Name: Date:
Teacher: Class/Period:

1) As Juaquin travels by train up a mountain, he observes that the terrain changes from coniferous trees to small shrubs. Which level of organization has most likely remained constant?

A. Population

B. Ecosystem

C. Community

D. Biosphere

2) Assume that 10% of the energy absorbed by one trophic level is transferred to the next successive level and the same amount of energy is available at the primary producer level of each of these food chains.

Food Chain 1:
phytoplankton → zooplankton → smelt → trout → h
umans

Food Chain 2: phytoplankton → smelt → humans

How much energy would be available to humans in Food Chain 2 as compared to the energy available to humans in Food Chain 1 ?

A. 10 times less energy

B. 10 times more energy

C. 100 times less energy

D. 100 times more energy

3) Consider the following simple lake food chain.

Algae → Mosquito larvae → Dragonfly
larvae → Perch → Pike

According to this diagram, which of these organisms is a tertiary consumer?

A. Pike

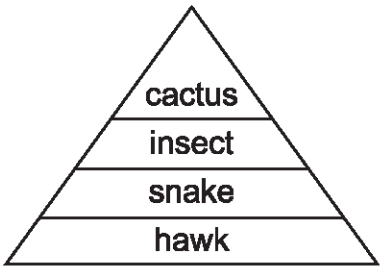
B. Perch

C. Dragonfly larvae

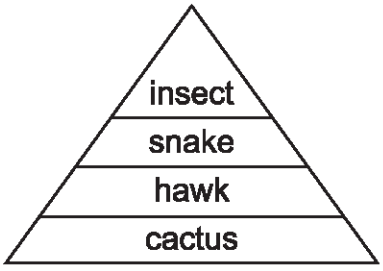
D. Mosquito larvae

4) Which energy pyramid accurately represents the amount of energy in a desert food chain including cactus, hawk, insect, and snake?

A.



B.



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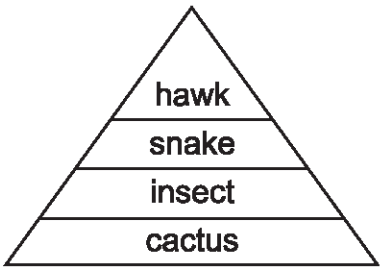
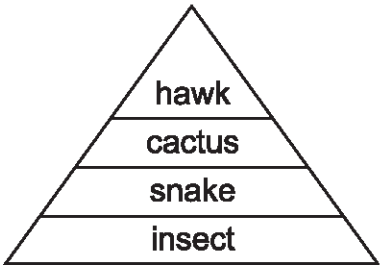


D.



5) A hospital patient had a serious bacterial infection that required treatment with strong antibiotics. The patient recovered from the infection, but experienced side effects, including oral fungal infections and digestive problems. What is the most probable reason for the side effects?

A. The patient experienced an allergic reaction to the antibiotics.

B. The patient had not fully recovered from the infection.

C. The antibiotics killed both harmful and beneficial bacteria.

D. The antibiotics encouraged an overgrowth of beneficial bacteria.

6) Zooxanthellae are protists that live inside reef-building coral polyps and provide the corals nutrients. Corals protect zooxanthellae and give them access to light for photosynthesis. When most of the zooxanthellae inside corals die, the corals also die. Zooxanthellae living in closely related coral species may not be closely related, while zooxanthellae living in distantly related corals may be more closely related. Which description of the relationship between zooxanthellae and corals is accurate?

A. It is a chance relationship that occurs frequently only if both types of organisms exist close together.

B. It is a chance relationship that occurs frequently because zooxanthellae are common on coral reefs.

C. It is a symbiotic relationship that most likely evolved on coral reefs in 1 geographic location.

D. It is a symbiotic relationship that most likely evolved on coral reefs in a number of geographic locations.

7) An oxpecker is a bird that usually feeds on parasites on a rhinoceros's back. It occasionally picks scabs off the rhinoceros's back and drinks blood from the wounds. Describe the relationship(s) between the oxpecker and the rhinoceros.

