a species of dinosaurs has the color of their eyes and the color of their fur decided by a single gene. What is this called?
- Epistasis
 - Codominance
 - Missense
 - Pleiotropy
 - Incomplete dominance
19. Also on Planet Z, a species of living tanks have 324 chromosomes in a somatic cell. During telophase of mitosis, how many chromosomes are present?
- 162
 - 324
 - 648
 - 1,296
 - 4,815,162,342
20. During transcription, pre-mRNA is formed and what is spliced, as they are not required for protein synthesis?
- Introns
 - Anticodons
 - Spindle fibers
 - Exons
 - Okazaki fragments
21. Transcription is to _____, as translation is to _____.
- DNA; RNA
 - Ribosome; nucleosome
 - Nucleoid; golgi apparatus
 - Smooth ER; rough ER
 - Nucleus; ribosome
22. What is the proper notation for the sex chromosomes in a person who has Turner's syndrome?
- XXY
 - XO
 - XXYY
 - XY
 - XYY
23. Which type of mutation arises from a DNA base pair changing and the codon codes for a premature stop?
- Frameshift mutation
 - Missense mutation
 - Repeat expansion
 - Insertion/Deletion
 - Nonsense mutation

24. PCR, also known as Polymerase Chain Reaction, is a method of quickly making copies of a desired section of DNA. What are the key ingredients to conduct PCR?
- The DNA template, primers, DNA helicase, DNA ligase, DNA polymerase
 - The DNA template, primers, DNA helicase, DNA polymerase, nucleotides, proteins
 - The DNA template, nucleotides
 - The DNA template, mRNA, tRNA, miRNA
 - The DNA template, primers, DNA polymerase, nucleotides
25. If you start with 1 strand of DNA, how many strands of DNA will result after 7 cycles of PCR?
- 32
 - 64
 - 128
 - 256
 - 512

Section 2: Short Answer/Applications

1. For the following template strand of DNA:

3'-TACGACACCGAGTGGACCACTGAGTTACAG-5'

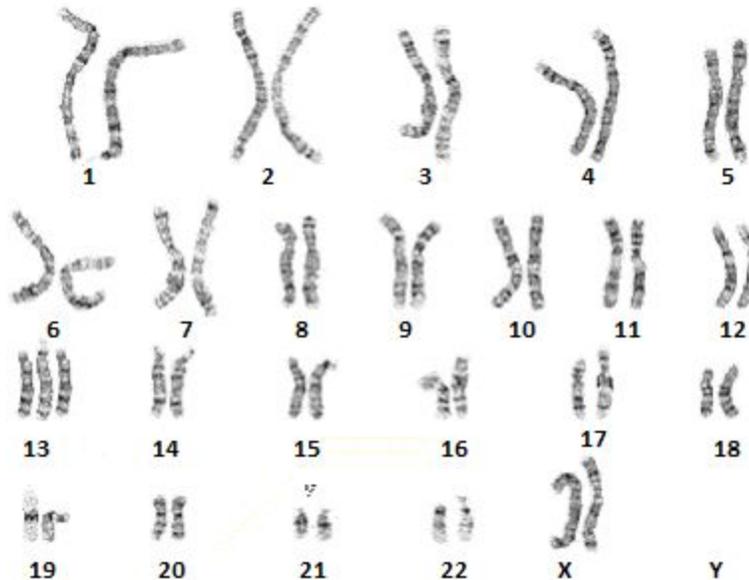
List the corresponding mRNA strand: (2 points)

List the corresponding tRNA strand: (2 points)

List the corresponding amino acid chain: (4 points)

2. Explain the difference between meiosis and gametogenesis. (2 points)

3. Analyze the following karyotype:



What is the gender of this individual? (1 point)

What is the condition of this individual? (1 point)

List ONE syndrome of this condition. (1 point)

How many autosomes does this individual have? (1 point)

4. List four of the seven traits that Mendel studied in pea plants, and explain the three laws of genetics he discovered. Give an exception to one of the laws. (8 points)

5. Identify the 3 types of RNA involved in transcription/translation and briefly describe their processes. (6 points)

6. Define aneuploidy. (2 points)

7. In a species of unicorns, the trait for a straight/pointed horn is dominant and denoted by the allele H, while the trait for a curved/irregular horn is recessive and denoted by the allele h. Also, the trait for pink fur is dominant (F) while the trait for blue fur is recessive (f). A male unicorn with a curved horn and pink fur mates with a female unicorn that has a straight horn and pink fur. Assume both unicorns are true-breeds.

