

**SCIENCE TEST***35 Minutes—40 Questions*

**DIRECTIONS:** There are several passages in this test. Each passage is followed by several questions. After reading a passage, choose the best answer to each question and fill in the corresponding oval on your answer document. You may refer to the passages as often as necessary.

You are NOT permitted to use a calculator on this test.

**Passage I**

In a particular *playa* (relatively flat, dry desert basin) evidence shows that some large rocks have moved along the surface, leaving shallow trails in the clay sediment, some up to several hundred meters long. Three scientists provided explanations for how these rocks moved.

*Scientist 1*

In the spring, snowmelt from surrounding mountains runs downhill and collects in the *playa*. At night, cold temperatures cause this water to freeze around the rocks. When temperatures rise again, the ice begins to melt, leaving a layer of mud on the surface and ice “rafts” around the rocks. The buoyancy of the ice rafts floats the rocks on top of the mud such that even light winds can then push the rocks along the surface. Evidence of this lifting is seen in that the trails left by rocks are both shallow and only about  $\frac{2}{3}$  as wide as the rocks themselves. Due to the combination of ice, mud, and light winds, the rocks are able to move several hundred meters in a few days.

*Scientist 2*

Snowmelt from surrounding mountains does collect in the *playa* during the spring. However, the temperature in the *playa* does not get cold enough for ice to form. When the *playa*’s surface gets wet, the top layer of clay transforms into a slick, muddy film. In addition, dormant algae present in the dry clay begin to grow rapidly when the clay becomes wet. The presence of mud and algae reduces friction between the rocks and the clay. Even so, relatively strong winds are required to push the rocks along the wet surface, forming trails. Due to the combination of mud, algae, and strong winds, the rocks are able to move several hundred meters in a few hours.

*Scientist 3*

Water does collect in the *playa*, producing mud and ice. However, neither mud nor ice is responsible for the rocks’ movements. The *playa* is located along a fault line between tectonic plates. Minor vertical shifts in the plates cause the rocks to move downhill, leaving trails. Due to the combination of tectonic plate movement and strong winds, the rocks are able to move only a few meters over several years.

- According to Scientist 2, friction between the rocks and the clay is reduced by which of the following?
  - Ice only
  - Algae only
  - Ice and mud only
  - Mud and algae only
- Suppose a researcher observed that wind speeds greater than 80 miles per hour are needed to move the rocks in the *playa*. This observation is consistent with which of the scientists’ explanations?
  - Scientists 1 and 2 only
  - Scientists 1 and 3 only
  - Scientists 2 and 3 only
  - Scientists 1, 2, and 3
- Suppose that no seismic activity was recorded in the *playa* where the trails left by the rocks are found. This finding would *weaken* which of the scientists’ explanations?
  - Scientist 1 only
  - Scientist 3 only
  - Scientist 1 and Scientist 2 only
  - Scientist 2 and Scientist 3 only
- Suppose it were discovered that a particular rock formed a 200 m long trail in 72 hr. Would this discovery support Scientist 1’s explanation?
  - Yes; Scientist 1 indicated the rocks can move several hundred meters in a few hours.
  - Yes; Scientist 1 indicated the rocks can move several hundred meters in a few days.
  - No; Scientist 1 indicated the rocks can move several hundred meters in a few hours.
  - No; Scientist 1 indicated the rocks can move several hundred meters in a few days.

**4****4**

5. Suppose that during one year there was no measurable movement of any rocks in the playa during the spring. Scientists 1 and 2 would most likely both agree that this was due to the absence of which of the following factors?
- A. Algae
  - B. Snowmelt
  - C. Strong winds
  - D. Subzero temperatures
6. Suppose that air temperature in the playa varies between  $4^{\circ}\text{C}$  and  $47^{\circ}\text{C}$ . Would this information support the explanation of Scientist 2 ?
- F. Yes, because ice cannot form in that temperature range.
  - G. Yes, because ice can form in that temperature range.
  - H. No, because ice cannot form in that temperature range.
  - J. No, because ice can form in that temperature range.
7. Based on Scientist 1's explanation, a rock trail that is 33 cm wide was most likely made by a rock with approximately what width?
- A. 10 cm
  - B. 25 cm
  - C. 50 cm
  - D. 65 cm

**Passage II**

When certain substances are added to diet cola,  $\text{CO}_2$  gas is produced, generating a foam. Two experiments were done to study this process.

