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LIFE SCIENCES

Topic: Practice Test, genetics objects

Date:

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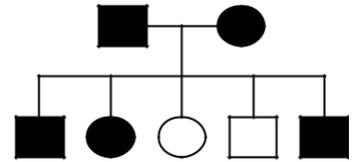
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Question 1

Genetics Practice Multiple Choice Questions

The first three questions are based on the pedigree to the right:



- The characteristic indicated by the blackened figures is probably:
 - Dominant.
 - Recessive.
 - Non-dominant.
 - Sex-linked recessive.
- What are the genotypes of the parents?
 - Both are homozygous dominant.
 - Both are heterozygous dominant.
 - Both are homozygous recessive.
 - The male is homozygous dominant; the female is homozygous recessive.
- If one parent has type A blood and the other parent has type B blood, what blood type will the offspring denoted by the white square and circle have?
 - Type A.
 - Type B.
 - Type AB.
 - Type O.
- Meiotic cell division results in four cells that have:
 - n chromosomes and are genetically identical.
 - n chromosomes and are genetically different.
 - $2n$ chromosomes and are genetically identical.
 - $2n$ chromosomes and are genetically different.
- In mouse, if the diploid number of chromosomes is 48, how many chromosomes will be found in a sperm?
 - 96.
 - 48.
 - 24.
 - 12.
- The four cells produced in meiosis will have a:
 - $2n$ number of chromosomes and will differ genetically from each other.
 - $2n$ number of chromosomes and will be genetically identical to each other.
 - n number of chromosomes and will be genetically identical to each other.
 - n number of chromosomes and will differ genetically from each other.
- In the F_1 generation of a monohybrid cross, the phenotypic ratio would be:
 - 3:1
 - 1:2:1
 - 2:1:1
 - 1:1:2



8. Hemophilia is a sex-linked recessive trait in humans. If a father and a son are both hemophiliacs, but the mother is normal, her genotype must be:
- X^hX^h
 - X^HX^h
 - X^HX^H
 - X^hY
9. Mitosis involves separation of only sister chromatids while meiosis involves?
- Also separation of only sister chromatids.
 - Separation of only homologous chromosomes.
 - Separation of homologous chromosomes as well as sister chromatids.
 - Separation of sister chromatids twice.
10. The cytoplasm of an animal cell is divided to form two cells. This process is called
- cleavage
 - cell plating.
 - cytokinesis.
 - karyokinesis
11. The step of meiosis in which chromosomes line up along the equator of the cell is called:
- Prophase.
 - Metaphase.
 - Anaphase.
 - Telophase.
12. An example of alleles is:
- AB and Tt.
 - TT and Tt.
 - T and t.
 - X and Y.
13. An example of a genotype is:
- A tall pea plant.
 - R and r.
 - TtHH.
 - Hemophiliac.
14. Which of the following gives information about the phenotype but not the genotype?
- X^HY .
 - Hemophiliac man.
 - Tall pea plant.
 - Female carrier for colour-blindness.
15. Which blood type would not be possible for children of a type AB mother and a type A father?
- O.
 - A.
 - B.
 - AB.
16. Long radishes crossed with round radishes result in all oval radishes. This type of inheritance is:
- Multiple alleles.



