31. It is reasonable to infer that the migratory behavior of the mole salamander:
    - A. will change in the near future.
    - B. is important for the continuation of the species.
    - C. has only been observed since the Henry Street tunnels were built in 1987.
    - D. is of little interest to wildlife biologists.

32. The author suggests that public interest in salamander migration:
    - F. has made tourism the major source of income for the city of Amherst.
    - G. has been encouraged by publicity surrounding the Big Night.
    - H. is not as great as he would like it to be.
    - J. is not focused on one geographic area.

33. Why does the author say that mole salamanders "need a helping hand" (line 70)?
    - A. The species will soon be extinct.
    - B. They have to learn to use the tunnels built for them in Amherst.
    - C. They face many predators in their breeding pools.
    - D. They are ill prepared to adapt to unforeseen changes in their customary breeding grounds.

34. What does the author mean when he refers to an overnight rain as "gloriously" dismal (line 45)?
    - F. The rain really wasn't dismal at all.
    - G. He found the rain quite refreshing.
    - H. He enjoys weather conditions that are normally considered unpleasant.
    - J. The storm he experienced was so severe that it would be remembered for many years.

35. According to the passage, what happens to the salamander eggs after the Big Night?
    - A. They are buried in the sand.
    - B. They are eaten by predator fish and frogs.
    - C. They are deposited on the banks of breeding pools.
    - D. They are attached to branches underwater.

36. When the author refers to the Big Night as "a magical confluence of the calendar and the weather," he is saying that:
    - F. the forces that cause salamanders to seek out breeding pools are not explainable by science.
    - G. the Big Night occurs only when both the conditions and the time of year are right for the migration.
    - H. the migration only occurs in those years when the weather conditions are perfect on an exact date.
    - J. the migration date never changes.

37. According to the passage, salamander migrations occur:
    - A. primarily in central Massachusetts.
    - B. from the Catskills to the Great Smokies.
    - C. only where adequate tunnels have been built to protect their migration routes.
    - D. throughout the United States.

38. According to the passage, salamanders seek out vernal pools because:
    - F. the pools are free of many predatory creatures that like to feed on salamanders and their eggs.
    - G. the pools are populated by frogs and water bugs.
    - H. the pools are shallow enough for the salamanders to wade in.
    - J. the chemical composition of the water in the vernal pools is conducive to breeding.

39. According to the author, where do mole salamanders spend their time outside of breeding season?
    - A. In the woods outside Amherst
    - B. Clinging to underwater twigs and stumps
    - C. Underground
    - D. As close as possible to vernal pools

40. The author exclaims, "What a stew of primordial sights and sounds!" (lines 64–65) to make the point that:
    - F. the noise on the Big Night is extremely loud.
    - G. the Big Night presents an interesting mix of visual and aural stimuli.
    - H. most people would be frightened if they observed the Big Night.
    - J. predators were feasting on the salamanders.

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.

SCIENCE TEST

35 Minutes—40 Questions

Directions: This test contains seven passages, each followed by several questions. After reading each passage, select the best answer to each question and fill in the corresponding oval on your Answer Grid. You may refer to the passages while answering the questions. You may NOT use a calculator on this test.

Passage I

The growth of flowering plants and trees can depend on a number of factors, including the type of plant and the latitude where it is grown. Table 1 below contains typical adult heights for several different varieties of a particular flowering plant.

The rate of flowering for many plants and trees, such as the pecan tree, depends on the age of the organism. Growth occurs in several distinct phases, which reflect changes in the development of the organism over time. See Figure 1.

Table 1

Variety	Soil type	Latitude (degrees)	Height (meters)
Lagerstroemia Apalachee	Soil alone	28	5.2
Lagerstroemia indica Catawba	Soil and organic compost	28	2.7
Lagerstroemia Chickasaw	Soil alone	28	0.9
Lagerstroemia Choctaw	Soil and mulch	28	7.3
Lagerstroemia indica Conestoga	Soil alone	28	2.4
Lagerstroemia fauriei Kiowa	Soil and organic compost	28	8.3
Lagerstroemia Miami	Soil alone	28	6.4
Lagerstroemia Natchez	Soil and mulch	33	5.8
Lagerstroemia Natchez	Soil and natural fertilizer	28	8.6
Lagerstroemia Natchez	Soil and artificial fertilizer	28	7.6
Lagerstroemia indica Potomac	Soil alone	28	4.6
Lagerstroemia Tuscarora	Soil alone	25	4.9

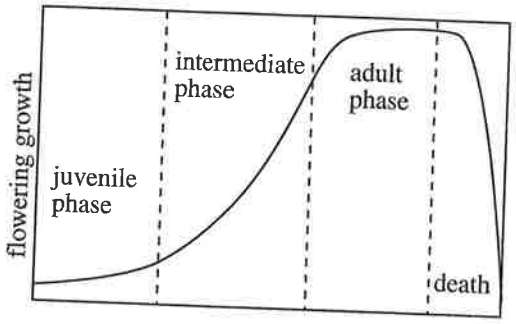


Figure 1

1. Based on the information presented in Table 1, if a you *Lagerstroemia Natchez* was planted at a latitude of degrees, one would predict its adult height to most likely b
   - **A.** less than 6.0 meters.
   - **B.** between 6.0 and 6.5 meters.
   - **C.** between 6.5 and 7.5 meters.
   - **D.** between 7.5 and 9.0 meters.

