

Important Questions on Evolution & Behaviour



1. Scientists consider the horse and donkey to be different species, but when individuals of these two species mate they produce a strong offspring called a mule. According to the biological species concept, should scientists reclassify the horse and donkey as belonging to the same species?
 - A. Yes, horses and donkeys must be considered one species if they can mate and produce an offspring
 - B. Yes, because horses and donkeys are morphologically similar
 - C. No, because the mule cannot breed with either horse or donkey
 - D. No, because this cross-mating is rare in nature

2. Which type of selection is seen in a peacock's tail?
 - A. Natural selection
 - B. Diversifying selection
 - C. Sexual selection
 - D. Group selection

3. In studies related to circadian rhythm, the following may be possible generalizations for the effectiveness of light entrainment to the day/night cycle:
 - i. Short exposures have a greater effect than long exposures
 - ii. Bright light exposures have a greater effect than dim light exposures
 - iii. Intermittent light sources have a greater effect than consistent exposures
 - iv. Dim light can affect entrainment relative to darknessFind the correct combination of statements
 - A. ii and iii
 - B. ii and iv
 - C. i, iii and iv
 - D. i, ii and iv

4. Certain indigenous tribes in the Amazon basin, tip the darts of their blowguns with poison derived from frogs. These frogs are often brilliantly colored and easy to spot in the forest. What is this an example of?
 - A. Batesian mimicry
 - B. Warning coloration
 - C. Mullerian mimicry
 - D. Cryptic coloration

5. There are two opposing views about origin of modern man. According to one view Homo erectus in Asia were the ancestors of modern man. A study of variation of DNA however suggested African origin of modern man. What kind of observation on DNA variation could suggest this?
 - A. Greater variation in Asia than in Africa
 - B. Greater variation in African than in Asia
 - C. Similar variation in Africa and Asia
 - D. Variation only in Asia and no variation in Africa

6. Although the seal and penguin both have the streamlined, fish-like bodies with a layer of insulating fat, they are not closely related. This similarity results from.
 - A. Homologous radiation
 - B. Convergent evolution
 - C. Adaptive radiation
 - D. Coevolution

7. Often the frequency of a particular deleterious allele is very different in neighbouring populations. For example, the frequency of the allele causing cystic fibrosis is 0.03 in Population P and 0.008 in Population Q. Such a difference in allele frequencies between two close populations is probably the result of?

- A. The occurrence of the founder effect in an earlier generation
 - B. More effective repair of DNA damage caused by mutation
 - C. Selective advantage of the allele in one population but not the other
 - D. Recurring migration between the population
8. Multigene families are groups of two or more identical or very similar genes. Which of the following statements about multigene families is correct?
- A. Globin gene families do not have pseudogenes, because globins are essential for oxygen transport.
 - B. Ribosomal RNA gene families in multicellular eukaryotes have many identical genes, because many ribosomes are required for active protein synthesis
 - C. Compared with multicellular eukaryotes, prokaryotes have many multigene families, because prokaryotes have to reproduce very quickly
 - D. The number of genes in a multigene family always increase by unequal crossing over
9. Which statement regarding demographic changes for the global human population during the last 6000 years is most likely to be correct?
- A. The value of the carrying capacity K has changed during the last 6000 years
 - B. The overall population trend for the past 6000 years has been exponential
 - C. Since about 1800 the overall global population has reached its carrying capacity
 - D. Prior to 1800, the intrinsic rate of natural increase (r) was much greater than 1
10. How does the occurrence of self-fertilization relative to cross-fertilization affect the fixation of an advantageous and recessive allele that newly appeared in a population by mutation?
- A. The allele will be fixed most quickly when the relative occurrence of self-fertilization is highest
 - B. The allele will be fixed most quickly when the relative occurrence of self-fertilization is lowest
 - C. The allele will be fixed most quickly when the relative occurrence of self-fertilization is moderate
 - D. The relative occurrence of self-fertilization does not affect the fixation of the allele

Answers

- | | | | | | |
|------|------|------|-------|------|------|
| 1. C | 2. C | 3. B | 4. B | 5. B | 6. B |
| 7. A | 8. B | 9. A | 10. A | | |

Solutions

Solution 1.

Horse and donkey cannot be reclassified as belonging to same species because the mule is sterile and it cannot interbreed with either horse or donkey.

Solution 2.

Brightly colored and large peacock's feathers serve as courtship signals which is due to sexual selection.

Solution 3.

The hormones cortisol and melatonin is affected by the signals light sends through the body's nervous system. Cortisol levels are high when the body is waking up and gradually decreases over the day. Melatonin levels are high when the body is entering a sleeping state. The length, intensity and wavelength of light exposure influences the entrainment. Longer exposures have a greater effect than intermittent exposure. Consistent light exposure has a greater effect than intermittent exposure. Brighter light is more effective than dim light. In humans, a lower intensity short wavelength (blue/violet) light appears to be equally effective as a high intensity white light.

Solution 4.

These frogs are brightly colored and avoided by the predators. Hence, this is a warning coloration which is also called as aposematic coloration. Cryptic coloration is just the opposite of aposematic coloration in which the prey species hinder the predator's ability to detect the prey. In Batesian mimicry the non-harmful species mimics the appearance of a harmful species to save itself from the predators. Mullerian mimicry occurs when two or more distasteful or poisonous organisms resemble each other.

Solution 5.

Increasing variations occur with larger populations. At the point of origin, population size would be small.

Solution 6.

Seals are mammals while penguins are birds. However, both evolved the same mechanism to survive in the same environment. This is an example of convergent evolution.

Solution 7.

Cystic fibrosis critically affects lungs, liver, pancreas etc. Hence, it cannot have a selective advantage in Population P and Q. Since it is an autosomal recessive genetic disease the chances of DNA repair in both the population is equal. Migration would cause disturbances in the percentage of people with the disease and not keep it constant. Hence, it is due to founder effect.

Solution 8.

Globins are basic proteins and are present in many forms. Eukaryotes have greater DNA number and a greater possibility for multi-genes. The increase in multigene family may or may not be due to unequal crossing over. Else they may not be identical as given in the population.

Solution 9.

Humans continually modify the environment. Hence, K changes. Population have risen and fallen in the last 6000 years due to war, famine, natural disasters etc. Since industrial revolution (1800s) population is exponentially increasing even today.

Solution 10.

Minimal variation and higher number of allele is required in an allele to ensure that it becomes part of the gene pool. Hence, self-fertilization should be high.



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