What are the gametes for the male unicorn? What about for the female? (2 points)

Create a dihybrid cross demonstrating this situation. Give the genotypic and phenotypic ratios. (4 points)

The two unicorns have a child that has a straight horn and pink fur. This child mates with a unicorn that has a curved horn and blue fur. Create a dihybrid cross demonstrating this situation. Give the genotypic and phenotypic ratios. (4 points)

8. Here are some questions regarding bonds:

What kind of bond is between adenine and thymine? (1 point)

What kind of bond is between guanine and cytosine? (1 point)

What kind of bond joins together two nucleotides? (1 point)

What kind of bond links amino acids? (1 point)

9. A population of zebras are at Hardy-Weinberg equilibrium. The allele for stripes is dominant and has an allele frequency of 0.73. The allele for no stripes is recessive and has an allele frequency of 0.27. What percentage of the population is the heterozygous? Show all work. (2 points)

10. Dwight, who has Type A blood, has a child with Angela, who has Type B blood. However, their child has Type O blood.

Create a Punnett square modeling this situation. Determine the probability of their next child having Type B blood. (3 points)

In another scenario, two people that have Type AB blood have a child. Create a Punnett square to model this scenario. Determine the probability that their child will have Type A blood. (3 points)

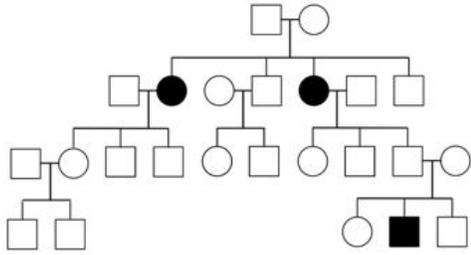
11. Elaborate the difference between a transition and transversion mutation. (3 points)
12. Two flowers produce an offspring. One flower has red petals and the other has white petals. However, the trait for the color of petals displays incomplete dominance and their offspring has pink petals.

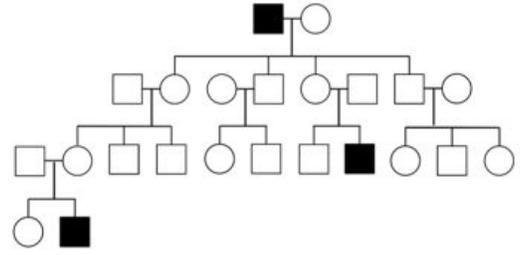
Create a Punnett square displaying this situation. (3 points)

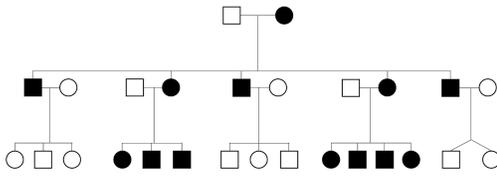
The pink flower crosses with a red flower. Create a Punnett square and provide the genotypic and phenotypic ratios. (4 points)

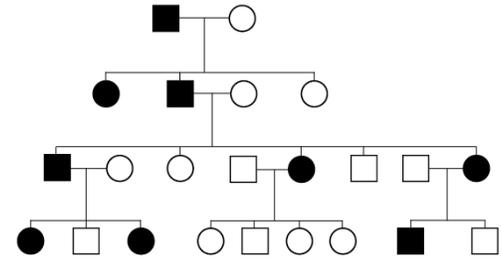
The trait for plant height is a recessive epistatic trait, in which if the plant is short, the plant will have rainbow flowers. A tall plant with pink flowers is crossed with a tall plant with white flowers. If both plants are heterozygous for the tall gene, what is the probability that they will produce a short plant? Show work. (5 points)

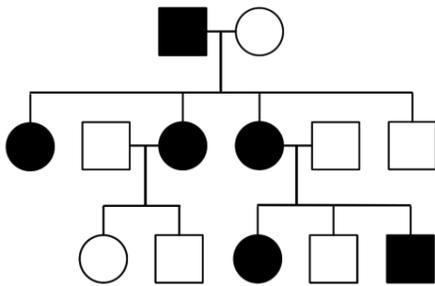
13. For the following pedigrees, list what pattern of inheritance each pedigree displays: autosomal dominant, autosomal recessive, X-linked dominant, X-linked recessive, Y-linked, or maternal. (6 points)

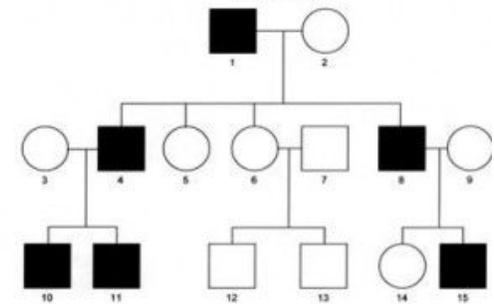












14. Explain how maternal inheritance works. (2 points)