2. Flowering growth increases most rapidly during which c the following phases?
   - **F.** Juvenile phase
   - **G.** Intermediate phase
   - **H.** Adult phase
   - **J.** Death

3. Based on the information contained within Table 1, whic of the following varieties grown in soil alone reached the greatest adult height?
   - **A.** *Lagerstroemia indica Conestoga*
   - **B.** *Lagerstroemia Miami*
   - **C.** *Lagerstroemia indica Potomac*
   - **D.** *Lagerstroemia Tuscarora*

GO ON TO THE NEXT PAGE

4. Seedlings of the plant varieties shown in Table 1 were planted in a patch of soil enriched with organic compost at a latitude of 28 degrees. Which of the following varieties would probably come closest to an adult height of 3 meters?

   F. *Lagerstroemia indica Catawba*
   G. *Lagerstroemia Chickasaw*
   H. *Lagerstroemia fauriei Kiowa*
   J. *Lagerstroemia Natchez*

5. Which of the following hypotheses about flowering trees is supported by the information displayed in Figure 1?

   A. Flowering growth increases at a constant rate throughout the life cycle of the tree.
   B. The flowering growth of juvenile trees begins to increase sharply immediately after they are planted.
   C. The flowering growth of juvenile trees begins to decrease immediately after they are planted.
   D. Young trees experience little flowering growth until they reach a certain point in their developmental cycle.

GO ON TO THE NEXT PAGE

Passage II

Scientists noted an increase in acid rainfall and reports of respiratory ailments in a certain community. They suspected that both of these outcomes were due to increased levels of airborne pollutants, such as carbon monoxide and sulfur dioxide, entering the atmosphere in that community. Common sources of gaseous pollutants are factories, motor vehicles, or industrial processes that burn fossil fuels and release byproducts of their reactions into the air. To determine the sources of these pollutants, scientists conducted the following experiments.

Experiment 1

The scientists found that one likely source of pollutant gases was a network of highways located near the community. Sampling stations at ground level were set up near two major highways so that air samples could be recorded daily. The results of these measurements are shown in Table 1.

Table 1

Date	Carbon monoxide level (parts per million)	Sulfur dioxide level (parts per million)
Highway 1		
January 6	2.3	0.002
January 7	3.2	0.002
January 8	2.9	0.003
January 9	2.6	0.002
January 10	2.1	0.004
Highway 2		
January 6	3.4	0.004
January 7	3.8	0.006
January 8	4.9	0.004
January 9	3.4	0.003
January 10	3.2	0.002

Experiment 2

Scientists also suspected that another source of pollutants was from the community's power plant, an older coal-burning plant. Air samples were recorded from the tops of two different monitoring towers near the power plant's two main smokestacks, which emit most of the byproducts created in the electricity-generating process. The results are shown in Table 2.

Table 2

Date	Ozone level (parts per million)	Carbon monoxide level (parts per million)	Sulfur dioxide level (parts per million)
Tower 1			
January 6	0.05	3.3	0.005
January 7	0.06	3.2	0.006
January 8	0.11	3.3	0.009
January 9	0.15	4.3	0.013
January 10	0.10	4.2	0.009
Tower 2			
January 6	0.04	2.0	0.004
January 7	0.05	2.9	0.005
January 8	0.06	3.0	0.008
January 9	0.05	2.8	0.006
January 10	0.04	2.1	0.004

6. How is the design of Experiment 1 different from the design of Experiment 2, in terms of sampling methods?

   F. In Experiment 1, sampling was done weekly, while in Experiment 2, sampling was done every day.
   G. In Experiment 1, air was sampled at ground level, while in Experiment 2, air was sampled at the tops of two towers.
   H. In Experiment 1, ozone levels were sampled, while in Experiment 2, ozone levels were not sampled.
   J. In Experiment 1, only carbon monoxide was sampled, while in Experiment 2, only sulfur dioxide was sampled.

7. In order to obtain more information about the relationship between carbon monoxide, sulfur dioxide, and respiratory ailments, which of the following experiments should be carried out next?

   A. Studying how asthma is affected by changes in temperature throughout the year
   B. Assessing the rates of respiratory illness in communities with varying average levels of carbon monoxide and sulfur dioxide
   C. Adding large amounts of carbon monoxide and sulfur dioxide to the air surrounding Highway 1
   D. Encouraging carpools to decrease traffic levels in the highways around this community

GO ON TO THE NEXT PAGE

8. Scientists suspected that sulfur dioxide emissions from the power plant were contributing to acid rain, which in turn was affecting the acidity of lakes in the surrounding countryside. In order to test this hypothesis, which of the following should the scientists do next?

   F. Sample sulfur dioxide levels near the power plant's smaller smokestacks.
   G. Measure the number of respiratory ailments suffered by people living near the lakes.
   H. Increase the amount of coal burned by the power plant.
   J. Measure the acidity of the water at a number of lakes with varying levels of atmospheric sulfur dioxide.

