READING DRILL #3

Salamanders and Species Names

➤When reviewing the current journals of taxonomy, the science of organizing animals into neat classifications, it is important to remember that names are a human convenience. Nature is not concerned with putting her creations into simple and objective categories. The classifications that we now have are the result of scientists' need to put some sort of order into what is a very chaotic situation. And although taxonomists have the best intentions when naming and classifying new or existing species, there are many occasions when naming a species causes quite a bit of confusion.

An excellent example of the problem with naming species is the case of *Ensatina*, a genus of salamander found in the Central Valley area of California. Central Valley is about 40 miles wide, and although salamanders do not live in the valley itself, they are found in the forests and mountains that ring the valley. At the southern tip of the valley live two distinct types of salamander—one salamander is characterized by its yellow and black spots, whereas the other is light brown in color and has no spots.

■ In biology, a species is typically defined as a group of animals that breed only with one another. ■ Thus, any two animals that can breed belong to the same species, whereas animals that are unable to breed with each other are of a different species. ■ The two Central Valley salamanders do not interbreed, which would seem to make it pretty clear that the salamanders should be classified as different species. ■

➤But there is one interesting problem with these salamanders. A number of other salamanders inhabit the ring surrounding Central Valley. Moving north along the eastern side of the valley, the salamanders have fewer and fewer blotches. At the northern end of the valley, the salamanders appear to be a mixture of the two species; these salamanders are mostly brown, but they still have visible blotches.

Now, moving south along the western end of the valley, the salamanders have blotches that are more and more pronounced. Finally, by the time the southern tip of the valley is reached, the salamanders fully resemble the yellow and black spotted species. The salamanders in effect form an almost continuous ring around the outside of the Central Valley, and although the two distinct species at the "ends" of the ring do not interbreed, the salamanders can and do breed with "the intermediates" along the ring. So although it is fairly clear that the salamanders at the ends of the ring are distinct species, what of the other salamanders found around the valley?

This situation presents quite a problem in classification. Most taxonomists have decided that the best solution is to put each of the intermediary salamanders into its own subspecies. However, this messy solution results in ten different species names for a salamander that is found only in the Central Valley. One can imagine how such a solution, applied to other species, could result in hundreds of thousands of subspecies for each species.

➤Further complicating the situation is the new evidence from genetic studies. It appears that the salamanders in Central Valley are all rather closely related, meaning that they all probably evolved from a common ancestor. **A likely scenario is that the ancestral salamander species arrived at either the northern or southern tip of the valley and dispersed from there, with the offspring moving farther and farther down the eastern and western sides of the valley.** In any case, the genetic evidence indicates a continuous gene flow along the Central Valley.

The case of the Central Valley salamander, sometimes called a "ring species," is not unique. The salamander shows the difficulty of attempting to place animals into neat compartments; although classification may be helpful to scientists and researchers, it is not a primary concern of the animals

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themselves—the salamander certainly doesn't care what species it belongs to! Still, despite the problems with the current taxonomic system, it is admittedly useful. There is simply no other consistent way to label or classify the gradations found in nature, so the use of distinct species names will continue.

1. The word convenience in the passage is closest in meaning to

   (A) comfort
   (B) support
   (C) aid
   (D) luxury

2. The word genus as used in the passage is closest in meaning to

   (A) kind
   (B) color
   (C) location
   (D) quality

3. Based on the information in paragraph 1, which of the following can be properly inferred?

   (A) Nature's creations cannot be put into simple categories.
   (B) Some scientists are concerned with sorting and arranging natural phenomena.
   (C) Scientists do not agree on the value of taxonomy.
   (D) The confusion caused by naming species is not worth the value gained from such a practice.

   Paragraph 1 is marked with an arrow [➤]

4. According to the passage, which of the following is true in the biological definition of a species?

   (A) A member of one species is unable to breed with a member of a different species.
   (B) A member of one species often lives more than 40 miles away from a member of another species.
   (C) Species classification is based on coloration and markings, such as black and yellow spots.
   (D) There is no clear definition of what a species is.

