2019 Heredity Practice Test

50 minutes, 56 questions, 2 people

Answer to the best of your ability, **only** the answer sheet located at the back of the test will be graded.

Section 1: General Vocabulary (13 questions)

Match the terms on the right to the letter of a statement which correctly represents the term. Terms **can** have the same corresponding statement. Some statements **may** not be used.

1. Chiasma	A.) A compound structure at the end of a chromosome
2. Nullisomy	B.) The genetic disorder, Marfan syndrome, is an example of this
3. Telomere	C.) By definition, this group does not include gametes
4. Kinetochore	D.) This consists of protein, DNA, and RNA
5. Aneuploidy	E.) This is a result of nondisjunction in Meiosis I
6. Chromatin	F.) The location of a gene on a chromosome
7. Pleiotropy	G.) Having 45 chromosomes in a cell
8. Tetrasomy	H.) Cells that are derived from Somatin
9. Locus	I.) This structure aids in the attachment of microtubules to the centromere of a chromosome during cell division
10. Somatic Cells	J.) A point of overlap of paired chromatids at which fusion and exchange of genetic material takes place

11. HGO is the acronym for the Human Genome Organization
    A. True
    B. False

12. Dizygotic twins is another term for fraternal twins
    A. True
    B. False

13. What is an exon?

Section 2: Laws of Heredity (4 questions)

14. In your own words, describe Gregor Mendel's law of independent assortment.

15. Create a monohybrid cross between a heterozygous rabbit, and a homozygous brown-furred rabbit. Use (B) to represent dominant brown fur, and (b) to represent recessive black fur. Write the phenotypic ratio of black to brown fur.

16. Which law did you use to determine the phenotypic outcome of (Bb) in question 15?

17. During what decade were these laws discovered? (Those used the previous 3 questions)

Section 3: Blood Types (6 questions)

Write the letter of the best answer on the answer sheet for questions 18-20

18. Someone with the blood genotype I^Ai will have the phenotype…
    A. O, because I^A is recessive, and i is dominant, and you need two recessive genes to be present to have type A blood
    B. A, because any genotype containing the symbol ^ is an A type
    C. O, because I^Ai is the notation used to show that there are 2 O alleles
    D. A, because I^A is dominant over i

19. Someone with the blood type B…
    A. Has only B antigens in the plasma of their blood
    B. Has only A antigens on the surface of their blood cells
    C. Has only A antigens in the plasma of their blood
    D. Has no antigens in the plasma of their blood

20. How many types of antigens that appear on blood are currently known?
    A. 3
    B. 36
    C. More than 100
    D. More than 600
    E. More than 800

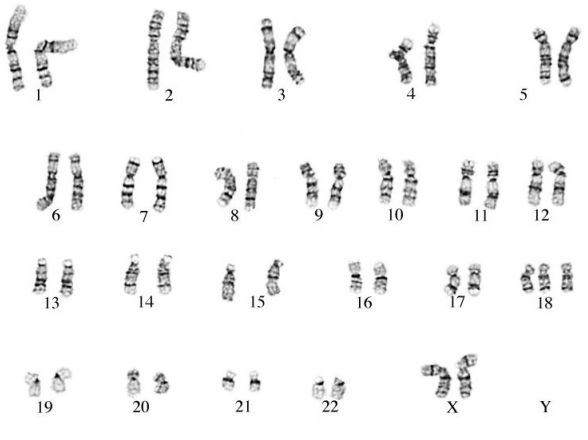
21. Write two genotypes that can give you B type blood.

22. Can a two people with the blood types A+ and B- have a child with the universal donor blood type? Explain.

23. Is blood type a Mendelian, or non-Mendelian trait? Explain in a short sentence.

Section 4: Karyotype Analysis (7 questions)

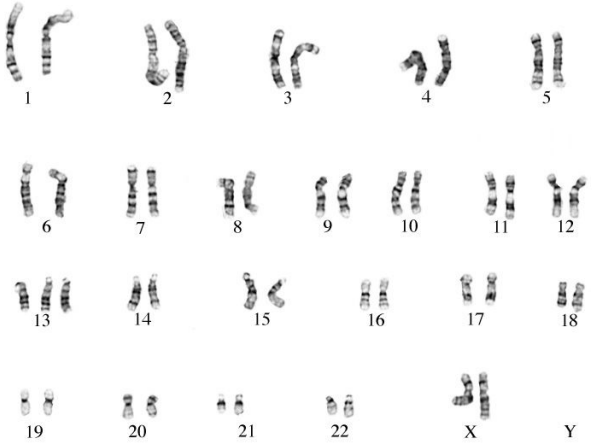
Answer questions 24-30 based on images A, B, and C shown below.