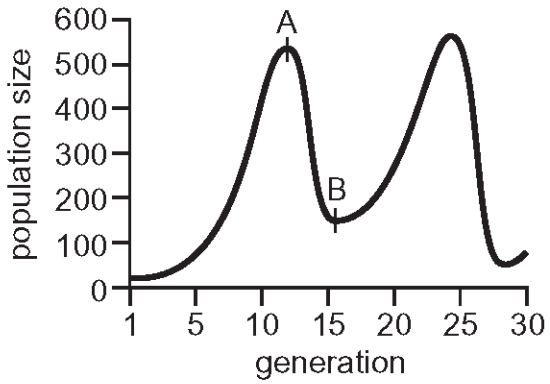
A. Mutualism only

B. Mutualism and predation

C. Mutualism and parasitism

D. Mutualism and commensalism

8) A biologist recorded the number of rabbits in a population over 30 generations.



Which of the following statements best explains why the number of rabbits in the population dramatically decreased between Points A and B? Shortly after the 10th generation:

A. a new predator that feeds solely on the rabbits' main competitor was introduced into the rabbits' habitat.

B. area farmers set traps for coyotes, the rabbits' main predator.

C. a change in environmental conditions led to a significant increase in the amount of food available to the rabbits.

D. a fatal disease infected a large proportion of the rabbits in this population.

9) A certain species of protist lives within the intestines of a termite. After the termite chews and swallows wood, the protist enzymatically digests the wood, providing a usable source of energy for both itself and the termite. The relationship between the protist and the termite is best described as:

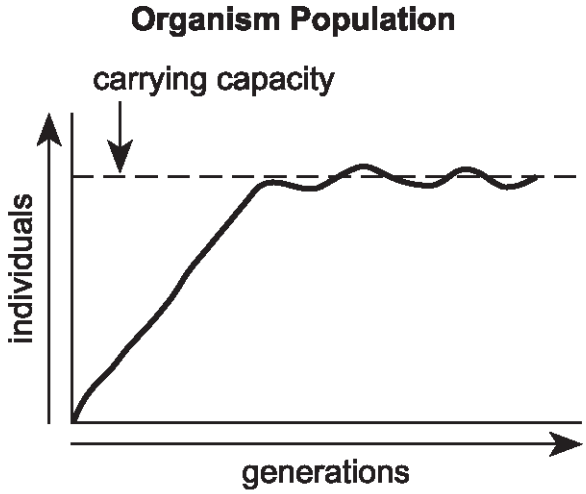
A. competitive.

B. mutualistic.

C. parasitic.

D. predatory.

10) Using the graph, determine which statement most likely describes the relationship between the population of organisms and the resources available to the population.



A. There are adequate resources to support this stable population.

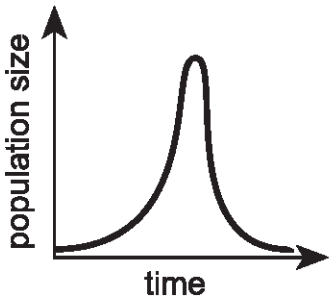
B. There are adequate resources to support this unstable population.

C. There are inadequate resources to support this stable population.

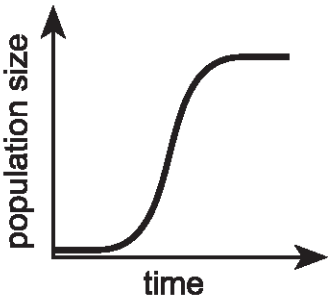
D. There are inadequate resources to support this unstable population.

11) For years, runoff from a nearby industrial plant has entered a certain lake. The runoff causes seasonal blooms of algae in the lake. These algae are short-lived and die off quickly. Which of the following graphs most likely illustrates the growth pattern of this algal population from the beginning of the spring seasonal bloom to the end of the resultant die-off of the algal population?

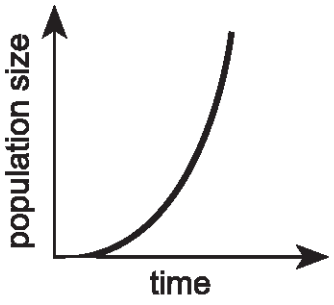
A.