9. What hypothesis concerning respiratory ailments were the scientists testing in Experiment 1?

   A. Pollutants from vehicular highway traffic cause an increase in respiratory ailments.
   B. Emissions from coal-burning power plants cause a decrease in respiratory ailments.
   C. Rainfall in the communities located near the highways causes a decrease in respiratory ailments.
   D. Acid rain tends to deposit pollutants into areas where highway traffic is least frequent.

10. Given the results of Experiments 1 and 2, all of the following actions would reduce levels of airborne pollutants EXCEPT:

    F. building more highways in the areas surrounding the community.
    G. placing limits on the amount of highway traffic near the community.
    H. reducing the amount of coal burned at the power plant.
    J. installing filters in the power plant's smokestacks that remove sulfur dioxide from the plant's emissions.

11. As carbon monoxide emissions are carried away from their sources, they tend to diffuse (become less concentrated). Which of the following would be the most likely approximate carbon monoxide level near Highway 1 on January 7 if the sampling station were set up closer to the roadway?

    A. 1.0 parts per million
    B. 2.0 parts per million
    C. 3.0 parts per million
    D. 4.0 parts per million

GO ON TO THE NEXT PAGE

Passage III

Ultraviolet (UV) light, a component of natural sunlight, can be damaging to human skin at high doses. UV light occurs in several ranges, including less damaging UV-A light and more damaging UV-B and UV-C light. Scientists designed two experiments to investigate the various factors affecting levels of UV light in a certain region of the United States.

Experiment 1

Scientists studied how levels of UV-A light vary seasonally and with elevation. They measured UV-A energy over a 10-minute span of time for several days to determine an average daily UV-A value for each site. Three sites were studied at three different elevations, and measurements from each site were obtained once in the winter and once in the summer. UV-A levels for an average 10-minute period beginning 30 minutes after the sun appeared directly overhead were calculated in millijoules per square centimeter (mJ/cm^2). The results are shown in Table 1.

Table 1

Season	Elevation (meters above sea level)	Average UV-A level (mJ/cm^2)
Winter	0	1,270
	1,000	1,400
	2,000	1,530
Summer	0	1,580
	1,000	1,740
	2,000	1,900

Experiment 2

Next, the levels of UV-A and UV-B were measured at 0, 1, and 2 hours past the time of day at which the sun was directly overhead during the winter at the site with an elevation of 2,000 meters above sea level. The level of UV-A decreased from 1,620 mJ/cm^2 at 0 hours to 1,430 mJ/cm^2 at 2 hours. The level of UV-B decreased from 48 mJ/cm^2 at 0 hours to 42 mJ/cm^2 at 2 hours.

Experiment 3

UV-B light is another component of sunlight that occurs at a lower rate than UV-A but with higher energy. Levels of UV-B light, in millijoules per square centimeter (mJ/cm^2), were measured at various times of day during the summer at the site with an elevation of 2,000 meters above sea level. The results are shown in Table 2.

Table 2

Hours after sun is directly overhead	Average UV-B level (mJ/cm2)
0	68
1	63
2	57
3	49
4	41

12. Which of the following variables was changed Experiment 3?

- **F.** Background levels of UV-A light
- **G.** Background levels of UV-B light
- **H.** Time of day
- **J.** Season of the year

13. According to the results of these experiments, one way reduce exposure to UV-A light would be to:

- **A.** spend time in environments with higher levels of U B light.
- **B.** live in an area with shorter summers and longer winte
- **C.** live in an area with longer summers and shorter winte
- **D.** make sure that all windows are designed to filter c UV-B light.

14. Based on the results of these experiments, if one compar UV-B levels when the sun is directly overhead to tho when the sun is low on the horizon, the UV-B levels:

- **F.** when the sun is overhead would be lower than wh the sun is low on the horizon.
- **G.** when the sun is overhead would be higher than wh the sun is low on the horizon.
- **H.** when the sun is overhead would be the same as wh the sun is low on the horizon.
- **J.** would be measurable only when the sun is overhead

15. UV-C light is a third type of UV light that was not direct studied in the experiments above. However, if it behav like the other types of UV light in the experiments, o would expect that UV-C levels:

- **A.** would decrease from year to year.
- **B.** would increase from year to year.
- **C.** are higher when the sun is directly overhead.
- **D.** are lower when the sun is directly overhead.

GO ON TO THE NEXT PAGE

16. Based on the experimental results, as the number of hours after the sun is directly overhead increases:

    F. UV-A and UV-B levels both increase.
    G. UV-A levels increase and UV-B levels decrease.
    H. UV-A levels increase and UV-B levels stay the same.
    J. UV-A and UV-B levels both decrease.

17. A community near the region studied has an elevation of 3,000 meters above sea level. At a time 30 minutes after the sun is directly overhead, one would predict that UV-A levels during the summer are:

    A. less than 1,580 mJ/cm^2.
    B. between 1,580 and 1,740 mJ/cm^2.
    C. between 1,740 and 1,900 mJ/cm^2.
    D. above 1,900 mJ/cm^2.

