



Sample Test Questions

Biology



SAMPLE TEST QUESTIONS

The sample test questions in this document are designed to give you an introduction to the nature of the questions included in the Washington Educator Skills Tests—Endorsements (WEST–E). They represent the various types of questions you may expect to see on an actual test in this test field; however, they are *not* designed to provide diagnostic information to help you identify specific areas of individual strength or weakness or to predict your performance on the test as a whole.

Work through the sample questions carefully before referring to the answer key that follows. The answer key provides the correct response for each question and lists the objective within the test framework to which each question is linked. When you are finished with the sample questions, you may wish to review the test objectives and descriptive statements provided in the test framework for this test field.

In addition to reading and answering the sample questions, you should also utilize the following preparation materials available on the WEST Web site:

- Read **WEST–E Test-Taking Strategies** to understand how test questions are designed to measure specific test objectives and to learn important test-taking strategies for the day of the test.
- Review the **Test Summary and Framework** for your test field to familiarize yourself with the structure and content of the test. This document contains general testing information as well as the percentage of the total test score derived from each content domain described in the test framework.

A scientific calculator may be used for this test as needed in responding to the sample test questions, and one will be provided at the test administration. Please refer to the current WEST registration information regarding the use of calculators at the test administration.

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SAMPLE MULTIPLE-CHOICE QUESTIONS

1. A species of shellfish that is an efficient suspension feeder is introduced into a river system. As a consequence of this introduction, the growth of rooted aquatic plants in the shallow waters of the river system increases. Which of the following is the most likely explanation for this increased growth in the rooted aquatic plants?
 - A. greater penetration of sunlight into the water
 - B. reduced competition from phytoplankton for nutrients
 - C. more rapid cycling of nutrients in the river system
 - D. reduced grazing pressure from zooplankton
2. Coniferous forests cover extensive portions of the Northern Hemisphere adjacent to the arctic tundra. In North America these forests extend along mountainous areas as far south as Mexico. The most significant reason that coniferous trees are able to succeed and dominate in these regions is that their:
 - A. thick bark and tough, closed cones resist damage by fire.
 - B. deep root systems compensate for the nutrient-deficient soils.
 - C. needles reduce loss of water when it is not readily available.
 - D. needles resist damage from ultraviolet radiation.



3. Which of the following tables identifies the factors that generally limit primary productivity in freshwater lakes and the open ocean?

A.

	Nitrogen	Phosphorus	Solar Radiation
Lakes	✓	✓	
Oceans		✓	✓

B.

	Nitrogen	Phosphorus	Solar Radiation
Lakes	✓		✓
Oceans	✓	✓	✓

C.

	Nitrogen	Phosphorus	Solar Radiation
Lakes		✓	✓
Oceans	✓	✓	✓

D.

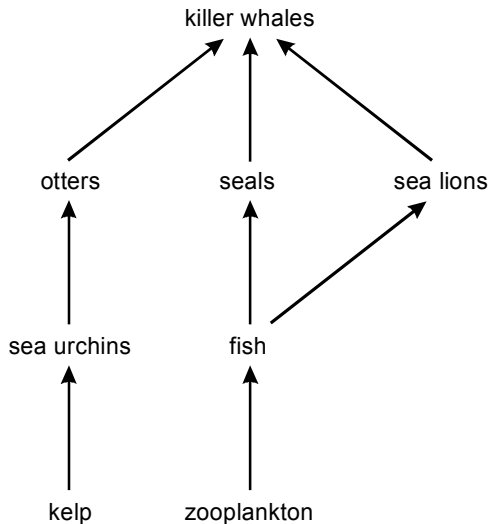
	Nitrogen	Phosphorus	Solar Radiation
Lakes	✓		
Oceans		✓	✓



