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SKU: 9781264638048-TEST-BANK

Correct Answers are located at the end of each chapter.

CHECK ALL THE APPLY. Choose all options that best completes the statement or answers the question.

1) Cell theory is one of the foundations of biology. What are the tenets of the cell theory?
   A) All organisms are made up of more than one cell.
   B) All cells have the ability to move.
   C) Cells carry genetic material passed to daughter cells during cellular division.
   D) Cells arise from other cells through the process of cell division.
   E) Organisms are formed through spontaneous generation
   F) All living organisms consist of cells

2) Darwin's theory of evolution is supported by many modern pieces of evidence.
   A) New measurements of the age of the earth.
   B) An understanding of the mechanism of heredity.
   C) Human population growth.
   D) Comparative studies of animal structures.
   E) Similarities in DNA of related species.

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

3) Science is subdivided into specific areas of study termed disciplines. These divisions are artificial but are helpful to narrow the massive scope of scientific knowledge to a manageable amount. Given what you know about each, which scientific division is likely to present the best answer to a question about how fluid dynamics affect blood pressure in mammals?
   A) Biochemistry – study of chemical reactions needed for life function, usually at the cellular level.
   B) Bioinformatics – use of technology to study and store biological data
   C) Biophysics – study of biological processes through physics
   D) Biology – study of life

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4) Based on hierarchical levels of biological organization, which of these choices represents the broadest level?
   A) Endocrine system
   B) 3 toed sloths
   C) School of piranhas
   D) Amazon Basin
   E) Jaguars, giant anteaters, macaws, capybaras

5) Experiments are carried out to test a hypothesis by changing one variable at a time and should include an unchanged variable termed a(n)_____.
   A) experimental variable
   B) altered variable
   C) control
   D) stable variable

6) The method of reasoning that uses construction of general principles by careful examination of many specific cases is called:
   A) deductive reasoning.
   B) theoretical reasoning.
   C) hypothetical reasoning.
   D) inductive reasoning.
   E) experimental reasoning.

7) Dr. Ratard was trying to determine the cause of a mysterious epidemic affecting fish in the Gulf of Mexico. His proposal that the deaths were caused by an organism called a protist is considered a(n)_____
   A) experiment.
   B) hypothesis.
   C) conclusion.
   D) theory.
   E) data set.

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8) After Darwin concluded his voyage on the *Beagle*, he proposed that the process of natural selection was a mechanism for:
   A) artificial selection.
   B) evolution.
   C) sexual selection.
   D) speciation.
   E) overpopulation of finches on the Galapagos Islands.

9) A scientific theory is:
   A) a suggested explanation that accounts for observations.
   B) a way to organize how we think about a problem.
   C) a concept that is supported by experimental evidence that explains the facts in an area of study.
   D) a way to understand a complex system by reducing it to its working parts.

10) What common life characteristic would cells from a daisy, bacteria, and a dog all have?
   A) DNA
   B) cell walls
   C) organs
   D) ability to conduct photosynthesis

11) A yellow jacket, an insect in the order Hymenoptera, stung me. A wasp, an insect in Hymenoptera, stung me. A hornet, an insect in Hymenoptera, stung me. I see a pattern. All insects in this order must have stingers. What type of reasoning does this represent?
   A) inductive reasoning
   B) deductive reasoning
   C) reductionism
   D) comparative reasoning

12) You explain to your study group that a hypothesis is:
   A) an explanation that accounts for careful observations.
   B) a proposition that will be true and fits the known facts.
   C) a theory.
   D) constant over time.

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13) A suggested explanation that might be true and is subject to testing by further observations is a(n):
    A) experiment.
    B) generality.
    C) hypothesis.
    D) scientific principle.
    E) theory.

14) Based on the literature, you hypothesize that students in traditional biology lectures will have the same grades as students in online biology lectures. You decide to test your hypothesis by comparing grades of students in traditional and online biology lectures over a semester. As a result of the experiment, you observe that the grades in the traditional lectures and the grades in the online lectures are not significantly different. What do these observations allow you to do?
    A) reject the hypothesis
    B) modify the hypothesis to fit the results
    C) develop a scientific theory
    D) retain the hypothesis

15) Your microwave will not turn on, and you speculate that a circuit breaker in the house has been tripped. In scientific terminology, the steps would be described as:
    A) forming conclusions from the results of experiments.
    B) developing an observation based on a hypothesis.
    C) developing a hypothesis based on an observation.
    D) testing a prediction generated from a hypothesis.

