UT-Austin Regional Tournament

Heredity
Division B

Team Number__

School Name _____

Name _____

Name _____

1. In one strand of DNA the nucleotide sequence is 5'-ATGC-3'. The sequence of the other strand must be
A. 5'-CGTA-3'
B. 3'-ATGC-5'
C. 5'-TACG-3'
D. 5'-ATCG-3'
E. 3'-TACG-5'

2. The base pairing that holds the two strands together utilizes only two types of base pairs. Those two types of base pairs are (Note: each hydrogen bond is indicated by a horizontal line.)
A. A=T and G≡C
B. A≡T and G=C
C. A≡G and T=C
D. A=C and G≡T
E. A≡C and G=T

3. The “backbone” of a DNA molecule is made of
A. phosphate groups
B. nitrogenous bases.
C. alternating sugars and phosphate groups.
D. purines.
E. pyrimidines.

4. The members of a homologous pair of chromosomes
A. are identical in size and appearance.
B. contain identical genetic information.
C. separate to opposite poles of the cell during mitosis.
D. are found only in haploid cells.
E. are present only after the S phase.

5. When dividing cells are examined under a light microscope, chromosomes first become visible during
A. interphase.
B. telophase.
C. prophase.
D. metaphase.
E. prometaphase (late prophase).

6. In cells that have completed DNA synthesis and will undergo mitosis, the centrosome will be duplicated during
A. interphase.
B. telophase.
C. prophase.
D. metaphase.
E. prometaphase (late prophase).

7. In cells undergoing mitosis, the nuclear membrane reforms during
A. interphase.
B. telophase.
C. prophase.
D. metaphase.
E. prometaphase (late prophase).

8. During meiosis, the sister chromatids separate during
A. anaphase II.
B. anaphase I.
C. the S phase.
D. metaphase I.
E. telophase II.

9. The principle difference between mitosis and meiosis I is that
A. homologous chromosome pairs synapse during mitosis but not meiosis.
B. chromosomes do not replicate in the interphase preceding meiosis.
C. homologous chromosome pairs synapse during meiosis but not mitosis.
D. spindles composed of microtubules are not required during meiosis.
E. sister chromatids separate during meiosis but not mitosis.

10. Which feature of the Watson–Crick model of DNA structure explains its ability to function in replication and gene expression?
A. Each strand contains all the information present in the double helix.
B. DNA and RNA are structurally and functionally similar.
C. The double helix is right-handed and not left-handed.
D. DNA replication does not require enzymes.
E. Bases are exposed in the major groove of the double helix.

11. Crossing spherical-seeded pea plants with wrinkled-seeded pea plants resulted in progeny that all had spherical seeds. This indicates that the wrinkled-seed trait is
A) codominant.
B) dominant.
C) recessive.
D) Both a and b
E) Both a and c

12. The physical appearance of a character is called
A) the genotype.
B) the phenotype.
C) an allele.
D) a trait.
E) a gene.

13. The different forms of a gene, that correspond to different DNA sequences, are called
A) traits.
B) phenotypes.
C) genotypes.
D) alleles.
E) None of the above

14. A pea plant with red flowers is test crossed, and one-half of the resulting progeny have red flowers, while the other half
have white flowers. You know that the genotype of the test-crossed parent was
A) RR.
B) Rr.
C) rr.
D) either RR or Rr.
E) This cannot be answered without more information.

15. Classical albinism results from a recessive allele. Which of the following is the expected ratio for the progeny when a
normally pigmented male with an albino father has children with an albino woman?
A) 3/4 normal; 1/4 albino
B) 3/4 albino; 1/4 normal
C) 1/2 normal; 1/2 albino
D) All normal
E) All albino

16. In *Drosophila*, white eyes is a recessive, sex-linked trait. If a white-eyed female fruit fly is mated to a red-eyed male, their offspring should be
A. 50% red-eyed, 50% white-eyed for both sexes.
B. all red-eyed for both sexes.
C. all white-eyed males, all red-eyed females.
D. all white-eyed females, all red-eyed males.
E. 50% red-eyed males, 50% white-eyed males, all red-eyed females.