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5. In paragraph 4, the author states that

   (A) many different species of salamanders live along the Central Valley
   (B) salamanders along the western end of the valley have fewer spots
   (C) salamanders found at the northern end of the valley cannot interbreed with salamanders found at the southern end
   (D) the range of salamanders found along the valley presents a difficulty

   Paragraph 4 is marked with an arrow [➤]

6. The phrase the intermediates refers to

   (A) salamanders found outside the Central Valley ring
   (B) distinct species of salamanders found only in the Central Valley
   (C) a range of salamanders that do not fit neatly into a species classification
   (D) salamanders found at the ends of the "ring" around the Central Valley

7. Which of the sentences below best expresses the meaning of the highlighted sentence in the passage? *Incorrect* answer choices change the meaning in important ways or leave out essential information.

   (A) It is possible that all the salamanders found along the valley are descended from one early species.
   (B) Salamander species are typically descended from a common ancestor.
   (C) The ancestor of all salamander species found in the valley initially lived at the southern tip of the valley.
   (D) Some theories on the emergence of salamander species focus on the existence of an ancestral species.

8. In paragraph 7, the author provides information about genetic studies to

   (A) suggest that researchers have ignored a crucial piece of evidence
   (B) support an earlier assertion about the problem with classification
   (C) argue that new studies will eventually prove that the salamanders are part of the same species
   (D) assert that the presence of a common ancestor is the most likely explanation for the different types of salamanders found in the valley

   Paragraph 7 is marked with an arrow [➤]

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9. The phrase neat compartments most nearly means

(A) clear areas
(B) distinct groups
(C) different times
(D) main division

10. The word admittedly as used in the passage is closest to

(A) precisely
(B) literally
(C) certainly
(D) rarely

11. The author's opinion about species classification would best be described as

(A) uncertain of the need for a system of species classification
(B) dismissive toward species classification because of the many problems it creates
(C) assured of the need for species classification despite its difficulties
(D) optimistic that the problems with species classification will soon be overcome

12. There are four black squares [■] in the passage, indicating where the following sentence could be added.

This definition is widely accepted by biologists and zoologists, but its application isn't always simple.

Where would the sentence fit best?

Click on a square [■] to add the sentence to the passage.

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13. **Directions:** An introductory sentence for a brief summary of the passage is provided below. Complete the summary by selecting the THREE answer choices that express the most important ideas in the passage. Some sentences do not belong in the summary because they express ideas that are not presented in the passage or are minor ideas in the passage. ***This question is worth 2 points.***

Using species classifications is a human convenience.

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Answer Choices	
It is likely that the Central Valley salamanders were all descended from a common ancestor.	Despite the difficulties found in species classification, there is a need for it in science.
Although scientists may have a need to place animals into classes, nature is not always so easily categorized.	The Central Valley salamander and other "ring species" illustrate the difficulties in classifying animals.
Any two animals that can breed with each other are considered members of the same species.	One solution to the problem involves placing animals into subspecies, but this approach results in problems of its own.

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READING DRILL #4

Solutions to Spam

➤Although it seems like the proliferation of spam—junk E-mails sent unsolicited to millions of people each day—is a recent problem, spam has been around as long as the Internet has. In fact, the first documented case of spam occurred in 1978, when a computer company sent out 400 E-mails via the Arpanet, the precursor to the modern Internet. Now, spam E-mails account for more than two-thirds of all the E-mail sent over the Internet, and for some unlucky users, spam makes up 80 percent of the messages they receive. And, despite technological innovations such as spam filters and even new legislation designed to combat spam, the problem will not go away easily.

The reason spammers (the people who and businesses that spread spam) are difficult to stop is that spam is so cost effective. It costs a spammer roughly one-hundredth of a cent to send spam, which means that a spammer can still make a profit even with an abysmally low response rate, as low as one sale per 100,000 E-mails sent. This low rate gives spammers a tremendous incentive to continue sending out millions and millions of E-mails, even if the average person never purchases anything from them. With so much at stake, spammers have gone to great lengths to avoid or defeat spam blockers and filters.

Most spam filters rely on a fairly primitive "fingerprinting" system. In this system, a program analyzes several typical spam messages and identifies common features in them. Any arriving E-mails that match these features are deleted. But the fingerprinting defense proves quite easy for spammers to defeat. To confuse the program, a spammer simply has to include a series of random characters or numbers. These additions to the spam message change its "fingerprint" and thus allow the spam to escape detection. And when programmers modify the fingerprint software to look for random strings of letters, spammers respond by including nonrandom content, such as sports scores or stock prices, which again defeats the system.

