Name	Test Bank Chapter 01
Description	
Instructions	The following questions challenge you to think about how ecologists study and learn about the natural world. The emphasis of these questions is on application of the scientific method. Imagine that you are following up on some pioneering research carried out in the 1930s by the entomologist V. G. Dethier on feeding behavior of swallowtail butterflies. Dethier observed that larvae of certain swallowtail butterfly species feed selectively on plants belonging to the carrot family (Apiaciae). He wondered how the larvae were able to locate such plants. Using simple but cleverly designed experiments, Dethier was able to demonstrate that these larvae recognize their preferred food plants based on their odors.

Question 1 **Essay**

Question Dethier and other entomologists have spent considerable time watching the behaviors of butterfly larvae as they move about in natural habitats and select different plants to eat. Dethier recorded his observations until he felt he could identify trends that might lead to an understanding of the processes underlying larval food selection. Which component of the scientific method did this aspect of Dethier's research represent?

Answer observation and description

Question 2 **Essay**

Question Dethier proposed that swallowtail larvae locate their preferred food plants using their sense of smell. In other words, he believed that the larvae were able to discriminate among various kinds of plants by detecting particular kinds of volatile chemicals released by the plants. Which component of the scientific method did this aspect of Dethier's research represent? Answer: development of hypotheses and explanations

Answer development of hypotheses and explanations

Question 3 **Essay**

Question Dethier conducted experiments to determine if his explanation of how swallowtail larvae locate their host plants might be correct. Which component of the scientific method did this aspect of Dethier's research represent?

Answer testing of hypotheses

Question 4 **Essay**

Question You are interested in studying the role of olfaction (using the sense of smell) in location of host plants by larvae of a particular species of swallowtail butterfly. You hypothesize that these larvae detect their preferred host plants in the carrot family by olfaction. Following Dethier's methodology,

you establish the following experiment. Extracts obtained from various kinds of plants (including some belonging to the carrot family) are used to moisten small pieces of paper arranged randomly under a wire screen. Other pieces of paper are simply moistened with water. Swallowtail larvae are allowed to crawl about on the wire screen, but the larvae cannot come into direct physical contact with the pieces of paper. Why do you not simply present the larvae with a choice among various plants in this experiment?

Answer You want to vary the volatile chemicals presented to the larvae without giving the larvae other cues as to the "identity" of the plants from which these chemicals are extracted. Since all the pieces of paper look alike, you can eliminate the possibility that the larvae use visual cues to recognize the pieces of paper moistened with extracts from plants in the carrot family. Separating the larvae from the pieces of paper also ensures that the larvae cannot use their sense of taste. The scientific method typically involves manipulating one or a small number of variables independently of others to reveal their effects.

Question 5 **Essay**

Question In your experiment, why do you include pieces of paper moistened with extracts from plants in other plant families or moistened with water, among those moistened with extracts from plants in the carrot family?

Answer You expect that the larvae will orient themselves toward the pieces of paper moistened with extracts from plants in the carrot family. However, you have to ascertain that larvae are not attracted to just any piece of moistened paper. The pieces of paper moistened with extracts from other plants enable you to determine whether or not larvae are selective in their orientation to pieces of paper moistened with extracts from plants belonging to the carrot family. The pieces of paper moistened with water serve as experimental controls.

Question 6 **Essay**

Question In your experiments with the swallowtail larvae, you indeed find that these larvae orient toward pieces of paper moistened with extracts from plants belonging to the carrot family and not toward pieces of paper moistened with water or extracts of other plants. Does this finding prove your original hypothesis?

Answer Most scientists agree that it is never possible to prove any hypothesis in the strictest sense. Although the results of your experiment are consistent with the predictions of your hypothesis and offer strong support for it, they do not prove the hypothesis. In the case described, it would be desirable to subject the hypothesis to further testing. It would be important, for example, for experimenters in another laboratory to repeat your experiment to determine if similar results occur consistently at other times and places. Other explanations for these results would also have to be considered and eliminated by further experimentation. It would also be important to conduct investigations aimed at determining the mechanism of causation. If the hypothesis held up after additional evaluation, then it would become more widely accepted by the scientific community.