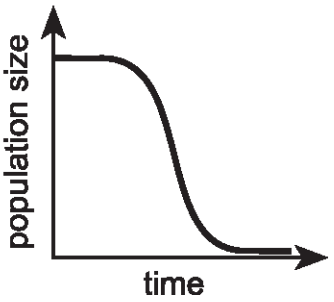
C.



B.



D.



12) Louise places 1 bacterium in a Petri dish at time 0. The population increases exponentially, doubling every hour, and there are no limiting factors. How many bacteria will be in the Petri dish after 6 hrs ?

A. 6

B. 16

C. 32

D. 64

13) When a new volcanic island forms, the pioneer species are the first species to successfully colonize the island. Which of the following characteristics would be the most advantageous to a pioneer species colonizing this newly formed island?

A. Low dispersal rate

B. Narrow environmental tolerance

C. High reproductive rate

D. Long generation time

14) Aisha wants to conduct an experiment to determine whether sun and shade varieties of the same plant species prefer the same wavelengths of light. She plans to measure rates of photosynthesis. Which design would be best for her experiment?

A. 1 plant of the sun variety tested under blue light only, and 1 plant of the shade variety tested under blue light only

B. 4 plants of the sun variety: 1 tested under blue light, 1 under green, 1 under red, and 1 under yellow light, and 4 plants of the shade variety: 1 tested under blue light, 1 under green, 1 under red, and 1 under yellow light

C. 10 plants of the sun variety tested under blue light only; and 10 plants of the shade variety tested under blue light only

D. 40 plants of the sun variety: 10 tested under blue light, 10 under green, 10 under red, and 10 under yellow light, and 40 plants of the shade variety: 10 tested under blue light, 10 under green, 10 under red, and 10 under yellow light

15) Ethan wants to determine whether temperature affects the rate at which mold grows on bread. He puts one piece of bread inside a petri dish, closes the lid, and places the petri dish in the refrigerator. To determine whether temperature affects the growth of mold, Ethan should place another piece of bread into a petri dish:

A. leave the dish uncovered, and place the dish in the refrigerator.

B. cover the dish, and place the dish in the refrigerator.

C. leave the dish uncovered, and place the dish in a dark, room temperature cabinet.

D. cover the dish, and place the dish in a dark, room temperature cabinet.

16) Which experimental design would provide scientists with the best data for investigating which type of feed yields the greatest gain in lean muscle mass in cattle?

A. Test 5 different types of cows with the same feed mixture and measure their weight gain at the end of a 6-week trial.

B. Test 5 similar groups of cows with 5 different feed mixtures and measure their weight gain at the end of a 6-week trial.

C. Test 5 similar groups of cows with the same feed mixture, give each group varying amounts of feed, and measure their weight gain at the end of a 6-week trial.

D. Test 5 different types of cows with 5 different feed mixtures, give each group varying amounts of feed, and measure their weight gain at the end of a 6-week trial.

17) Bryce is planning to plant tomatoes in his garden. He wants to determine if tomato seeds will germinate (sprout) faster in soil with sugar added than in soil with no sugar added. He plants one seed in 100 grams of soil in each of 20 pots.

Which experiment will give him the most useful results?

A. Placing 5 grams of sugar in all 20 pots; then giving 10 pots 40 mL of water daily and the other 10 pots 80 mL of water daily

B. Placing 5 grams of sugar in 10 pots, and 10 grams of sugar in the other 10 pots; then giving all 20 pots 40 mL of water daily

C. Placing 5 grams of sugar in 10 pots, and no sugar in the other 10 pots; then giving all pots 40 mL of water daily

D. Placing 5 grams of sugar in 10 pots, and no sugar in the other 10 pots; then giving the 10 pots with sugar 40 mL of water daily and the 10 pots without sugar 80 mL of water daily

18) Morgan hypothesizes that the activity of amylase, an enzyme that catalyses the breakdown of starch, will be greater at 37°C than at 25°C. She prepares 2 tubes: Tube 1 and Tube 2. Morgan adds 2 g of starch and 1 mL of an enzyme suspension to Tube 1 and incubates it at 37°C for 20 min. To accurately test her hypothesis, Morgan should add 2 g of the starch and 1 mL of the enzyme suspension to Tube 2 and incubate it at _____ for _____.