(A)

(B)

(C)



24. What condition does person C have? State it in two different ways.

25. What are some symptoms of person C's condition? Name 4.

26. On person A, one of their 1st chromosomes is bent at a 90 degree angle. How dangerous is this, and why?

27. Out of person A, B, and C, without including gender, which karyotype is more common?

28. Does person A have an autosomal disorder?

29. On person B, their Y chromosome is much smaller than their X chromosome. Is this normal to have in male? If not, name 3 symptoms of this condition.

30. How many acrocentric chromosomes does person B have?

Section 5: The Cell Cycle/DNA (17 questions)

Write the letter of the correct answer on the answer sheet for questions 31-43

31. Sister chromatids are pulled apart during anaphase of mitosis
    A. True
    B. False

32. DNA is copied in prophase of mitosis
    A. True
    B. False

33. tRNA stands for transforming ribonucleic acid
    A. True
    B. False

34. Meiosis results in the formation of gametes
    A. True
    B. False, it results in the formation of sperm or egg cells
    C. False, it results in the duplication of cells

35. Those with Klinefelter's syndrome are by definition female
    A. True
    B. False

36. While DNA has a sugar phosphate backbone, RNA does not.
    A. True
    B. False, neither has a sugar phosphate backbone
    C. False, they both have sugar phosphate backbones

37. There is a total of 3 types of RNA: tRNA, rRNA, and mRNA
    A. True
    B. False

38. Arginine is a protein
    A. True
    B. False

39. DNA polymerase moves down the template strand 5' to 3'
    A. True
    B. False, it does not move down the template strand
    C. False, it moves 3' to 5'

40. Osteoporosis can be a symptom of Monosomy X, which is also called Gonadal dysgenesis
    A. True
    B. False, it is known as Turner's syndrome, not Gonadal dysgenesis
    C. False, the only area of influence that Monosomy X has is within female hormones, so it cannot cause Osteoporosis

41.The four phases of the cell cycle are...

A. Anaphase, Metaphase, Interphase, Prophase
B. G1 phase, S phase, M phase, G2 phase
C. G phase, S1 phase, M phase S2 phase
D. Anaphase, Metaphase, G1 phase, G2 phase

42. Both compound structures at the ends of a 14th chromosome break off.,.

A. This can cause Trisomy 14 syndrome
B. This can cause Ring Chromosome 14 syndrome
C. This can cause Guillain-Barre syndrome
D. This can cause Proteus 14 syndrome

43. Jacob's syndrome…

A. Can cause Dwarfism
B. Can cause a deficiency of the enzyme Pepsin
C. Only occurs in females
D. Can cause low intelligence

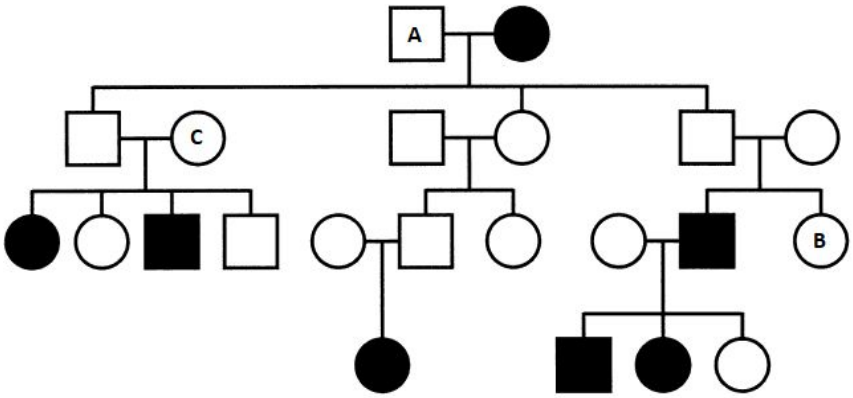
44. Describe the difference between a Purine and Pyrimidine.

45. Describe the difference between a translocation, a reciprocal translocation, and a robertsonian translocation.

46. If the anticodon of a tRNA carrying an amino acid reads UGA, which amino acid is it carrying?

47. Describe the difference between ribose and deoxyribose.

Section 6: Pedigree Analysis (5 questions)



The chart on the left depicts the spread of a genetic disorder within a family. Write the letter of the correct answer on the answer sheet for question 48.

