SCIENCE TEST

35 Minutes—40 Questions

DIRECTIONS: There are seven 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

Two species of aquatic plants, Species A and Species B, are often found in the same freshwater lakes. Both species can grow in water up to 2 m deep. However, typically, Species A is found closer to the lake's edge in shallower water whereas Species B grows farther out in deeper water. Both species spread by means of underground stems called *rhizomes* and by means of seeds. A scientist conducted 2 studies to examine the effect of water depth on the growth of Species A and Species B plants from seeds.

Study 1

In early June, seeds from Species A and Species B were germinated. In mid-June, 24 seedlings of each species, all having shoot lengths of 3 cm to 5 cm, were transferred to identical pots (1 seedling per pot). The pots were suspended beneath the water in large outdoor tanks that were located in full sun. Eight seedlings of each species were submerged to each of 3 water depths—0.2 m, 0.4 m, and 0.8 m. In late September, the average shoot length for surviving Species A seedlings and Species B seedlings at each of the 3 water depths was determined. The results are shown in Figure 1.

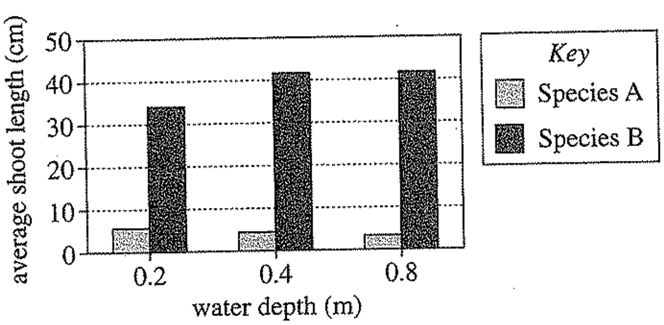


Figure 1

Study 2

Immediately after Study 1, the surviving seedlings of Species A and B were removed from the tanks, dried, and then weighed. The average dry mass of the surviving Species A seedlings from each water depth was 2.3 mg. The average dry mass of the surviving Species B seedlings from each water depth is shown in Figure 2.

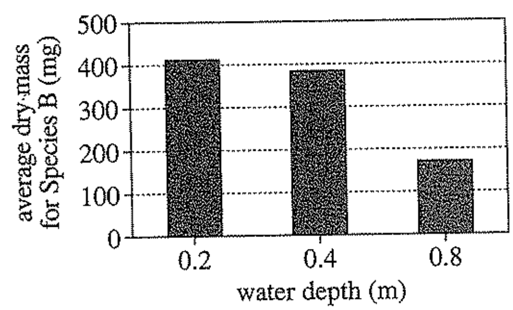


Figure 2

For each water depth, the shoot length and dry mass of each surviving Species B seedling were plotted. The best-fit curve for each set of data points is shown in Figure 3.

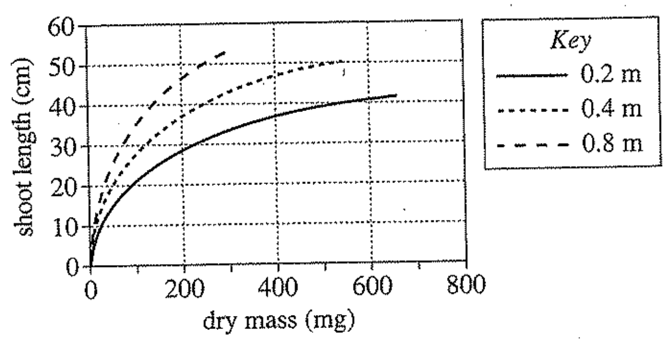


Figure 3

Figures adapted from Stefan E. B. Weisner et al., "Influence of Submergence on Growth of Seedlings of *Scirpus lacustris* and *Phragmites australis*." ©1993 by Blackwell Publishing.

1. Based on Figure 3, for a water depth of 0.8 m, the shoot length and dry mass of how many Species B seedlings were plotted?

   A. 5
   B. 8
   C. 24
   D. Cannot be determined from the given information

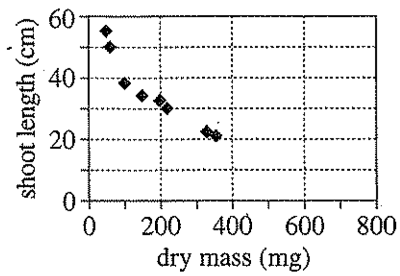
2. Suppose that a fourth group of pots containing Species B seedlings had been suspended at a water depth of 0.3 m. The average shoot length of these seedlings in late September would most likely have been:

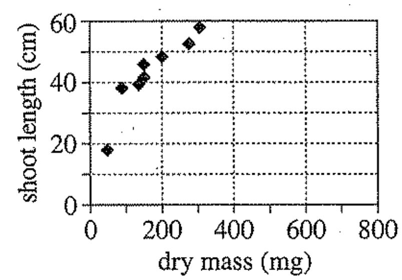
   F. less than 34 cm.
   G. between 34 cm and 42 cm.
   H. between 42 cm and 50 cm.
   J. greater than 50 cm.

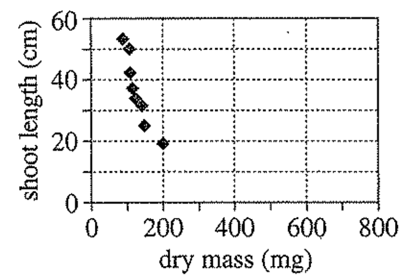
3. At the conclusion of Study 2, a seedling of Species B was found to have a dry mass of 400 mg and a shoot length of 33 cm. Based on Figure 3, this seedling most likely had been submerged at which of the following water depths?