In each trial, an apparatus like that shown in Figure 1 was used as follows: A jar was nearly filled with  $\text{H}_2\text{O}$  and fitted with a 2-holed lid. One end of a tube (Tube B) was inserted through one of the holes and submerged. The other end of Tube B was placed in an empty graduated cylinder. Another tube (Tube A) was inserted through the other hole in the lid. A certain solid substance was inserted into the other end of Tube A, and the substance was secured by a clamp. Tube A was then attached to a freshly opened bottle containing 355 mL of diet cola. The clamp was removed, releasing the substance into the diet cola. The foam that was produced traveled into the jar, and liquid was transferred into the cylinder. The mass of  $\text{CO}_2$  produced was calculated based on the volume of liquid that was measured in the cylinder after foaming had ceased.

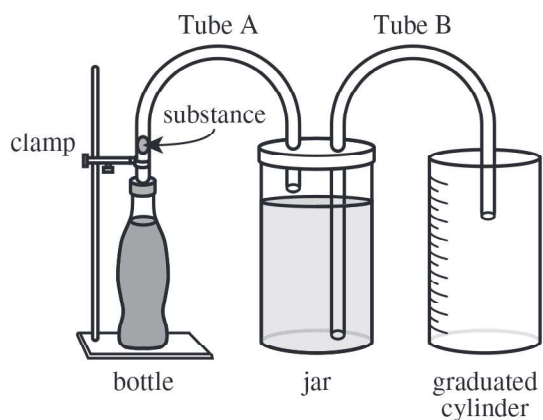


Figure 1

*Experiment 1*

In each of Trials 1–4, a different 1 of 4 substances of equal mass—a piece of chalk, a sugar cube, a fruit-flavored piece of candy, or a mint-flavored piece of candy—was added to a bottle of diet cola at  $3^\circ\text{C}$ . See Table 1.

Trial	Substance	Volume of liquid in cylinder (mL)	Mass of $\text{CO}_2$ produced (g)
1	chalk	699	1.36
2	sugar cube	570	1.11
3	fruit candy	525	1.02
4	mint candy	631	1.23

*Experiment 2*

In each of Trials 5–8, Trial 4 from Experiment 1 was repeated, except that the temperature of the diet cola was different in each trial. See Table 2.

Trial	Temperature ( $^\circ\text{C}$ )	Volume of liquid in cylinder (mL)	Mass of $\text{CO}_2$ produced (g)
5	10	598	1.13
6	25	539	0.969
7	45	501	0.844
8	60	476	0.766

Tables 1 and 2 adapted from Christopher J. Huber and Aaron M. Massari, "Quantifying the Soda Geyser." ©2014 by Division of Chemical Education, Inc., American Chemical Society.



8. If another trial had been performed in Experiment 2 and 450 mL of liquid had been measured in the cylinder, the temperature of the diet cola in this trial would most likely have been:
- F. less than 25°C.
  - G. between 25°C and 45°C.
  - H. between 45°C and 60°C.
  - J. greater than 60°C.
9. Suppose Trial 6 had been repeated, but the bottle of diet cola had been opened and then left undisturbed at 25°C for 12 hours *before* it was attached to the apparatus. Would the mass of CO<sub>2</sub> produced in this trial likely be greater than 0.969 g or less than 0.969 g?
- A. Greater, because over the 12 hours, the concentration of CO<sub>2</sub> in the diet cola would have decreased.
  - B. Greater, because over the 12 hours, the concentration of CO<sub>2</sub> in the diet cola would have increased.
  - C. Less, because over the 12 hours, the concentration of CO<sub>2</sub> in the diet cola would have decreased.
  - D. Less, because over the 12 hours, the concentration of CO<sub>2</sub> in the diet cola would have increased.
10. One *millimole* (mmol) of CO<sub>2</sub> has a mass of 0.044 g. How many trials resulted in the production of at least 1 mmol of CO<sub>2</sub>?
- F. 1
  - G. 4
  - H. 5
  - J. 8
11. According to Figure 1, which of Tube A and Tube B, if either, had at least one end submerged in a liquid before the clamp was removed?
- A. Tube A only
  - B. Tube B only
  - C. Both Tube A and Tube B
  - D. Neither Tube A nor Tube B
12. Is the relationship between the volume of liquid in the cylinder at the end of the experiment and the mass of CO<sub>2</sub> produced a direct relationship or an inverse relationship?
- F. Direct; as the volume of liquid that was measured in the cylinder increased, the mass of CO<sub>2</sub> produced increased.
  - G. Direct; as the volume of liquid that was measured in the cylinder increased, the mass of CO<sub>2</sub> produced decreased.
  - H. Inverse; as the volume of liquid that was measured in the cylinder increased, the mass of CO<sub>2</sub> produced increased.
  - J. Inverse; as the volume of liquid that was measured in the cylinder increased, the mass of CO<sub>2</sub> produced decreased.
13. Consider these steps that were performed in each trial.
1. Removing clamp
  2. Measuring liquid in cylinder
  3. Inserting a solid substance into Tube A
  4. Attaching Tube A to a bottle of diet cola
- According to the procedure, these steps were performed in what sequence?
- A. 3, 1, 2, 4
  - B. 3, 4, 1, 2
  - C. 4, 2, 3, 1
  - D. 4, 3, 1, 2
14. Assume that *room temperature* is 25°C. In how many trials was the diet cola tested at a temperature *lower* than room temperature?
- F. 1
  - G. 2
  - H. 5
  - J. 8