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16) A student poses the question: How does the presence of dissolved salt affect the freezing point of water? To answer this question, the student set up two conditions. In the first condition, the student added salt to water in a container and referred to this condition as the variable. In the second condition, the student did not add any salt to water in a second container and referred to this condition as the control. The student took both containers and attempted to freeze the water at various temperatures to assess the freezing point. Would this be a valid experiment?

A) Yes, because there is more than one variable.
B) Yes, because there is one variable and a control
C) No, because there is not more than one variable
D) No because there is only one variable and a control

17) Karl Popper suggested that scientists use "imaginative preconception," which means that successful scientists:

A) often predict the outcome of experiments.
B) cannot predict the outcome of experiments.
C) do not need to do experiments to test their ideas.
D) do not keep records of experiments that fail.
E) only perform applied research.

18) The proposal that one type of organism can change gradually into another type over a long period of time is known as:

A) evolution.
B) natural history.
C) preconception.
D) preservation.

19) Darwin's ideas on evolution were advanced for his time. His approach to science and natural selection were supported by what main tenet?

A) Various organisms and their structures resulted from a spontaneous action.
B) Species were unchangeable over the course of time.
C) The world is fixed and constant.
D) Operation of natural laws produces constant change and improvement.

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20) Besides Darwin, the theory of evolution by means of natural selection was also independently proposed by:
A) Alfred Wallace.
B) Charles Lyell.
C) Thomas Malthus.
D) Karl Popper.
E) Peter Raven.

21) The term that Darwin used to describe the concept that those with superior physical, behavior or other attributes are more likely to survive than those that are not so well endowed, and thus are more likely to pass their traits to the next generation, is called:
A) biological diversity
B) geometric progression
C) natural selection
D) superior beings
E) survival of modifications

22) A key contribution to Darwin's thinking was the concept of limits put on the geometric growth of populations by nature, originally proposed by:
A) Charles Lyell.
B) Thomas Malthus.
C) Karl Popper.
D) Peter Raven.
E) Russel Wallace.

23) Darwin's book in which he described his views on evolution is:
A) Principles of Geology.
B) On the Principle of Population.
C) On the Origin of Species.
D) Survival of the Fittest.

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24) Recent discoveries of microscopic fossils have extended the known history of life to about:
A) 3.5 billion years ago.
B) 2 billion years ago.
C) 4.5 billion years ago.
D) 1 billion years ago.

25) In California, a species of salamanders were geographically separated over time. The group that lived in southern California relied heavily on large gold blotches on their skin that helped to camouflage them from predators. The group that lived along the coast adopted a color pattern that mimicked a poisonous, colorful newt common to that area. Instead of being camouflaged, these salamanders advertised their colors. What type of selection process has occurred over time?
A) artificial selection
B) natural selection
C) experimental selection
D) theoretical selection

26) The same basic array of bones is modified to give rise to the wing of a bat and the fin of a porpoise. Such anatomical structures are called:
A) analogous.
B) uniform.
C) homologous.
D) inherited.
E) evolutionary modifications.

27) Structures that have similar structure and function but different evolutionary origins are called:
A) homologous.
B) analogous.
C) inherited.
D) uniform.
E) evolutionary modifications.

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28) The rate at which evolution is occurring cannot be estimated by:
    A) studying comparative anatomy.
    B) inferring that apes are related to humans.
    C) measuring the degree of difference in genetic coding.
    D) interpretation of the fossil record.

29) Differences in domesticated animals over relatively short periods of time most likely occur through:
    A) natural selection
    B) adaptation
    C) evolution
    D) experimental selection
    E) artificial selection

30) If you were to design a long-term research study to determine why there are no human births in Lapland during the months of August, September, and October, you would need to examine a comparison population of humans in which births took place every month. The primary reason for including a comparison population within the design of this experiment would be to:
    A) accumulate more facts that could be reported to other scientists.
    B) test the effects of more than one variable at the same time.
    C) prove that there are no births in Lapland during August, September, and October.
    D) act as a control to ensure that the results obtained are due to a difference in only one variable.