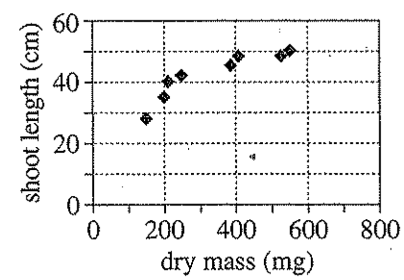
   A. 0.2 m
   B. 0.4 m
   C. 0.8 m
   D. 1.0 m

4. Which of the following sets of data points most likely yielded the best-fit curve for surviving Species B seedlings grown at a depth of 0.4 m ?

   F.


   G.


   H.


   J.


5. According to the results of Studies 1 and 2, for a given water depth, how did surviving seedlings of Species A compare to surviving seedlings of Species B ? On average, seedlings of Species A had:

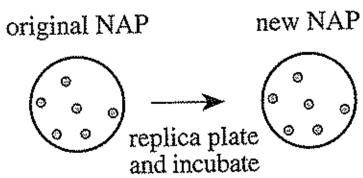
   A. longer shoot lengths and greater dry mass.
   B. longer shoot lengths but lesser dry mass.
   C. shorter shoot lengths and lesser dry mass.
   D. shorter shoot lengths but greater dry mass.

6. Of the 8 Species A seedlings grown at a water depth of 0.2 m, 6 survived. The *total* dry mass of these surviving seedlings can be calculated using which of the following expressions?

   F. 2.3 mg × 6
   G. 2.3 mg ÷ 6
   H. 2.3 mg × 8
   J. 2.3 mg ÷ 8

Passage II

S. cerevisiae (baker's yeast) cells can form *colonies* (patches of genetically identical cells) on nutrient agar plates (NAPs), each of which contains the same 20 amino acids. The pattern of colonies on 1 NAP can be reproduced on another NAP using the technique of *replica plating*. A velvet cloth is pressed onto the first NAP so that the cloth collects cells from each colony. The cloth is then pressed onto a new NAP to transfer the cells, which, when incubated, grow to form colonies (see Figure 1).



Note: ⊙ represents a colony.

Figure 1

Experiment 1

Students determined if 10 strains (Strains 1–10) of *S. cerevisiae* could grow in the absence of certain amino acids. Cells from Strain 1 were spread on an NAP, which was then incubated at 30°C for 72 hr to allow colonies to form. Cells from each colony were replica plated to each of 4 experimental plates (EPs). The EPs were identical to the NAPs except that each EP lacked 1 amino acid—either arginine (Arg), histidine (His), lysine (Lys), or leucine (Leu)—while still containing the remaining 19 amino acids. This process was also followed with Strains 2–10. All the EPs were incubated at 30°C for 72 hr and then examined for colonies (see Table 1).

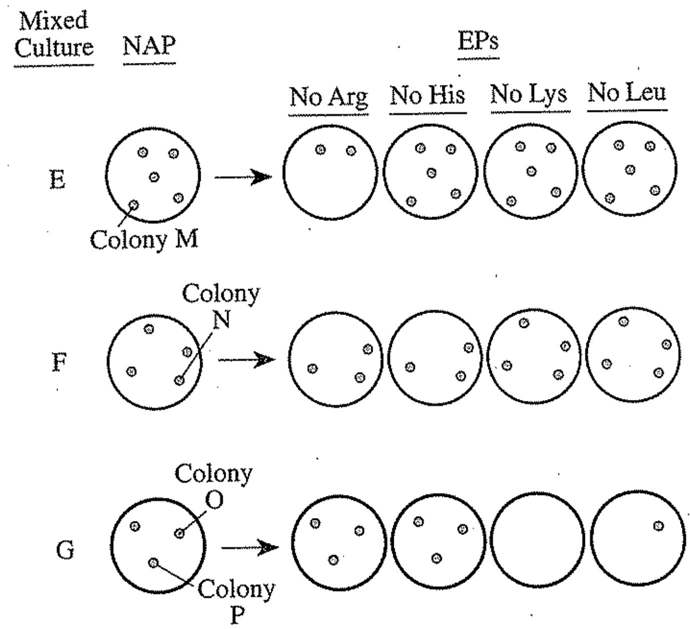
Table 1

Strain	EPs			
	No Arg	No His	No Lys	No Leu
1	+	–	+	+
2	+	+	+	–
3	–	+	+	+
4	+	+	–	+
5	+	+	–	–
6	–	–	+	+
7	+	–	+	–
8	–	+	–	+
9	–	+	+	–
10	+	+	+	+

Note: + indicates colonies formed; – indicates colonies did not form.

Experiment 2

The students tested 3 mixed cultures (Mixed Cultures E, F, and G), each containing cells from 2 of the strains tested in Experiment 1. Each mixed culture was incubated on a separate NAP until colonies formed. The colonies were then replica plated and incubated as in Experiment 1 (see Figure 2).



Note: The arrow represents replica plating and incubation.

Figure 2

7. Which of the labeled colonies shown in Figure 2 did NOT form in the absence of Leu ?
   - **A.** Colony M
   - **B.** Colony N
   - **C.** Colony O
   - **D.** Colony P

8. According to Table 1, how many of the strains tested in Experiment 1 were able to grow on the EPs that lacked histidine?
   - **F.** 1
   - **G.** 3
   - **H.** 5
   - **J.** 7

9. Which of the labeled colonies shown in Figure 2 is most likely to be from Strain 4 ?

A. Colony M
B. Colony N
C. Colony O
D. Colony P

10. Suppose cells from Strain 2 had been incubated on an EP lacking both His and Leu. Do the data in Table 1 indicate that colonies would have formed?