Question 7 **Essay**

Question Does your study of the feeding preferences of swallowtail larvae address a "how" or a "why" question?

Answer This study clearly focuses on a "how" question. You are interested primarily in answering a question dealing with a physiological process involving sensory perception.

Question 8 **Essay**

Question Given your answer to the preceding question, decide whether the kind of question you identified ("how" or "why") addresses a **proximate** or **ultimate** factor.

Answer This study clearly focuses on a "how" question dealing with a physiological process, or **proximate** factor.

Question 9 **Essay**

Question Formulate at least one hypothesis to address a "why" question applicable to the subject of your study. State your question, then your hypothesis (or hypotheses).

Answer There are many possible questions. One might ask, "Why do larvae of swallowtail butterflies select plants belonging to the carrot family as their food?" There are several possible hypotheses that would address this question. For example, one might speculate that the larvae of swallowtail butterflies are capable of safely eating any plants belonging to the carrot family, but that certain plants belonging to other plant families might be toxic. One might also speculate that the larvae of swallowtail butterflies can sequester in their bodies certain toxic chemicals contained in their preferred plant foods. Such chemicals could then be used defensively by the larvae.

Question 10 **Essay**

Question Given your answer to the preceding question, decide whether the kind of question you identified ("how" or "why") addresses a **proximate** or **ultimate** factor.

Answer This is clearly a "why" question dealing with costs and benefits to individuals, or **ultimate** factors that guide evolution.

Question 11 **Essay**

Question Plants and animals exchange energy and materials with their physical environments. These exchanges occur across surfaces. In animals. these surfaces (lungs, for example) tend to be internal, while in plants, these surfaces tend to be external (leaves, for example). Discuss the principal reason for this important difference.

Answer Consider energy acquisition. Animals obtain energy by extracting it from foods they consume. This absorption is best accomplished internally, where foods can be subjected to appropriate conditions (presence of enzymes, physical processing, acidic pH, etc.) that

release molecules to be taken up across large areas of absorptive structures. Plants, in contrast, obtain energy from sunlight, and thus must expose relatively large external absorptive surfaces (typically leaves) to sunlight in order to obtain this energy. Internal absorption of energy is simply not an option for plants.

Question 12 **Essay**

Question A living system is characterized by maintenance of a dynamic steady state. This steady state represents an internal equilibrium (inputs balanced by outputs). However, the living system is typically not in equilibrium with its surroundings. As an example, consider a warm-blooded organism maintaining a constant temperature different from that of its surroundings. For this organism, what is the cost associated with maintenance of the dynamic steady state, and how is this cost met?

Answer To maintain a system in disequilibrium with its environment requires expenditure of energy. A warm-blooded animal in cold surroundings must acquire food and use the metabolic energy released from that food to maintain its temperature higher than that of its surroundings.

Question 13 **Essay**

Question Scientists ask questions about how the natural world works. These questions can usually be classified as "how" questions and "why" questions. Compare and contrast these fundamentally different kinds of questions; in particular, explain clearly the attributes that make each kind of question distinctive. Present an example of related "how" and "why" questions.

Answer Although both questions focus on the functioning of the natural world, they are fundamentally different. The "how" questions, which require proximate explanations, usually address physical or biological processes. Our understanding of physiological or metabolic processes is usually enhanced by asking "how" questions. The "why" questions, which require ultimate explanations, usually address the evolutionary significance of structures, processes, or behaviors. When we ask why an organism does something, we usually expect to learn how a behavior, for example, leads to enhanced survival or reproductive success. A good example of related "how" and "why" questions might involve a homeostatic process, such as thermoregulation. One might ask *how* animals maintain constant body temperatures (seeking physiological explanations) and *why* animals maintain constant body temperatures (seeking evolutionary explanations).

Question 14 **Essay**

Question Using an example from a natural ecosystem, show how humans are an important part of the biosphere. In your example, indicate how human activities may have a pervasive influence on the structure and function of ecological systems.

Answer Several suitable examples are provided in Chapter 1. For example, one might discuss the example of human intervention in the natural ecosystem of Lake Victoria, which led to catastrophic failure of the fishery based upon native cichlid fishes.