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31) *Essay on the Principle of Population*, written by Thomas Malthus in 1798, influenced Darwin's thoughts as he struggled to understand what mechanisms could be at work to produce evolution. Malthus proposed that populations of animals and plants, including humans,

A) increased arithmetically in numbers while the nutrients available only increased geometrically.
B) increased geometrically in numbers while the nutrients available only increased arithmetically.
C) decreased arithmetically in numbers while the nutrients available increased geometrically.
D) evolved from islands to mainland, thus explaining why unrelated species on the mainland are found in the same location.
E) evolved from mainland to islands, thus explaining why the island flora and fauna resembled the mainland species so closely.

32) A student set up an experiment to test if plants give off water vapor. Fifty pea plants, growing in pots, were covered with individual glass containers and left overnight. The next morning, the inside of each lid was covered in droplets of water. The lab student concluded that plants generally give off water vapor. What critique would you make of the experimental design?

A) There was no control so the water could have come from other sources such as air in the jar or the soil.
B) There was not a large enough sample of pea plants used to get adequate data.
C) The student did not have a clearly stated hypothesis before beginning the experiment.
D) The experiment was not precise, meaning it was not reproducible.

33) It is known that many trees lose their leaves in response to decreasing day length. As a result, you think that *Gingko* trees may also lose their leaves in response to decreasing day length. This statement is an example of:

A) deductive reasoning
B) an experiment
C) a hypothesis
D) a theory

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34) Multiple independent experiments have demonstrated that phytochrome helps trigger seasonal change responses in planta such as changing color and losing leaves.
Plants have the ability to adapt to seasonal changes in their surroundings.
This statement is an example of:

A) deductive reasoning
B) an experiment
C) a hypothesis
D) inductive reasoning
E) a theory

35) Plants are raised under artificial lights turned off and on by an electric clock. Some are given long periods of light, others short periods. This is an example of:

A) deductive reasoning
B) an experiment
C) a hypothesis
D) inductive reasoning
E) a theory

36) Both walnut and *Gingko* trees lose their leaves in the fall when day length starts decreasing. Based on these observations one may conclude that many tree species will lose their leaves in the fall in response to decreasing day length. This statement is an example of:

A) deductive reasoning
B) an experiment
C) inductive reasoning
D) a theory

37) *Gingko*trees are known to lose their leaves at a certain time each year throughout the United States. Based on this information,
*Gingko*trees in China must behave the same way. These statements are an example of:

A) deductive reasoning
B) an experiment
C) inductive reasoning
D) a theory

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38) Most individuals in academia are basic researchers, funded through research grants from agencies or foundations. Based on your knowledge of applied research, an industrial company would most likely employ individuals
A) who develop alternative fuel sources.
B) who identify a new species of beetle in the Amazon rainforest.
C) looking at novel proteins involved in the development of a neurological disease.
D) who document fossils found in a specific archeological expedition.

39) Wings of birds and butterflies have similar functions, but different evolutionary origins. They are:
A) homologous structures.
B) physiological structures.
C) phylogenetic structures.
D) analogous structures.

40) A budding mechanic is fascinated by cars and is determined to figure out how they work. He decides to disassemble one of them and examine each part independently. He removes one of the tires and proceeds to learn all he can about the tire. He then removes one of the headlights and proceeds to learn all he can about the headlight. What type of approach is being used to learn about the car?
A) reductionism
B) deductive reasoning
C) inductive reasoning
D) Emergent properties

41) While you are riding the ski lift up to the top of the mountain on a very cold day you start to shiver involuntarily. You know that the shivering is your body's attempt to help regulate your body temperature and is an example of what type of mechanism?
A) energy utilization
B) sensitivity
C) homeostasis
D) evolutionary adaptation

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42) You have been assigned to address the problem of overpopulation of species X in a nearby county. One of the members of your team suggests introducing species Y, which is a natural predator of species X, but not normally found in the area. After some discussion, you go ahead and introduce species Y. What aspects of the hierarchical organization may be affected within a period of a several years?

A) population, species, community
B) population, community
C) population, species, community, biosphere
D) organism, population, species

43) You have been assigned to analyze some extraterrestrial material recently collected from Mars. After examining a sample using a microscope you jump up excitedly and shout to your colleagues that you have confirmed the existence of life on Mars. One of your colleagues takes a look at your sample and remarks that all he sees is a single-celled "blob" with little internal structure. Assuming that life on Mars can be classified into similar domains and kingdoms as Earth, to which domain does your "blob" belong?

A) Animalia
B) Fungi
C) Protista
D) Archaea

44) Why was the determination of the actual sequence of the human genome considered to be descriptive science?