F. Yes; the results shown in Table 1 indicate that Strain 2 can grow without both His and Leu.
G. Yes; the results shown in Table 1 indicate that Strain 2 cannot grow without His.
H. No; the results shown in Table 1 indicate that Strain 2 can grow without both His and Leu.
J. No; the results shown in Table 1 indicate that Strain 2 cannot grow without Leu.

11. Based on Table 1 and Figure 2, which mixed culture, if any, contained cells from Strains 6 and 10 ?

A. Mixed Culture E
B. Mixed Culture F
C. Mixed Culture G
D. None of the mixed cultures

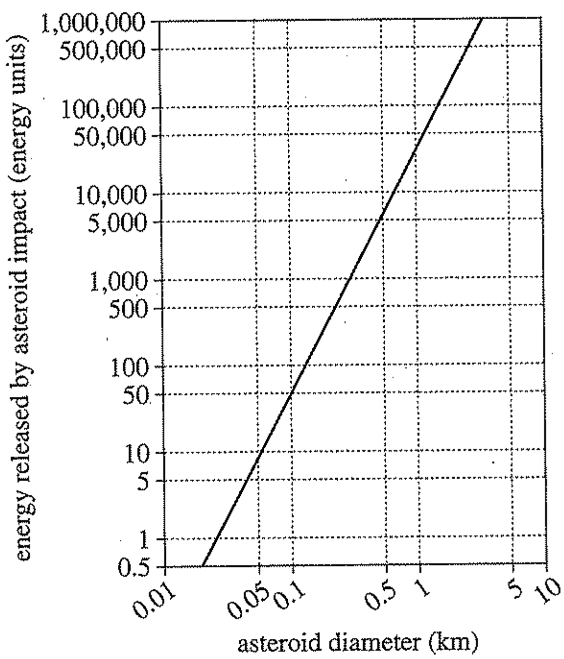
12. Before beginning the experiments, the students sterilized the velvet cloths used to transfer cells from the NAPs to the EPs. The most likely reason that the velvet cloths were sterilized was to avoid contaminating the:

F. EPs with cells from the NAPs.
G. EPs with cells that were not from the NAPs.
H. velvet cloths with yeast from the NAPs.
J. velvet cloths with bacteria from the NAPs.

Passage III

When an asteroid hits the surface of a planet or moon, an *impact crater* is formed. An asteroid that hits Earth under a specific set of conditions (including speed and angle), referred to here as Set C, forms a crater with a diameter about 20 times the asteroid's diameter. Figure 1 shows the energy released by the impact, for a range of asteroid diameters.

Figure 2 shows the average amount of time that elapses between consecutive impacts on Earth by asteroids with the same diameter, for a range of asteroid diameters. Figure 3 shows the percent of the surface of the Moon, Mercury, and Mars that is covered by impact craters, for various ranges of crater diameter.



Note: One energy unit = the energy released by the detonation of 1 million tons of TNT.

Figure 1

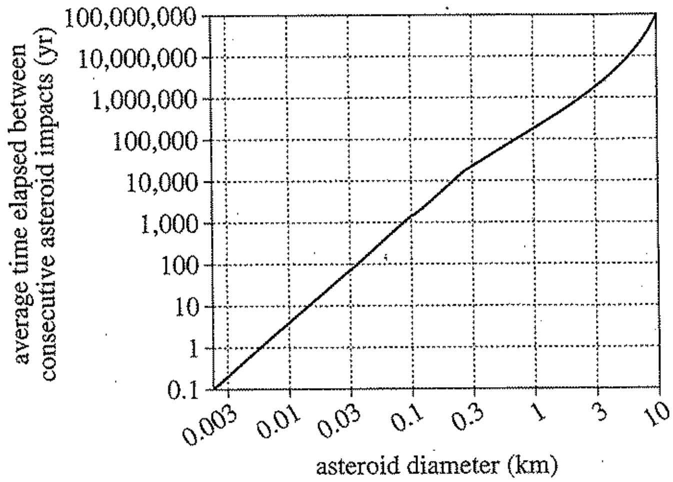


Figure 2

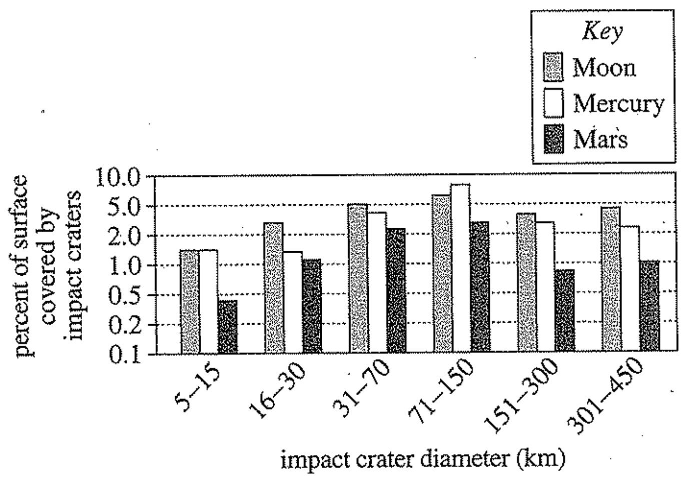


Figure 3

Figures adapted from Eugene M. Shoemaker and Carolyn S. Shoemaker, "The Role of Collisions." ©1999 by Sky Publishing Corp.

13. Suppose that 55 units of energy were released when a particular asteroid, under Set C conditions, hit Earth. According to Figure 1, the asteroid's diameter was most likely closest to which of the following?