Question 15 **Essay**

Question While it may be said that many human activities have resulted in negative impacts on the structure and function of ecological systems, there is reason to be hopeful that humans will eventually be able to come to grips with environmental problems. Briefly discuss some recent events that indicate the ability of humans to respond in a positive and successful way to environmental problems.

Answer Several suitable examples are provided in Chapter 1. For example, one might discuss efforts made to save endangered species from extinction. Public laws, such as the U.S. Endangered Species Act, contribute to this effort, as do specific interventions, such as the breeding of endangered species in captivity.

Question 16 **Multiple Choice**

Question Do ecological studies support the idea of a balanced natural world that exists in a pristine state?

Answer

A) Yes, ecological studies support this idea.

✓ B) No, ecological studies show historical variation in nature and the pervasive influence of human activities.

Question 17 **Multiple Choice**

Question How can ecology best help each of us understand the role of humans in nature?

Answer

A) Ecology provides a reference point of unspoiled nature.

B) Ecology provides a set of moral precepts.

C) Ecology provides a set of values.

✓ D) Ecology provides a scientific understanding of how natural systems work and how humans function as part of the natural world.

Question 18 **Multiple Choice**

Question The word "ecology" is derived from the Greek *oikos*, which means:

Answer

money or currency

ocean

✓ house

root or origin

Question 19 **Multiple Choice**

Question Who gave the word "ecology" its current broad meaning?

Answer

✓ the German zoologist Ernst Haeckel
the Swedish botanist Carl Linnaeus
the English naturalist Charles Darwin
the American ecologist Rachel Carson

Question 20 **Multiple Choice**

Question Of the following fields, all except one focus on the application of ecological understanding to solve problems concerning the environment and its inhabitants. Which is the exception?

Answer

environmental science
applied ecology
conservation biology
✓ ecology

Question 21 **Multiple Choice**

Question In Chapter 1, Dr. Ricklefs states: "No smaller unit in biology, such as the organ, cell, or macromolecule, has a separate life in the environment." To which level of ecological organization is he referring?

Answer

✓ organism
population
community
ecosystem
biosphere

Question 22 **Multiple Choice**

Question Which of the following systems is comprised of assemblages of organisms together with their physical and chemical environments?

Answer

organism
population
community
✓ ecosystem
biosphere

Question 23 **Multiple Choice**

Question Gray whales feed in the Bering Sea, then migrate far to the south, reproducing in the Gulf of California. Feeding conditions in the Bering Sea influence the reproductive success of these animals in their breeding area. Reproductive success, in turn, modifies the impact of the gray whale on marine ecosystems in the Gulf of California. What important principle do

these processes illustrate?

Answer

✓ All ecosystems are ultimately linked together in a single biosphere.

All ecosystems are tightly bounded and poorly linked with other ecosystems.

Question 24 **Multiple Choice**

Question It may be said that the approach taken by an ecologist to the study of the natural world depends on the level of ecological organization studied. For example, an ecologist who takes the *population* approach to the study of ecology would most likely be interested in:

Answer

adaptations of individual organisms that suit them for life in their environment.

✓ changes in numbers, resulting from births and deaths, of individuals belonging to a particular species in a particular place.

the number and relative abundances of species living in a particular place.

activities of organisms as well as physical and chemical transformations of energy and materials in the soil, atmosphere, and water.

transport of energy and materials at the global scale.

Question 25 **Multiple Choice**

Question As a rule, terrestrial plants and animals differ in which of the following ways?

Answer

Terrestrial plants usually are larger than terrestrial animals.

Terrestrial plants usually live longer than terrestrial animals.

✓ Terrestrial plants usually need a more continuous supply of water than terrestrial animals.

Terrestrial plants usually live in warmer climates than terrestrial animals.

Question 26 **Multiple Choice**

Question Which of the following kinds of organisms typically assumes a threadlike growth habit, which may exist as a loose network or may coalesce into a reproductive structure?

Answer

plants

animals

✓ fungi

protists

bacteria

Question 27 **Multiple Choice**

Question There are many examples in nature of cooperation among organisms, such as the bacteria that inhabit the root nodules of leguminous plants. Typically such cooperative associations develop because each organism can provide its partner with something the partner lacks or needs. When such partnerships exist between organisms that live in close association, these are called:

Answer

networks
communities
✓ symbioses
assemblages

Question 28 **Multiple Choice**

Question Which of the following best defines the *habitat* of an organism?