4. In general, organisms at which trophic level use the *lowest* percentage of the energy that is potentially available to them?
- A. decomposers
 - B. primary producers
 - C. secondary consumers
 - D. primary consumers
5. The majority of known parasitic relationships involve parasites with nonlethal effects on their hosts. The most likely explanation for this is that:
- A. parasitic strategies that have lethal effects are energetically expensive for the parasite.
 - B. parasitic strategies that have lethal effects are complex and require more time to evolve.
 - C. parasites are more likely to be evolutionarily successful when their hosts survive.
 - D. parasites that kill their hosts are less likely to be detected and become known to scientists.
6. Which of the following is an assumption of the logistic model of population growth?
- A. Carrying capacities of environments will increase over time as organisms become better adapted to high population densities.
 - B. Lag times between increasing population densities and reduced rates of growth are greater at low rather than at high densities.
 - C. Predation and interspecific competition will have greater effects on population growth rates at high rather than at low population densities.
 - D. Reproductive rates are maximal at intermediate population densities rather than at very high or low population densities.



7. Use the marine food web below to answer the question that follows.



Which of the following consequences of human activity is most likely to lead to a reduction in the size of the large kelp forests found in many areas of the northern Pacific Ocean?

- A. reduced fish populations that result from commercial overfishing
- B. increased sea lion populations as a result of protected breeding habitat
- C. reduced killer whale populations as a result of disturbed mating areas
- D. increased otter populations that result from their protected status

8. Next to habitat destruction, which of the following poses the greatest threat to worldwide biodiversity?
- A. the widespread and intensive application of herbicides and pesticides
 - B. the overcollecting, overhunting, and overfishing of native plant and animal populations
 - C. the introduction and establishment of exotic species in habitats where they are not native
 - D. the interbreeding of genetically engineered livestock and crops with native species
9. In most animals (except mammals) cleavage in a zygote results in regional differences in the early embryo that determine body axes and affect the developmental fate of cells. This early determination of polarity and basic body plan is a result of:
- A. the shape of the blastomeres formed by the first cleavage.
 - B. interactions among groups of cells that induce changes in gene expression in other groups of cells.
 - C. the asymmetrical distribution of cytoplasmic constituents in the unfertilized egg.
 - D. the migration of cells during gastrulation.

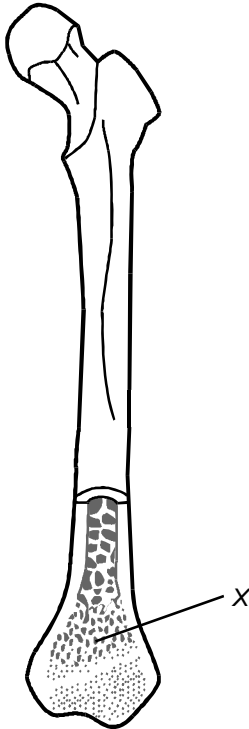


10. In mammals, embryonic stem cells are capable of differentiating into all types of specialized cells, whereas adult stem cells are not. Which of the following best explains this difference?
- A. Embryonic stem cells are able to reproduce themselves, but adult stem cells are not.
 - B. Adult stem cells are no longer able to express certain portions of the common genome.
 - C. Embryonic stem cells have a full complement of genes, but adult stem cells do not.
 - D. Adult stem cells are no longer able to induce developmental changes in nearby cells.
11. Brown, red, and green algae have evolved a diverse array of life cycles, the most complex of which include an alternation of generations. Unlike the alternation of generations in the angiosperms, the generations in the algae are:
- A. both free-living.
 - B. both diploid.
 - C. both multicellular.
 - D. heteromorphic.
12. The lateral line systems of sharks and bony fishes are the functional equivalent of which of the following structures in terrestrial vertebrates?
- A. nostril
 - B. eardrum
 - C. retina
 - D. tongue
13. Which of the following mammalian physiological processes involves a countercurrent exchange mechanism?
- A. the exchange of respiratory gases in the lungs
 - B. the concentration of urine in the kidney
 - C. the absorption of water in the large intestine
 - D. the conversion of glucose to glycogen in the liver