A) It involved hypothesis-driven research.
B) It did not involve hypothesis-driven research.
C) It involved inductive reasoning.
D) It did not involve deductive reasoning.

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45) You look outside and realize that your grass needs to be mowed. You pick up the container of gasoline and see that you have approximately a third of a gallon left. You hypothesize that this amount will be enough to mow your entire lawn. Unfortunately, half way through mowing your lawn you run out of gasoline. You grumble and think to yourself that the next time you mow the lawn, you hypothesize that you will need to have at least two-thirds of a gallon of gasoline available. How did the results of your lawn-mowing experience influence the validity of your new hypothesis for future gasoline needs?

A) Your prediction of future gas needs is based on experimental data and therefore increases the validity of your hypothesis.
B) The hypothesis was invalidated by your experimental evidence.
C) Your hypothesis was supported by trial and error. One more trial added to your data set.
D) Your prediction proved that your hypothesis is correct.

46) Why is it necessary to take an interdisciplinary approach to studying biology?

A) Interdisciplinary approaches are required to answer all scientific questions since all disciplines borrow knowledge from each.
B) Research methods used to solve many biological questions often require a number of different types of approaches and the expertise of a variety of scientists.
C) An interdisciplinary approach is the only way we can further our biological knowledge.

47) How does peer review influence the development of scientific theories?

A) Peer review allows other scientists to know what is current in their field.
B) Careful evaluation of research results by other scientists ensures that only solid and legitimate research results are published, and helps prevent faulty research or false claims from being viewed as scientific fact.
C) Peer review increases competition among scientists and thus increases the quality of the published work.
D) Peer review makes it extremely difficult for work to be published other than earth-shattering scientific theories.

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48) Amanda was studying turtles based on DNA analysis. Under the current classification scheme, which of the following turtle species are thought to be most closely related?

1. Graptemys ouachitensis,
2. Trachemys scripta,
3. Apalone spinifera,
4. Graptemys kohni.

A) 1 and 3 due to inductive reasoning
B) 1 and 3 due to deductive reasoning
C) 2 and 3 due to inductive reasoning
D) 1 and 4 due to inductive reasoning
E) 2 and 3 due to deductive reasoning
F) 1 and 4 due to deductive reasoning

49) Marceau is studying small single-celled organisms that contain phospholipid membranes. These organisms can be broadly classified into the domain:

A) Bacteria
B) Protista
C) Animalia
D) Fungi

50) Bacterial cells are placed into a 250mL liquid growth medium in a closed laboratory flask. According to Malthusian theory, they will reproduce exponentially and then:

A) continue reproducing geometrically as long as there are no limitations on food supply.
B) continue reproducing arithmetically as long as there are no limitations on food supply.
C) continue reproducing geometrically until the food supply is used up, then they will cease to grow.
D) continue reproducing arithmetically until the food supply is used up, then they will cease to grow.

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51) If two different species of fish fossils were found in two different layers of sedimentary rock, what might one infer about the specimens?
A) They died at the same time
B) The two species are unrelated
C) The species in the higher layer evolved from the species in the lower layer
D) The species in lower layer died first
E) The species in the higher layer died first

52) A dental student wants to test if fluoride is an effective additive against tooth decay. The student studies tooth decay in a population of people who live in neighborhoods supplied with fluoridated water. This student would like to ask whether access to fluoridated water prevents tooth decay. What would be an effective control group to ask this question?
A) Individuals with access to fluoridated water.
B) Individuals with access to differing amounts of fluoride in the water.
C) Individuals who have fluoride added to their toothpaste but not their water.
D) Individuals with access to water with no fluoride added.

53) Which statement represents the biological characteristics that kittens, oak trees, swans, earth worms, elephants and crickets have in common?
A) DNA nucleotides form the basis of all inherited life, with cells that are formed from other cells.
B) DNA nucleotides form the basis of inherited life, with cells that are formed spontaneously from the environment.
C) RNA nucleotides form the basis of all inherited life, with cells that are formed from other cells.
D) RNA nucleotides form the basis of inherited life, with cells that are formed spontaneously from the environment.

54) Viruses contain DNA or RNA, but lack genes necessary for metabolism and reproduction. Why are viruses not considered to be alive?
A) Viruses are unable to reproduce independently of a host.
B) Viruses do not contain nucleic acids.
C) Viruses do not have the ability to evolve in their environment.
D) Viruses do not contain internal organelles.

