

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Which of the following statements about cells is correct?

- A) Some cells are non-living in nature.
- B) Both prokaryotic and eukaryotic organisms are made up of cells.
- C) Single cells cannot exist independently.
- D) Cells are limited in size, which is between 200 to 500 micrometers in diameter.

Answer: B

2) A cell lacking which of the following structures is most likely to be a prokaryote?

- A) Cell membrane
- B) Nucleic acid
- C) Cytoplasm
- D) Nuclear membrane

Answer: D

3) Which of the following types of cells use deoxyribonucleic acid (DNA) as their genetic material but do not have their DNA encased within a nuclear envelope?

- A) fungi
- B) animal
- C) plant
- D) archaean

Answer: D

4) To understand the chemical basis of inheritance, we must understand the molecular structure of DNA. This is an example of the application of which concept to the study of biology?

- A) reductionism
- B) emergent properties
- C) feedback regulation
- D) evolution

Answer: A

5) A double-stranded DNA molecule with three guanine and five thiamine nucleotides (in 3 strand) has how many nucleotides in total?

- A) 3
- B) 8
- C) 16
- D) 5

Answer: C

6) Which of the following statements is true regarding the complexity of biological systems?

- A) Knowing the function of a component of a living system can provide insights into the structure and organization of the living system.
- B) An ecosystem displays complex properties of the biotic component only.
- C) An understanding of the interactions between different components within a living system is an approach towards understanding reductionism.
- D) Understanding the chemical structure of DNA reveals how it directs the functioning of a living cell.

Answer: A

7) Which statement about ecological organization is correct?

- A) An ecosystem is made up of organisms only
- B) An organism is part of a community.
- C) Biosphere is a part of the ecosystem
- D) A community is part of a population.

Answer: D

8) Apple on tree ripens ripe apple produces ethylene ethylene signals neighboring apples to ripen neighbor apples produce more ethylene more apples ripen. The above process is an example of which of the following?

- A) chemical cycling
- B) positive feedback regulation
- C) emergent properties
- D) negative feedback regulation

Answer: B

- 9) Which of the following is the correct order of organization of genetic material from smallest to largest?
A) chromosome, genome, nucleotide, gene
B) gene, nucleotide, chromosome, genome
C) genome, chromosome, gene, nucleotide
D) nucleotide, gene, chromosome, genome

Answer: D

- 10) As letters are to English language, _____ is/are to genetic information.
A) proteins
B) DNA double helix
C) nucleotides
D) carbohydrates

Answer: C

- 11) Three important research developments that have made the genomic and proteomic approaches possible are _____.

- A) cloning, computers, and gene therapy
B) computers, nanotechnology, and bioinformatics
C) bioinformatics, gene therapy, and genetically modified organisms
D) high throughput technology, bioinformatics, and interdisciplinary research teams

Answer: D

- 12) Which of the following questions is considered a thought-provoking scientific query?

- A) Does the amount of solute in water affect the boiling point of the solution?
B) Who invented the telescope?
C) How many tigers are left in India?
D) How long ago did the Pterosaurs live on this planet?

Answer: C

- 13) Which of the following statements about genetic information is correct?

- A) DNA is not found in prokaryotic cells
B) mRNA is the only type of RNA found in a eukaryotic cell
C) A typical human liver cell has one set of chromosomes
D) All forms of life employ the same genetic code

Answer: D

- 14) Which of these provides evidence of the common ancestry of all life?

- A) near universality of the genetic code
B) structure of chloroplasts
C) structure of the nucleus
D) structure of cilia

Answer: A

- 15) Two organisms are _____ if they share more classification levels.

- A) further apart in the food chain
B) easier to tell apart
C) closer together in the biosphere they live
D) more similar in characteristics

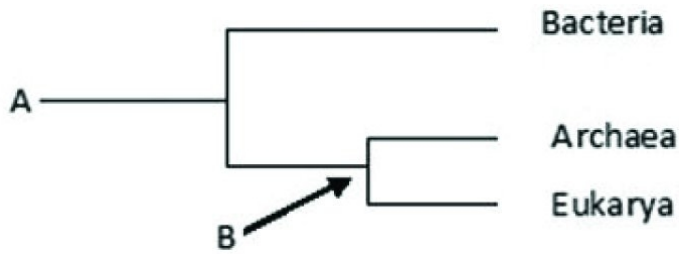
Answer: D

- 16) Which branch of biology is concerned with the naming and classifying of organisms?

- A) taxonomy
B) informatics
C) evolution
D) genomics

Answer: A

17) Use the following figure to answer the question.