14. Double fertilization in angiosperm flowers is directly responsible for which of the following events?
- A. the generation of the embryo sac
 - B. the formation of multiple viable embryos per ovule
 - C. the production of tetraploid embryos
 - D. the development of a tissue that nourishes the embryo
15. The characteristic that distinguishes heterotrophs from autotrophs is that:
- A. heterotrophs use CO_2 as an energy source.
 - B. autotrophs use organic compounds as a carbon source.
 - C. heterotrophs use inorganic compounds as an energy source.
 - D. autotrophs use CO_2 as a carbon source.
16. The treatment of individuals diagnosed with type 1 diabetes often includes daily insulin injections. Which of the following best explains the role of insulin in treating this disease?
- A. It decreases blood glucose levels by blocking glucose absorption in the small intestine.
 - B. It increases blood glucose levels by stimulating the release of glucose from the liver.
 - C. It decreases blood glucose levels by accelerating the rate of glucose uptake by cells.
 - D. It increases blood glucose levels by inhibiting glucagon secretion from the pancreas.

17. Use the illustration below to answer the question that follows.



The illustration above shows a partial longitudinal cross section of a typical human long bone. Which of the following is the primary function of the region labeled *X*?

- A. to absorb mechanical stress
 - B. to provide a contact point for nerve fibers from adjoining muscle
 - C. to serve as a reservoir for the storage of fat molecules
 - D. to produce red and white blood cells
18. A calcium deficiency most directly affects the human muscular system in which of the following ways?
- A. Actin molecules degenerate.
 - B. Lactic acid accumulates.
 - C. Myosin binding sites are blocked.
 - D. Membrane depolarization occurs.
19. Which of the following best describes the relationship between the endoplasmic reticulum and the plasma membrane in eukaryotic cells?
- A. The rough endoplasmic reticulum manufactures some of the components of the plasma membrane.
 - B. Macromolecules that are actively transported through the plasma membrane are hydrolyzed in vesicles of the endoplasmic reticulum.
 - C. The rough endoplasmic reticulum secretes substances that have been detoxified by passage through the plasma membrane.
 - D. ATP from the smooth endoplasmic reticulum provides energy for active transport in the plasma membrane.



20. Use the table below to answer the question that follows.

Cell Number	Cell Wall Present	Nuclear Envelope Present	Carries Out Photo-synthesis	Cilia or Flagellum Present
1		✓	✓	✓
2	✓		✓	
3	✓	✓	✓	
4		✓		✓

Based on the information provided in the table above, which of the cells is a prokaryotic cell?

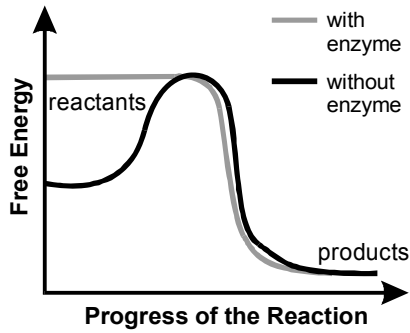
- A. cell 1
- B. cell 2
- C. cell 3
- D. cell 4



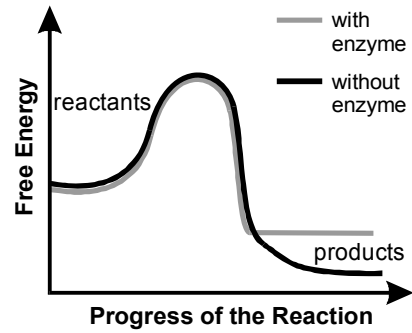
21. Embryonic stem cells in mammals are most similar in function to which of the following types of plant cell?
- A. meristem
 - B. collenchyma
 - C. endodermis
 - D. parenchyma
22. Biochemical analysis of an unknown compound has revealed the presence of lysine, tryptophan, phenylalanine, valine, and methionine. These results suggest that the unknown compound is most likely:
- A. a lipid.
 - B. DNA.
 - C. a protein.
 - D. RNA.
23. The primary advantage that lipids have over polysaccharides as a way for organisms to store energy is that lipids:
- A. are less bulky.
 - B. are less soluble in water.
 - C. are more easily hydrolyzed.
 - D. are more likely to be saturated.