A. 25°C; 20 min

B. 37°C; 20 min

C. 25°C; 10 min

D. 37°C; 10 min

19) Dr. Hansen performs an experiment testing the effectiveness of different cough syrups. Identify the independent variable in the experiment.

A. Type of cough syrup

B. Flavor of the cough syrup

C. Number of people taking each cough syrup

D. Number of days people take each cough syrup

20) The number and type of macroinvertebrates are good indicators of the amount of pollution in a stream because they tolerate varying levels of pollution. A biology textbook provides this table of tolerance levels.

Macroinvertebrate	Pollution level tolerated
Stonefly	Low
Crayfish	Medium
Blackfly	High
Leech	Very high

Biology students gather samples from a local stream and conclude that it is extremely polluted. Which table most likely reflects the data gathered by the students?

A.

Macroinvertebrate	Number collected
Stonefly	2
Crayfish	10
Blackfly	5
Leech	3

B.

Macroinvertebrate	Number collected
Stonefly	2
Crayfish	1
Blackfly	3
Leech	2

C.

Macroinvertebrate	Number collected
Stonefly	0
Crayfish	2
Blackfly	5
Leech	5

D.

Macroinvertebrate	Number collected
Stonefly	0
Crayfish	12
Blackfly	8
Leech	3

21) Scientists collected data on the height and weight of individuals in a population. They recorded their results in this scatterplot.

What is the most accurate conclusion regarding the relationship between height and weight?

A. Tall individuals are always heavier than short individuals.

B. There is no relationship between height and weight.

C. There is a negative relationship between height and weight.

D. There is a positive relationship between height and weight.

22) Biology students carried out an experiment to determine if a certain fertilizer increased the height of plants. The students selected 4 types of plants and planted 10 seeds of each type. Five seeds of each type were treated with fertilizer and 5 seeds of each type were not treated with fertilizer. All other conditions were identical. The students recorded the plant height after 120 days, as shown in the table.

Plant Height (cm)							
Castor bean		Okra		Radish		Tomato	
Fertilizer	No fertilizer	Fertilizer	No fertilizer	Fertilizer	No fertilizer	Fertilizer	No fertilizer
150	145	75	70	15	10	150	140
145	140	80	80	20	15	145	130
155	150	75	70	25	20	155	135
160	155	75	65	20	15	160	120
140	140	75	70	20	20	165	125

Based on the results shown in this table, the difference (in cm) between the average height of the plants treated with fertilizer and the average height of the unfertilized plants was greatest for which of these plant types?

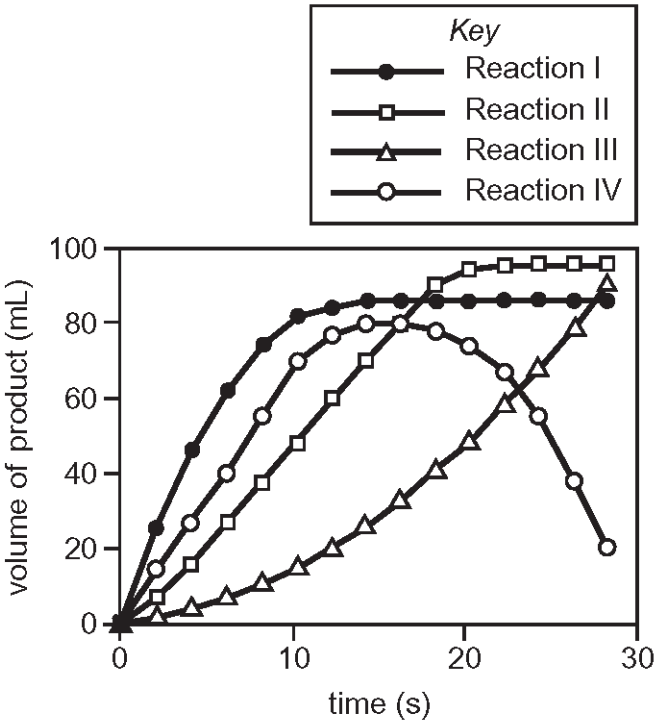
A. Castor bean

B. Okra

C. Radish

D. Tomato

23) This graph shows the volume of product produced over time for 4 different enzyme-catalyzed reactions.