Answer

✓ the place, or physical setting, in which the organism lives
the organism's role in the ecological system

Question 29 **Multiple Choice**

Question The Peruvian rhinoceros katydid (*Copiphora rhinoceros*) is specialized for chewing leaves. This information helps us better understand which of the following?

Answer

its habitat
✓ its niche

Question 30 **Multiple Choice**

Question Thunderstorms and hurricanes. Unusually cold winters and glacial epochs. Each of these pairs of phenomena illustrates an important general principle that applies to temporal variation in the environment. Which of the following is the best statement of this principle?

Answer

All events occur with about the same severity and frequency.
✓ The more severe or extreme the event, the less frequent it is.
The more severe or extreme the event, the more frequent it is.
There is no relationship between severity and frequency of events.

Question 31

Question Is a particular scale of spatial variation equally important to all organisms?

Answer

Yes, all organisms respond in a similar fashion to spatial variation at a particular scale.
✓ No, each organism experiences spatial variation at a particular

scale in a unique way.

Question 32

Question Are scales of spatial and temporal variation in the environment related in any way?

Answer

✓ Yes, temporal and spatial scales of environmental variation are correlated; the area affected by an event is roughly proportional to its duration.

No, temporal and spatial scales of environmental variation are unrelated.

Question 33

Question For a given spatial scale (equivalent to the area of North America, for example), terrestrial, oceanic, and atmospheric systems undergo changes at dramatically different rates. From the choices below, correctly rank these systems from least to most rapid rate of change:

Answer

oceanic, atmospheric, terrestrial

✓ oceanic, terrestrial, atmospheric

terrestrial, atmospheric, oceanic

terrestrial, oceanic, atmospheric

Question 34

Question Most scientific investigations begin with a set of facts about nature. These facts are obtained by which of the following steps?

Answer

✓ observation and description

development of mathematical models

development of hypotheses

experimental testing of hypotheses

Question 35

Question The formulation of hypotheses represents a critical step in the scientific process. In the simplest terms, what is an hypothesis?

Answer

✓ an explanation

an experiment

an observation

a proven fact

Question 36

Question Marquis and Whelan conducted research on the role of bird predation in reducing the consumption of plants by insect herbivores. Which of the following features did they incorporate into their experiment?

Answer

controls reproducing all aspects of the experiment except for the variable of interest

additional controls for assessing experimental effects

replication to ensure that results were repeatable

✓ all of the above

Question 37

Question Ecologists sometimes state hypotheses in a special way, representing the system as a set of equations. What is this special kind of hypothesis called?

Answer

a control

✓ a mathematical model

a null hypothesis

an alternative hypothesis

Question 38

Question Ecologists using global carbon-balance models were overestimating the rate of increase of atmospheric carbon dioxide. This discovery led these ecologists to:

Answer

discard their models.

switch to modeling of other phenomena.

conclude that increase in atmospheric carbon dioxide is not a serious environmental problem.

✓ search for evidence of other carbon dioxide "sinks" in the global cycle of carbon.

Question 39

Question What approximate percentage of the biological productivity of the biosphere do humans currently usurp?

Answer

close to 0%

about 5%

about 10%

✓ about 50%

close to 100%

Question 40

Question Many ecosystems are sensitive to human intervention. Nile Perch were introduced into Lake Victoria with the intention of providing additional food for people living in the area. The ultimate result of this introduction was:

Answer

no change in the yield of fish to people living in the area.

a twofold increase in yield of fish to people living in the area.

a tenfold increase in yield of fish to people living in the area.

✓ destruction of native fish populations and devastation of the entire fishery.

Question 41

Question Fisherman living along the North Pacific Rim felt threatened by increased populations of sea otters because sea otters consume commercially valuable abalone, sea urchins, and spiny lobster. What beneficial aspect of sea otter ecology did these fishermen ignore?

Answer

Sea otters are consumed by killer whales, which would otherwise eat commercially valuable fish.

Sea otters catch and eat "trash fish," allowing stocks of commercially valuable fish to increase.