Describe groups labeled A and B.

- A) A is the common ancestor of all life whereas B is the common ancestor of Bacteria and Archaea
- B) A is the common ancestor of all life whereas B is the last common ancestor of Archaea and Eukarya
- C) A is the most recent species to evolve on Earth whereas B is the last common ancestor of Archaea and Eukarya
- D) A is the most recent species to evolve on Earth whereas B is an ancestor of group "A"

Answer: B

18) An individual is suffering from a streptococcus infection in their throat. Which of the following do the individual and the streptococcus bacteria have in common?

- A) They both are made up of cells.
- B) They both have genetic material in their nucleus.
- C) The individual and *Streptococcus* have nothing in common.
- D) They both belong to the same domain.

Answer: A

19) Which of the following is an example of genetic variation?

- A) One sibling has brown eyes, the other has green
- B) Two brothers who are twins
- C) One of the twins has a scar the other does not
- D) One sibling is vegan, the other eats meat

Answer: A

20) Which of the following is one of Charles Darwin's observations?

- A) Many of the traits in an individual are heritable.
- B) Species generally are not adapted to their environments.
- C) A population avoids competition by producing only as many offspring as can successfully reproduce on their own.
- D) Individuals in a population are similar in their traits.

Answer: A

21) The evolution two or more species from one species as a result of different populations becoming reproductively isolated from each other is best described as _____.

- A) creationism
- B) prototype
- C) adaptive radiation
- D) natural selection

Answer: C

22) Cotton-topped tamarins are small primates with tufts of long white hair on their heads. While studying these creatures, researchers noticed that males with longer hair get more opportunities to mate and father more offspring. Which of the following research questions would best test the hypothesis that having longer hair is adaptive in these males?

- A) test whether males with shaved heads are still able to mate
- B) determine if hair length is heritable
- C) look for evidence of hair in ancestors of tamarins
- D) test whether other traits in these males are also adaptive

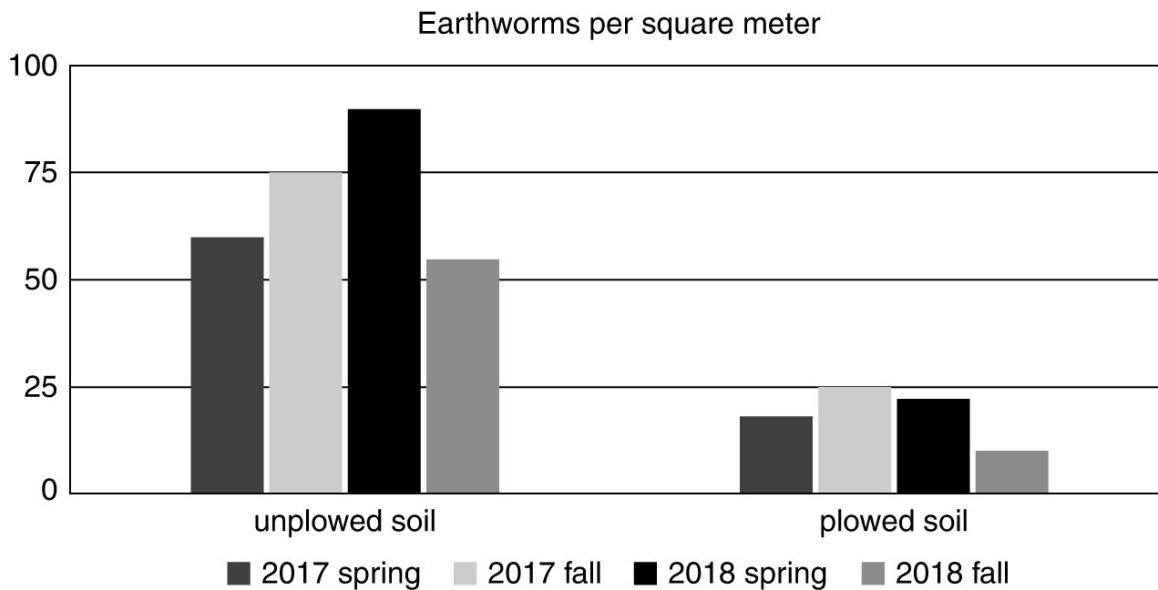
Answer: B

23) Following a scientific method, which of the following is the correct order of steps?

- A) Observation → Hypothesis → Experiment → Analysis → Conclusion → Communicate results
- B) Observation → Hypothesis → Experiment → Communicate results → Analysis → Conclusion
- C) Observation → Analysis → Hypothesis → Conclusion → Communicate results → Experiment
- D) Experiment → Hypothesis → Observation → Analysis → Conclusion → Communicate results

Answer: A

24) Use the information in the graph to answer the following question.