## Passage III

Scientists studied the effects of pH and of nickel concentration on plant growth and on the uptake of iron and zinc by plants. Recently germinated seedlings of Species M and Species U were fed 1 of 12 nutrient solutions (Solutions 1–12) for 8 days and then were harvested. Solutions 1–12 differed only in pH and/or nickel concentration. Table 1 shows, for each species, the average dry mass of the plants that were fed each nutrient solution. Figure 1 shows, for each species, the average iron content and the average zinc content of the plants that were fed Solutions 1–4.

Solution	pH	Nickel concentration ( $\mu\text{M}^*$ )	Average dry mass (g) of plants of Species:	
			M	U
1	7	0	33.9	10.7
2	7	5	28.8	10.7
3	7	10	23.8	9.6
4	7	15	18.7	8.5
5	6	0	33.9	9.2
6	6	5	28.8	9.2
7	6	10	23.8	8.1
8	6	15	18.7	7.0
9	5	0	27.8	7.7
10	5	5	22.7	7.7
11	5	10	17.6	6.6
12	5	15	12.4	5.4

\* $\mu\text{M}$  = micromoles per liter

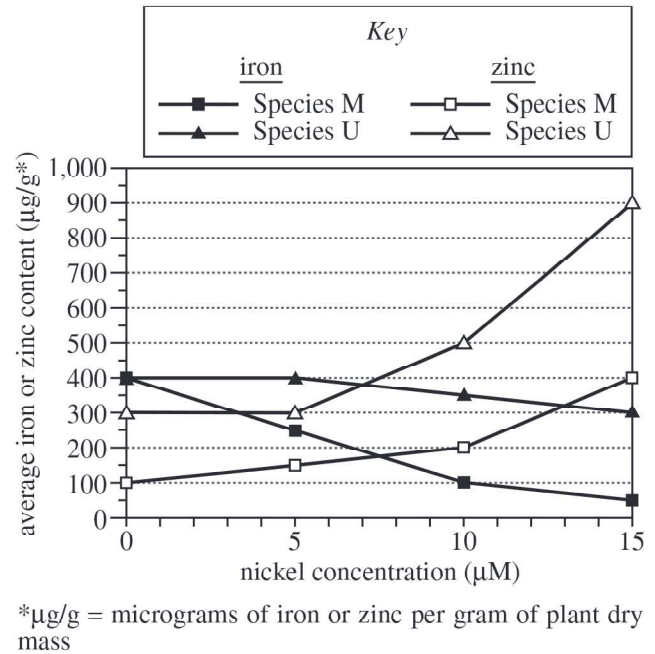


Figure 1

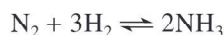
15. According to Figure 1, as the nickel concentration in the nutrient solutions increased, the average iron content of Species M plants:
- increased only.
  - decreased only.
  - increased, then decreased.
  - decreased, then increased.