Between 0 s and 2 s, which of these 4 reactions has the greatest average rate of production?

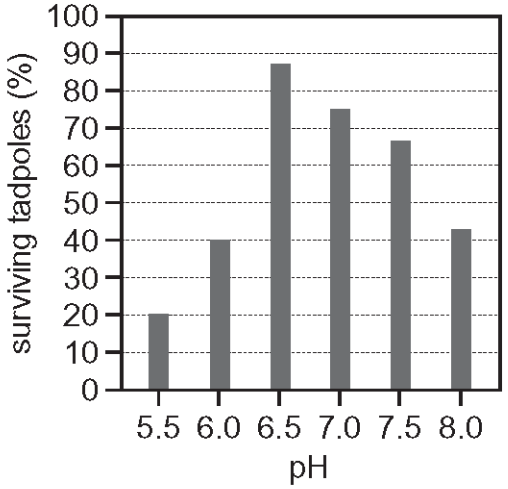
A. Reaction I

B. Reaction II

C. Reaction III

D. Reaction IV

24) A biologist conducted an experiment to determine whether the survival of tadpoles was affected by the pH of the pond water in which they live. His results are shown in this graph.



Based on this graph, the difference between the percentage of surviving tadpoles is greatest for which 2 consecutive pH values?

A. 5.5 and 6.0

B. 6.0 and 6.5

C. 6.5 and 7.0

D. 7.5 and 8.0

25) Paul and Simon want to determine who is more fit. They decide to run in place for 5 minutes and then measure their blood pressures to see whose returns to normal most quickly. They record the data in this table.

	Paul		Simon	
Physiological condition	Systole/Diastole (mm Hg)	Pulse (beats/min)	Systole/Diastole (mm Hg)	Pulse (beats/min)
Sitting	114/73	58	113/74	62
Exercise	160/75	94	170/75	100
1 min after exercise	142/72	74	158/73	76
3 min after exercise	122/72	65	139/73	70
5 min after exercise	114/73	58	121/74	66

Paul told Simon that the heart pumps more blood during exercise than at rest. How do the experiment's results support Paul's statement?

A. Exercise increases only the pulse.

B. Exercise increases only the systolic pressure.

C. Exercise increases both the systolic and diastolic pressure.

D. Exercise increases both the pulse and the systolic pressure.

26) Lupe performed an experiment to test the ability of different heavy metals to inhibit normal enzyme activity in liver.

Lupe placed 5 g of liver in each of 5 test tubes. In 4 of the tubes, she also placed equal amounts of a heavy metal. She then added 6 mL of hydrogen peroxide to all 5 tubes. She used the resulting bubble column as an indicator of enzyme activity in the liver and recorded the data in this table.

(Note: The greater the height of the bubble column, the greater the enzyme activity.)

	Height of bubble column (cm)			
	Trial #1	Trial #2	Trial #3	Average
Control (No heavy metal)	7	8	8	7.7
Lead (Pb)	4	4	5	4.3
Mercury (Hg)	4	6	5	5.0
Magnesium (Mg)	5	5	6	5.3
Zinc (Zn)	10	9	9	9.3

Based on Lupe's data, enzyme activity was inhibited the most by which of the 4 heavy metals?