A. 0.05 km
B. 0.1 km
C. 0.5 km
D. 1 km

14. According to Figure 2, for progressively larger asteroids, the average amount of time that elapses between consecutive impacts on Earth by asteroids with the same diameter:

F. increases only.
G. decreases only.
H. varies, but with no general trend.
J. remains the same.

15. According to Figure 3, for any given range of crater diameters, the percent of the surface of Mars that is covered by impact craters with those diameters is:

A. less than that for Mercury or the Moon.
B. less than that for Mercury but greater than that for the Moon.
C. greater than that for Mercury or the Moon.
D. greater than that for Mercury but less than that for the Moon.

16. Suppose an asteroid, under Set C conditions, hit Earth to form a crater 20 km in diameter. Based on Figure 1 and other information provided, that asteroid impact most likely released an amount of energy closest to which of the following?

F. 1,000 energy units
G. 3,000 energy units
H. 10,000 energy units
J. 30,000 energy units

17. Assume that an asteroid that hit Earth 65 million years ago was 10 km in diameter. Also assume that another 10 km asteroid will hit Earth in the future. If the amount of time that elapses between these consecutive impacts is equal to the average amount of time as given by Figure 2, a 10 km diameter asteroid will next hit Earth approximately:

A. 35 million years from now.
B. 65 million years from now.
C. 100 million years from now.
D. 135 million years from now.

Passage IV

A teacher placed 50 mL of Liquid A at 20°C in a *buret* (see Figure 1). A buret is a graduated tube with a *stopcock*. Liquid flows out of the buret when the stopcock is opened.

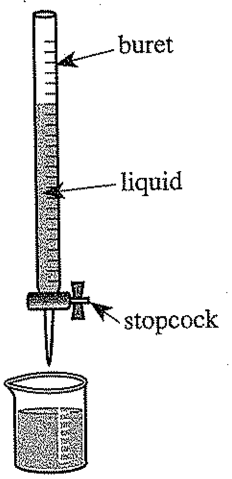


Figure 1

The stopcock was opened and the *flow time*, the time it took for 20 mL of the liquid to flow out of the buret, was measured and found to be 7 sec. The procedure was repeated with Liquid B, which had a flow time of 14 sec.

The teacher asked 3 students to try to explain why the liquids had different flow times.

Student 1

Liquid B drained more slowly than Liquid A because it is denser than Liquid A. As a liquid flows, some of its molecules bump into each other. This causes the molecules to lose speed in the direction of flow, slowing the overall flow of the liquid. Since molecules of a denser liquid are closer together than are molecules of a less dense liquid, collisions occur more often in the denser liquid. Thus, if 2 liquids are at the same temperature, the less dense liquid will always flow more easily.

Student 2

Liquid B drained more slowly than Liquid A because it has a greater *molecular mass* (the mass of each molecule) than Liquid A. Consider 2 objects of different mass. More force is required to move the object with the greater mass. Thus, if 2 liquids are at the same temperature, the liquid with the smaller molecular mass will always flow more easily.

Student 3

Liquid B drained more slowly than Liquid A because it has a larger *molecular volume* (the volume occupied by each molecule) than Liquid A. Large molecules readily bump into each other when a liquid flows, forming molecular "logjams" that slow down the overall flow. Thus, if 2 liquids are at the same temperature, the liquid with the smaller molecular volume will always flow more easily.

Table 1 gives the density, molecular mass (in atomic mass units, amu), and molecular volume (in nm^3; 1 billion nm = 1 m) for several liquids at 20°C.

Table 1

Liquid	Density (g/mL)	Molecular mass (amu)	Molecular volume (nm^3)
Acetone	0.791	58.08	0.122
DMSO	1.100	78.13	0.118
H_2O	1.000	18.02	0.030
Isopropanol	0.786	60.10	0.127
Nonane	0.718	128.3	0.297
Toluene	0.865	92.14	0.177

18. In the teacher's demonstration, as the 7 sec elapsed during the measurement of Liquid A, the height of the liquid in the buret:

F. increased only.
G. decreased only.
H. increased, then decreased.
J. decreased, then increased.

19. Based on Student 1's explanation, which of the liquids listed in Table 1 would flow most easily at 20°C ?

A. Acetone
B. DMSO
C. Nonane
D. Toluene

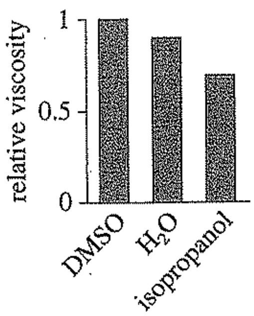
20. Suppose that the teacher had also tested isopropanol in the demonstration and found it to have a flow time of 11 sec. Student 1 would claim that isopropanol:

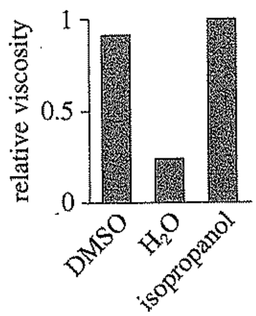
F. is more dense than Liquid A, but not as dense as Liquid B.
G. is more dense than Liquid B, but not as dense as Liquid A.
H. has a greater molecular mass than Liquid A, but a smaller molecular mass than Liquid B.
J. has a greater molecular mass than Liquid B, but a smaller molecular mass than Liquid A.

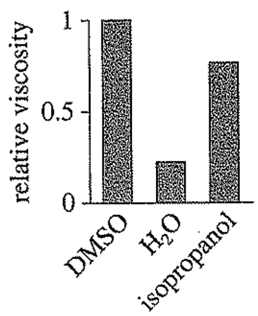
21. Is the claim "At 20°C, nonane flows more easily than acetone" consistent with Student 2's explanation?