16. According to Table 1, the Species U plants that were fed the solution that had a pH of 6 and a nickel concentration of  $10 \mu\text{M}$  had an average dry mass of:
- F. 7.0 g.  
 G. 8.1 g.  
 H. 9.2 g.  
 J. 23.8 g.
17. According to Table 1, Species M plants that were fed a nutrient solution with which of the following combinations of pH and nickel concentration had the greatest average dry mass?
- |    | pH | nickel concentration |
|----|----|----------------------|
| A. | 6  | $0 \mu\text{M}$      |
| B. | 6  | $5 \mu\text{M}$      |
| C. | 5  | $0 \mu\text{M}$      |
| D. | 5  | $5 \mu\text{M}$      |
18. According to Table 1 and Figure 1, the Species M plants that were fed Solution 3 had an average zinc content of:
- F.  $100 \mu\text{g/g}$ .  
 G.  $150 \mu\text{g/g}$ .  
 H.  $200 \mu\text{g/g}$ .  
 J.  $400 \mu\text{g/g}$ .
19. According to Table 1 and Figure 1, for the Species M plants that were fed Solutions 1–4, what was the order of the nutrient solutions, from the solution that resulted in the lowest average iron content to the solution that resulted in the highest average iron content?
- A. 1, 2, 3, 4  
 B. 1, 4, 3, 2  
 C. 4, 2, 1, 3  
 D. 4, 3, 2, 1
20. According to Table 1, compared to the average dry mass of Species U plants that were fed Solution 3, the average dry mass of Species M plants that were fed Solution 6 was approximately:
- F.  $\frac{1}{3}$  as great.  
 G.  $\frac{1}{2}$  as great.  
 H. 2 times as great.  
 J. 3 times as great.

**Passage IV**

Ammonia ( $\text{NH}_3$ ) can be produced according to the chemical equation



The *equilibrium arrow* ( $\rightleftharpoons$ ) indicates that this reaction proceeds in both directions until it is at *equilibrium*, so that both the forward reaction (production of  $\text{NH}_3$ ) and the backward reaction (production of  $\text{N}_2$  and  $\text{H}_2$ ) occur at the same rate. Equilibrium can be shifted forward or backward by changing the temperature, pressure, or concentration of reactants or products.

Two experiments were done using the following apparatus to produce  $\text{NH}_3$ .

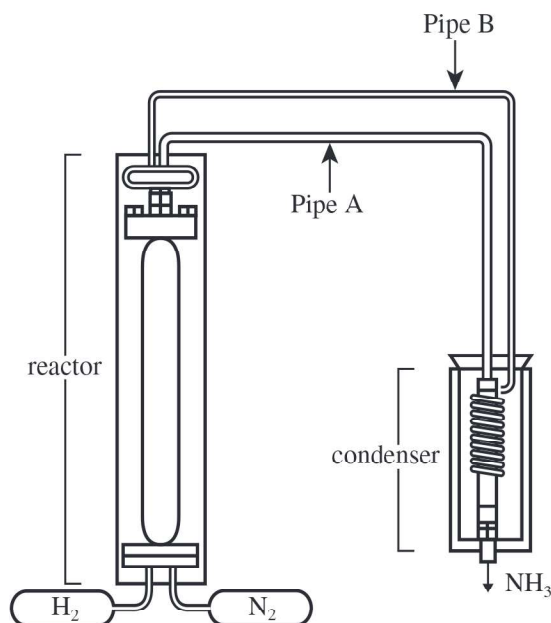


diagram of apparatus

In each trial, Steps 1–4 occurred:

1. A fresh catalyst (Catalyst W, X, Y, or Z), 160 kg of  $\text{H}_2$ , and 745 kg of  $\text{N}_2$  were placed in the reactor.
2. The  $\text{H}_2$  and  $\text{N}_2$  reacted at a constant temperature and a constant pressure until equilibrium was established.
3. A mixture of  $\text{NH}_3$  and any unreacted  $\text{H}_2$  and  $\text{N}_2$  flowed through Pipe A to a  $-50^\circ\text{C}$  condenser at 1 atmosphere (atm) of pressure.
4.  $\text{NH}_3$  condensed and exited the apparatus. ( $\text{H}_2$  and  $\text{N}_2$  do not condense at  $-50^\circ\text{C}$ .) Any unreacted  $\text{H}_2$  and  $\text{N}_2$  flowed into Pipe B, returning to the reactor.

