ANSWERS

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

ACT IV Science Reasoning Answers Explained

PASSAGE I

1. **D.** If the dam release is moved back two days, then the April 2 reading will be the same as the original April 4 reading. For most of April 4, the reading is 8,000 cfs. Therefore, this will be the reading on April 2 for the new release date.
2. **H.** The obvious answer is the correct answer. The water readings decline more gradually because the water flow stops more gradually than it starts.
3. **D.** The graph shows that the declining flow at Diamond Creek (mile 225) lasts a longer period of time than the declining flow at the dam (mile −15).
4. **F.** Simulations based on accurate models accurately predict the real event. Simply using a computer is not enough to ensure an accurate prediction.
5. **D.** Consider the choices in turn:
   - A. The duration of the flows at river mile 100 is a consequence of the assumptions.
   - B. The time of day of the initial release will not affect the ultimate outcomes.
   - C. The distance downstream is known and fixed. It is not an assumption.
   - D. The duration of the releases is an assumption in the simulation that affects the outcomes.
6. **H.** Results of a model simulation would help confirm the results of the experiment.

PASSAGE II

7. **D.** According to the chart, reptiles first appeared at the end of the Mississippian Period, about 330 million years ago. This means the plants would first have appeared about 380 million years ago, in the Devonian Period.
8. **G.** With each successive half-life, half of the remaining parent atoms decay to form daughter atoms. To determine the age of a substance, one must know the ratio of parent isotope atoms to daughter isotope atoms.
9. **B.** Potassium-40 is the only isotope that can date elements to about 4.6 billion years and also date them to 250,000 years ago.

10. **H.** The fossil chart gives enough information to estimate the time that reptiles and mammals coexisted. Information about specific organisms in choices F and G and is not needed.

11. **D.** The fossil chart does not mean that every fossil is found everywhere. The "missing" fossils most likely mean that the organism itself was not present in that area.

12. **H.** Once all of the carbon-14 atoms have degraded to nitrogen-14 atoms, carbon-14 dating is not a useful dating technique. The substance is likely to be at least 30,000 years old, but the age of the substance cannot be determined from the information. The substance may be too recent to be dated by uranium dating.

PASSAGE III

13. **C.** Multiply the weight of an object on Earth by 0.07 to find the weight of that object on Pluto: $80 \times 0.07 = 5.6$. This is most like the weight of an object on Neptune that weighs 5 pounds on Earth.

14. **H.** As Table 2 shows, the weight of the object does not affect the time it takes the object to fall to the surface. If the gravity is twice the moon's gravity, then the free-fall time will be half the moon's free-fall time. Thus, $23.5 \div 2 = 11.75$ seconds, or 12 seconds to the nearest second.

15. **A.** Free-fall time is proportional to a planet's gravity. You can confirm this by using information in Table 2. For example, the free-fall time for Object A on Mars is 10.5 seconds and the free-fall time for it on Earth is 4 seconds. Thus, $10.5 \div 4 = 2.625$; and 2.625×1.9 (the weight of the object on Mars) $= 4.9875 \approx 5$. Indeed, Object A weights 5 pounds on Earth. Given free-fall times on Earth and on another planet, and the weight of the object on another planet, you can determine the weight of the object on Earth.

16. **H.** Objects always free fall from 80 meters to the surface at the times shown in Table 2, regardless of weight. Of the choices given, an object will always fall most quickly to the surface of Neptune.

17. **D.** As the height increases, the free-fall time increases at the same rate.

PASSAGE IV

18. **G.** Bromthymol blue reacts in the pH range of 6.0–7.6. This indicator would help identify the substance as an acid or a base.

19. **A.** Use the formula $pH + pOH = 14$. The table shows the maximum pH is 12.1. The minimum pOH is $14 - 12.1 = 1.9$.

20. **H.** The pH must be within the reaction range of both indicators. The "highest" low number is 4.5 and the "lowest" high number is 6. The pH is in the range of 4.5 to 6.