✓ Sea otters catch and eat sea urchins, thereby protecting kelps, which in turn shelter populations of larval fish.

Sea otters have been used in medical research to develop vaccines that protect domestic cats from a variety of diseases.

Question 42

Question Which of the following specifically forbids the transport of endangered species or their products (ivory, for example) across international boundaries?

Answer

the International Union for the Conservation of Nature (IUCN)

the World Wildlife Fund (WWF)

✓ the Convention on International Trade in Endangered Species (CITES)

the Kyoto Protocol on climate change

Question 43

Question What was accomplished by the Rio Convention on Biodiversity?

Answer

cessation of all poaching of elephants

✓ recognition of the proprietary interest of countries in their own biological heritage

addition of one hundred species to the U.S. Endangered Species List

permanent protection of one million hectares of Brazilian rain forest

Question 44

Question Many populations of different species living in the same place make up an ecological _____.

Answer community

Incorrect Feedback Many populations of different species living in the same place make up an ecological community.

Question 45

Question The _____ approach to the study of ecology concerns itself with the largest scale in the hierarchy of ecological systems.

Answer biosphere

Incorrect Feedback The biosphere approach to the study of ecology concerns itself with the largest scale in the hierarchy of ecological systems.

Question 46

Question The *Plasmodium* organisms responsible for malaria in humans are considered _____ because they make their living by consuming resources from a living host, in this case either humans or mosquitoes.

Answer parasites

Incorrect Feedback The *Plasmodium* organisms responsible for malaria in humans are considered parasites because they make their living by consuming resources from a living host, in this case either humans or mosquitoes.

Question 47

Question The attributes of organisms are not fixed, but change through time. This process of change is called _____.

Answer evolution

Incorrect Feedback The attributes of organisms are not fixed, but change through time. This process of change is called evolution.

Question 48

Question Attributes of an organism that suit it to the conditions of the environment are called _____.

Answer adaptations

Incorrect Feedback Attributes of an organism that suit it to the conditions of the environment are called adaptations.

Question 49

Question Individuals well suited to their environment survive and produce successful offspring, while individuals less well suited to their environment fail to survive or produce fewer successful offspring. In this way, inherited traits that are more suitable tend to be passed on to successive generations to a greater extent than less suitable traits. The process described in the preceding sentences is called evolution by _____.

Answer natural selection

Incorrect Feedback Individuals well suited to their environment survive and produce successful offspring, while individuals less well suited to their environment fail to survive or produce fewer successful offspring. In this way, inherited traits that are more suitable tend to be

passed on to successive generations to a greater extent than less suitable traits. The process described in the preceding sentences is called evolution by natural selection.

Question 50

Question All biological and ecological process obey the physical laws of _____.

Answer thermodynamics

Incorrect Feedback All biological and ecological process obey the physical laws of thermodynamics.

Question 51

Question The number of species in a biological community tends to remain constant over time, despite gains and losses of species, resulting from invasions and extinctions, respectively. This condition (constancy of species number) is an example of a(n) _____.

Answer dynamic steady state

Incorrect Feedback The number of species in a biological community tends to remain constant over time, despite gains and losses of species, resulting from invasions and extinctions, respectively. This condition (constancy of species number) is an example of a(n) dynamic steady state.

Question 52

Question Ecologists find it difficult or impossible to manipulate experimentally large ecological systems (populations, communities, ecosystems). One way of getting around this problem is to replicate the essential features of such systems in smaller, simplified laboratory or field settings, called _____.

Answer microcosms

Incorrect Feedback Ecologists find it difficult or impossible to manipulate experimentally large ecological systems (populations, communities, ecosystems). One way of getting around this problem is to replicate the essential features of such systems in smaller, simplified laboratory or field settings, called microcosms.

Question 53

Question Ecologists sometimes find it necessary to rely on natural variation in the environment to create reasonably controlled experimental treatments. This approach, used in studies of island biogeography, is referred to as a _____.

Answer natural experiment

Incorrect Ecologists sometimes find it necessary to rely on natural

Feedback	variation in the environment to create reasonably controlled experimental treatments. This approach, used in studies of island biogeography, is referred to as a natural experiment.