

Biology E/M

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SAT® Subject Test in Biology E/M

In this document, you will find detailed answer explanations to all of the biology practice questions from *Getting Ready for the SAT Subject Tests*. By reviewing these answer explanations, you can familiarize yourself with the types of questions on the test and learn your strengths and weaknesses. The estimated difficulty level is based on a scale of 1 to 5, with 1 the easiest and 5 the most difficult.

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- Difficulty: 1**
Choice (B) is correct. Organisms that comprise the greatest biomass in a terrestrial food chain are the producers. Net productivity (photosynthesis minus respiration) creates biomass.
- Difficulty: 3**
Choice (A) is correct. Of the list of organisms given, decomposer bacteria are the only ones that can convert nitrogen-containing organic molecules into ammonia. Ammonia, which is a form of a nitrogen-containing molecule, is subsequently converted to nitrate that plants can use to synthesize new organic compounds with nitrifying bacteria.
- Difficulty: 3**
Choice (C) is correct. The greatest rate of bacterial population growth occurs between 4 and 6 hours after inoculation. This question asks when the greatest rate of growth occurred, not when the number of bacteria was greatest. The curve is steepest between 4 and 6 hours after inoculation, making that the time period with the greatest rate of growth.
- Difficulty: 2**
Choice (E) is correct. In photosynthesis (I), solar energy is used by chlorophyll-containing plants to produce ATP. Aerobic respiration (II) in cells uses energy from oxidizing glucose to produce ATP. Fermentation (III) involves the breakdown of glucose in the absence of oxygen and produces limited quantities of ATP. Choice (E) is correct because ATP is produced during all of the listed processes.
- Difficulty: 2**
Choice (B) is correct. A population can be characterized by the number of individuals present, the sex ratio among individuals, the age distribution and the death rate within the population. Phenotype is a characteristic of an individual organism, not a population.
- Difficulty: 1**
Choice (A) is correct. In flowering plants, the fruit is derived from the wall of the ovary, which is indicated by number 2 in the diagram.
- Difficulty: 3**
Choice (D) is correct. Pollination involves the transfer of pollen from the anther (top portion of the stamen) to the stigma (top portion of the carpel). The correct order is from structure 5 to structure 4.
- Difficulty: 4**
Choice (A) is correct. In cross IV, the gray female parent must be homozygous dominant. In cross II, the gray male parent must be heterozygous. Therefore, all of the offspring from this cross would show the dominant phenotype, gray: choice (A).
- Difficulty: 4**
Choice (B) is correct. In cross IV, since the gray female parent must be homozygous dominant and the male parent is homozygous recessive, all of the offspring are heterozygous. The expected results from a cross of two heterozygous individuals is a phenotypic ratio of 3:1, resulting in a 0.75 (or 75%) probability that the offspring will show the dominant phenotype (gray) and a 0.25 (or 25%) probability that the offspring will show the recessive phenotype (white).
- Difficulty: 3**
Choice (D) is correct. An independent variable is one that is being manipulated. In this experiment, the variable being manipulated is the temperature of the water.
- Difficulty: 4**
Choice (B) is correct. In a graph, the independent variable is usually plotted on the x -axis and the dependent variable on the y -axis. The data in the table show the heartbeat per minute increasing with increased temperature, with the average heartbeat per minute increased by about 80 heartbeats per every 10°C increase in temperature. The graph in choice (B), which shows a steady increase in average heartbeat with rise in temperature, accurately reflects the data given in the table.

12. Difficulty: 3

Choice (B) is correct. In evolutionary terms, fitness refers to an organism's ability to leave offspring in the next generation that survive to pass on genetic traits. The woman of 40 with seven adult offspring has left the most surviving offspring and is the most fit evolutionarily.

13. Difficulty: 3

Choice (C) is correct. The graph shows that when the mixture of seeds planted contained 25 percent species *X* (and therefore 75 percent species *Y*, to make 100 percent), 50 percent of the seeds harvested were species *X*. If 50 percent of the seeds harvested were species *X*, the other 50 percent of the seeds harvested must have been species *Y*.

14. Difficulty: 5

Choice (C) is correct. The graph shows that the survival of either of the two species depends on the relative abundance of each species at the time of seed planting. In a mutualistic relationship, both species benefit, but the data do not show that this is true at either low or high percentages of species *X*, ruling out choices (A) and (B). Species *Y* does not compete successfully against species *X* in all mixtures, ruling out choice (D). There is no evidence for parasitism, ruling out choice (E). Competition occurs in all seed mixtures, and species *X* is a stronger competitor in most of the seed mixtures.

15. Difficulty: 2

Choice (A) is correct. To assess common ancestry or evolutionary relationships among organisms, differences or similarities in homologous structures are studied. Differences in homologous structures reflect the accumulation of mutations over time. The only choice listed that represents a comparison of a homologous structure is choice (A): Cytochrome C is a protein that can be studied, and its amino acid sequences compared. The fewer differences in the amino acid sequence, the closer the relationship.

16. Difficulty: 4

Choice (E) is correct. The graph shows an increase in the radioactive nucleotide, thymine, after fertilization. As the new sea urchin embryos grow, cell division occurs. The radioactive thymine is incorporated into new DNA in the growing embryos.

17. Difficulty: 3

Choice (C) is correct. RNA contains uracil instead of thymine. Therefore, in order to test whether RNA synthesis occurred — and to prove that this experiment measures DNA synthesis and not RNA synthesis — the same procedures would need to be repeated with radioactive uracil substituted for radioactive thymine.