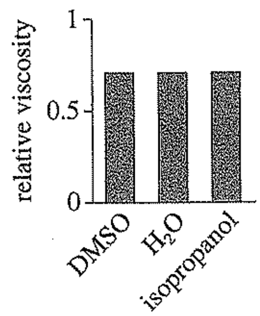
A. No, because nonane has a greater molecular mass than acetone.
B. No, because nonane has a larger molecular volume than acetone.
C. Yes, because nonane has a greater molecular mass than acetone.
D. Yes, because nonane has a larger molecular volume than acetone.

22. Which of the following graphs of the relative viscosities of DMSO, H_2O, and isopropanol is most consistent with Student 3's explanation?

F.


H.


G.


J.


23. Suppose that Liquid A had been isopropanol and Liquid B had been nonane. The results of the teacher's demonstration would have supported the explanation(s) provided by which student(s)?

A. Student 1 only
B. Student 2 only
C. Students 1 and 2 only
D. Students 2 and 3 only

24. Consider the data for heptane (a liquid) at 20°C shown in the table below:

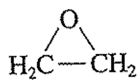
Density	Molecular mass	Molecular volume
0.684 g/mL	100.20 amu	0.243 nm^3

Which student(s), if any, would predict that heptane would have a shorter flow time than toluene at 20°C ?

F. Student 1 only
G. Students 2 and 3 only
H. Students 1, 2, and 3
J. None of the students

Passage V

Ethylene oxide, a widely used industrial chemical, has the structure shown below:



Figures 1–3 each show how a property of solutions of ethylene oxide in H_2O varies as the concentration of ethylene oxide increases at 1 atmosphere (atm) of pressure. Concentration is given as the percent ethylene oxide by mass in H_2O (% EO). Figure 1 shows how density at 10°C varies with % EO. Figure 2 shows how freezing point varies with % EO. The *bubble point* is the lowest temperature at which bubbles of gas (in this case, ethylene oxide) form in a solution. Figure 3 shows how bubble point varies with % EO.

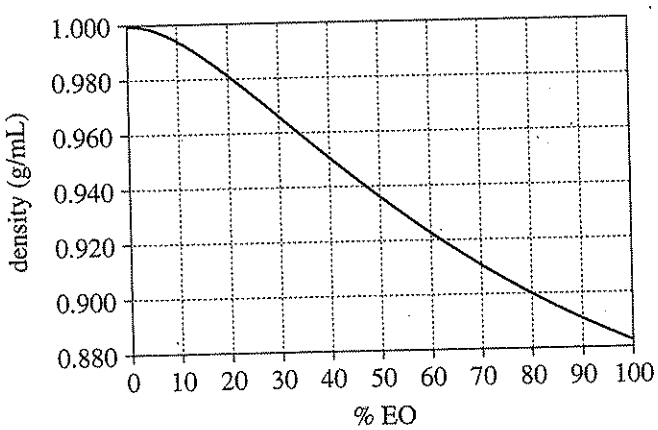


Figure 1

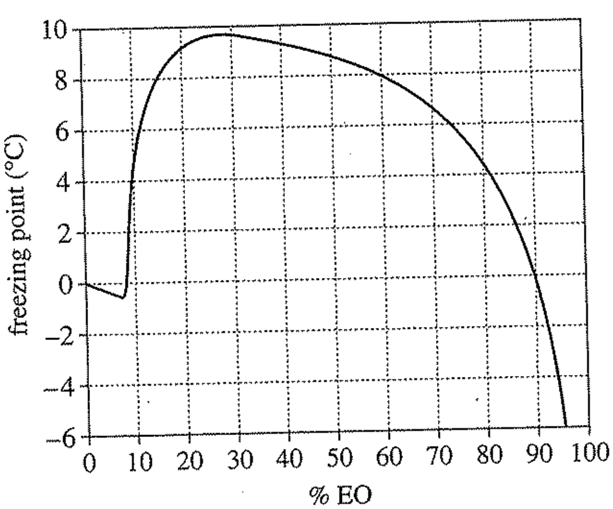


Figure 2

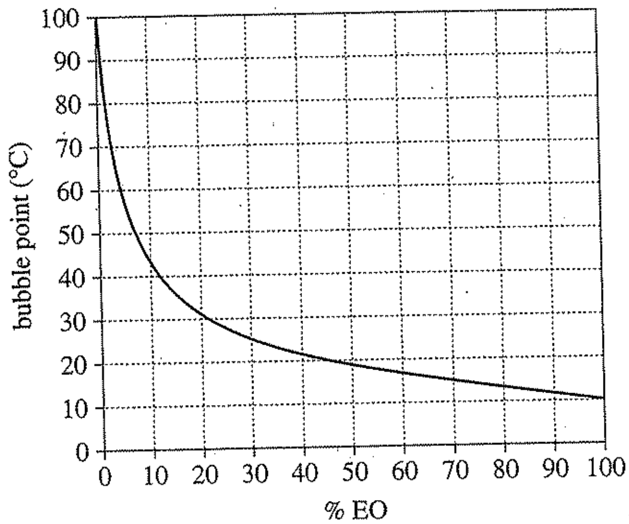


Figure 3

Figures adapted from Old World Industries, The Dow Chemical Company, Shell Chemical Company, Sunoco, Inc., and Equistar Chemicals, LP, *Ethyleneoxide* (2nd ed.). 1999.

25. According to Figure 3, the lowest temperature at which bubbles will form in a 30% EO solution at 1 atm is closest to which of the following?

A. 11°C
B. 25°C
C. 50°C
D. 97°C

26. At 10°C and 1 atm, as % EO increases from 0% to 100%, the mass per unit volume:

F. increases only.
G. decreases only.
H. increases, then decreases.
J. decreases, then increases.

27. At 1 atm, which of the following solutions will have the *lowest* melting point?

A. 20% EO
B. 40% EO
C. 60% EO
D. 80% EO

28. According to Figures 2 and 3, at 1 atm, a solution of ethylene oxide in H_2O that has a bubble point of 15°C will have a freezing point closest to which of the following?