24. Which of the following graphs best illustrates how the presence of an enzyme changes the energy profile of a biochemical reaction?

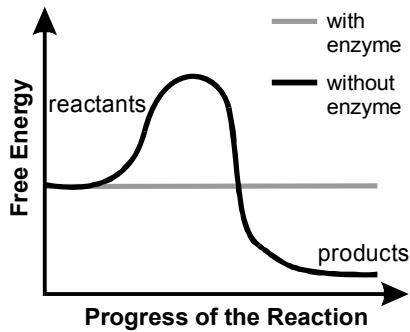
A.



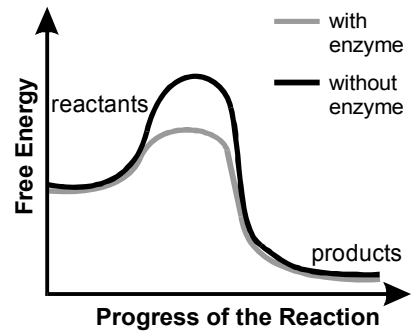
B.



C.



D.



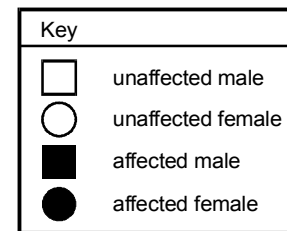
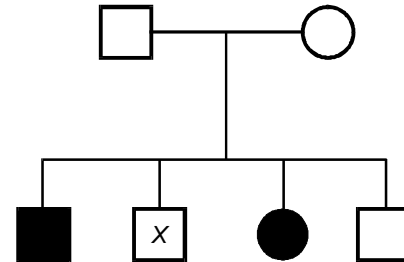


25. Which of the following is the primary role of the electron transport chain in photosynthesis?
- A. ATP production
 - B. chlorophyll synthesis
 - C. photon absorption
 - D. carbon dioxide fixation
26. Yeast cells can utilize both aerobic and anaerobic respiration. Which of the following best explains why yeast cells preferentially utilize aerobic respiration when oxygen is present in the environment?
- A. Glucose levels are reduced under anaerobic conditions.
 - B. The yield of energy is greater using aerobic respiration.
 - C. Aerobic conditions are more common than anaerobic conditions.
 - D. The end products of anaerobic respiration are toxic.
27. Scientists trying to find a cure for cancer are especially interested in studying which of the following topics?
- A. the factors that regulate the cell cycle
 - B. the conditions that induce asexual reproduction
 - C. the mechanism of receptor-mediated endocytosis
 - D. the significance of replication in mitochondrial DNA
28. In the early 1900s, Hans Spemann and Hilde Mangold conducted an embryology experiment in which the dorsal lip of one newt gastrula was transplanted to the ventral side of a second newt gastrula. Instead of the transplanted cells simply developing into back tissue, a second embryo containing cells from both the second gastrula and the transplanted tissue formed at the site of the transplant. The results of this experiment illustrate that cell differentiation:
- A. produces cells that retain the ability to be transformed into all cell types.
 - B. is influenced by signals from neighboring cells.
 - C. involves the amplification of frequently transcribed genes.
 - D. is a process that is initiated at fertilization.

29. In pea plants, flowers in an axial position are dominant over flowers in a terminal position, and long stems are dominant over short stems. Two plants that are heterozygous for both flower position and for stem length are crossed. If the genes for flower position and stem length segregate independently, which of the following is the best estimate of the number of offspring that will have axial flowers on long stems out of 180 offspring?
- A. 34
 B. 45
 C. 90
 D. 100

30. How many different combinations of maternal and paternal chromosomes can be produced by an organism with a diploid number of six?
- A. 6
 B. 8
 C. 12
 D. 16

31. Use the pedigree below to answer the question that follows.



The family pedigree above shows the inheritance of a trait that is determined by two alleles. What is the probability that the individual labeled *X* is homozygous?

