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QUESTION 1

In a certain genetically stable population, the frequency of a recessive allele (for a trait with two alleles) is

0.6. What is the frequency of individuals expressing the dominant trait?

A. 0.64

B. 0.36

C. 0.24

D. 0.16

Correct Answer: A

The question stem asks you to determine the frequency of individuals expressing the dominant trait in a genetically stable population. However, before you do that, you need to determine the allelic frequencies in the population. This question involves a practical application of the Hardy-Weinberg equation. The Hardy-Weinberg equilibrium states that within a genetically stable population, the gene frequencies of dominant and recessive alleles will not change over time. Two mathematical expressions are associated with the Hardy-Weinberg equilibrium. The first relationship, p + q = 1, describes the relative allelic frequencies in a population. p is defined as the frequency of the dominant allele and q is defined as the frequency of the recessive allele, and the sum of both those frequencies adds up to 1, or 100%. The second relationship, p2

+ 2pq+ q2 = 1, describes the relative genotypic frequencies in the population. p2 represents homozygous, or dominant pp genotypes; q2 represents homozygous, or frequency of the dominant allele, p, by the mathematical relationship p + q = 1. Therefore, the frequency of p is 0.4 because 0.6 + 0.4 = 1. Next, you need to determine the frequency of individuals expressing the dominant trait by recessive qq genotypes; and 2pq represents the frequency of heterozygotes, or hybrids.applying the second relationship, p2 + 2pq+ q2 = 1. The individuals expressing the dominant trait are those that have the pp and pq genotypes, so to find the total frequency of individuals expressing the dominant trait, you add p2 and 2pq. Thus, p2 = 0.4 ? 0.4, or 0.16 and 2pq = 2 ?0.6 ?0.4, or 0.48. If you add the two together, you get 0.16 + 0.48, or 0.64. Thus,

0.64 is the correct frequency of individuals expressing the dominant trait.

QUESTION 2

What results in extra or fewer chromosomes in a cell?

A. nondisjunction

B. double replication

C. double cytokinesis

D. epistasis

Correct Answer: A

Nondisjunction is when chromosomes do NOT separate during anaphase. Consequently, the resulting cells display an unequal sharing of chromosomes, with some cells having too many, and others having too few.

QUESTION 3

For most Americans, the words "Alzheimer\\'s disease" (AD) ?often mispronounced purposefully or accidentally as "old timers\\' disease" ?signify devastating memory loss and stigma. The information about AD ?often learned solely through the media ?may lead individuals to believe that AD is inevitable (it isn\\'t), and possibly think that all AD patients receive poor care (there are many remarkably good AD units). Many individuals may envision a future burdened with more dementia patients and fewer societal resources to help support them (a real possibility). In general, pharmacists are well aware of what AD is and isn\\'t. AD is complex and relentlessly progressive; it affects patients, loved ones, and caregivers adversely. Pharmacists can provide pertinent information about AD\\'s myths, realities, and available symptomatic treatments. AD\\'s harbinger is language difficulties, which include aphasia (language disturbance), apraxia (inability to carry out motor functions), and agnosia (failure to recognize or identify objects). Consequently, those with AD will often create new words for items. They may call a pencil a "list writer," or a key a "door turner." Clinicians stage AD as mild, moderate, or severe depending on the patient\\'s cognitive and memory impairment, communication problems, personality changes, behavior, and loss of control of bodily functions. People often dismiss mild AD as normal cognitive decline or senility ?in other words, "normal" aging. For this reason, most people don\\'t seek treatment and are diagnosed in the late-mild to early-moderate stage. In the severe stage, difficulty swallowing elevates the risk of aspiration pneumonia, which often marks the beginning of the downward spiral that ultimately ends with death; AD has no cure. A handful of pharmacologic treatments ?acetylcholinesterase inhibitors and N-methyl-D-aspartate antagonists ?alter the decline trajectory. These treatments slow disease progression, enhance cognitive function, delay cognitive decline, and decrease disruptive behaviors. Not all patients respond to these medications, but experts generally believe that those who do will show mild to moderate improvements for 6 months to a year. Although the drugs\\' effects are short-lived, they improve patients\\' quality of life and briefly enable independence. Determining when medications stop providing a therapeutic benefit and should be discontinued is challenging. Clinicians use various methods to monitor decline, including mental status tools, patient self-report, and loved ones\\' observations. Most clinicians continue drug treatment if the patient seems to tolerate the medication well, can afford it, and if there seems to be a benefit. With disease progression, specific behavioral symptoms including depression, agitation, hallucinations, and sleep disturbances become concerns. Antianxiety drugs, antipsychotics, and antidepressants are sometimes used to alleviate symptoms, but effective behavioral strategies are much preferred.

Acetylcholinesterase inhibitors and N-methyl-D-aspartate antagonists can do which of the following to help AD patients?

A. monitor progression

B. decrease disruptive behavior

C. stop disease progression

D. delay cognitive function

Correct Answer: B

The passage states, "A handful of pharmacologic treatments ?acetylcholinesterase inhibitors and Nmethyl-D-aspartate antagonists ?alter the decline trajectory. These treatments slow disease progression, enhance cognitive function, delay cognitive decline, and decrease disruptive behaviors."

QUESTION 4

Which of the following is found to be different in isotopes of the same chemical element?

A. Protons

B. Neutrons

C. Electrons

D. Atomic number

Correct Answer: B

Isotopes are defined as forms of the same chemical element that differ only by the number of neutrons in their nucleus. Most elements have more than one naturally occurring isotope. The atomic number "Z" is the same in such elements, however their atomic mass "A" is different due to differ numbers of neutrons in the nucleus of the atom.

QUESTION 5

Which of the following is necessary for the penetration of an egg?

A. the flagellum

B. mitochondria

C. acrosome

D. centriole

Correct Answer: C

In order to penetrate an egg, a spermatozoon must bind with the exterior of the egg. This binding takes place by way of the acrosome reaction, in which the sperm penetrates the jelly coat of the egg to breach and fuse with the egg plasma membrane before releasing its constituents into the eggs cytoplasm.