Steps 2–4 reoccurred in cycles until no more  $\text{H}_2$  and  $\text{N}_2$  returned from the condenser.

**Experiment 1**

A set of 9 trials was conducted with each of the 4 catalysts. For each set, the pressure was 150 atm; within each set, the temperature was different for each trial. Figure 1 shows, for each trial, the number of cycles of Steps 2–4.

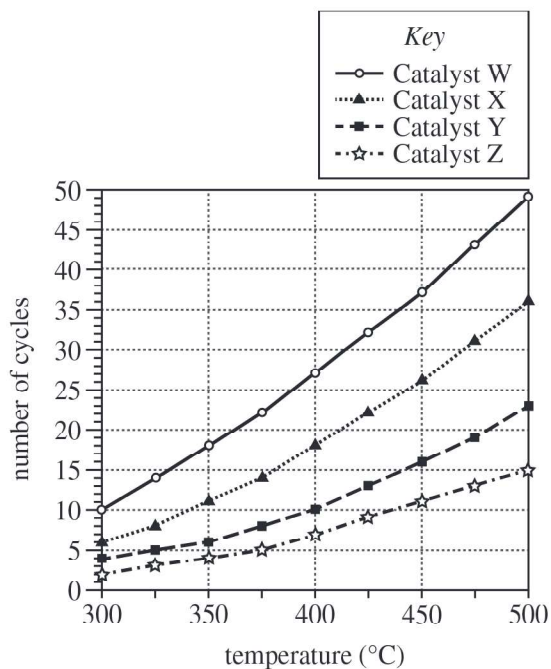


Figure 1

**Experiment 2**

Four sets of 9 trials each were conducted with Catalyst Z. For each set, the temperature was different; within each set, the pressure was different for each trial. Figure 2 shows, for each trial, the amount of  $\text{NH}_3$  produced in the first cycle of Steps 2–4.

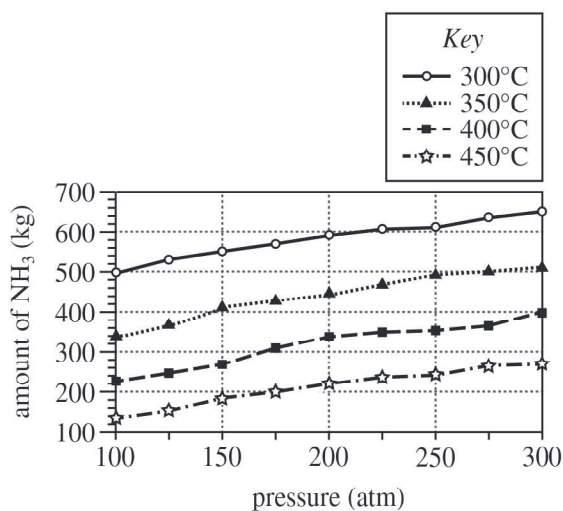


Figure 2



Diagram and figures adapted from Jayant M. Modak, "Haber Process for Ammonia Synthesis." ©2002 by Indian Academy of Sciences.

21. According to the results of Experiment 1, for any given catalyst, as the temperature was increased, the number of cycles needed to complete the reaction:
- increased only.
  - decreased only.
  - increased, then decreased.
  - decreased, then increased.
22. In Experiment 1, 26 cycles were needed to complete the reaction at 450°C when which catalyst was used?
- Catalyst W
  - Catalyst X
  - Catalyst Y
  - Catalyst Z
23. The movement of  $H_2$  and  $N_2$  through the apparatus as Steps 1–4 occurred is best represented by which of the following expressions?
- Reactor → condenser → Pipe A → Pipe B
  - Condenser → reactor → Pipe A → Pipe B
  - Reactor → Pipe A → condenser → Pipe B
  - Condenser → Pipe A → reactor → Pipe B
24. Consider the results of Experiment 1 for 375°C. All the  $H_2$  and  $N_2$  were consumed in less than 20 cycles when which catalysts were used?
- Catalysts W and X only
  - Catalysts Y and Z only
  - Catalysts W, X, and Y only
  - Catalysts X, Y, and Z only
25. If a trial had been performed in Experiment 2 at 425°C and 225 atm, the amount of  $NH_3$  produced would most likely have been:
- less than 230 kg.
  - between 230 kg and 320 kg.
  - between 320 kg and 410 kg.
  - greater than 410 kg.
26. At 1 atm of pressure, the melting point of  $NH_3$  is  $-77^\circ C$  and the boiling point of  $NH_3$  is  $-33^\circ C$ . Based on this information and the description of the apparatus, when the  $NH_3$  exited the condenser, was it more likely a solid or a liquid?
- Solid, because the temperature of the condenser was lower than the melting point of  $NH_3$  and the boiling point of  $NH_3$ .
  - Solid, because the temperature of the condenser was between the melting point of  $NH_3$  and the boiling point of  $NH_3$ .
  - Liquid, because the temperature of the condenser was higher than the melting point of  $NH_3$  and the boiling point of  $NH_3$ .
  - Liquid, because the temperature of the condenser was between the melting point of  $NH_3$  and the boiling point of  $NH_3$ .
27. Consider the trial in Experiment 2 that produced 550 kg of  $NH_3$ . Based on Figure 1, the number of cycles that were needed to complete the reaction in this trial was most likely:
- less than 5.
  - between 5 and 10.
  - between 10 and 15.
  - greater than 15.