- A. 25%
 B. 33%
 C. 50%
 D. 67%

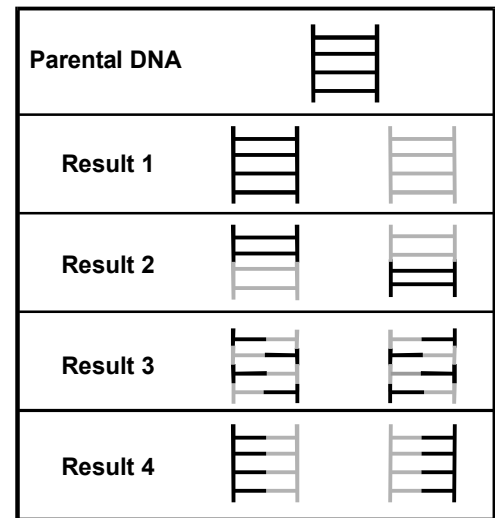
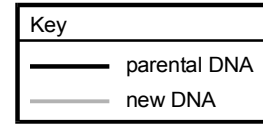
32. Which of the following is most likely to result from the deletion of a nucleotide pair from a gene that codes for a protein?

- A. Missense or nonsense will occur, resulting in a protein that is nonfunctional.
- B. The tRNA will detect an mRNA codon with only two nucleotides and stop translation prematurely.
- C. The redundancy of the genetic code will result in a silent mutation with no effect on the phenotype.
- D. RNA polymerase will correct the error, resulting in accurate translation of the original protein.

33. For which of the following applications have genetic engineering techniques been most successful?

- A. reducing rejection of transplanted organs
- B. reducing competition from nonnative plant species
- C. reducing crop damage from pests
- D. reducing incompatibility of human blood types

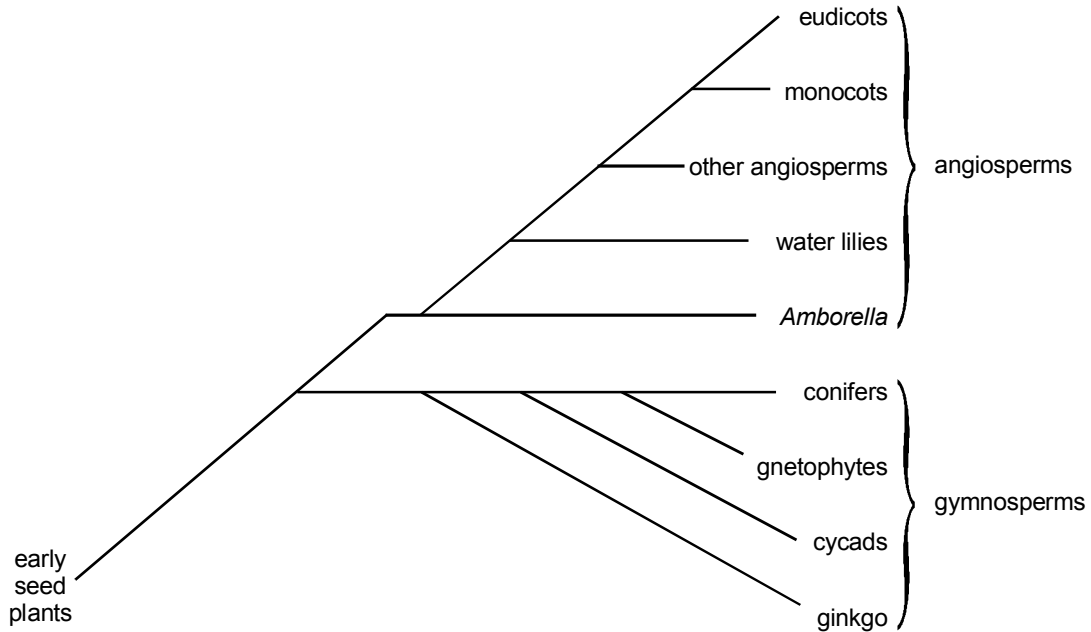
34. Use the diagram below to answer the question that follows.