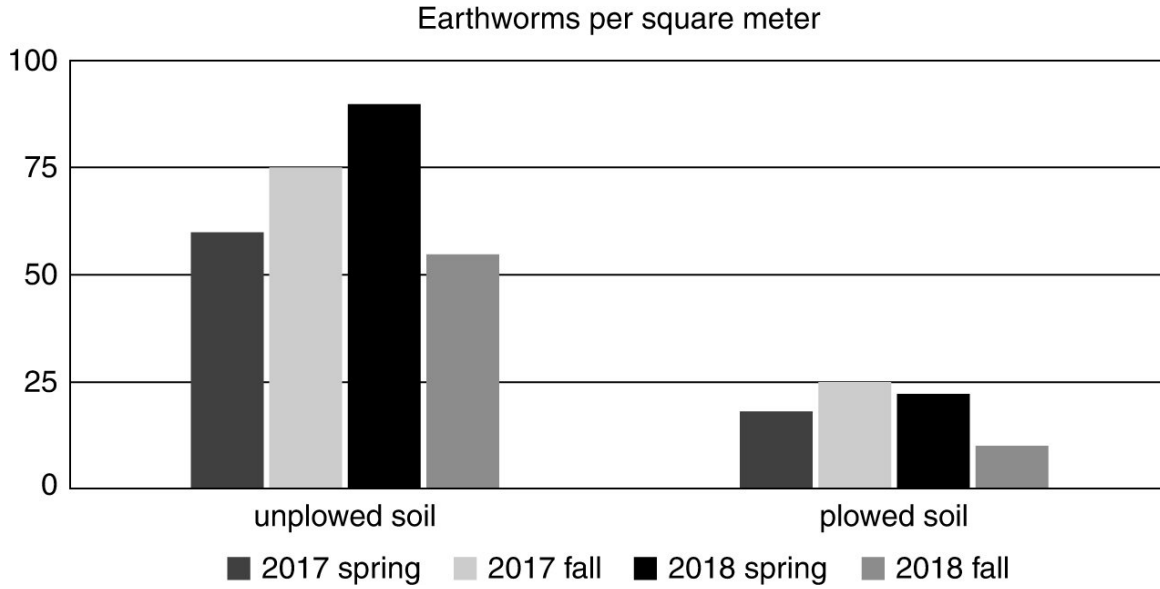


The data can best be used to address which of the following questions?

- A) What is the impact of plowing on the speed of growth of the earthworms?
- B) Does season has an impact on the size of the earthworms?
- C) Does plowing have an impact on the size of the earthworms?
- D) What is the impact of plowing soil on the number of earthworms?

Answer: D

25) Use the information in the graph to answer the following question.

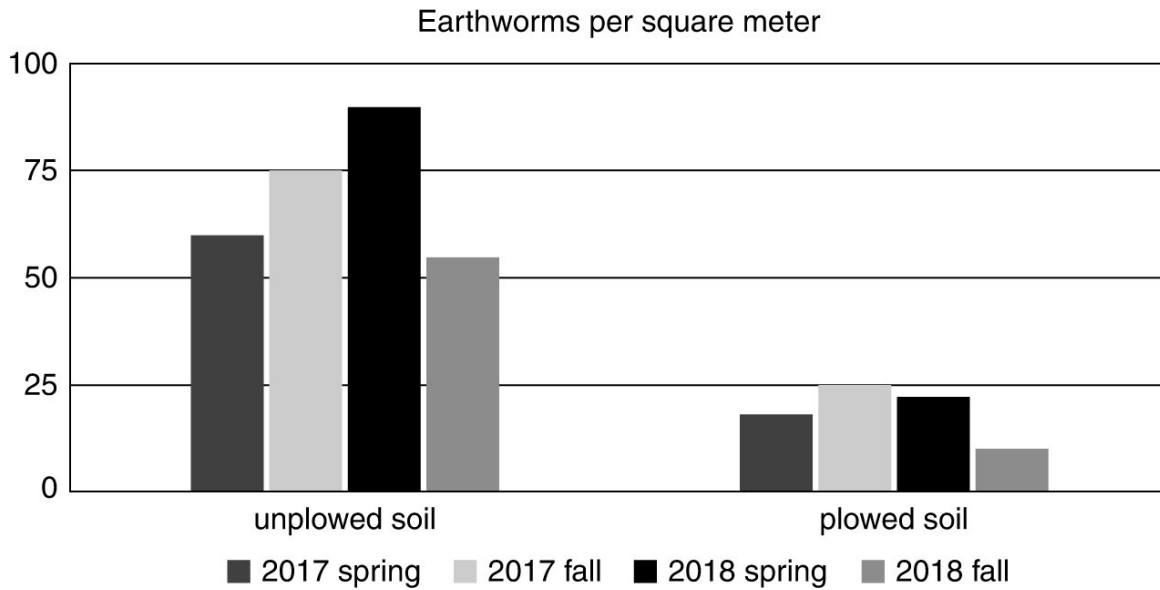


Which of the following claims is best supported using the graph?