48. There is only one possible genotype for person C.
    A. True
    B. False
49. Is this disorder recessive, or dominant? How can you tell?

50. What are the possible genotypes for person A?

51. What are the possible genotypes for person B?

52. If two people with the same genotypes as person C's spouse and person A's spouse had a child, what is the probability that the child will be affected by this genetic disorder?

Section 7: Polygenic Traits/Trihybrid Cross (4 questions)

Let (B) represent dominant black hair, and (b) represent recessive ginger hair. Let (C) represent dominant straight hair, and (c) represent recessive curly hair. Let (T) represent dominant thin hair, and (t) represent recessive thick hair. When writing genotypes/creating a cross, write color first, then thickness, then whether or not it's curly. Person G and person H are planning on having a child. Person G has thin, straight ginger hair. For two of person G's traits, they are heterozygous. One of person H's parents has black hair, while the other has ginger hair. Person H has thick, curly black hair.

53. Write both person G and person H's genotypes for hair type.

54. Create a trihybrid cross between person G and H, showing the possible hair types of their child. Put person G on the top, and person H on the side.

55. What is the probability that the child will have the same exact hair genotype as one of their parents?

56. Out of the ones created in the cross, write the most likely type(s) of hair the child will

have. (phenotypes)

Answer Sheet

Section 1: General Vocabulary (13 questions)

1. ___	4. ___	7.___	10.___
2. ___	5.___	8.___	11.___
3. ___	6.___	9.___	12.___

13. _____

Section 2: Laws of Heredity (4 questions)

14._____

_____

15. Phenotypic ratio: _____ to _____

16. _____ 17. _____

Section 3: Blood Types (6 questions)

18. ___ 19. ___ 20. ___

21. _____

22._____

_____

_____

23._____

Section 4: Karyotype Analysis (7 questions)

24. _____

25._____

26._____

27. _____

28._____

29._____

_____

30. _____

Section 5: The Cell Cycle/DNA (17 questions)

31. ___	34. ___	37.___	40.___	43.___
32. ___	35. ___	38.___	41.___	
33. ___	36.___	39.___	42.___	

44._____

_____

45._____

_____

_____

46. _____

47._____

Section 6: Pedigree Analysis (6 questions)

48. ___

49._____

_____

_____

50. _____

51. _____

52. _____

Section 7: Polygenic Traits/Trihybrid Cross (4 questions)

53.

Person G: _____

Person H: _____

54.

55. _____

56. _____

Answer Key

Section 1: General Vocabulary

1. (1 point) J
2. (1 point) E
3. (1 point) A
4. (1 point) I
5. (1 point) G
6. (1 point) D
7. (1 point) B
8. (1 point) E
9. (1 point) F
10. (1 point) C

(H will not be used)

11. (1 point) B
12. (1 point) A
13. (1 point) An exon is a portion of a strand of DNA or RNA that codes for a protein

Section 2: Laws of Heredity

14. (1 point) The answer should either mention that different genes are independently distributed among cells during gamete production, or say that the traits are transmitted to offspring independent of one another.

15. (2 points) Give one point if the cross is done correctly, and another if the phenotypic ratio is correct.
Phenotypic Ratio: 1 to 1
There are 2 possible correct crosses:

	B	b
b	Bb	bb
b	Bb	bb

	b	b
B	Bb	Bb
b	bb	bb

16. (1 point) Gregor Mendel's Law of Dominance, or Law of Dominance is acceptable
17. (1 point) The 1860s

Section 3: Blood Types

18. (1 point) D
19. (1 point) C
20. (1 point) D
21. (1 point) I^Bi and I^BI^B. If they give only one correct, give a ½ point. If they write more than 2 give them no points.

22. (3 points) Answer: yes. In their explanation they should state that the parents' genotypes are unknown, and since rH + alleles are dominant over rH - alleles, and A (I^A)/B (I^B) alleles are dominant over O (i) alleles, their parents genotypes can possibly both contain O (i) alleles, and rH - alleles, meaning that there is a chance that they could come together in a cross.
If they have the correct answer, but explain incorrectly or do not explain, give them 1 point. If they do not explain fully, and have the correct answer give them 2 points.

23. (2 points) Blood type is non-mendelian. Their explanation should mention that blood can have codominance. If the explanation does not mention codominance, or there is no explanation, give them no points.

Section 4: Karyotype Analysis

24. (1 point) Patau syndrome and Trisomy 13. If they give only one, give them ½ a point.