17. Cleft chin is an X-linked dominant trait. A man with a cleft chin marries a woman with a round chin. What proportion of their female progeny will show the trait?
A. 0%
B. 25%
C. 50%
D. 75%
E. 100%

Problems 18-20: Some mice and horses have patchy spots of pigment. This is called piebald spotting, and is caused by a single autosomal gene. Solid color is dominant to piebald. The dominant allele is called "P" and the recessive allele is called "p"

18. What would be the genotype of a true breeding solid colored mouse?
A. PP
B. Pp
C. pp
D. PP or Pp

19. If you cross a true breeding piebald mouse, to a true breeding solid colored mouse what percentage of the offspring will be piebald?
A. 0%
B. 25%
C. 75%
D. 100%

20. If you mate brothers and sisters from the cross in problem 14 to each other, what percentage of their offspring (on average) will be solid colored?
A. 0%
B. 25%
C. 75%
D. 100%

21. In *Drosophila*, white eyes is a recessive, sex-linked trait. If a white-eyed female fruit fly is mated to a red-eyed male, their offspring should be
A. 50% red-eyed, 50% white-eyed for both sexes.
B. all red-eyed for both sexes.
C. all white-eyed males, all red-eyed females.
D. all white-eyed females, all red-eyed males.
E. 50% red-eyed males, 50% white-eyed males, all red-eyed females.

22. Which of the following karyotypes would be a phenotypically normal male in humans?
A. XO
B. XX
C. XY
D. XXY
E. XXX

23. Diploid cells of the fruit fly Drosophila have 10 chromosomes. How many chromosomes does a Drosophila gamete have?
A. 1
B. 2
C. 5
D. 10
E. 20

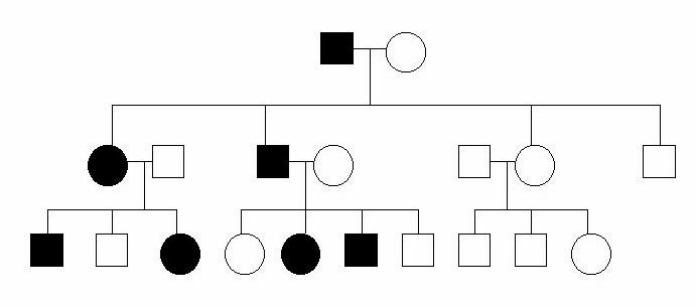
24. In Andalusian fowl, one gene controls feather color. If you cross black fowl to blue fowl you get equal numbers of black and blue fowl. If you cross blue fowl to white fowl you get equal numbers of blue and white fowl. If you cross black and white fowl you get all blue fowl. This is an example of
A. codominance
B. simple dominance
C. incomplete dominance
D. epistasis

25. You cross two true breeding varieties of Snapdragon. One variety has blue flowers, the other has red flowers. The F1 progeny have purple flowers. When the F1 plants are allowed to self-fertilize, they produce F2 plants with purple, red, and blue flowers in a 2:1:1 ratio. This is an example of
A. codominance
B. simple dominance
C. incomplete dominance
D. epistasis

26. In a plant, one protein encoding genes have an effect on flower color. In plants that are homozygous for the dominant allele or heterozygous for gene A flowers are red, while homozygotes for the recessive allele are white. In plants homozygous for the dominant allele in gene B flowers are red, and homozygotes for the recessive allele are white, but heterozygotes in gene B are pink. Explain at the level of why the proteins that code for the dominant alleles of these two genes effect the flower color differently.

27. In humans, what determines if a person is female? Limit your answer to 10 words or less.

28. In the accompanying pedigree, what is the most likely mode of inheritance? Limit your answers to the following list: autosomal dominant, autosomal recessive, maternal, X-linked dominant, X-linked recessive.



29. In the accompanying pedigree, what is the most likely mode of inheritance? Limit your answers to the following list: autosomal dominant, autosomal recessive, maternal, X-linked dominant, X-linked recessive.