GO ON TO THE NEXT PAGE

Passage IV

The following experiments were performed to study the motion of gyroscopes, objects on a surface that spin quickly around an axis of rotation. These experiments focus on the gyroscopes' rate of *precession*, or the rate at which they revolve around the point where the axis of rotation touches a surface (see Figure 1).

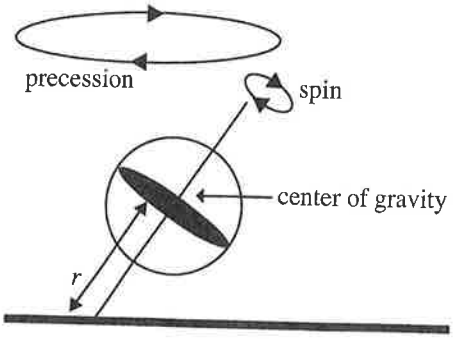


Figure 1

Experiment 1

A scientist tested several different gyroscopes that differed only in the distance from the gyroscope's center of gravity to the surface (r). A mechanical device was used to spin each gyroscope at the exact same rate of spin on the same surface, and the rate of precession was measured for each gyroscope in revolutions per minute (rpm). These rates are given in Table 1.

Table 1

r (centimeters)	Precession rate (rpm)
4	9
6	14
8	19
10	24
12	28

Experiment 2

Then, the scientist used a gyroscope of fixed size and varied the settings on the mechanical device spinning the gyroscope. The precession rate was measured several times for different spin rates, also measured in revolutions per minute (rpm). The results of this experiment are given in Table 2.

Table 2

Spin rate (rpm)	Precession rate (rpm)
250	41
400	25.5
600	17
750	14
1,200	8.5

Experiment 3

A scientist placed a gyroscope similar to that used in the first two experiments on board a satellite orbiting Earth. It was found that for a gyroscope of fixed size and spin rate, its precession rate on the satellite was about one-eighth of its precession rate on the surface of Earth. For example, a precession rate of approximately 24 rpm would become approximately 3 rpm on the satellite.

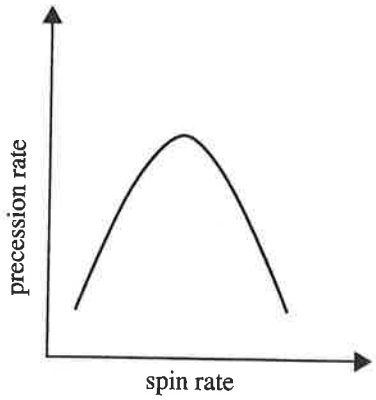
18. According to the results of Experiment 1, one can conclude that the gyroscope's precession rate increases as the gyroscope's center of gravity:

F. decreases in distance from the surface.
G. increases in distance from the surface.
H. remains the same distance from the surface.
J. changes in mass.

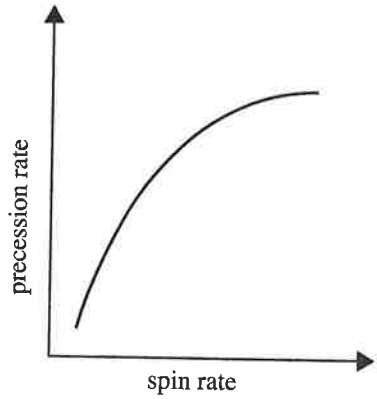
GO ON TO THE NEXT PAGE

19. Of the following graphs, which best represents how changes in precession rate are related to changes in spin rate, as shown in Experiment 2?

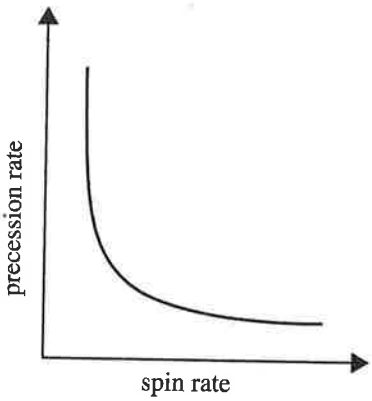
A.



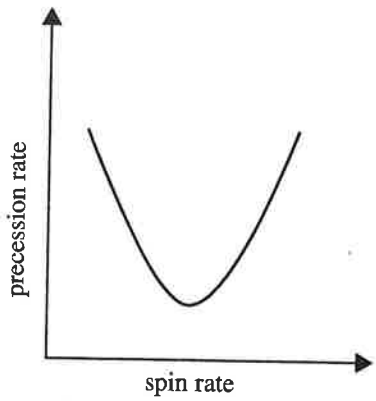
B.



C.



D.



20. The hypothesis of the scientist in Experiment 3 was that precession rate is related to gravity, which decreases as one's distance from Earth increases. To confirm this hypothesis, the scientist should repeat this experiment on:

- **F.** several different satellites at varying distances from Earth.
- **G.** another satellite at the exact same distance from Earth as the first satellite.
- **H.** a satellite orbiting in the opposite direction.
- **J.** Earth's surface while varying the gyroscope's spin rate.

