**Evolution and Heredity Pre-Test Practice**

**1. For each of the following statements indicate whether it is true or false:**

 **A. Mutations always lead to improvements in a species**

 **B. Individuals with a beneficial trait always produce more offspring**

 **C. Individuals with a beneficial trait are more likely to produce more offspring**

 **D. Sexual reproduction is advantageous to evolution because it is much quicker than asexual reproduction**

 **E. Acquired traits can be passed on through sexual reproduction**

 **F. Sexual reproduction leads to a greater variation in genetic makeup of a population**

 **G. Greater genetic variance generally increases the odds of survival of a species when the environment changes**

 **H. Evolution is driven forward by competition for niches**

 **I. Evolution guarantees that humans will never go extinct**

**2. The example of the experimental breeding Russian foxes by Dmitry K. Belyaev showed which of the following:**

 **A. Only traits that make an animal more friendly to humans can be passed on to the next generation.**

 **B. Evolution is only possible with human assistance (artificial selection)**

 **C. Foxes are not related to wolves in any way.**

 **D. Selecting certain traits may have unexpected effects to other, seemingly unrelated, traits.**

 **E. Selective breeding always creates improvements within a species.**

**3. In your own words describe *evolution by natural selection*. Don’t just say change over time, be specific. How does it occur, what pressures drive it forward, why is it so slow?**

**4. What is the difference between a scientific Law and a scientific Theory?**

**5. Consider a species of rabbitt in which the colour of the nose is controlled by a single gene with two alleles. The alleles are:**

**P: Pink Nose**

**p: black Nose**

 **A. What is the phenotype of a PP individual?**

 **B. What is the phenotype of a Pp individual?**

 **C. What is the phenotype of a pp individual?**

 **D. List all possible genotypes for an individual with a black nose.**

 **E. List all possible genotypes for an individual with a pink nose.**

**F. Draw a Punnett square showing a cross between two Pp rabbits. Beneath each offspring, within the Punnet square, write the phenotype.**

**G. What is the probability of each of the following in the offspring?**

**Pink Nose \_\_\_\_\_ % Pp \_\_\_\_\_ % Black Nose \_\_\_\_\_ % pp \_\_\_\_\_ % PP \_\_\_\_\_ %**

 **H. Draw a punnet square for the cross of a heterozygous pinknose male with a black nose female.**

**6. Consider a type of plant that has two possible phenotypes for stem shape, straight and curly. When purebred straight stems are crossed with purebred curly stems, 100% of the offspring have curly stems.**

 **A. Show the Punnett square that illustrates this cross.**

 **B. Draw a Punnet square showing the result if two of the offspring from the first cross are bred.**

 **C. Write the percentage of theses F2 generation plants that have straight stems.**

 **D. What percentage of the F2 generation are homozygous?**

**7. In a certain type of hamster all individuals have either round ears or pointed ears. When pure breeding round eared hamsters are crossed with pure breeding pointed ear hamsters, 100% of the offspring have pointed ears.**

**A. Clearly define the alleles for pointed ears and round ears:**

**B. Draw a Punnett square showing the cross of a hamster that is heterozygous pointed eared with a round ear hamster. Clearly label on the Punnett square which parent has round ears and which parent has pointed ears.**

**8. In a certain breed of cow there are three possible phenotypes. Black, white or white with black spots. When black cows are bred with black cows 100% of offspring are black. When white are bred with white 100% white. When white with black spots are crossed with white with black spots 25% of offspring are black, 25% of offspring are white and 50% of offspring are white with black spots.**

 **A. Clearly define the TWO ALLELES that control colour in cows.**

 **B. Draw the Punnett square showing the cross of two white with black spots cows.**

**9. Imagine a situation in which a type of plant has three distinct flower colours: Red, Yellow and Purple. The following THREE alleles exist:**

 **FR: Red flowers**

 **fY: yellow flowers**

 **fp: purple flowers.**

**Complete the following list of genotypes and phenotypes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Genotype** | **FRFR** | **FRfY** | **FRfp** | **fYfY** | **fYfp** | **fpfp** |
| **Phenotype** | **Red** |  |  |  | **Yellow** |  |

**A. Draw a Punnett square showing the cross of an FRfY with an fYfp individual. State the phenotype of each offspring.**

**B. Draw a cross in which a red flower crosses with a yellow flower to produce a purple flower.**

**10. Consider a tri-hybrid cross between two AaBbCc individuals.**

 **A. What are the odds of the offspring having the following genotypes?**

 **i. AABbCc**

 **ii. AaBbCc**

 **iii. aabbcc**

 **B. How many unique germ cells can be produced by each parent?**

**Evolution and Heredity Pre-Test Practice**

**1. For each of the following statements indicate whether it is true or false:**

**F A. Mutations always lead to improvements in a species**

**F B. Individuals with a beneficial trait always produce more offspring**

**T C. Individuals with a beneficial trait are more likely to produce more offspring**

**F D. Sexual reproduction is advantageous to evolution because it is much quicker than asexual reproduction**

**F E. Acquired traits can be passed on through sexual reproduction**

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 **C. Foxes are not related to wolves in any way.**

 **D. Selecting certain traits may have unexpected effects to other, seemingly unrelated, traits.**

 **E. Selective breeding always creates improvements within a species.**

**3. In your own words describe *evolution by natural selection*. Don’t just say change over time, be specific. How does it occur, what pressures drive it forward, why is it so slow? All populations have natural variation. All populations produce more individuals than can be supported by the available resources. This leads to competition within the species (INTRASPECIES competition). Individuals with beneficial traits are more likely to pass on their traits to the next generation, while harmful traits will be passed on less often. Thus over time the beneficial traits become more common. Over enough time the species can evolve into entirely new forms.**