**Passage V**

As a sound wave travels through a medium, the wave becomes *attenuated* (loses energy). The attenuation coefficient,  $\alpha$ , is the rate at which the wave's *intensity level* (a measure of sound volume) decreases with distance as a result of this energy loss; the greater the value of  $\alpha$ , the greater the decrease in intensity level with distance. Figure 1 shows, for waves of 3 different frequencies (in hertz, Hz), how  $\alpha$  (in decibels per kilometer, dB/km) varies with temperature in air at 10% relative humidity.

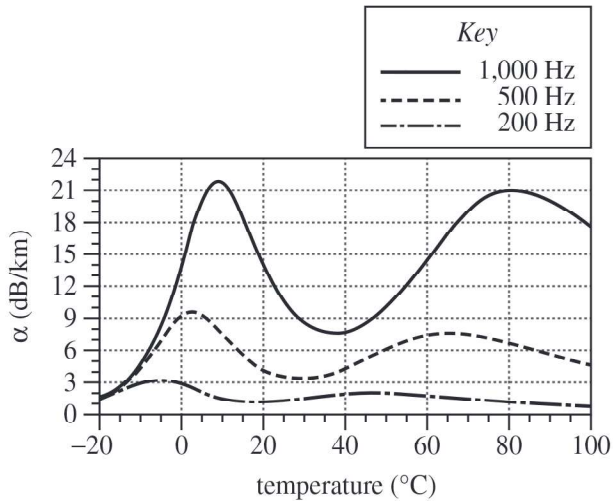


Figure 1

Figure 2 shows, for waves of 3 different frequencies, how  $\alpha$  varies with relative humidity in air at 20°C.

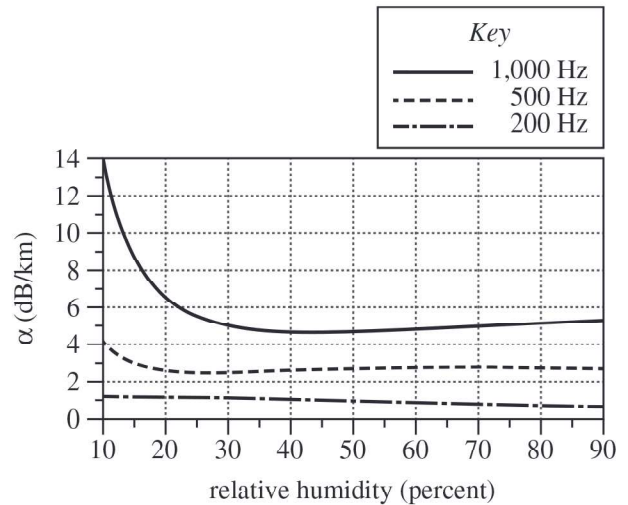


Figure 2

Figures adapted from Richard Lord, "Calculation of Absorption of Sound by the Atmosphere." ©2004 National Physical Laboratory.



28. What is the approximate maximum  $\alpha$  shown in Figure 1 for a 200 Hz sound wave in air at 10% relative humidity, and at approximately what temperature does that maximum occur?

