Exam

Name_____

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

1) Which of the following observations demonstrates the fundamental characteristic of life known as energy?
   A) Organisms are made of membrane-bound units called cells.
   B) A bacterium replicates to become two bacteria.
   C) Plants absorb sunlight to stay alive and reproduce.
   D) The use of antibiotics has increased the frequency of bacteria populations that are resistant to those antibiotics.
   E) The gene that specifies skin colour in frogs is passed from parent to offspring.

   Answer: C

2) How does a scientific theory differ from a scientific hypothesis?
   A) Theories define scientific laws; hypotheses are used to set up experiments.
   B) A hypothesis is an explanation for a very general phenomenon; theories treat more specific issues.
   C) There is no difference—the terms are interchangeable.
   D) A theory is an explanation for a very general phenomenon or observation; hypotheses treat more specific observations.

   Answer: D

3) Algae in the genus *Caulerpa* typically grow to a length of over half a meter and have structures similar to stems, leaves, and roots. Reproduction occurs when adults produce sperm and eggs that fuse to form offspring. Each adult *Caulerpa*, however, consists of just a single cell. Which of the following statements is true?
   A) *Caulerpa* violate both the pattern and process components of the cell theory.
   B) The existence of *Caulerpa* is consistent with the cell theory.
   C) *Caulerpa* violate the process component of the cell theory—that all cells come from preexisting cells.
   D) *Caulerpa* violate the pattern component of the cell theory—that all organisms consist of cells.

   Answer: B

4) Which statement about spontaneous generation is FALSE?
   A) It apparently occurred at least once–when life on Earth began.
   B) It addresses the formation of living cells from previously nonliving material.
   C) It occurs every time a new species evolves from a preexisting species.
   D) Pasteur demonstrated that it does not occur under normal laboratory conditions.

   Answer: C

5) Recall Pasteur's experiment on spontaneous generation. Originally, he used sealed and unsealed flasks instead of swan-necked and unsealed flasks. Critics claimed that the experiment was inconclusive. Which of the following criticisms would be addressed by using a swan-necked flask instead of the sealed flask?
   A) Fresh air is required for spontaneous generation.
   B) The broth was not nutritious enough.
   C) There had not been enough time for spontaneous generation to occur.
   D) The broth was heated too intensively.

   Answer: A

6) Which of the following is the best example of a heritable variation?
   A) amputation B) skin cancer C) red hair D) love for music

   Answer: C

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7) How does artificial selection differ from natural selection?
   A) Artificial selection occurs only with plants.
   B) Artificial selection is not based on heritable variation, but on new mutations.
   C) Artificial selection occurs only in computer simulations, not with actual organisms.
   D) Artificial selection is based on conscious choices by humans.

   Answer: D

8) Over the past several decades, natural selection has caused populations of *Staphylococcus aureus* (an infectious wound bacterium) to evolve resistance to most antibiotics. If antibiotic use were stopped, what would you predict would happen to these *S. aureus* populations?
   A) The frequency of resistant forms will definitely increase in these populations.
   B) The frequency of nonresistant forms will increase in these populations.
   C) They will go extinct without the antibiotic.
   D) The populations will begin colonizing new environments.

   Answer: B

9) Environments all over the world are changing as a result of global warming. Could this influence natural selection?
   A) Yes. Traits that help individuals produce more offspring in warmer environments will increase in frequency.
   B) No. The environment is always changing. Global warming is nothing new.
   C) No. The only change will be that species from hot environments will expand their ranges.
   D) Yes. Mutations occur more frequently in hot environments.