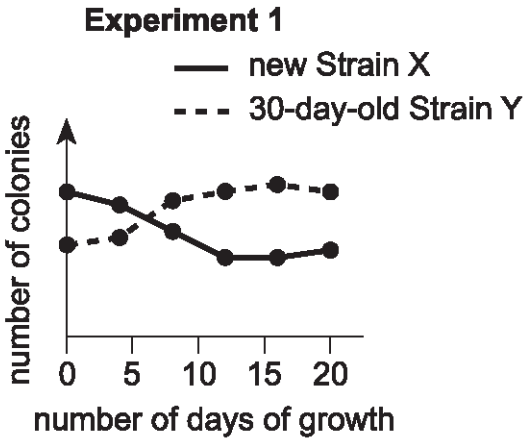
A. Zn

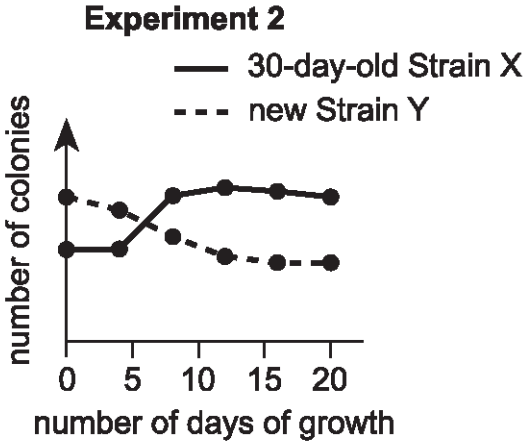
B. Mg

C. Hg

D. Pb

27) Sunee and Jamila grow 2 distinct strains of *E. coli* bacteria following appropriate lab procedures. In Experiment 1, they use a new culture of Strain X and a 30-day old culture of Strain Y. In Experiment 2, they use a new culture of Strain Y and a 30-day old culture of Strain X. Sunee and Jamila measure the number of bacterial colonies and record the data in these graphs.





What is the most accurate conclusion about the growth rate of the bacteria?

A. Strain X grows faster than Strain Y regardless of the culture's age.

B. Strain Y grows faster than Strain X regardless of the culture's age.

C. The 30-day old culture grows faster regardless of the strain.

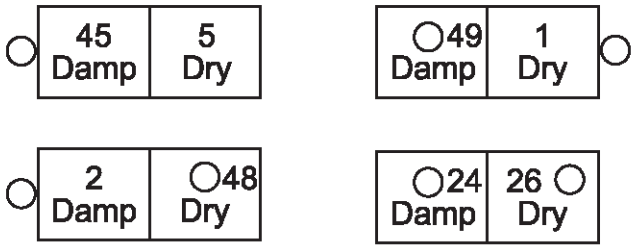
D. The new culture grows faster regardless of the strain.

28) Several students in a biology lab tested mealworms' preference for damp or dry conditions. The students placed 50 mealworms one-by-one in the middle of a layer of paper towels with a damp area and a dry area. The mealworms were allowed to move freely over the paper towels for 10 min. After 10 min the students noted the location of each mealworm. The data is summarized below.

47 Damp	3 Dry

In a second experiment the same 50 mealworms were exposed to each of 4 different arrangements of paper towels with food sources in different locations. Food sources just off the paper towels can be sensed by the mealworms, but are out of their reach. The diagram below shows the location of the worms after 10 min.

○ = food source



Which conclusion best supports the data collected in both experiments?

A. Mealworms prefer damp conditions over dry conditions.

B. Mealworms prefer dry conditions over damp conditions.

C. Mealworms are more strongly influenced by food than by damp or dry conditions.

D. Mealworms are more strongly influenced by damp or dry conditions than by food.

29) A student doing research on pill bugs hypothesized that pill bugs would be found in moist habitats, but not in dry habitats. The student found 2 pill bugs at 1 site: 1 under a log in moist conditions and another underneath some dry leaves. This finding did not support the student's original hypothesis. What should the student do next to determine if the original hypothesis is valid?

A. Change the focus of the research from moisture to light sensitivity.

B. Assume these findings are representative of all pill bugs and accept the null hypothesis.

C. Find other organisms at the site to test for changes in moisture level.

D. Look for more pill bugs at the site to generate a larger sample size.

30) A scientist found that the results of an experiment did not support her hypothesis. If she is following proper scientific procedure, what should she do next?

A. Discard those results and repeat the experiment.

B. Accept the hypothesis and exclude data that does not fit.

C. Reject the hypothesis and assume it is incorrect.

D. Create a new hypothesis and a new experiment to test it.

31) Aden wanted to determine the effects of stress on heart rate. As his stress factor, he asked subjects to complete math problems. He randomly divided his biology class of 24 students into 2 groups. He gave 1 group a timed test of difficult algebra problems; he gave the other group a timed test of simple arithmetic problems. Aden measured heart rates both before and immediately after the test. He hypothesized that the group given the difficult problems would show a higher mean heart rate (that is, a higher stress level) than those given simple problems. Results are shown below.

Group	Initial heart rate (beats/min)	Final heart rate (beats/min)
Difficult algebra	72	77
Simple arithmetic	71	75

Because the results were so similar, Aden decided to do a second test in which he collected additional types of information. Which changes in experimental design would best help him accept or reject his initial hypothesis?