	$\alpha$ (dB/km)	temperature ( $^{\circ}$ C)
F.	3.0	-5
G.	3.0	35
H.	9.5	-5
J.	9.5	35

29. Based on Figure 2, the attenuation coefficient for a 1,000 Hz sound wave in air at  $20^{\circ}$ C reaches a *minimum* value at a relative humidity closest to which of the following?

- A. 25%  
B. 45%  
C. 65%  
D. 85%

30. For the range of temperatures and the range of relative humidities shown in Figures 1 and 2, respectively, is  $\alpha$  for a 200 Hz sound wave more strongly affected by changes in temperature or by changes in relative humidity?

- F. Temperature, because the maximum variation in  $\alpha$  is about 0.5 dB/km in Figure 1 but about 2.5 dB/km in Figure 2.  
G. Temperature, because the maximum variation in  $\alpha$  is about 2.5 dB/km in Figure 1 but about 0.5 dB/km in Figure 2.  
H. Relative humidity, because the maximum variation in  $\alpha$  is about 0.5 dB/km in Figure 1 but about 2.5 dB/km in Figure 2.  
J. Relative humidity, because the maximum variation in  $\alpha$  is about 2.5 dB/km in Figure 1 but about 0.5 dB/km in Figure 2.

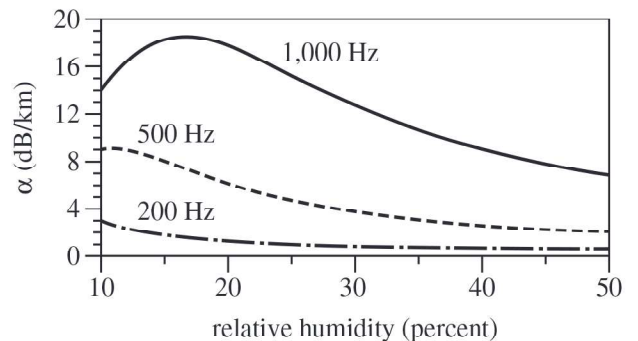
31. Consider a 1,000 Hz sound wave in air at 10% relative humidity. At how many of the temperatures shown in Figure 1 does  $\alpha$  for this wave have a value of 18 dB/km?

- A. 2  
B. 3  
C. 4  
D. 5

32. Suppose that 2 sound waves—a 150 Hz wave and a 1,100 Hz wave—are simultaneously emitted from a speaker into air at  $20^{\circ}$ C and 45% relative humidity. Based on Figure 2, as the waves travel away from the speaker, the intensity level of which wave will more likely decrease at the greater rate due to attenuation?

- F. The 150 Hz wave, because the value of  $\alpha$  is lesser for the 150 Hz wave than for the 1,100 Hz wave.  
G. The 150 Hz wave, because the value of  $\alpha$  is greater for the 150 Hz wave than for the 1,100 Hz wave.  
H. The 1,100 Hz wave, because the value of  $\alpha$  is lesser for the 1,100 Hz wave than for the 150 Hz wave.  
J. The 1,100 Hz wave, because the value of  $\alpha$  is greater for the 1,100 Hz wave than for the 150 Hz wave.

33. The graph below shows, for sound waves of 3 different frequencies, how  $\alpha$  varies with relative humidity in air at a particular temperature.



Based on Figure 1, the particular air temperature is most likely which of the following?

- A.  $-20^{\circ}$ C  
B.  $0^{\circ}$ C  
C.  $20^{\circ}$ C  
D.  $100^{\circ}$ C

**Passage VI**

Three studies compared the effects of 5 sweeteners (Sweeteners Q–U) on food consumption by rats and on the concentrations of *leptin* and *ghrelin* (hormones that regulate appetite) in the blood of rats. Sweeteners Q–U differ only in the percent by mass of fructose and of glucose (see Table 1).

Sweetener	Percent by mass of:	
	fructose	glucose
Q	0	100
R	42	58
S	50	50
T	55	45
U	100	0

**Study 1**

Each of 5 groups (Groups 1–5) of rats was assigned a solution having a 100 g/L concentration of 1 of the 5 sweeteners. Each rat was placed in a separate cage and provided unlimited access to the assigned sweetener solution and to solid food for 56 days. Table 2 shows, for each group, the amounts of sweetener solution and solid food consumed per rat per day. On Day 56, blood was collected from each rat for analysis in Studies 2 and 3.