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55) Osmometer cells in the brain sense an increase in the salt concentration of plasma. This information is sent to the hypothalamus, which notifies the pituitary gland to release the hormone, ADH. ADH causes the kidney to save water, which lowers the salt concentration of the plasma. What characteristic of life does this overall pathway represent?

A) Cellular organization
B) Sensitivity
C) Energy utilization
D) Evolutionary adaptation
E) Homeostasis

56) A chemical imbalance in the blood can cause the heart to stop pumping blood, which will have a detrimental effect on other organs. This observation can be attributed to:

A) Reductionism
B) Emergent properties
C) Equilibrium state
D) Evolutionary conservation

57) Dr. Edward Jenner realized that cows have a disease called cowpox, which is like a disease that infects humans called smallpox; Jenner noticed that milkmaids whose hands were infected with cowpox were not contracting smallpox. Jenner infected a child with the pus from a cowpox blister, and found that the child did not contract smallpox. Which statement represents a supporting hypothesis?

A) The cowpox infection will prevent the child from being infected by the smallpox virus.
B) The cowpox infection will have no effect on the child's immunity to the smallpox virus.
C) The smallpox virus was so similar to the cowpox virus that the child's immune system recognized it and was able to fight it.
D) The cowpox virus prevented the smallpox virus from entering the child's immune system.

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58) A beautiful wood desk you may do your homework on was once a living tree, but after being cut down its tissues died. Now, it only exhibits what property of life?

A) Metabolism
B) Homeostasis
C) Sensitivity
D) Organization

SECTION BREAK. Answer all the part questions.

59) As part of your research project, you travel to an island to learn more about the habitats and relationships of flies, spiders, and centipedes. You and your assistant plot out five different areas on the island and count the numbers of flies, spiders, and centipedes living in each plot. Your results show the following:

Plot	Flies	Spiders	Centipedes
1	300	25	4
2	426	17	10
3	147	15	21
4	739	78	0
5	79	13	93

59.1) The most plausible explanation for the high number of spiders in plot 4 is:

A) there are too many flies overall.
B) there are no centipedes to prey on the spiders and there are abundant flies upon which to feed.
C) the spiders preyed on the centipedes and ignored the flies.
D) the flies and spiders worked together to eliminate the centipedes.

59.2) The plots that were staked out on the island were part of the:

A) applied research.
B) basic research.
C) constructed model.
D) experimental design.

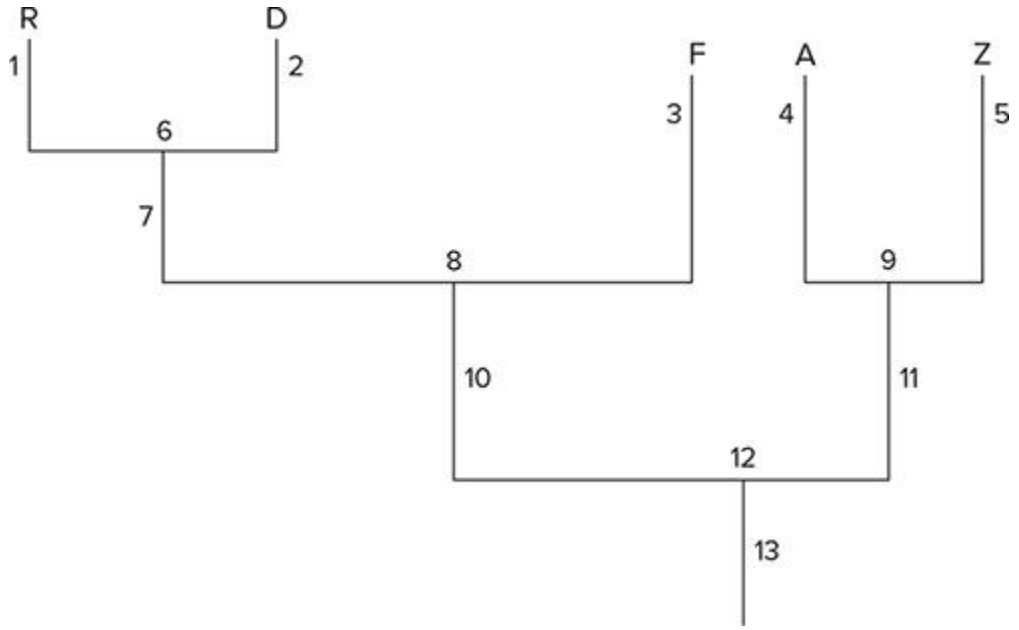
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59.3) Based in the information provided, the best explanation for the low numbers of spiders and flies in plot 5 is:

A) centipedes are actively consuming flies and spiders.
B) there were not enough flies to support a large centipede population.
C) centipedes prefer spiders to flies.
D) there were not enough spiders to catch and consume all the flies.