25. (2 points) abnormally small head, birth defect with intestinal organs outside of body, failure to thrive, or low birth weight, cleft lip and cleft palate, episodes of no breathing, flaccid muscles, having extra fingers or toes, heart murmur, intellectual disability, low-set ears, microphthalmia, seizures, or underside of foot is convex (rounded on the bottom, sticking out)
Give ½ a point if they name any of the above, they can name up to 4.

26. (1 point) This is not dangerous, it was only the way that the chromosomes were positioned when photographed.

27. (1 point) Person B's karyotype is most common.
28. (1 point) Yes.
29. (1 point) It is normal.
30. (2 points) 11 acrocentric chromosomes. (Or they can say 5 pairs, and one extra chromosome 21)

Section 5: The Cell Cycle/DNA

31. (1 point) A
32. (1 point) B
33. (1 point) B
34. (1 point) A
35. (1 point) B
36. (1 point) C
37. (1 point) B
38. (1 point) B
39. (1 point) C
40. (1 point) A
41. (1 point) A
42. (1 point) B
43. (1 point) D
44. (1 point) While Purines have 2-carbon nitrogen ring bases, pyrimidines have only 1. (Or they can say that purines are twice as wide)

45. (4 points) A translocation is a general term to describe when part of a chromosome moves onto another chromosome. A reciprocal translocation is a specific type of translocation that occurs when two parts of separate chromosomes switch places. A robertsonian translocation is also a specific type of translocation that occurs when two chromosomes of a particular kind (specifically nonhomologous and acrocentric) break at their centromeres, and fuse (specifically the 2 larger parts fuse to form the robertsonian translocation, and the 2 smaller parts fuse to create a fragment).
Give 1 point for each correct definition, and 1 more point if they go into the specifics of a robertsonian translocation.

46. (1 point) Threonine

47. (2 points) While ribose is a normal sugar, deoxyribose is a modified sugar. Ribose has an oxygen atom bonded to each carbon atom, while deoxyribose is missing one oxygen atom.
Give two points for the above answer, and one point if they say that ribose is found in RNA while deoxyribose is found in DNA without mentioning the structure.

Section 6: Pedigree Analysis

48. (1 point) A
49. (3 points) Recessive. Person C would not have been able to pass on a dominant disease without them or their spouse being affected by it.
If they do not explain/explain incorrectly but have the correct answer, give them one point.
50. (1 point) Homozygous dominant, and heterozygous.
51. (1 point) Homozygous dominant, and heterozygous.
For 50-51, they can give variables and write genotypes using those. If they only give one correct genotype, give them half a point.
52. (1 point) 50% or 1/2

Section 7: Polygenic Traits/Trihybrid Cross

53. (2 points) Person G: bbTtCc, Person H: Bbttcc
Do not accept any other order, give 1 point for each.

54. (10 points) Give 0.25 point for each 2 correct boxes filled

	bTC	bTc	btC	btc	bTC	bTc	btC	btc
Btc	BbTtCc	BbTtcc	BbttCc	Bbttcc	BbTtCc	BbTtcc	BbttCc	Bbttcc
Btc	BbTtCc	BbTtcc	BbttCc	Bbttcc	BbTtCc	BbTtcc	BbttCc	Bbttcc
Btc	BbTtCc	BbTtcc	BbttCc	Bbttcc	BbTtCc	BbTtcc	BbttCc	Bbttcc
Btc	BbTtCc	BbTtcc	BbttCc	Bbttcc	BbTtCc	BbTtcc	BbttCc	Bbttcc
btc	bbTtCc	bbTtcc	bbttCc	bbttcc	bbTtCc	bbTtcc	bbttCc	bbttcc
btc	bbTtCc	bbTtcc	bbttCc	bbttcc	bbTtCc	bbTtcc	bbttCc	bbttcc
btc	bbTtCc	bbTtcc	bbttCc	bbttcc	bbTtCc	bbTtcc	bbttCc	bbttcc
btc	bbTtCc	bbTtcc	bbttCc	bbttcc	bbTtCc	bbTtcc	bbttCc	bbttcc

Do not accept with person G on the side and person H on top. Do not accept another order of alleles. Do not accept if recessive alleles are listed before dominant alleles. However, if the list of (bTC, bTc, btC, btc, bTC, bTc, btC, btc) or (Btc, Btc, Btc, Btc, btc, btc, btc, btc) are out of order, and the cross is done correctly do not take off points.

55. (2 points) 25% or 1/4
56. (2 points) They all have an equal probability (or they list all of the phenotypes)