Comprehension

Directions for question 1-3:

Read the passage and answer the questions that follow on the basis of the information provided in the passage.

Are mutations really random?

Mutations are random: there's nothing fixed about what will come up next, mutations are not determined, or pre-ordained. But random does not mean that all mutations are equally likely. Some mutations are much more probable than others. This matters. Different types of mutations have different evolutionary consequences. If deletions are more common than insertions — as they are in fruit flies — genomes may evolve to be small and compact. This can have an impact on other aspects of the organism's physiology. Small genomes are easy to copy quickly, which means cells can divide fast — which means creatures with small genomes often have high metabolisms and fast growth. In contrast, the duplication of a genome potentially allows duplicate copies of some genes to evolve new functions, thus expanding the genetic repertoire of the organism. Indeed, an early ancestor of all of us animals with backbones is thought to have experienced at least one, perhaps two, genome duplications, allowing for an explosion of diversity in complexity and form. So, understanding the mutational spectrum – which mutations are more likely and why – is essential for estimating the odds of particular evolutionary trajectories.

But it's not simply a question of writing down all the possible types of mutations and then working out how often they happen. The mutant spectrum varies from one species to the next. In humans, for example, one of the most common types of mutation is the insertion or deletion of a small DNA sequence with a repeating motif, such as ATATAT or AGCAGCAGC. (The letters are shorthand for the bits of DNA known as bases.) Such mutations are implicated in a number of human diseases. The reason mutations to repeated sequences are so common is that, in such repeats, it's easy for the DNA copying machinery of the cell to slip and lose its place, and then put in too many repeats, or too few. And although, obviously, these mutations can only happen in part of the genome where there is a repeated sequence, they happen at such a high rate that each of us probably carries as many new slippage mutations as "point mutations" — mutations that swap one base for another, say A for C.

Even so, not all species are equally prone to slipping up. In the social amoeba, slippage mutations are about 1000 times less common than they are in humans. This is not because social amoebae don't have many repeated stretches of DNA; on the contrary. Stretches of repeated sequence make up 11 percent of the social amoeba genome — more than is known for any other organism. Instead, the machinery of these cells seems to have evolved a way of copying repeats without making so many mistakes. Nor is it just that different types of mutations happen at different rates in different organisms. Complicating matters further, mutations of a given type are not equally likely to happen in all parts of the genome: genomes have mutational hotspots (where mutations are likely) and coldspots (where they're not). Mutations to repeated segments of DNA, for example, are more likely to happen in a repeat that is already long — say 20 iterations of the motif — than in one that is short (2 or 3 iterations). The reason is simple: copying a long repeated segment without slipping is more difficult than copying a short one.

1) What is the importance of genome duplication?

a) It is the reason behind the diversity and complexity of form in animals with backbones.
b) It can help in expanding the genetic capabilities of an organism by developing new functions.
c) It helps in the determination of the rate of metabolism of an organism and hence its rate of growth.
d) All the options

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2) Which of the following is TRUE?

a) The type of mutation an organism undergoes determines the size its genomes will evolve into.
b) Different species may not always have entirely dissimilar spectrums of mutation.
c) Genome duplication is essential in vertebrates as it results in diversity in complexity and form.
d) Different types of mutations don't always happen at different rates in different organisms.

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3) What is the importance of the size of a genome?

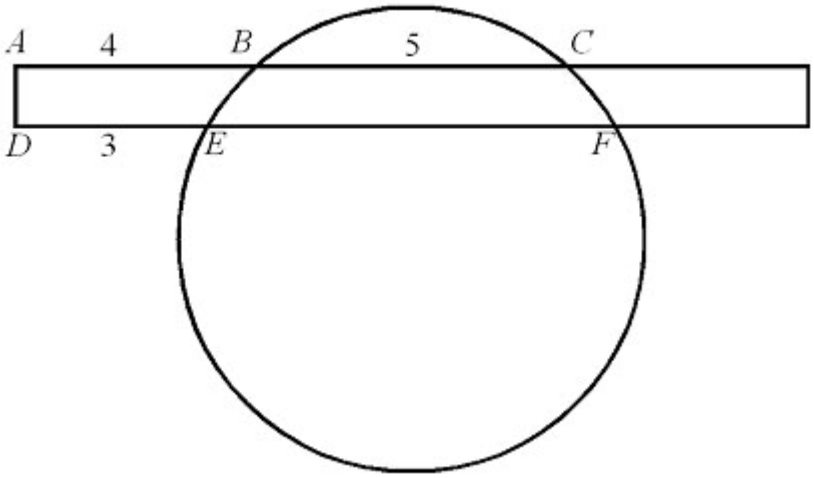
a) It determines the rate of metabolism and growth of the organism.
b) It determines the easiness of duplication of the genomes of the organism.
c) It helps in expanding the genetic range and diversity of the organism.
d) It helps determine the incidence of mutations in a repeat sequence.

Quantitative

1) The number of triples (a, b, c) of positive integers which satisfy the simultaneous equations ab + bc = 44, ac + bc = 23, is:

A) 0
B) 1
C) 2
D) 3
E) 4

2) A rectangle intersects a circle as shown: AB = 4, BC = 5 and DE = 3. Then EF equals



A) 6
B) 7
C) 20/3
D) 8
E) 9

3) The largest integer n for which $n^{200} < 5^{300}$ is:

A) 8
B) 9
C) 10
D) 11
E) 12

Logical/Analytical (Part I)

1) I am under the shelter whenever it rains.

a) It's raining.
b) I am under the shelter.
c) It's not raining.
d) I am not under the shelter.

A) a and b
B) b and c
C) c and d
D) All the options

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2) In a certain language VICTORY is coded as YLFWRUB. How is SUCCESS coded in that language?

A) VXEEIVV
B) VXFFIVV
C) VYEEHVV
D) VXFFHVV

Directions for question 3:

A bus has exactly six stops on its route. The bus first stops at Stop One and then at Stops Two, Stop Three, Stop Four, Stop Five, and Stop Six respectively. After the bus leaves Stop Six, it turns and returns to Stop One and repeats the cycle. The stops are at six buildings namely L, M, N, O, P and Q. P is at Stop Three. M is at Stop Six. O is at the stop immediately before Q. N is at the stop immediately before L.

3) In case N is at Stop Four, which among the following must be the stop immediately preceding P?

A) A
B) O
C) Q
D) M