59.4) The hypothesis that closely matches the data provided is:

A) herbivorous insects survive best on islands where spiders and centipedes live.
B) herbivorous insects feed on spiders and centipedes.
C) herbivorous insects and spider populations are decreased by centipedes.
D) spiders are the top predators on all islands.



60) McGraw Hill

60.1) The common ancestor that produced the most evolutionary recent derived characters is

A) 12
B) 9
C) 8
D) 6

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60.2) The species that have had proportionally the most time to diverge are:

A) R and D
B) F and Z
C) A and Z
D) F and R
E) F

61) Phil is conducting a seed germination experiment. He places 3 groups of lettuce seeds in a 34° Celsius incubator with adequate moisture. One set of seeds is placed in a dark area with no light source. A second set is placed under artificial light and third set of seeds is placed in direct sunlight. This experiment is intended to test Phil's hypothesis that light is necessary for lettuce seed germination.

61.1) Based on the experimental design, which variable was the control?

A) Seeds in the dark
B) Type of light
C) Germination rate
D) Temperature
E) Moisture

61.2) Based on the experimental design, which variable was the dependent variable?

A) Seeds in the dark
B) Type of light
C) Germination rate
D) Temperature
E) Moisture

62) Luke was taken to a pediatrician when he was 6 months old. The pediatrician consulted a graph and concluded that Luke was in the 97th percentile for height, weight and length. The pediatrician predicted that Luke would be tall when he reached adulthood.

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62.1) What type of reasoning did the pediatrician use to generate her prediction about Luke's future growth in height?

A) Inductive reasoning
B) Deductive reasoning
C) Applied theory
D) Reductionism

62.2) What type of logic is being used when the pediatrician uses the graph to make conclusions about Luke's progress?

A) Inductive reasoning
B) Applied theory
C) Reductionism
D) Deductive reasoning

63) Turtle hatchling survivorship rate is low in many turtle species due to predation. Amanda researched the predatory rate on a species of turtle eggs in the Red River. The eggs were harvested from trapped turtles and the egg's cloaca film (reproductive discharge) was either washed off or left on once gathered. Research suggests that predators use the female's cloaca scent to locate the eggs.
The eggs were only handled when wearing gloves and then reburied along islands where the turtles were trapped. The nests were monitored by cameras and manually on foot and data on nest predation were recorded.

63.1) Based on the experimental design, what is the dependent variable?

A) Number of hatchlings
B) Cloaca film on eggs
C) Eggs without cloaca film
D) Time eggs spent in ground

63.2) Based on the experimental design, what is the independent variable?

A) Number of hatchlings
B) Cloaca film on eggs
C) Inducing egg laying
D) Time eggs spent in ground

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63.3) Based on the experimental design, what is the control?

A) Hatchling survival rate
B) Cloaca scent on eggs
C) No cloaca scent on eggs
D) Time eggs spent in ground

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Answer Key

Test name: Chapter 01

1) [C, D, F]
2) [A, B, D, E]
3) C
4) D
5) C
6) D
7) B
8) B
9) C
10) A
11) A
12) A
13) C
14) D
15) C
16) B
17) A
18) A
19) D
20) A
21) C
22) B
23) C
24) A
25) B
26) C
27) B
28) B
29) E
30) D
31) B
32) A
33) A
34) E
35) B
36) C
37) A

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38) A
39) D
40) A
41) C
42) A
43) D
44) B
45) A
46) B
47) B
48) D
49) A
50) C
51) D
52) D
53) A
54) A
55) E
56) B
57) A
58) D
59) Section Break
59.1) B
59.2) D
59.3) A
59.4) C
60) Section Break
60.1) D
60.2) B
61) Section Break
61.1) A
61.2) C
62) Section Break
62.1) A
62.2) D
63) Section Break
63.1) A
63.2) B
63.3) B

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