0312 Practice Test

Passage 01

Mating Songs of Frogs

The calling or singing of frogs plays an important role in their reproduction-specifically, in helping individuals find and select mates. Sound has many advantages as a communication signal. When sounds are broadcast, the auditory receptors do not need to be in a particular orientation relative to the sound source in order to receive stimulation. Loud songs, particularly those made by choruses of frogs calling together, can travel long distances and thus attractdistant frogs. Sounds travel around large obstacles. These advantages are not found in the visual modality, where the receiver must be attentive and have its visual receptor orientated in the correct direction. Further, most frogs and toads breed at night, when light levels are low but sounds can be easily localized. We can conclude that auditory signals are used by frogs and toads because they can be effective over long distances at night.

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Male frogs do most of the courtship calling. Other male frogs can respond by adding their voices to form a calling chorus. Male frogs can also vocalize to each other as part of aggressive displays. Aggressive calls can be distinct from the advertisement calls used to attract females. Females can respond to male songs by moving toward the sound source or by selecting certain males as reproductive partners. In some species females also respond to males by calling: receptive pairs can even perform duets. Predators may also cue in on calling frogs as potential prey.

Frog songs contain several potentially important pieces of information about the calling male. First, sound amplitude can indicate the size of the individual that is Galling. Since many frogs exhibit indeterminate growth (i.e., they keep getting bigger as they get older), size is a good predictor of relative age. In many species, call amplitude is increased by specialized vocal sacs that can enlarge as the animal grows; thus, older frogs produce louder calls. The male` s age matters to the female because older frogs have successfully survived the environmental hazards that the offspring they sire will soon be facing. Amplitude can also convey information on how far away the calling frog is or, for choruses, how many frogs are calling together. An intensely vocalizing chorus may indicate a particularly favorable breeding site. Sound amplitude (subjectively: loudness) can be an ambiguous cue for a female, however. A very intense sound can indicate an old male at some distance or a younger male that is close. A close, small chorus could be confused with a louder chorus that is farther away.

Sound frequencies-or pitch-can also convey information about the calling male because the vocal apparatus grows larger as the frog grows older. In some frogs, the pitch of individual sounds varies with so that older and larger males give lower-pitched calls. Sound pitch is affected by temperature; small males can mimic the lower pitch of larger, older males by calling from colder locations. Finally, the length of time that an individual can afford to spend calling is a good indicator of his health. Many frogs invest considerable energy in calling, both because they do not feed and because it is a physically demanding behavior that relies on rapid muscular contractions of the vocalization apparatus. This effort can be debilitating in a male frog that is not in top physical condition. Calling in tree frogs is said to be the most energetically expensive behavior yet measured in any vertebrate.

Sound frequencies and the overall temporal pattern (rhythm and rate) of the song can also reveal the species of the calling male. The frequencies sounds and their temporal patterns are species- specific. The species of a potential mate is extremely important to the female. Females that choose to mate with members of another species risk losing the energy invest in eggs because the hybrid offspring will not survive and reproduce.

Thu complexity of a frog song can also affect how attractive it is to a female. The songs of male tungara frogs, for example, can consist simply of short high-frequency"whines" or by several lower-frequency "chucks." More females approach loudspeakers playing whines plus chucks than whines alone. The addition of chucks, however, also has the disadvantage of attracting bats that eat the frogs.

Passage 02

Consolidated Industry in the United States

Laws of incorporation passed in the United States in the 1830s and 1840s made it easier for business organizations to raise money by selling stock to members of the public. The ability to sell stock to a broader public made it possible for entrepreneurs to gather vast sums of capital and undertake large projects. This led to the emergence of modern corporations as a major force in the United States after 1865. These large, national business enterprises needed more systematic administrative structures. **As a result, corporate leaders introduced a set of managerial techniques that relied on systematic division of responsibilities, a carefully designed hierarchy of control, careful cost-accounting procedures, and perhaps above all a new breed of business executive: the middle manager, who formed a layer of command between workers and owners**. Efficient administrative capabilities helped make possible another major feature of the modern corporation: consolidation (combining many things into one).

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Businessmen created large, consolidated organizations primarily through two methods. One was horizontal integration-the combining of multiple firms engaged in the same enterprise into a single corporation. The consolidation of many different railroad lines into one company was an example. Another method, which became popular in the 1890s, was vertical integration-the taking over of all the different businesses on which a company relied for its primary function. Thus, Carnegie steel controlled mines and railroads as well as steel mills.

The most celebrated corporate empire of the late nineteenth century was John D. Rockefeller`s Standard Oil. Shortly after 1865, Rockefeller launched a refining company in Cleveland, Ohio, and immediately began trying to eliminate his competition. Allying himself with other wealthy capitalists, he proceeded methodically to buy out competing refineries. In 1870, he formed the Standard Oil Company of Ohio, which in a few years had acquired twenty of the twenty-five refineries in Cleveland, as well as plants in Pittsburgh, Philadelphia, New York, and Baltimore. He built his own barrel factories, warehouses, and pipelines. Standard Oil owned its own railroad freight cars and developed its own marketing organization. By the 1880s, Rockefeller had established such dominance within the petroleum industry that to much of the nation he served as a leading symbol of monopoly.