F. 0°C
G. 3°C
H. 7°C
J. 10°C

29. Based on Figure 2, at 1 atm, which of the following solutions has a freezing point closest to the freezing point of pure H_2O ?

A. 11% EO
B. 39% EO
C. 61% EO
D. 89% EO

Passage VI

In a rain cloud, small particles called *cloud condensation nuclei* (CCN) attract nearby water droplets to form a *cloud droplet*. A cloud droplet grows by attracting more water droplets until it becomes a *raindrop*, which then falls from the cloud. Rainfall can be increased by seeding the cloud with additional small particles, such as NaCl particles, to act as CCN.

Over a year, 2 studies of cloud-seeding were done at a subtropical location, using every cumulus cloud that was isolated from other clouds, that had a top at an altitude between 3,350 m and 4,900 m, and that had a liquid water content of at least 0.5 g/m^3.

Study 1

Four types of flares (A–D) were used. Flares of each type, when ignited, released NaCl particles having a specific distribution of particle sizes (see Table 1).

Table 1

Flare Type	Percent of NaCl particles having diameters (µm*):			
	0.1–0.5	0.6–1.0	1.1–2.0	2.1–5.0
A	64	15	12	9
B	72	12	9	7
C	81	9	6	4
D	90	5	3	2

*µm = 10^{-6} m

A plane carrying all 4 types of flares was sent into the base of each cloud. As the plane entered the base of a cloud, a computer determined whether or not to immediately ignite at least 1 flare, seeding the cloud. The computer also selected which type of flare to ignite, and how many flares to ignite to introduce a concentration of 10, 100, 1,000, or 10,000 particles/cm^3 into the cloud. The average amount of rainfall from the seeded clouds for each type of flare and at each concentration is shown in Figure 1.

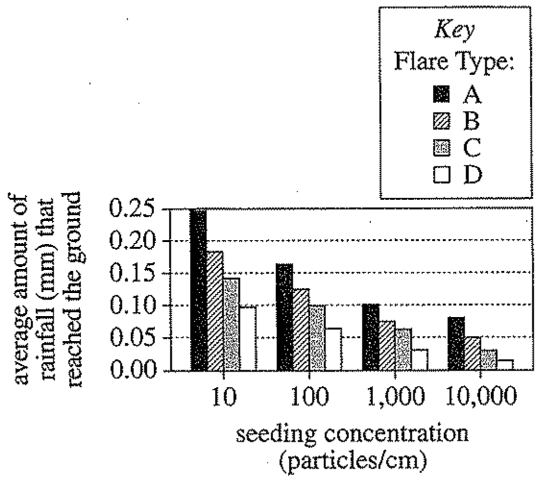


Figure 1

Table 1 and Figure 1 adapted from Y. Segal et al., "Effects of hygroscopic seeding on raindrop formation as seen from simulations using a 2000-bin spectral cloud parcel model." ©2004 by Elsevier B. V.

Study 2

Radar was used to monitor how the mass of raindrops within each cloud changed over the 55 minutes following the time the plane entered the base of the cloud. The averaged results for all the unseeded clouds and for all the seeded clouds are shown in Figure 2.

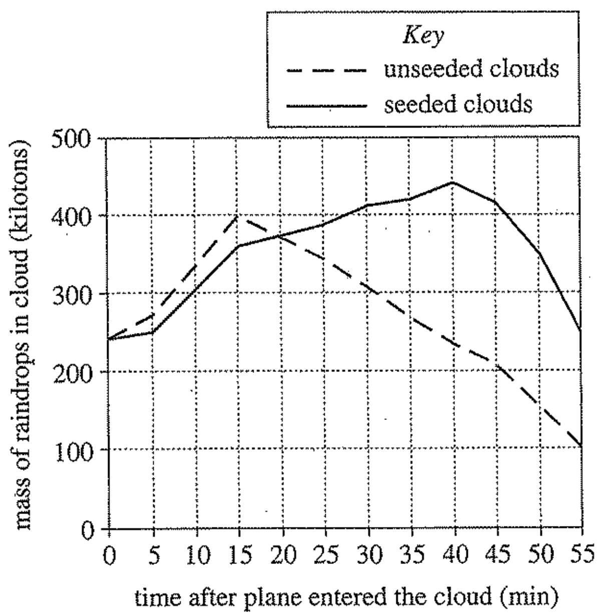


Figure 2

Figure 2 adapted from G. K. Mather et al., "Results of the South African Cloud-Seeding Experiments Using Hygroscopic Flares." ©1997 by American Meteorological Society.

30. According to the results of Study 1, as the seeding concentration increased, the average amount of rainfall that reached the ground:

F. increased for all 4 types of flares.
G. increased for Flare Types A and B, but decreased for Flare Types C and D.
H. decreased for all 4 types of flares.
J. decreased for Flare Types A and B, but increased for Flare Types C and D.

31. Based on the passage, what is the correct order of raindrops, water droplets, and cloud droplets according to their diameters, from smallest to largest?

A. Water droplet, raindrop, cloud droplet
B. Water droplet, cloud droplet, raindrop
C. Raindrop, water droplet, cloud droplet
D. Raindrop, cloud droplet, water droplet

32. According to the results of Study 2, how did the raindrops in the seeded clouds differ from the raindrops in the unseeded clouds with respect to their maximum mass?

