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Question: 1

A (n) _____ is a sequence of DNA forming a heredity unit, usually found in a specific place on a (n) _____. Its various versions are called_____.

- A. chromosome; allele; genes
- B. allele; gene; chromosomes
- C. zygote; chromosome; genes
- D. gene; chromosome; alleles

Answer: D

Explanation:

A gene is a hereditary unit composed of a sequence of DNA. It is normally found in a specific place on a chromosome, which is a structure found in the cells and composed of protein, DNA, and RNA. Chromosomes contain multiple genes and other sequences of nucleotides, including regulatory sequences that control gene expression. In a given population of a given species, many different versions of genes exist. These different versions of genes are called alleles. The particular alleles that an individual organism inherits from its parents influence the genetic traits expressed in that individual. A zygote (C) is a mother's ovum (egg) fertilized by a father's sperm. The zygote will develop into an embryo; the embryo will eventually develop into a fetus.

Question: 2

Among structural, functional, and behavioral adaptations, which of these is a functional adaptation?

- A. Frogs have green skin blending with plants.
- B. Sunflowers turn in the direction of the sun.
- C. Tigers have sharp teeth and claws for prey.
- D. Whales go without breathing during dives.

Answer: D

Explanation:

The fact that whales can go without breathing for long times, enabling them to make dives of long durations, is an example of functional adaptation. The bear's ability to survive without eating, drinking or eliminating during hibernation is another example, as is the camel's ability to go long times without water. Frogs' green skin, which camouflages them among green foliage (A), is an example of a structural adaptation, involving the size, shape, composition, or coloration of bodies or body parts. The sharp teeth and claws of tigers enabling them to catch and rip up prey (C) are also structural adaptations—as are their strong jaws and muscles and eyes that face forward. The fact that sunflowers turn toward the sun (B) and that plants in general grow in the direction of the sun

are examples of behavioral adaptations. So are birds' migration and nest building mating practices, and primates' use of tools, and so on.

Question: 3

In biological classification, which of the following orders the ranks of taxonomy in correctly from smallest to largest?

- A. Genus, Species, Order, Family, Phylum, Class, Domain, Kingdom
- B. Species, Genus, Family, Order, Class, Phylum, Kingdom, Domain
- C. Class, Order, Family, Genus, Species, Kingdom, Domain, Phylum
- D. Phylum, Genus, Species, Order, Domain, Kingdom, Class, Family

Answer: B

Explanation:

The smallest or least-inclusive taxonomic rank in biological classification is the species. For example, the domestic cat is the species *Felis catus*. The next rank up in the taxonomy is the genus; the genus of the cat is *Felis*, which also includes other small, wild cats. They belong to the family *Felidae*, which includes not only small domestic and wild cats but also big wild cats like lions and tigers. This family is part of the order *Carnivores*, which includes all meat-eating mammals like bears, pandas, dogs, wolves, foxes, weasels, badgers, otters, raccoons, skunks, seals, sea lions, walruses, and so on. The *Carnivores* order belongs to the class *Mammalian*, that is, mammals. This class is part of the phylum *Chordate*, that is, vertebrates. The *Chordate* phylum is part of the kingdom *Animalia*, that is, animals belonging to the domain *Eukaryote*, which are multicellular organisms whose cells have nuclei and organelles inside of membranes. (Eukaryotic organisms differ from prokaryotic organisms, whose cells do not have nuclei or organelles encased in membranes.)

Question: 4

Of the following factors affecting alleles in a gene pool, which occurs via change, not selection?