Rockefeller and other industrialists saw consolidation as a way to cope with what they believed was the greatest curse of the modern economy. "cutthroat competition." Most businessmen claimed to believe in free enterprise and a competitive marketplace, but in fact they feared that substantial competition could result in instability and ruin for all. As the movement toward consolidation accelerated, new vehicles emerged to facilitate it. The railroads began with so-called pool arrangements-informal agreements among various companies to stabilize rates and divide markets. But if even a few firms in an industry were unwilling to cooperate (as was almost always the case), the pool arrangements collapsed. The failure of the pools led to new techniques of consolidation. At first, the most successful such technique was the creation of the "trust"-pioneered by Standard Oil in the early 1880s and perfected by the banker J. P. Morgan. Under a trust agreement, stockholders in individual corporations transferred their stocks to a small group of trustees in exchange for shares in the trust itself. Owners of trust certificates often had no direct control over the decisions of the trustees, they simply received a share of the profits of the combination. The trustees themselves, on the other hand, might literally own only a few companies but could exercise effective control over many.

In 1889, the state of New Jersey helped produce a third form of consolidation by changing its laws of incorporation to permit companies to buy up the stock of other companies. Other states soon followed. These changes made the trust unnecessary and permitted actual corporate mergers. Rockefeller, for example, quickly relocated Standard Oil to New Jersey and created there what became known as a holding company-a central corporate body that would buy up the stock of various members of the Standard Oil trust and establish direct, formal ownership of the corporations in the trust.

Passage 03

The Brain Size of Bottlenose Dolphins

Large brain size does not always mean that an animal is highly intelligent. Brain size is necessarily associated with overall body size, with large animals having large brains and small animals having small brains. However, it is still necessary for there to be some minimum amount of circuitry (brain cells and processes) present for a species to have the potential to be highly intelligent, whatever way the term intelligence is defined. A measure of relative brain size that has been applied to a variety of species is the encephalization quotient (EQ), the radio of brain mass to body size. The EQ is calculated by measuring the relative size of different body parts over a wide range of species. An EQ of 1.0 means that the brain is exactly the size one would expect for an animal of a particular size, an EQ higher than 1.0 means that a species is relatively brainy.

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Bottlenose dolphins have a very high EQ, about 2.8 or higher. Thus, dolphin brains are not simply absolutely large: they are relatively very large as well. Humans, by the way, have extremely high EQ values, estimated to be in the neighborhood 7.5, making our species the brainiest in existence. Nonetheless, it is worth noting that EQ levels in several species of odontocetes (toothed whales, dolphins, and porpoises) are significantly higher than is the case for any primate except our own species. The EQ value for a species relates to a number of general measures of cognitive processing ability in different mammals, as well as to a number of life history patterns in mammals. EQ may be correlated with life span, home-range size, and social systems that characterize a particular species. Oddly enough, the relationships found between EQ and other factors in primates and some other mammals do not appear to apply as well to cetaceans (whales, dolphins, and porpoises), including the bottlenose dolphin.

The reasons for the larger-than-normal brain of the bottlenose dolphin (and indeed of small odontocetes in general) are not clearly understood. To navigate and detect prey, dolphins emit calls into the environment and then listen to the echoes of the calls that return from nearby objects, a process known as echolocation. Among the more plausible suggestions for large brain size are that the complexity of processing high-frequency echolocation information requires the development of large centers in the cerebral hemispheres, and/or that the degree of sociality exhibited by many species, in which individual animals recognize and have particular long- and short-term relationships with a number of other individuals, has favored the evolutionary development of a large, complex brain. Some authors develop a strong case that extreme development of the auditory (hearing) system may be the primary reason for the dolphin`s large brain. This opinion is supported by observations that the auditory regions of the dolphin brain are 7 to 250 times larger than the equivalent regions of the human brain and by observations of very fasts auditory brain stem responses to sounds. It should be noted, however, that sperm whales are very social and good echolocators (that is, good at locating objects by emitting sounds and detecting the reflections given back), yet their EQ values are low-only about 0.3. Even some small, less social odontocetes such as Indus river dolphins echolocate well but do not possess the exceptionally large brains that bottlenose dolphins do.

Noted biologist Peter Tyack has studies dolphin brains and argues persuasively that large brains evolved in dolphins to permit complex social functions. As is the case with certain primates, bottlenose dolphins and certain other large-brained odontocetes have developed societies in which there exists a balance between cooperation and competition among particular individuals. The social politics of chimpanzees and dolphins show some remarkable similarities, especially in terms of the importance of social relations extending far beyond the mother-offspring relationship to include individuals of both sexes across the age range. The development of such complex societies may have favored the evolution of large brain size.

The reason that dolphins have a large brain continues to be somewhat elusive but there must be a reason, since maintenance of brain tissue is metabolically expensive. The adult human brain, for example, may only represent 2 percent of the body weight, but it can account for nearly 20 percent of the metabolic rate (the energy used)