F. It took more time for the raindrops in the seeded clouds to reach a maximum mass, and they reached a greater maximum mass.
G. It took less time for the raindrops in the seeded clouds to reach a maximum mass, and they reached a greater maximum mass.
H. It took more time for the raindrops in the seeded clouds to reach a maximum mass, and they reached a lesser maximum mass.
J. It took less time for the raindrops in the seeded clouds to reach a maximum mass, and they reached a lesser maximum mass.

33. The design of Study 1 differed from the design of Study 2 in that in Study 1, the:

A. rainfall from a cloud was measured, whereas in Study 2, the particle-size distribution in types of flares was determined.
B. mass of raindrops in a cloud was determined, whereas in Study 2, the particle-size distribution in types of flares was determined.
C. rainfall from a cloud was measured, whereas in Study 2, the mass of raindrops in a cloud was determined.
D. mass of raindrops in a cloud was determined, whereas in Study 2, rainfall from a cloud was measured.

34. Which of the following statements gives the most likely reason that clouds with tops above an altitude of 4,900 m were *not* included in the studies? Above 4,900 m in such clouds, there would be present:

F. only water vapor.
G. only water droplets.
H. ice crystals but few water droplets.
J. water droplets but few ice crystals.

35. Which of the following statements about the particle-size distribution in the 4 types of flares is supported by Table 1 ?

A. For all 4 types of flares, the majority of particles belonged to the largest size category.
B. For all 4 types of flares, the majority of particles belonged to the smallest size category.
C. For Flare Types A and B, the majority of particles belonged to the largest size category, whereas for Flare Types C and D, the majority of particles belonged to the smallest size category.
D. For Flare Types A and B, the majority of particles belonged to the smallest size category, whereas for Flare Types C and D, the majority of particles belonged to the largest size category.

Passage VII

An *RCL circuit* contains an alternating current (AC) power supply, a resistor having a resistance R, a capacitor having a capacitance C, and an inductor having an inductance L (see Figure 1).

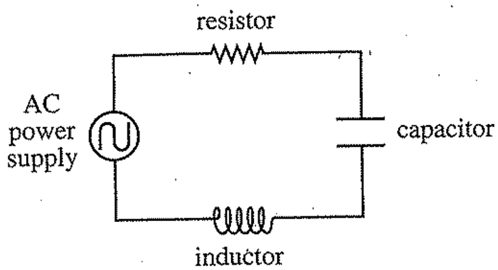


Figure 1

The capacitor and inductor each possess *impedance*, a type of electrical resistance. The *angular frequency* of the current, ω, is a measure of the number of times each second that the current reverses direction.

Figure 2 shows, for specific values of C, L, and average voltage, V, how the average current, I, varies with ω and with R.

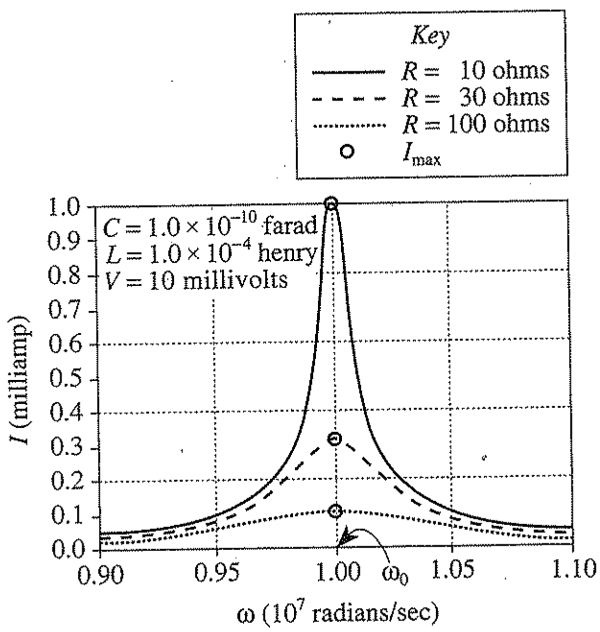


Figure 2

Figure 2 adapted from David Halliday and Robert Resnick, *Physics, Part 2*, 3rd ed. ©1978 by John Wiley and Sons, Inc.

For a given R, the peak average current, I_{max}, occurs at the *resonant angular frequency*, ω_0.

Figure 3 shows how ω_0 varies with L and C.

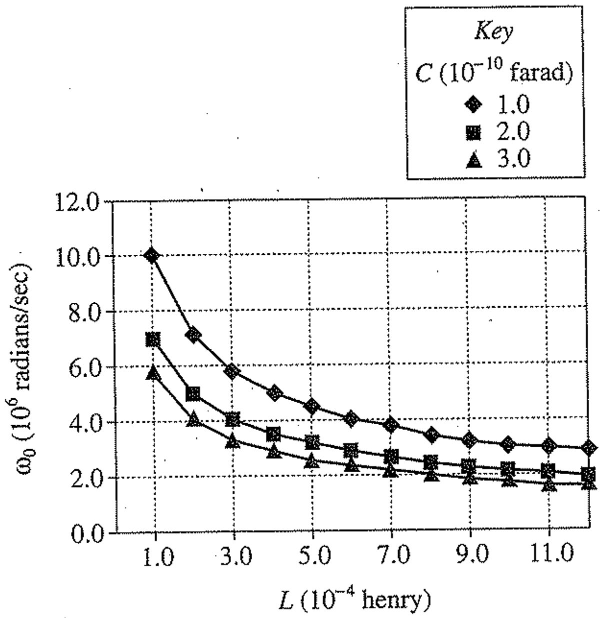


Figure 3

36. What is the resonant angular frequency of the RCL circuit for the conditions given in Figure 2 ?

- **F.** 0.90×10^7 radians/sec
- **G.** 0.95×10^7 radians/sec
- **H.** 1.00×10^7 radians/sec
- **J.** 1.05×10^7 radians/sec

37. According to Figure 3, for $C = 1.0 \times 10^{-10}$ farad, as L increases, ω_0:

- **A.** increases only.
- **B.** decreases only.
- **C.** varies, but with no general trend.
- **D.** remains the same.