- A. Migration
- B. Mutations
- C. Speciation
- D. Genetic drift

Answer: D

Explanation:

Migration (A) is individuals moving among populations, enabling gene flow, which can alter both variety and frequency of alleles in a population. When individuals emigrate or leave a population, they can decrease in genetic diversity; when they immigrate or enter a population, they can increase in genetic diversity. Genetic mutations (B) produce new alleles in a gene pool when they happen during DNA replication for meiosis. Natural selection enables reproduction of

favorable and adaptive mutations, selecting against unfavorable mutations. In the same way, natural selection enables individuals possessing the fittest adaptations to survive and reproduce, passing their successful alleles to offspring. These alleles increase in the gene pool; unfavorable and unsuccessful alleles decrease. These changes in allele proportions and frequencies signify evolution. Over generations, populations changing enough from other populations in a species can become reproductively isolated, resulting in speciation (C); that is, the changed population becomes a new species. Genetic drift (D) is random change—including loss—of a gene pool's alleles, NOT from natural selection, usually in smaller populations or gene pools. It can speed up a species' evolution.

Question: 5

Which of the following correctly orders the layers of the Earth's atmosphere, from the closest to the Earth to the farthest away?

- A. Exosphere, mesosphere, thermosphere, stratosphere, troposphere
- B. Stratosphere, troposphere, exosphere, mesosphere, thermosphere
- C. Thermosphere, exosphere, stratosphere, mesosphere, troposphere
- D. Troposphere, stratosphere, mesosphere, thermosphere, exosphere

Answer: D

Explanation:

The five layers of Earth's atmosphere become progressively thinner with increasing distance from the surface of the Earth. The troposphere is the layer of the atmosphere closest to the Earth. Half of the Earth's atmosphere is in the troposphere, and it is where weather happens. The stratosphere is the second layer, where many jet airplanes fly for its stability; it contains the ozone layer, which absorbs damaging sun rays. The mesosphere is the third layer; this is where meteors and pieces of rock coming into the atmosphere from outer space burn up before they can reach the Earth. The fourth layer is the thermosphere; auroras, like the aurora borealis, occur here, and the space shuttle also orbits in the thermosphere. The farthest layer of atmosphere from the Earth is the exosphere, which is the end of the Earth's atmosphere. It is the thinnest layer and ultimately merges into space.

Question: 6

What is true about the Coriolis Effect?

- A. It changes from Northern to Southern Hemisphere.
- B. It can be seen with objects moving at any distance.
- C. It affects objects but not water, wind, or weather.
- D. It affects things on the Earth but not outside of it.

Answer: A

Explanation:

The Coriolis Effect, due to the Earth's rotation, makes moving objects appear to curve to the

right in the Northern Hemisphere but seem to swerve to the left in the Southern Hemisphere. It cannot be seen with objects moving at any distance (B); it is only observable if an object is moving over a long enough distance, for example, hundreds of miles at the least. It not only occurs with moving objects: it also affects winds and ocean currents and causes hurricanes to spin (C). In addition to things on the Earth, the Coriolis Effect also affects stars, other planets, and nebulae (D)—clouds of cool, diffuse gases and dust that can be both sources for new star formation and the residues of dying stars.

Question: 7

Which of these is accurate regarding temperature inversions?

- A. Temperature inversions at or near the ground occur most in summer.
- B. Long nights, calm winds, and clear skies promote surface inversions.
- C. Only temperature inversions in the sky affect the air quality indices.
- D. The topography of the Earth's surface has no effects on inversions.

Answer: B

Explanation:

Normally, the atmosphere becomes progressively cooler with increasing altitude. Sunlight warms the ground, warming the air just above it. Warm air rises and then cools. When warmer air occurs above cooler air, this is upside down from the normal conditions and hence called a temperature inversion. Inversions can be in the sky (aloft) or near the ground (surface). Surface inversions occur most in winter, not summer (A), because winter's longer nights enable greater ground cooling, causing lower surface temperatures. The longer the nights, the more time the ground has to cool; the calmer the winds, the less chance of wind mixing warmer air above to the ground; and the clearer the skies, the faster the surface cools. Surface inversions have more impact on the air quality index (C) because warmer air above traps air pollution from gas vehicle emissions and wood fires below, causing poor air quality. Topography does affect inversions (D): In mountain valleys, inversions are more likely to form.

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