Which of the four potential results shown in the diagram above best represents the products formed during the replication of DNA?

- A. Result 1
- B. Result 2
- C. Result 3
- D. Result 4

35. Use the cladogram below to answer the question that follows.



The evolutionary relationships among the major groups of seed plants are uncertain. The cladogram above is one possible representation of these relationships. Which of the following can be inferred from this cladogram of the seed plants?

- A. Conifers evolved from gnetophytes.
- B. Conifers share a common ancestor with cycads.
- C. Conifers and *Amborella* are morphologically similar.
- D. Conifers are polyphyletic.



36. The accumulation of gaseous oxygen in the atmosphere coincided with which of the following major changes in biological diversity on the earth?
- A. the evolution of the first eukaryotes
 - B. the colonization of land
 - C. the origin of life
 - D. the Cambrian radiation of animals
37. Within which of the following groups are the three kinds of organisms listed most closely related to each other taxonomically?
- A. sharks, bony fishes, and amphibians
 - B. snails, octopuses, and clams
 - C. flies, beetles, and grasshoppers
 - D. spiders, centipedes, and shrimp
38. Which of the following was Charles Darwin's primary concern about the validity of his published ideas on evolution and natural selection?
- A. the lack of evidence about the mechanism by which adaptations are passed between generations
 - B. the conflict between his theory and the known age of the earth
 - C. the conflict between his theory and Linnaeus's widely accepted system of biological classification
 - D. the lack of evidence in the fossil record supporting his theory
39. Which of the following is the best evidence that species change over time?
- A. the occurrence of large groups of similar species that are able to coexist in stable communities
 - B. the convergence in form of functionally similar organs in distantly related species
 - C. the existence of fossils of extinct species that share characteristics with existing taxa
 - D. the increase in numbers of closely related fossil species during a relatively short period of time



40. Which of the following types of natural selection is most common during periods of environmental change like global warming?
- A. sexual
 - B. stabilizing
 - C. directional
 - D. diversifying
41. The discovery of retroviruses and their evolutionary success has altered scientists' views on the universality of which of the following biological phenomena?
- A. the direction in which genetic information flows in organisms
 - B. the reliance of living systems on a triplet genetic code
 - C. the existence of introns and exons in prokaryotic and eukaryotic genomes
 - D. the proportion of the genome shared by distantly related organisms
42. Canada geese breed across northern North America and overwinter in southern parts of the continent. They feed on various plant materials, including aquatic vegetation and field grains. A scientist hypothesizes that a lack of sufficient food is responsible for inducing migratory behaviors in the fall. Which of the following experiments best tests this hypothesis?
- A. Split a flock of geese into two groups. Provide extra food to one of the groups, and record the dates when migratory behaviors are first displayed within each group.
 - B. Measure fat content as a percentage of body weight in individual geese over the summer. Compare this with the dates on which migratory behaviors are first displayed.
 - C. Observe several flocks of geese over a ten-year period. Record the dates of the first killing frost and the dates when migratory behaviors are first displayed in each flock.
 - D. Raise geese in large outdoor cages. Beginning in midsummer, gradually reduce the available food supply and record the dates when migratory behaviors are first displayed.



Use the information below to answer the two questions that follow.

A scientist is interested in producing transgenic agricultural crops that can be grown in fields irrigated with seawater. Genes for salt tolerance were isolated from a salt marsh plant and inserted into the genomes of four agricultural crops: rice, corn, soybeans, and wheat. The resulting transgenic plant seedlings were grown hydroponically in a nutrient medium containing 0.5%, 1.0%, 1.5%, or 2.0% sodium chloride (NaCl). The total biomass of the resulting plants was determined after 21 days and in the table below the results are compared to nontransgenic plants grown under the same conditions.