38. For the conditions specified in Figure 2 and $R = 30$ ohms, the resistor will generate the greatest amount of heat when ω is closest to which of the following values?

- **F.** 0.90×10^7 radians/sec
- **G.** 0.95×10^7 radians/sec
- **H.** 1.00×10^7 radians/sec
- **J.** 1.05×10^7 radians/sec

39. According to Figure 2, does ω_0 vary with R ?

A. Yes; as R increases, ω_0 decreases.
B. Yes; as R increases, ω_0 remains the same.
C. No; as R increases, ω_0 increases.
D. No; as R increases, ω_0 remains the same.

40. For a given L, what is the correct ranking of the values of C in Figure 3, from the C associated with the lowest ω_0 to the C associated with the highest ω_0 ?

F. 1.0×10^{-10} farad, 2.0×10^{-10} farad, 3.0×10^{-10} farad
G. 1.0×10^{-10} farad, 3.0×10^{-10} farad, 2.0×10^{-10} farad
H. 2.0×10^{-10} farad, 3.0×10^{-10} farad, 1.0×10^{-10} farad
J. 3.0×10^{-10} farad, 2.0×10^{-10} farad, 1.0×10^{-10} farad

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

Form 68G (April 2010)
Weimaraner

CrackACT.com

English

1) B
2) H
3) A
4) J
5) B
6) G
7) B
8) F
9) C
10) J
11) D
12) G
13) A
14) H
15) C
16) J
17) A
18) H
19) A
20) F
21) D
22) H
23) B
24) J
25) C
26) H
27) D
28) J
29) A
30) H
31) D
32) G
33) C
34) G
35) A
36) H
37) D
38) G
39) D
40) F
41) B
42) J
43) A
44) F
45) B
46) J
47) A
48) J
49) D
50) F
51) C
52) H
53) D
54) F
55) B
56) G
57) B
58) F
59) C
60) J
61) B
62) G
63) A
64) F
65) B
66) H
67) C
68) H
69) D
70) J
71) A
72) J
73) C
74) J
75) A

Math

1) B
2) H
3) C
4) K
5) C
6) F
7) E
8) G
9) D
10) F
11) D
12) H
13) C
14) G
15) D
16) F
17) B
18) J
19) B
20) K
21) D
22) K
23) B
24) K
25) D
26) K
27) C
28) K
29) C
30) H
31) A
32) H
33) B
34) H
35) D
36) K
37) B
38) K
39) B
40) F
41) D
42) J
43) A
44) F
45) B
46) K
47) D
48) G
49) D
50) J
51) C
52) K
53) D
54) F
55) E
56) H
57) B
58) F
59) A
60) F

Reading

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

Science

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

Explanation of Procedures Used to Obtain Scale Scores from Raw Scores

On each of the four tests on which you marked any responses, the total number of correct responses yields a raw score. Use the table below to convert your raw scores to scale scores. For each test, locate and circle your raw score or the range of raw scores that includes it in the table below. Then, read across to either outside column of the table and circle the scale score that corresponds to that raw score. As you determine your scale scores, enter them in the blanks provided on the right. The highest possible scale score for each test is 36. The lowest possible scale score for any test on which you marked any responses is 1.

Next, compute the Composite score by averaging the four scale scores. To do this, add your four scale scores and divide the sum by 4. If the resulting number ends in a fraction, round it off to the nearest whole number. (Round down any fraction less than one-half; round up any fraction that is one-half or more.) Enter this number in the blank. This is your Composite score. The highest possible Composite score is 36. The lowest possible Composite score is 1.

ACT Test 68G	**Your Scale Score**
English	________
Mathematics	________
Reading	________
Science	________
Sum of scores	________
Composite score (sum ÷ 4)	________

NOTE: If you left a test completely blank and marked no items, do not list a scale score for that test. If any test was completely blank, do not calculate a Composite score.

Scale Score	Raw Scores				Scale Score
	Test 1 English	Test 2 Mathematics	Test 3 Reading	Test 4 Science	
36	75	60	40	40	36
35	74	59	39	39	35
34	73	57-58	38	—	34
33	72	56	37	38	33
32	71	55	36	37	32
31	70	54	35	—	31
30	69	53	34	36	30
29	68	52	33	35	29
28	66-67	50-51	32	33-34	28
27	65	47-49	31	32	27
26	63-64	45-46	30	31	26
25	61-62	42-44	29	29-30	25
24	58-60	40-41	28	27-28	24
23	56-57	37-39	27	25-26	23
22	53-55	35-36	25-26	23-24	22
21	50-52	33-34	24	21-22	21
20	47-49	31-32	23	19-20	20
19	45-46	29-30	21-22	17-18	19
18	43-44	26-28	20	16	18
17	40-42	22-25	19	14-15	17
16	38-39	17-21	17-18	13	16
15	35-37	13-16	16	12	15
14	32-34	10-12	14-15	11	14
13	30-31	8-9	13	10	13
12	28-29	6-7	11-12	9	12
11	25-27	5	9-10	8	11
10	22-24	4	8	6-7	10
9	19-21	—	7	5	9
8	16-18	3	6	4	8
7	13-15	—	5	—	7
6	10-12	2	4	3	6
5	8-9	—	—	2	5
4	6-7	1	3	—	4
3	4-5	—	2	1	3
2	3	—	1	—	2
1	0-2	0	0	0	1