- A) Plowed soil contains more earthworms than unplowed soil.
- B) Plowing has no effect on the number of earthworms in the soil.
- C) More earthworms are found in the soil in spring than in fall.
- D) Unplowed soil contains more earthworms than plowed soil.

Answer: D

26) Use the information in the graph to answer the following questions.



Based on the bar graph, which season, year, and soil condition were the worst for cultivating earthworms?

- A) spring 2017, plowed soil
- B) spring 2017, unplowed soil
- C) fall 2018, plowed soil
- D) fall 2018, unplowed soil

Answer: C

- 27) How does a scientific theory differ from a scientific hypothesis?
- A) Confirmed theories become scientific laws; hypotheses become theories.
 - B) Hypotheses are usually an explanation for a more general phenomenon; theories typically address more specific issues.
 - C) Theories are proposed to test scientific hypotheses.
 - D) Theories are usually an explanation for a more general phenomenon; hypotheses typically address more specific issues.

Answer: D

- 28) *Agrobacterium* infects plants and causes them to form tumors. You are asked to determine how long a plant must be exposed to these bacteria to become infected. Which of the following experiments will provide the best data to address that question?
- A) Determine the survival rate of *Agrobacterium* when exposed to different concentrations of an antibiotic.
 - B) Measure the concentration of *Agrobacterium* in different soil environments where the plants grow.
 - C) Measure the number of tumors formed on plants, which are exposed to *Agrobacterium* for different lengths of time.
 - D) Measure the number of tumors formed on a plant when exposed to various concentrations of *Agrobacterium*.

Answer: C

- 29) *Agrobacterium* infects plants and causes them to form tumors. Tumor formation requires a large amount of the plant's energy for tissue formation. What could be the possible impact of tumor formation on plant reproduction? And why?
- A) The number of offspring should increase because in general, illness increases the reproductive output of organisms.
 - B) The number of offspring should decrease because the plant will divert energy from reproduction to tumor formation.
 - C) There should be no effect of infection on offspring production because energy for reproduction is independent of infection.
 - D) The number of offspring should increase because the bacteria will provide energy for the plant.

Answer: B

- 30) Use the following information when answering the following question.
- In 1668, Francesco Redi performed a series of experiments on spontaneous generation. He began by putting small pieces of meat into eight identical jars. Four jars were left open to the air, and four were sealed. He then did the same experiment with one variation: Instead of sealing four of the jars completely, he covered them with gauze (the gauze excluded the flies while allowing the meat to be exposed to air). In both experiments, he monitored the jars and recorded whether or not maggots (young flies) appeared in the meat.
- What hypothesis was being tested in the initial experiment with open versus sealed jars?
- A) Spontaneous generation is more likely during the long days of summer.
 - B) Maggots do not arise spontaneously, but from eggs laid by adult flies.
 - C) The type of meat used affects the likelihood of spontaneous generation.
 - D) Spontaneous generation can occur only if meat is exposed to air.

Answer: B

31) Use the following information when answering the following question.

In 1668, Francesco Redi performed a series of experiments on spontaneous generation. He began by putting small pieces of meat into eight identical jars. Four jars were left open to the air, and four were sealed. He then did the same experiment with one variation: Instead of sealing four of the jars completely, he covered them with gauze (the gauze excluded the flies while allowing the meat to be exposed to air). In both experiments, he monitored the jars and recorded whether or not maggots (young flies) appeared in the meat.

In both experiments, maggots appeared in all of the open jars and only in the open jars. Which one of the following statements is correct?

- A) The experiment supports the hypothesis that spontaneous generation occurs in rotting meat.
- B) The experiment was inconclusive because Redi used only one kind of meat.
- C) The experiment supports the hypothesis that maggots arise only from eggs laid by adult flies.
- D) The experiment was inconclusive because it did not run long enough.

Answer: C

32) Which of the following instructions contribute to a productive experimental design?