➤A second possible solution takes advantage of a computer's limited learning abilities. So-called "smart filters" use complex algorithms, which allow them to recognize new versions of spam messages. These filters may be initially fooled by random characters or bogus content, but they soon learn to identify these features. Unfortunately, spammers have learned how to avoid these smart filters as well. **The smart filter functions by looking for words and phrases that are normally used in a spam message, but spammers have learned to hide words and phrases by using numbers or other characters to stand in for letters.** For example, the word "money" might appear with a zero replacing the letter "o." Alternatively, spammers send their messages in the form of a picture or graphic, which cannot be scanned in the same way a message can.

Another spam stopper uses a proof system. With this system, a user must first verify that he or she is a person before the E-mail is sent by solving a simple puzzle or answering a question. This system prevents automated spam systems from sending out mass E-mails since computers are often unable to pass the verification tests. With a proof system in place, spam no longer becomes cost effective because each E-mail would have to be individually verified by a person before it could be sent. So far, spammers have been unable to defeat proof systems, but most E-mail users are reluctant to adopt these systems because they make sending E-mails inconvenient. ■A similar problem prevents another effective spam blocker from widespread use. ■This system involves charging a minimal fee for each E-mail sent. ■The fee, set at one penny, would appear as an electronic check included with the E-mail. ■Users can choose to waive the fee if the E-mail is from a legitimate source; however, users can collect the fee from a spammer. A fee system would most likely eliminate a great deal of spam, but unfortunately many users find such a system too intrusive and inconvenient.

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➤In some ways, the battles being fought over intrusive E-mails are very much an arms race. Computer engineers will continue to devise new and more sophisticated ways of blocking spam, while spammers will respond with innovations of their own. It is unfortunate that the casualties in this technological war will be average E-mail users.

1. The word proliferation most nearly means

   (A) addition
   (B) spread
   (C) diminishment
   (D) enlargement

2. In paragraph 1, the author describes spam as

   (A) a recent problem that affects millions of users
   (B) totaling more than 80 percent of E-mails sent via the Internet
   (C) a technological innovation
   (D) unwanted messages sent to a mass audience

   Paragraph 1 is marked with an arrow [➤]

3. In the passage, the word abysmally is closest in meaning to

   (A) unknowingly
   (B) disastrously
   (C) disappointingly
   (D) extremely

4. The phrase the program refers to

   (A) spam messages
   (B) random characters and numbers
   (C) a type of spam filter
   (D) common features

5. According to paragraph 4, smart filters are superior to fingerprinting systems because smart filters

   (A) are eventually able to recognize new versions of spam messages
   (B) are able to learn from their mistakes
   (C) do not need to find common features to detect spam
   (D) are not fooled by random characters or content

   Paragraph 4 is marked with an arrow [➤]

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6. Which of the choices below best expresses the meaning of the highlighted sentence in the passage? *Incorrect* answer choices change the meaning in important ways or leave out essential information.

   (A) Once spammers figured out how smart filters functioned, they were able to defeat them by changing words in the message.
   (B) Spammers can avoid smart filters by replacing certain letters in words or phrases with other characters.
   (C) Smart filters function by looking for words that have certain letters replaced by numbers.
   (D) A smart filter is easily defeated by spammers who are able to disguise words and phrases with numbers and characters.

7. The word automated as used in the passage most nearly means

   (A) computerized
   (B) automatic
   (C) costly
   (D) illegal

8. The passage mentions all of the following as hindrances to adopting verification systems EXCEPT

   (A) user reluctance
   (B) inconvenience
   (C) ineffectiveness
   (D) violation of privacy

9. The author describes the fight over spam as an arms race because

   (A) computer engineers and spammers are constantly reacting to each other's strategies
   (B) some of the techniques used by spammers may cause harm to E-mail users
   (C) there is no peaceful solution to the problem of spam
   (D) computer engineers will never be able to completely protect against spam E-mails

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10. In paragraph 6, the author implies that

(A) most spam E-mails will eventually be blocked
(B) E-mail users suffer the greatest costs from the fight over spam
(C) there is no way to stop new and more sophisticated spam E-mails
(D) the battle over spam E-mails will never end

Paragraph 6 is marked with an arrow [➤]

11. There are four black squares [■] in the passage, indicating where the following sentence could be added.

Although a fee to send an E-mail seems an extreme solution, the fee is more of a verification device than an actual payment.

Click on a square [■] to add the sentence to the passage.

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