   Answer: A

10) The "heat" in chili peppers is due to a molecule called capsaicin. Suppose you breed chili peppers that have low amounts of capsaicin over many generations in order to make them milder (have less capsaicin). What process is occurring?
   A) environmental change
   B) heritable variation
   C) natural selection
   D) artificial selection

   Answer: D

11) The "heat" in chili peppers is due to a molecule called capsaicin. Suppose you breed only the hottest chili peppers over many generations–predict the characteristics of the resulting individuals.
   A) smaller fruits
   B) larger fruits
   C) less capsaicin
   D) more capsaicin

   Answer: D

12) Starting from the wild mustard *Brassica oleracea*, breeders have created the strains known as Brussel sprouts, broccoli, kale, and cabbage. Which of the following statements is supported by this observation?
   A) In this species, most of the variation present is due to differences in soil, nutrition, amount of sunlight, or other aspects of the environment.
   B) In this species, there is enough heritable variation to create a variety of features.
   C) Heritable variation is low–otherwise the wild strain would have different characteristics.
   D) Natural selection has not occurred very frequently in the wild populations.

   Answer: B

13) The structure of double helical DNA
A) is used to synthesize messenger RNA.
B) contains two identical single strands of DNA.
C) must be accurately copied to ensure variation in organisms.
D) serves as a template for protein synthesis.

Answer: A

14) Which of the following describes the flow of genetic information in cells according to the central dogma?
A) Protein codes for RNA, which codes for DNA.
B) RNA codes for protein, which codes for DNA.
C) DNA codes for RNA, which codes for protein.
D) RNA codes for DNA, which codes for protein.
E) DNA codes for protein, which codes for RNA.

Answer: C

15) Which of the following best reflects a phylogenetic conclusion regarding chimpanzees and baboons?
A) They are grouped together because they both feed their young breast milk.
B) They are grouped together because they live in similar habitats.
C) They are grouped together because they both have opposable thumbs.
D) They are grouped together because they have a common ancestor in recent history.

Answer: D

16) One aspect of Darwin's theory of natural selection is that adaptations not useful to fitness are lost faster if they have a greater cost. With this in mind, which of the following explanation is most likely true?
A) It is a mystery why we do not have tails.
B) Our little toe is not going away in the near future.
C) The human appendix must currently serve an essential function or it would not be in our bodies.
D) Humans are relatively hairless because we look better without hair.

Answer: B

17) Many phylogenetic trees are based on DNA sequence similarities. What is the practical result of this similarity?
A) Closely related species will not look similar to each other.
B) Artificial selection can bring closely related species even closer to each other.
C) Mitochondrial DNA might be different from nuclear DNA.
D) Species with very similar DNA will have similar structures, enzymes, and appearance.

Answer: D

18) Which of the following would not be a good reason for studying SSU RNA to understand the major branches in the evolutionary history of life?
A) It is passed on through evolutionary history with only minor modifications.
B) It mutates very frequently.
C) It is a necessary part of the cellular machinery for reproduction and other purposes.
D) This molecule is found in every species.

Answer: B

19) Which taxon would generally include the largest number of species?
A) phylum B) genus C) species D) domain

Answer: D

20) Why did the five-kingdom system of classification fall out of favor?
A) It was too difficult to distinguish plants from fungi and animals from protistans.
B) It was too complex—Linnaeus' original two-kingdom system was more useful.
C) It did not reflect the actual evolutionary relationships among organisms very well.
D) There were too few monerans to justify their classification at the kingdom level.

Answer: C

21) What do the nodes and branch points on a phylogenetic tree represent?
A) species
B) groups that got new names
C) ancestral groups that split into two descendant groups
D) new kingdoms or domains

Answer: C

22) On an evolutionary tree, any group that includes a common ancestor and all of its descendants is called monophyletic ("one-tribe"). Draw the tree for Bacteria, Archaea, and Eukarya. Are prokaryotes monophyletic?
A) yes B) no

Answer: B

23) On an evolutionary tree, any group that includes a common ancestor and all of its descendants is called monophyletic ("one-tribe"). Draw the tree for Bacteria, Archaea, and Eukarya that we think best represents the current data. According to this tree, are all organisms alive today monophyletic?
A) yes B) no

Answer: A

24) On the tree of life, the branch leading to animals is closer to fungi than it is to the branch leading to land plants. Which of the following statements is correct?
A) Animals and plants do not have a common ancestor.
B) Fungi and animals do not have a common ancestor.
C) Animals and fungi are more closely related to each other than animals are to land plants.
D) Animals and land plants are more closely related to each other than either is to fungi.