21. If an r of 6 cm was used throughout Experiment 2, what was the most likely spin rate used in Experiment 1?

- **A.** 400 rpm
- **B.** 600 rpm
- **C.** 750 rpm
- **D.** 1,200 rpm

22. If the effects tested in Experiment 1 had not been known during the design of Experiment 2, how might this have affected Experiment 2?

- **F.** The scientist might have used gyroscopes with different masses.
- **G.** The scientist might not have always used the same size gyroscope.
- **H.** The scientist might have tested the gyroscope on a different surface.
- **J.** The scientist might have used a different-shaped gyroscope.

23. Which is the best way to investigate the effect of gyroscope mass on precession rate while keeping the spin rate constant?

- **A.** Use gyroscopes made by different companies.
- **B.** Use gyroscopes that are the same size and shape, but that are made from different types of metal.
- **C.** Use several different gyroscopes that are each measured on both Earth and on a satellite.
- **D.** Use gyroscopes that are all the same mass but that have different sizes.

GO ON TO THE NEXT PAGE

Passage V

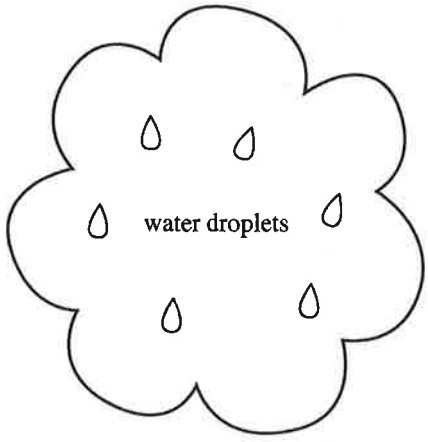
Precipitation is a general term for a form of water, such as rain, snow, sleet, or hail, that falls from the sky to the surface of Earth. There are two theories that attempt to explain how the tiny water droplets in clouds combine to form precipitation.

Collision and Coalescence Theory

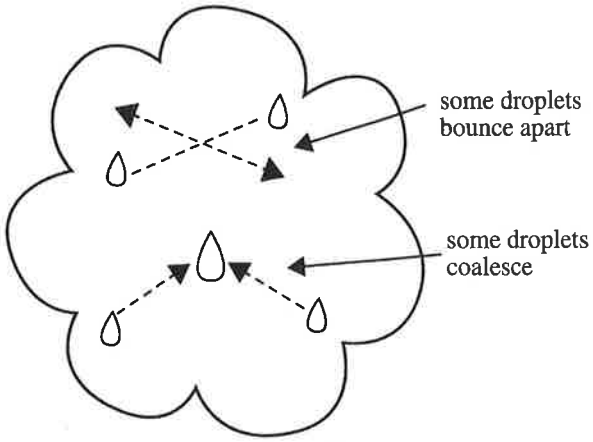
As shown in Stage I of Figure I, a cloud is initially composed of numerous droplets of liquid water of varying sizes, but all microscopic. As these droplets move about within the cloud, they can collide with one another. These collisions can either result in the droplets bouncing apart again or sticking together (*coalescence*) to form a larger droplet (see Stage II). The process continues until large drops are formed which are too heavy to remain suspended in the cloud any longer. Some of these drops will then split apart into smaller drops that continue the collision and coalescence process, while others will fall to the ground in the form of precipitation (see Stage III).

Ice Crystal Theory

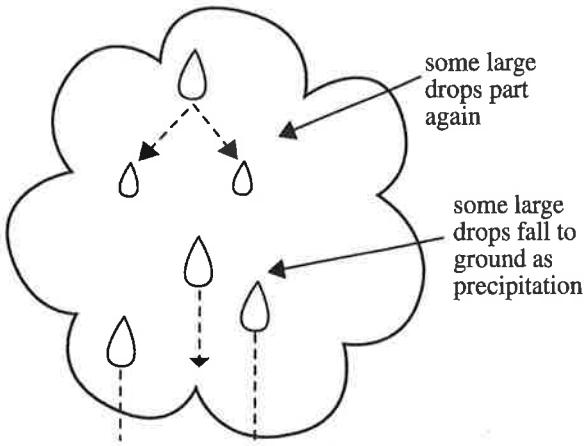
In this theory, the tiny droplets in clouds rise to a point in Earth's atmosphere where the temperature is lower than the freezing point of water. Initially, the cloud is composed of many supercooled water droplets, still in liquid form (see Stage I of Figure II). Some of these droplets then condense around tiny impurities in the air to form miniature ice crystals (see Stage II). Water vapor in the air can then freeze onto the surface of the crystals, causing some of the droplets to evaporate in order to maintain a constant level of water vapor (see Stage III). The ice crystals quickly become too heavy to remain suspended in the air and fall to the ground, often melting again in the warmer temperatures near the ground to form rain (see Stage IV). The net effect is that the formation of ice crystals takes moisture out of the air, allowing the crystals to grow larger at the expense of the droplets.