- b. Complete dominance.
 - c. Co-dominance.
 - d. Incomplete dominance.
17. If two white sheep produce a black offspring, the parent's genotypes for colour must be:
- a. Heterozygous.
 - b. Homozygous white.
 - c. Homozygous black.
 - d. Not enough information was given.
18. An extra finger in humans is rare but is due to a dominant gene. When one parent is normal and the other parent has an extra finger but is heterozygous for the trait, what is the probability that the first child will be normal?
- a. 0%.
 - b. 25%.
 - c. 50%.
 - d. 75%.
19. In drosophila (fruit flies), eye colour is sex-linked and red eye colour is dominant to white eye colour. Which of the following are not possible in a cross between a red-eyed male and a heterozygous female?
- a. Red-eyed male.
 - b. White-eyed male.
 - c. Carrier female.
 - d. Homozygous white-eyed female.
20. Which statement concerning a pair of alleles for a gene controlling a single characteristic in humans is true?
- a. Both genes come from the father.
 - b. Both genes come from the mother.
 - c. One gene comes from the mother and one gene comes from the father.
 - d. The genes come randomly in pairs from either the mother or father.
21. Which of the following factors could lead to variations in the offspring of asexually reproducing organisms?
- a. Crossing over.
 - b. Fertilization.
 - c. Mutations.
 - d. Independent assortment.
22. Genetic traits of seeds are noted as follows:
- L = long, l = short
 - W = wrinkled, w = smooth
 - Y = yellow, y = white
 - R = ribbed, r = grooved
- Which of the following is the genotype for a short, wrinkled, yellow, grooved seed?
- a. llWwyyrr
 - b. LLWWyYRr
 - c. LlWwYYRr
 - d. llWwYYrr
23. Mendel discovered principles of inheritance because he:



- a. Observed simultaneously all of the many characteristics in which the parents differed.
- b. Believed that the hereditary characteristics of two individuals became thoroughly blended in the offspring.
- c. Ignored all characteristics except a few markedly contrasting ones in which he studied.
- d. Studied only the offspring obtained from a single mating.

For the next three questions, use the following key to indicate how many different kinds of gametes (with respect to the traits listed) could be produced by each of the individuals described.

KEY: a = 1, b = 2, c = 4, d = 8

24. An individual with the genotype BBFF.
25. An individual with the genotype ddffMm.
26. An individual with the genotype BbffMm.
27. Carriers of the colour-blindness trait include:
 - a. Men who are heterozygous for the trait.
 - b. Men who are homozygous for the trait.
 - c. Women who are heterozygous for the trait.
 - d. Women who are homozygous for the trait.
28. Normal human eggs have:
 - a. 22 autosomes and an X chromosome.
 - b. 22 autosomes and a Y chromosome.
 - c. 23 autosomes.
 - d. 46 chromosomes.

29. A strand of DNA with the sequence A A C T T G will have a complimentary strand with the following sequence:
 - a. CCAGGT
 - b. AACTTG
 - c. TTCAAG
 - d. TTGAAC

30. A pedigree chart shows:
 - a. The genotypic ratios of the offspring.
 - b. The types of gametes produced by the parents.
 - c. The pattern of inheritance of a specific gene.
 - d. Which genes are co-dominant.
 - e. The genotypes of any parents.

For the next four questions, use the following key:

- KEY: a = All the offspring will exhibit the dominant trait.
b = All the offspring will exhibit the recessive trait.
c = The recessive trait will show up in about 50% of the offspring.
d = The dominant trait will show up in about 75% of the offspring.

What will be the result if:

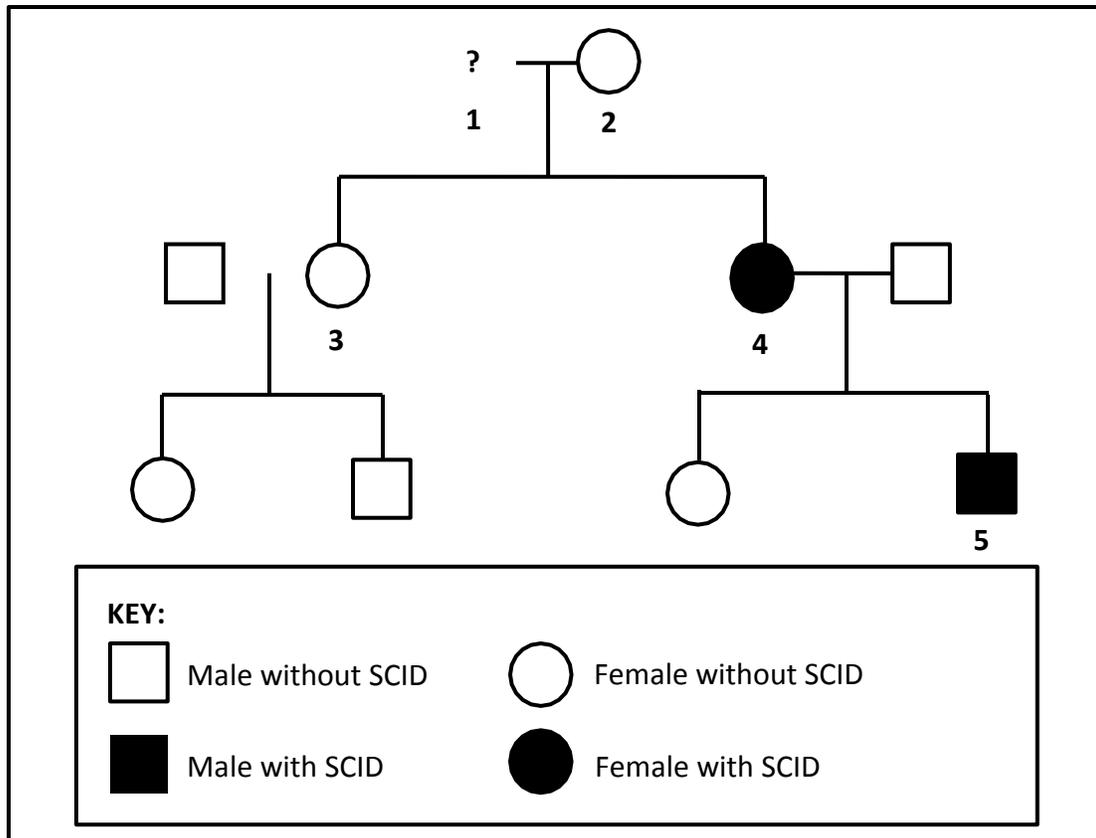
31. Bb mates with bb?
32. BB mates with bb?
33. bb mates with bb?
34. Bb mates with Bb?



SECTION B

- 2.2 Severe combined immune deficiency syndrome (SCID) is a disorder affecting the immune system. It is caused by a sex-linked recessive allele (X^d).

The diagram below shows the inheritance of the disorder in a family. It is not known if individual 1 has the disorder or not.



2.2.1 Give the:

- (a) Phenotype of individual 2 (1)
- (b) Phenotype of individual 1 (1)
- (c) Genotype of individual 3 (2)

2.2.2 Explain how individual 5 inherited the disorder. (2)

(6)

- 2.3 In certain marine invertebrates the colour of the shell is under the control of one gene with three alleles. In different combinations,



the three alleles produce four phenotypes: orange, yellow, orange-yellow and black.

The table below shows the results of the offspring produced from crosses involving parents of different phenotypes.

CROSS	PHENOTYPES OF SHELLS	
	PARENTS	OFFSPRING
1	Yellow x yellow	27 yellow: 9 black
2	Black x black	All black
3	Orange x orange	30 orange: 10 black
4	Orange x yellow	All orange-yellow

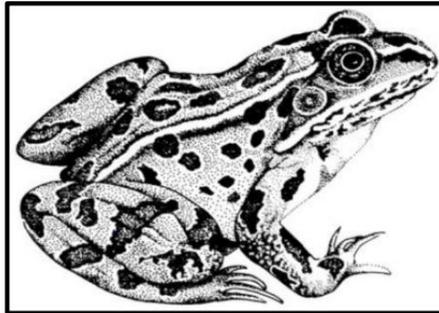
2.3.1 Name and describe the type of dominance shown by cross 4. (3)

2.3.2 Which shell colour is controlled by the recessive allele? (1)

2.3.3 Use information in the table to support your answer to QUESTION 2.3.2. (2)
(6)

2.4 The back of the leopard frog (*Rana pipiens*) can be spotted, as shown below, or be without spots.

Spotted frogs were allowed to interbreed and they produced 150 spotted offspring and 50 offspring without spots.



2.4.1 Which phenotype is dominant? (1)

2.4.2 Explain your answer to QUESTION 2.4.1. (2)

2.4.3 A frog that is heterozygous for spotted back was crossed with a frog without spots.

Using the letters D and d, represent a genetic cross to show the expected genotypes and phenotypes of the F1 generation.



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