**4. What is the difference between a scientific Law and a scientific Theory?A scientific law describes WHAT happens without any attempt to explain why. A scientific theory explains WHY and HOW something happens; theories provide a mechanism. Both are verified by evidence, experiment, peer review. Both can be changed or discarded depending on new evidence.**

**5. Consider a species of rabbit in which the colour of the nose is controlled by a single gene with two alleles. The alleles are:**

**P: Pink Nose**

**p: black Nose**

 **A. What is the phenotype of a PP individual? Pink nose**

 **B. What is the phenotype of a Pp individual? Pink nose**

 **C. What is the phenotype of a pp individual? Black nose**

 **D. List all possible genotypes for an individual with a black nose. pp**

 **E. List all possible genotypes for an individual with a pink nose. PP, Pp**

**F. Draw a Punnett square showing a cross between two Pp rabbits. Beneath each offspring, within the Punnet square, write the phenotype.**

|  |  |  |
| --- | --- | --- |
|  | **P** | **p** |
| **P** | **PP****pink** | **Pp****pink** |
| **p** | **Pp****pink** | **pp****black** |

**G. What is the probability of each of the following in the offspring?**

**Pink Nose 75% Pp 50% Black Nose 25% pp 25% PP 25%**

**H. Draw a punnet square for the cross of a heterozygous pinknose male with a black nose female.**

 **Male**

Female

|  |  |  |
| --- | --- | --- |
|  | **P** | **p** |
| **p** | **Pp****pink** | **pp****pink** |
| **p** | **Pp****pink** | **pp****black** |

**6. Consider a type of plant that has two possible phenotypes for stem shape, straight and curly. When purebred straight stems are crossed with purebred curly stems, 100% of the offspring have curly stems.**

 **A. Show the Punnett square that illustrates this cross.**

|  |  |  |
| --- | --- | --- |
|  | **C** | **C** |
| **c** | **Cc****curly** | **Cc****curly** |
| **c** | **Cc****curly** | **Cc****curly** |

 **B. Draw a Punnet square showing the result if two of the offspring from the first cross are bred.**

|  |  |  |
| --- | --- | --- |
|  | **C** | **c** |
| **C** | **CC****curly** | **Cc****curly** |
| **c** | **Cc****curly** | **cc****straight** |

 **C. Write the percentage of theses F2 generation plants that have straight stems. 25%**

 **D. What percentage of the F2 generation are homozygous? 50%**

**7. In a certain type of hamster all individuals have either round ears or pointed ears. When pure breeding round eared hamsters are crossed with pure breeding pointed ear hamsters, 100% of the offspring have pointed ears.**

**A. Clearly define the alleles for pointed ears and round ears: P: pointed Ears**

 **p: round ears**

**B. Draw a Punnett square showing the cross of a hamster that is heterozygous pointed eared with a round ear hamster. Clearly label on the Punnett square which parent has round ears and which parent has pointed ears.**

 **Pointed Ears**

Round Ears

|  |  |  |
| --- | --- | --- |
|  | **P** | **p** |
| **p** | **Pp****pointed** | **pp****pointed** |
| **p** | **Pp****pointed** | **pp****round** |

**8. In a certain breed of cow there are three possible phenotypes. Black, white or white with black spots. When black cows are bred with black cows 100% of offspring are black. When white are bred with white 100% white. When white with black spots are crossed with white with black spots 25% of offspring are black, 25% of offspring are white and 50% of offspring are white with black spots.**

 **A. Clearly define the TWO ALLELES that control colour in cows.**

 **W: White B: Black**

 **B. Draw the Punnett square showing the cross of two white with black spots cows.**

|  |  |  |
| --- | --- | --- |
|  | **W** | **B** |
| **W** | **WW** | **WB** |
| **B** | **WB** | **BB** |

**9. Imagine a situation in which a type of plant has three distinct flower colours: Red, Yellow and Purple. The following THREE alleles exist:**

 **FR: Red flowers**

 **fY: yellow flowers**

 **fp: purple flowers.**

**Complete the following list of genotypes and phenotypes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Genotype** | **FRFR** | **FRfY** | **FRfp** | **fYfY** | **fYfp** | **fpfp** |
| **Phenotype** | **Red** | **Red** | **Red** | **Yellow** | **Yellow** | **Purple** |

**A. Draw a Punnett square showing the cross of an FRfY with an fYfp individual. State the phenotype of each offspring.**

|  |  |  |
| --- | --- | --- |
|  | **FR** | **fY** |
| **fY** | **FRfY****red** | **fYfY****yellow** |
| **fp** | **FRfp****red** | **fYfp****yellow** |

**B. Draw a cross in which a red flower crosses with a yellow flower to produce a purple flower.**

|  |  |  |
| --- | --- | --- |
|  | **FR** | **fp** |
| **fY** | **FRfY****red** | **fYfp****yellow** |
| **fp** | **FRfp****red** | **fpfp****purple** |

**10. Consider a tri-hybrid cross between two AaBbCc individuals.**

 **A. What are the odds of the offspring having the following genotypes?**

 **i. AABbCc** $\frac{1}{4}×\frac{2}{4}×\frac{2}{4}=\frac{4}{64}$

 **ii. AaBbCc** $\frac{2}{4}×\frac{2}{4}×\frac{2}{4}=\frac{8}{64}$

 **iii. aabbcc** $\frac{1}{4}×\frac{1}{4}×\frac{1}{4}=\frac{1}{64}$

 **B. How many unique germ cells can be produced by each parent?**

**23 = 8 (ABC, ABc, AbC, Abc, aBC, aBc, abC, abc)**