A. Heart rates of the 2 groups taken during the test

B. Average math grades of the 2 groups

C. Before and after heart rates when both groups are given a more difficult test

D. Before and after heart rates when a single group is given the same test

32) Which laboratory safety procedure is most important for a student working with bacterial cultures?

A. Storing nutrient agar in a beaker

B. Wearing rubber gloves and a lab coat

C. Using warm water to clean glassware

D. Recording data neatly in a notebook

33) To enhance laboratory safety, how should students begin a new laboratory activity?

A. Wait until other students begin and then follow their lead.

B. Gather supplies immediately and read the directions as needed.

C. Begin immediately and gather supplies as needed.

D. Read the laboratory exercise and gather supplies before beginning.

34) A researcher counted the number of eggs a single fruit fly laid in 24 hrs for 5 days and recorded the findings in this table.

Day	Number of eggs
1	10
2	14
3	7
4	8
5	11

What is the average number of eggs laid per day over the 5 days?

A. 5

B. 10

C. 25

D. 50

Two students wanted to estimate and compare the density of 2 species of plants in a grassland habitat. Student 1 randomly located 10 sampling plots and counted the number of plants of each species in each sampling plot. Each sampling plot was 1 m^2. The number of individuals of each species that Student 1 counted in each sampling plot were:

Species A: 9, 8, 15, 21, 8, 4, 25, 1, 11, 0

Species B: 15, 14, 15, 16, 15, 17, 14, 15, 18, 16

Student 2 was in a hurry and decided to locate his 10 sampling plots in the areas with the least amount of vegetation. He counted the number of plants of each species in each 1 m^2 sampling plot. The number of individuals of each species that Student 2 counted in each sampling plot were:

Species A: 2, 4, 1, 0, 0, 4, 2, 1, 1, 0

Species B: 13, 15, 14, 15, 14, 14, 15, 15, 14, 14

35) Based on the data collected by Student 1, what is the mean density of Species A in the grassland habitat he surveyed?

A. 1.5 individuals/m^2

B. 5.9 individuals/m^2

C. 10.2 individuals/m^2

D. 15.5 individuals/m^2

36) Based on the data collected by Student 2, what is the mean density of Species B in the grassland habitat he surveyed?

A. 1.5 individuals/m^2

B. 5.9 individuals/m^2

C. 10.2 individuals/m^2

D. 14.3 individuals/m^2

37) Hurricanes are rated on a scale of 1−5 by wind speed as summarized in the table below.

Category	Wind speed (mph)
1	74−95
2	96−110
3	111−130
4	131−155
5	156+

One source on hurricanes provides the following information about the intensity and occurrence of hurricanes in Texas and Mexico from 1900−2004.

Category	Number of hurricanes
1	65
2	41
3	50
4	16
5	2

Based only on the information in the tables, for the majority of the hurricanes that will strike the coast near Texas and Mexico, what is the most likely wind speed range, in mph ?

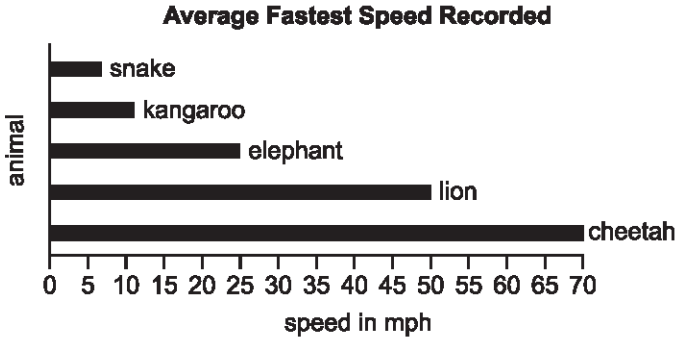
A. 74−95

B. 96−110

C. 111−130

D. 131−155

38) The graph represents the average fastest speed of 5 animals recorded in one study.



Based on the graph, which species is approximately $\frac{1}{3}$ as fast as the cheetah?

A. Elephant

B. Kangaroo

C. Lion

D. Snake

Answer Key

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

38) A