- A) do not run the experiment more than once, the results might become confusing
- B) do not include a control, it is a waste of resources.
- C) include a small sample size
- D) alter only one condition between the control and the experimental condition

Answer: D

33) Which of the following best describes a controlled experiment?

- A) An experiment includes at least two groups, one of which does not receive the experimental treatment
- B) An experiment that includes one group for which the scientist controls all variables
- C) An experiment that includes at least two groups, one differing from the other by two or more variables
- D) An experiment repeated many times to ensure that the results are accurate

Answer: A

34) Which of the following is the quality of a good scientific hypothesis?

- A) It always produces quantitative data
- B) It relies on controversial factors
- C) It should be testable in a valid period of time
- D) It always produces qualitative data

Answer: C

35) In presenting data that result from an experiment, a group of students shows that most of their measurements fall on a straight diagonal line on their graph. However, two of their data points are "outliers" and fall far to one side of the expected relationship. Which of the following is the most reasonable way to handle the outliers when analyzing the data?

- A) Do not show these points because clearly something went wrong in the experiment.
- B) Average several trials, rule out the improbable results, and do not show them in the final work.
- C) Change the details of the experiment until they can obtain the expected results.
- D) Show all results obtained and then try to explore the reason(s) for the variation in data.

Answer: D

36) In an experiment to test the hypothesis, "temperature controls sex determination in crocodile embryos" a researcher incubates crocodile eggs in incubators set at different temperatures. Which of the following correctly identifies the dependent and independent variables in the experiment?

- A) temperature is dependent, type of incubator is independent
- B) temperature is dependent, sex is independent
- C) type of incubator is dependent, temperature is independent
- D) sex is dependent, temperature is independent

Answer: D

- 37) Which of these is an example of inductive reasoning?
- A) If protists are all single-celled, then they are incapable of aggregating.
 - B) If two species are members of the same genus, they are more alike than each of them could be to a different genus.
 - C) Hundreds of individuals of a species have been observed and all are photosynthetic; therefore, the species is photosynthetic.
 - D) These organisms live in sunny regions. Therefore, they are using photosynthesis.

Answer: C

- 38) Which of the following best describes a model organism?
- A) It has been chosen for study by early biologists.
 - B) It is often pictured in textbooks and is easy for students to imagine.
 - C) It is small, inexpensive to raise, and lives a long time.
 - D) It is well studied, it is easy to propagate, and results are widely applicable.

Answer: D

- 39) Why is a scientific topic best discussed by people of varying points of view, from different subdisciplines, and representing diverse cultures?
- A) Robust and critical discussion between diverse groups improves scientific thinking.
 - B) This is a way of ensuring that everyone gets the same results.
 - C) Scientists can coordinate with others to conduct experiments in similar ways.
 - D) Scientific theory requires input from different cultures and communities.

Answer: A

- 40) All the organisms on your campus make up _____.
- A) a taxonomic domain
 - B) an ecosystem
 - C) a population
 - D) a community

Answer: D

- 41) Systems biology is mainly an attempt to _____.
- A) build high-throughput machines to rapidly acquire data
 - B) understand the behavior of entire biological systems by studying interactions among its component parts
 - C) analyze genomes from different species
 - D) simplify complex problems by reducing the system into smaller, less complex units

Answer: B

- 42) Which of these best demonstrates unity among organisms?
- A) emergent properties
 - B) natural selection
 - C) descent with modification
 - D) the structure and function of DNA

Answer: D

- 43) A controlled experiment is one that _____.
- A) is repeated many times to make sure the results are accurate
 - B) tests experimental and control groups in parallel
 - C) proceeds slowly so a scientist can make careful records
 - D) keeps all variables constant

Answer: B

- 44) Which of the following statements best distinguishes hypotheses from theories in science?
- A) Hypotheses are guesses; theories are correct answers.
 - B) Theories are proved true; hypotheses are often contradicted by experimental results.
 - C) Hypotheses usually are relatively narrow in scope; theories have broad explanatory power.
 - D) Theories are hypotheses that have been proved.

Answer: C

- 45) Which of the following is an example of qualitative data?
- A) The contents of the stomach are mixed every 20 seconds.
 - B) The six pairs of robins hatched an average of three chicks each.
 - C) The fish swam in a zigzag motion.
 - D) The temperature decreased from 20C to 15C.

Answer: C

- 46) Which sentence best describes the logic of scientific inquiry?
- A) If I generate a testable hypothesis, tests and observations will support it.
 - B) If my prediction turns out to be correct, my hypothesis is supported.
 - C) If my prediction is correct, it will lead to a testable hypothesis.
 - D) If my observations are accurate, they will support my hypothesis.

Answer: B