Group	Sweetener	Amount consumed per rat per day	
		sweetener solution (mL)	solid food (g)
1	Q	73	9
2	R	55	14
3	S	52	16
4	T	48	18
5	U	29	23

Table 2 adapted from Heather R. Light et al., “The Type of Caloric Sweetener Added to Water Influences Weight Gain, Fat Mass, and Reproduction in Growing Sprague-Dawley Female Rats.” ©2009 by the Society for Experimental Biology and Medicine.

**Study 2**

A 1 mL blood sample from each rat was placed in a separate test tube containing 0.2 mL of *Indicator N* (which reacts with leptin to form a blue dye). The concentration of blue dye in each tube was directly proportional to the leptin concentration in the blood sample. Table 3 shows the leptin concentration per sample for each group.

Group	Sweetener	Leptin concentration per sample (pM*)
1	Q	804
2	R	622
3	S	553
4	T	475
5	U	251

\*picomolar

**Study 3**

Study 2 was repeated, except that *Indicator P* (which reacts with ghrelin to form a yellow dye) was used instead of *Indicator N*. The concentration of yellow dye in each tube was directly proportional to the ghrelin concentration in the blood sample (see Table 4).

Group	Sweetener	Ghrelin concentration per sample (pM)
1	Q	852
2	R	1,125
3	S	1,279
4	T	1,450
5	U	1,758

Tables 3 and 4 adapted from Andreas Lindqvist, Annemie Baelemans, and Charlotte Erlanson-Albertsson, “Effects of Sucrose, Glucose and Fructose on Peripheral and Central Appetite Signals.” ©2008 by Elsevier B.V.



34. In Study 1, as the ratio of fructose to glucose in the sweetener solutions increased, the amount of sweetener solution consumed per rat per day:
- F. increased only.
  - G. decreased only.
  - H. increased and then decreased.
  - J. decreased and then increased.
35. In Study 1, the amount of sweetener solution consumed daily by each rat could be measured because which of the following steps had been taken?
- A. The rats' access to solid food had been restricted.
  - B. The rats' access to solid food had not been restricted.
  - C. The rats had been placed in the same cage.
  - D. The rats had been placed in separate cages.
36. Suppose that a sweetener composed of 46% fructose and 54% glucose by mass had been tested in Study 1. Based on Table 1 and the results of Study 3, the ghrelin concentration per sample would most likely have been:
- F. less than 852 pM.
  - G. between 852 pM and 1,125 pM.
  - H. between 1,125 pM and 1,279 pM.
  - J. greater than 1,279 pM.
37. Consider the claim "The group of rats that consumed the lowest amount of solid food per rat per day was also the group that had the lowest concentration of leptin per sample." Do the results of Studies 1 and 2 support this claim?
- A. Yes; the rats in Group 1 consumed the lowest amount of solid food per rat per day and also had the lowest concentration of leptin per sample.
  - B. Yes; the rats in Group 5 consumed the lowest amount of solid food per rat per day and also had the lowest concentration of leptin per sample.
  - C. No; the rats in Group 1 consumed the lowest amount of solid food per rat per day, but the rats in Group 5 had the lowest concentration of leptin per sample.
  - D. No; the rats in Group 5 consumed the lowest amount of solid food per rat per day, but the rats in Group 1 had the lowest concentration of leptin per sample.
38. Which of the following groups of rats should have been included in Study 1 to serve as a control for the effect of consuming a sweetener solution on the consumption of solid food by rats? A group of rats that had access:
- F. only to water.
  - G. only to solid food.
  - H. only to water and solid food.
  - J. to neither water nor solid food.
39. Consider the sweetener that resulted in a solid food consumption of 16 g per rat per day in Study 1. Based on Table 1, how many grams of fructose would be present in 200 g of this sweetener?
- A. 50 g
  - B. 100 g
  - C. 150 g
  - D. 200 g
40. The experimental designs of Studies 2 and 3 were identical with respect to which of the factors listed below, if either?
- I. The chemical indicator that was used
  - II. The hormone with which the chemical indicator reacted
- F. I only
  - G. II only
  - H. Both I and II
  - J. Neither I nor II

**END OF TEST 4**

**STOP! DO NOT RETURN TO ANY OTHER TEST.**