Stage I



Stage II



Stage III

Figure 1

GO ON TO THE NEXT PAGE

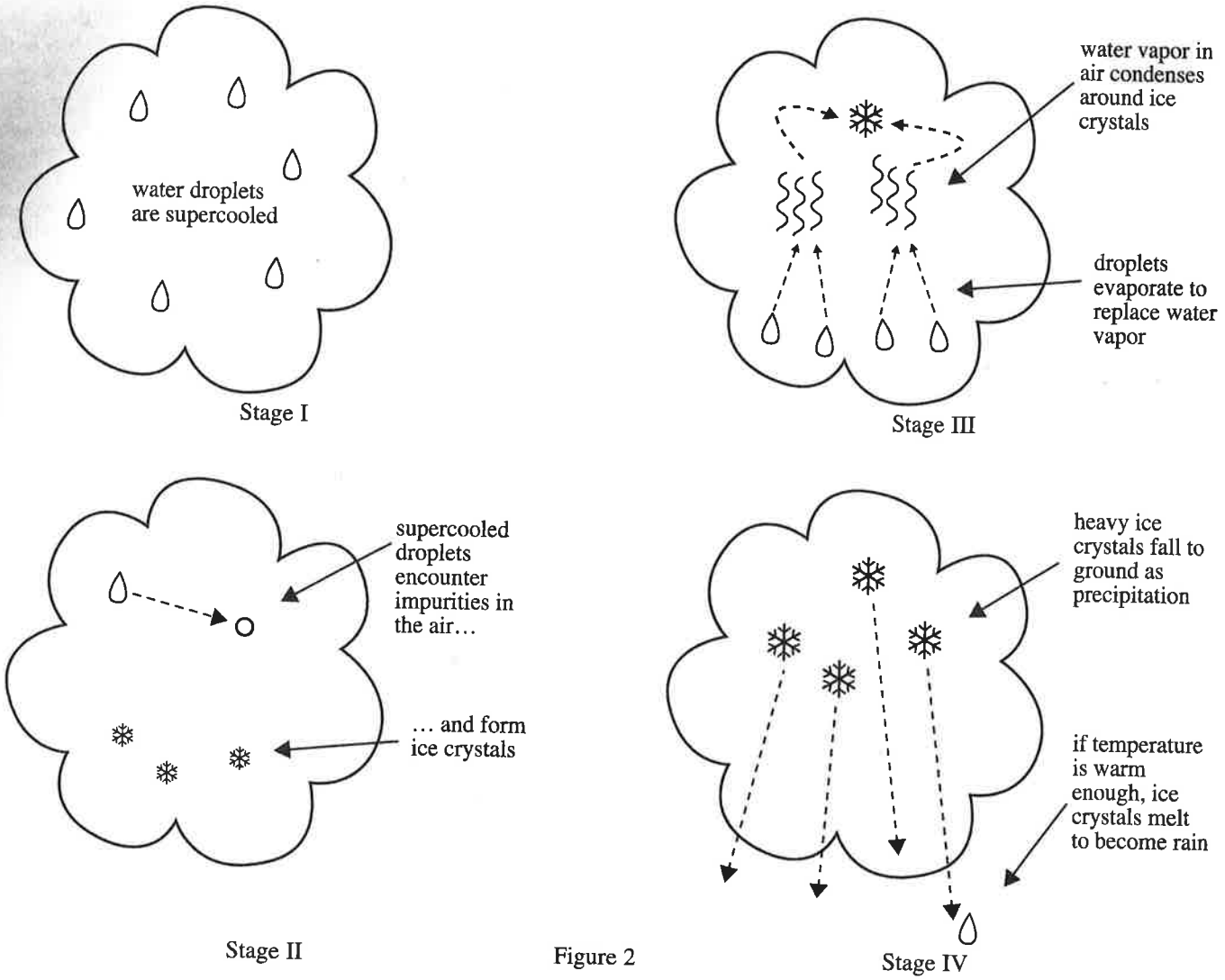


Figure 2

24. In which of the following situations would supporters of both theories agree that precipitation should NOT occur?

- **F.** A cloud with water droplets colliding and coalescing to produce larger droplets
- **G.** A cloud with water droplets forming crystals around impurities in the air
- **H.** A cloud with an insufficient number of water droplets
- **J.** A cloud containing elements too heavy to remain suspended in the air

25. The Collision and Coalescence and Ice Crystal Theories differ on which of the following points?

- **A.** Exterior shape of cloud formation
- **B.** State of matter of precipitation before falling from the cloud
- **C.** Amount of precipitation that reaches the ground
- **D.** Climate required for precipitation to occur

26. According to the Collision and Coalescence Theory, the likelihood of producing rainfall is greater:

- **F.** when the droplets collide at a high rate.
- **G.** when the droplets collide at a variable rate.
- **H.** when the temperature causes droplets to freeze.
- **J.** shortly after the last rainfall occurred.

27. A weather balloon travels through a cloud and detects a high proportion of particles in the cloud too heavy to remain suspended in the air. Both theories would agree that:

- **A.** there are insufficient impurities in the air to form ice crystals.
- **B.** the probability of precipitation occurring in the near future is very high.
- **C.** the water-based particles in the cloud are colliding at a very rapid rate.
- **D.** the entire cloud is decreasing in altitude.