Answer: C

25) On the tree of life, branches that lead to several groups of green algae branch off from the one that leads to land plants. Which one of the following statements is correct?
A) Land plants appeared first in the fossil record.
B) Green algae and land plants are not related.
C) Land plants and algae have a common ancestor.
D) Green algae are very closely related to the fungi.

Answer: C

26) Louis Pasteur's experiment had a good design because
A) simple equipment was used.
B) the experiment was a success.
C) a major question, spontaneous generation, was tested.
D) the possible outcomes led to distinct, unambiguous conclusions.

Answer: D

27) Which of the following is the best description of a control for an experiment?
A) The control group is kept in an unchanging environment.
B) The control group is matched with the experimental group except for one experimental variable.
C) The control group is exposed to only one variable rather than several.
D) Only the experimental group is tested or measured.
E) The control group is left alone by the experimenters.

Answer: B

28) Recall the experiment on ant navigation. To run a controlled experiment, what parameters were held constant for the test group of 75 ants?
A) stride number, leg length, and environmental temperature
B) leg length
C) all variables except leg length
D) stride number

Answer: C

29) Why was it important that researchers use large sample sizes?
A) It controls for all variables except for one.
B) It holds the experimental conditions constant.
C) It allows the researchers to create a null hypothesis.
D) It reduces the amount of distortion or "noise" in the data caused by unusual individuals or circumstances.

Answer: D

30) Which of the following is a powerful way to test a hypothesis?
A) Formulate a null hypothesis.
B) Perform an experiment that tests a prediction that follows from the hypothesis.
C) Formulate a competing or alternative hypothesis.
D) Incorporate the hypothesis into a more general theory.

Answer: B

31) A friend of yours calls to say that his car would not start this morning. He asks for your help. You say that you think the battery must be dead, and that if so, then jump-starting the car from a good battery will solve the problem. In doing so, you are
A) only stating a hypothesis for why the car won't start.
B) stating both a specific hypothesis about why the car won't start and a prediction of the hypothesis.
C) performing an experimental test of a hypothesis for why the car won't start.
D) searching for observations that might inspire a hypothesis for why the car won't start.

Answer: B

Use the following information when answering the corresponding question(s).

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

32) What hypothesis was being tested in the initial experiment with open versus sealed jars?
A) The type of meat used affects the likelihood of spontaneous generation.
B) Spontaneous generation can occur only if meat is surrounded by air.
C) Maggots do not arise spontaneously, but from eggs laid by adult flies.
D) Spontaneous generation is more likely during the long days of summer.

Answer: C

33) In both experiments, flies appeared in all of the open jars and only in the open jars. Which one of the following statements is correct?
A) The experiment was inconclusive because Redi used only one kind of meat.
B) The experiment supports the hypothesis that maggots arise only from eggs laid by adult flies.
C) The experiment supports the hypothesis that spontaneous generation occurs in rotting meat.
D) The experiment was inconclusive because it did not run long enough.

Answer: B

34) Why was it important that Redi replicate each treatment four times in each experiment?
A) to make sure that he made efficient use of his lab equipment
B) to practice his technique and make sure the experiment was done correctly
C) to make sure that there was enough meat to attract flies
D) to reduce the likelihood of getting an accidental result

Answer: D

35) Fireflies are nocturnal beetles that emit flashes of light to attract mates. A scientist studying the firefly population over the past 5 years observes that the firefly population has declined significantly as the area that she has been studying has become more developed (more buildings). The scientist proposes a series of hypotheses to explain the decline. Which of her hypotheses is *most likely* to be correct?
A) Excess amounts of artificial light resulted in the evolution of a different mechanism in the male firefly for attracting females and the females no longer recognize this signal.
B) Due to excess amounts of artificial light, the firefly is now active during the day; the scientist is trying to study them at the wrong time leading to incorrect counts of the number of fireflies.
C) Excess amounts of artificial light prevent the female fireflies from seeing the male's flashing mating signal.

Answer: C

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