	Percent Increase in Yield of Transgenic Plants Compared to Control Plants			
% NaCl	Rice	Corn	Soybeans	Wheat
0.5	27%	22%	33%	44%
1.0	18%	44%	34%	59%
1.5	12%	37%	31%	63%
2.0	5%	18%	29%	21%

43. Which of the following conclusions is best supported by the data presented in the table above?
- A. The yield of transgenic plants is greater than that of nontransgenic plants grown in freshwater.
 - B. Wheat produced the greatest total biomass of the four transgenic crops.
 - C. Seawater is not a viable replacement for freshwater in growing agricultural crops.
 - D. The concentration of salt tolerated without a significant decrease in yield is species specific.
44. Which of the following formats would be most effective for summarizing the results of the experiment described above?
- A. box-and-whisker plot
 - B. bar graph
 - C. scatter plot
 - D. circle graph



45. Use the table below to answer the question that follows.

	Species X	Species Y	Species Z
Sample 1	4	6	7
Sample 2	2	2	2
Sample 3	3	4	12

The data in the table above represent the numbers of individuals of three species of beetles collected in three different samples from the floor of a forest. If the number of samples from similar habitat is increased and a total of 560 beetles from these three species is collected, which of the following is the best estimate of the total number of beetles of species Y that will be collected in all the samples?

- A. 140
- B. 160
- C. 180
- D. 200



46. On a television news report, a biology teacher hears about a recently discovered fossil that is inconsistent with widely accepted views on human evolution. The teacher goes to an Internet search engine and finds several articles on the subject. In order to assess the reliability of the contents of these articles, the *first* step the teacher should take is to:
- A. verify the academic credentials of the author.
 - B. search for other papers on the subject by the same author.
 - C. find corroborating evidence in a printed source.
 - D. check that the articles have been peer-reviewed by other scientists.
47. Which of the following represents the greatest potential safety hazard in a laboratory situation?
- A. failing to completely seal a distillation apparatus
 - B. adding strong acid to water in a beaker instead of water to acid in a beaker
 - C. using tap water instead of a safety shower to wash off a corrosive chemical
 - D. pushing a glass tube through a hole in a cork or rubber stopper



48. A biologist is getting ready to study some plant and animal cells using a light microscope. The magnification to be used should be appropriate for examining material in which of the following size ranges?
- A. 100 nm–1000 nm
 - B. 1 nm–100 nm
 - C. 10 μm –100 μm
 - D. 1 mm–100 mm
49. Collectively it took contributions by scientists with deep knowledge of plant pathology, microbiology, and biochemistry to make which of the following discoveries?
- A. the structure of DNA
 - B. the cloning of eukaryotic genes
 - C. the existence of viruses
 - D. the role of plasmids
50. The Human Genome Project (HGP) has potential medical and scientific benefits that seem limitless. Already the HGP has contributed directly to:
- A. the improved diagnosis and treatment of genetic disorders.
 - B. the reduced need for embryonic stem cells in medical research.
 - C. the commercial production of mammalian hormones.
 - D. the development of DNA fingerprinting technology.



ANSWER KEY

Question Number	Correct Response	Test Objective
1	A	0001
2	C	0001
3	C	0002
4	B	0002
5	C	0003
6	D	0003
7	A	0004
8	C	0004
9	C	0005
10	B	0005
11	A	0005
12	B	0006
13	B	0006
14	D	0007
15	D	0007
16	C	0008
17	D	0008
18	C	0008
19	A	0009
20	B	0009
21	A	0009
22	C	0010
23	A	0010
24	D	0011
25	A	0011

Question Number	Correct Response	Test Objective
26	B	0011
27	A	0012
28	B	0012
29	D	0013
30	B	0013
31	B	0013
32	A	0014
33	C	0014
34	D	0014
35	B	0015
36	A	0015
37	C	0015
38	A	0016
39	C	0016
40	C	0016
41	A	0017
42	A	0017
43	D	0017
44	B	0018
45	B	0018
46	D	0018
47	D	0019
48	C	0019
49	C	0020
50	A	0020