GO ON TO THE NEXT PAGE

28. City A has a higher rate of precipitation than City B, despite similar temperatures, humidity, and cloud formations in both locations. The Ice Crystal Theory would suggest that the higher rate of precipitation in City A most likely results from which of the following?

- **F.** The greater frequency of thunder and lightning storms in City A
- **G.** Large atmospheric density differences between City A and City B
- **H.** A greater number of impurities released into the air by factories in City A
- **J.** The lower rate of air pollution in City A

29. If a cloud initially consisted entirely of liquid water droplets, which of the following statements about the cloud would support the Collision and Coalescence Theory?

- **A.** The mass of the droplets is too great for them to remain suspended in the air.
- **B.** Water droplets crystallize around smaller water droplets found in the atmosphere.
- **C.** Larger water droplets are formed by smaller droplets combining.
- **D.** Some of the droplets evaporate to make up for lost water vapor in the air.

30. Depending on temperature and other conditions, it is possible for precipitation to change forms on its way to the ground. If precipitation forms according to the Ice Crystal Theory, which of the following is NOT possible?

- **F.** After ice in the cloud falls, it melts to become rain.
- **G.** After ice in the cloud falls, it partially melts to become sleet.
- **H.** After water in the cloud falls, it freezes to become snow.
- **J.** Some ice crystals formed around impurities in the air first melt and then evaporate before they fall from the cloud.

GO ON TO THE NEXT PAGE

Passage VI

Elements as shown in the periodic table have a number of different properties which depend on the structure of the element's atoms. For example, these properties might depend on the atom's number of *electrons* (negatively charged particles), which move in patterns called *shells* (see Figure 1).

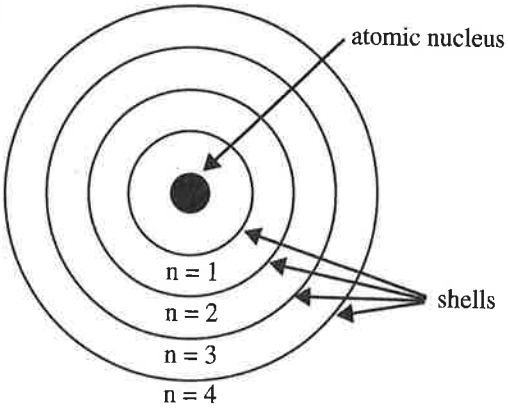


Figure 1

Note: Drawing is NOT to scale.

Table 1 lists properties for several chemical elements. The table includes the number of shells in the atom (n), the number of electrons in the atom's outer shell (e), the atomic radius (r), the energy (I) required to remove one electron from the atom's outer shell (in electron volts, eV), and a measure of attraction (c) to electrons in a chemical bond (in Pauling units).

Table 1

Element	n	e	r ($\times 10^{-11}$ m)	I (eV)	c
C	2	4	9.1	11.2	2.5
N	2	5	7.5	14.5	3.0
O	2	6	6.5	13.6	3.5
F	2	7	5.7	17.4	4.0
Si	3	4	14.6	8.2	1.8
P	3	5	12.6	10.5	2.1
S	3	6	10.9	10.4	2.5
Cl	3	7	9.7	13.0	3.0
Ge	4	4	15.2	7.9	1.8
As	4	5	13.3	9.8	2.0
Se	4	6	12.2	9.8	2.4
Br	4	7	11.2	11.8	2.8

31. For any value of n, Table 1 indicates that as e increases, r:

- **A.** increases only.
- **B.** first increases, then decreases.
- **C.** decreases only.
- **D.** remains unchanged.

32. According to Table 1, for an element with n = 2 and e = 3, the most likely value of r would be:

- **F.** 11.7×10^{-11} m
- **G.** 8.8×10^{-11} m
- **H.** 7.4×10^{-11} m
- **J.** 6.2×10^{-11} m

33. According to the information in the passage, it is possible to decrease an atom's negative charge by:

- **A.** decreasing the radius of the atom.
- **B.** forming a chemical bond with the atom.
- **C.** applying energy to the atom.
- **D.** changing the number of shells in the atom.

34. The hypothesis that for a given value of n, c increases as the number of electrons in the atom's outer shell increases, is supported by the data in Table 1 when:

- **F.** n = 2 only.
- **G.** n = 2 or 3 only.
- **H.** n = 4 only.
- **J.** n = 2, 3, or 4.

35. The most energy will be required to remove an electron from shell:

- **A.** n = 3 in Si
- **B.** n = 3 in Cl
- **C.** n = 2 in C
- **D.** n = 2 in F

GO ON TO THE NEXT PAGE

Passage VII

Consider the chemical reaction:

$H_2\,(g) + F_2\,(g) \rightleftharpoons 2HF\,(g)$

At *equilibrium*, hydrogen fluoride gas (HF) and hydrogen (H_2) and fluorine (F_2) gases occur at the same rate.

The *equilibrium constant* K_{eq} is the ratio of the square of the HF concentration ([HF]) to the product of the concentrations of H_2 and F_2 once the reaction reaches equilibrium. A scientist varied the temperature and the initial concentrations in the reaction and recorded his results in Table 1 below.

Table 1

Trial	Temperature (K)	K_{eq}	Initial [H_2] (mol/L)	Initial [F_2] (mol/L)	Initial [HF] (mol/L)	Final [H_2] (mol/L)	Final [F_2] (mol/L)	Final [HF] (mol/L)
1	640	54.8	0.5	0.5	0	0.106	0.106	0.787
2	660	52.7	0.5	0.5	0	0.108	0.108	0.784
3	680	50.9	0.5	0.5	0	0.109	0.109	0.781
4	700	49.3	0.5	0.5	0	0.111	0.111	0.778
5	720	47.8	0.5	0.5	0	0.112	0.112	0.776
6	740	46.5	0.5	0.5	0	0.113	0.113	0.773
7	680	50.9	1	1	0	0.219	0.219	1.562
8	700	49.3	1	1	0	0.222	0.222	1.557
9	700	49.3	1	0.5	0	0.533	0.033	0.934
10	700	49.3	0.5	1	0	0.033	0.533	0.934
11	700	49.3	0.75	0.25	0	0.509	0.009	0.482
12	700	49.3	0.25	0.75	0	0.009	0.509	0.482
13	700	49.3	0.15	0.85	0	0.003	0.703	0.295

GO ON TO THE NEXT PAGE

36. The theory that switching the initial values of $[H_2]$ and $[F_2]$ at the same temperature results in the same final value of [HF] is confirmed by which of the following pairs of trials?

F. Trials 1 and 2
G. Trials 7 and 8
H. Trials 8 and 11
J. Trials 9 and 10

37. According to the data presented in the table, when the initial concentrations of H_2 and F_2 are both doubled, the final concentration of HF is:

A. decreased by approximately half.
B. decreased by approximately one-fourth.
C. increased by approximately half.
D. increased by approximately two times.

38. According to the data in the table, keeping the initial concentrations of all the reactant chemicals constant while increasing the reaction temperature will yield which, if any, of the following changes in the concentrations?

F. A decrease in the initial concentrations of H_2 and F_2
G. A decrease in the final concentration of HF
H. An increase in the initial concentrations of H_2 and F_2
J. No changes in any of the final concentrations

39. Based on the information in the passage, which of the following statements best expresses the relationship between the value of K_{eq} and the temperature of a reaction?

A. The equilibrium constant decreases as the temperature increases.
B. The equilibrium constant initially decreases, then stabilizes as temperature increases.
C. The equilibrium constant remains unchanged as temperature increases.
D. The equilibrium constant increases as the temperature increases.

40. Based on the table's data, if the scientist acquiring this information had repeated the experiment at a temperature of 700 K and started with 2 mol/L each of H_2 and F_2, the final concentration of HF would be nearest to:

F. 0.4 mol/L.
G. 0.8 mol/L.
H. 1.6 mol/L.
J. 3.2 mol/L.

STOP! DO NOT RETURN TO ANY OTHER TEST.

NO TEST MATERIAL ON THIS PAGE

ACT Writing Test

30 *Minutes*

DIRECTIONS: This essay is designed to evaluate your writing skills. You will have 30 minutes to complete your essay. When you are told to begin, turn the page and carefully read the prompt. The prompt will describe a hypothetical situation that a high school student might face. You will be asked to take and support a position regarding this situation. Your essay will be scored on a number of factors. These include knowledge and use of correct English, understanding of the question posed by the prompt, ability to take a position on the issue, ability to support that position, organization, focus, and logical reasoning.

You may use the blank pages in the back of this test booklet to plan your essay, but ***only material written on the four lined pages in your Answer Grid will be scored***. Do NOT skip lines or write in the margins. If you want to delete something, draw a single line through it. If you need to add something, write it neatly between the lines and use a caret (^) to indicate where it should go. ***Essays that are illegible will not receive a score***. If your handwriting is difficult to read, consider printing your essay.

When time is called, you must stop writing and put your pencil down immediately.

PLEASE WAIT FOR THE PROCTOR'S SIGNAL BEFORE OPENING YOUR TEST BOOKLET.

ACT Writing Test Prompt

The United States has often been called a "melting pot" because the country's population is a mixture of various cultures that maintain their own characteristics while at the same time combining to create a unique American culture. Different languages are a typical characteristic of different cultures, and some people believe that schools should teach bilingual classes in order to provide an appropriate and accessible education to students whose first language is not English. Others, however, believe that everyone who lives in the United States should speak English; they want schools to provide English immersion classes for all students.

In your essay, take a position on this issue. You may write about either of the two points of view given, or you may present a different point of view on this question. Use specific reasons and examples to support your position.

Use this page to *plan* your essay.
Your work on this page will *not* be scored.

If you need more space to plan,
please continue on the back of this page.

Use this page to *plan* your essay.
Your work on this page will *not* be scored.

NO TEST MATERIAL ON THIS PAGE

KAPLAN

TEST PREP AND ADMISSIONS

1-800-KAP-TEST | kaptest.com

AC5128C