21. **D.** Alizarin yellow is the only indicator listed that shows a reaction in the pH range of a base.

22. **J.** The pH ranges from 3 to 11, very near the equivalence point. This accounts for most of the pH range.

PASSAGE V

23. **D.** The bottom seismograph scale shows vertical displacement. The maximum positive vertical displacement for Study 1 is about 1. The maximum positive vertical displacement for Study 3 is about 5.

24. **H.** Each trace is shown on a strip the same width. Different scales are used to most accurately show each trace within the strip.

25. **B.** The time, the latitude, and the depth were all set by the experimenters. The moment magnitude is a result of the experiment.

26. **G.** The amplitudes of each of the top two records are stronger than the amplitude of the bottom record. This shows there is more side-to-side (horizontal) movement than up-and-down (vertical) movement.

27. **A.** Deeper events have stronger magnitudes. The magnitudes of these events do not show a relationship with any of the other factors.

28. **G.** The question asks for the distance between the highest and lowest amplitudes and so this number will always be positive. The bottom trace shows the vertical amplitude.

The vertical amplitude for Study 2 ranges from about −3 to about 4. The distance between them is about 7.

The distance between the highest and lowest vertical amplitudes for Study 1 is about 3.

The distance between the highest and lowest vertical amplitudes for Study 3 is about 10.

PASSAGE VI

29. **C.** Some cover crops, such as field corn and soybeans, are used in the summer.

Choices A and B are incorrect because these statements are false for many cover crops. The table does not provide information about a relationship between pounds per bushel and quality of a cover crop.

30. **J.** The comments for alfalfa specifically mention that "Alfalfa needs lime and other minerals for good growth." Choice G, perennial ryegrass, is incorrect because the comments say to plow in nitrogen with the sod, which occurs after the grass has grown.

31. **C.** If there are half as many pounds per bushel, there are 30 pounds per bushel. It would take 3 bushels to make 90 pounds.

32. **H.** pH level is mentioned only in connection with clover cover crops.

33. **C.** The table specifically mentions that barley is for planting in winter, while the table indicates that the other listed crops are appropriate for summer.

PASSAGE VII

34. **H.** The scientist theorizes that the number of dinosaurs decreases by 40% every two million years. So, the number of dinosaurs 75 million years ago is 100%. The number of dinosaurs 73 million years ago is 40% less, or 60%; and the number of dinosaurs 71 million years ago is 40% less than 60%, or about 36%.

35. **A.** The ice age lasted from about 110,000 years ago to 10,000 years ago. A reduction in the size of the reptile population for the entire ice age would support the global cooling theory. However, since the reptile population rose to a high during the ice age, the impact theory is supported. Note that just because data support a theory, does NOT mean that the theory is correct.

36. **G.** A cataclysmic impact would throw up a huge cloud of dust, blocking out sunlight, denying green plants the energy they need to produce carbohydrates, and huge numbers of plants would die.

37. **B.** Experts have observed that it is easy to come up with scenarios that wipe out most or all of life on Earth; it is diffficult to come up with plausible explanations for why some types of organisms are wiped out while others survive. A weakness of the impact theory is that it seems improbable that a global disaster of that magnitude would have little effect on the mammals.

38. **H.** The impact could have caused cooling when the dust cloud resulting from the explosion blocked out the sun. These two theories are consistent for the reason stated.

39. **C.** If the impact caused the dinosaurs to become extinct, it should have caused the other animals to become extinct as well.

40. **H.** The global cooling theory is based on cold-blooded dinosaurs. If dinosaurs were not cold-blooded, this theory cannot be true.

Chapter 26

SCORING THE SCIENCE REASONING TESTS

This chapter shows you how to find the ACT scale scores and subscores.

The **raw score** on a test is the number correct. Use the charts provided to convert the raw score for each test to a scale score.

Scale scores are the scores reported to colleges. Because different ACTs have different difficulty levels, the same raw score does not always convert to the same scale score. The scale scores here are approximations and are given only to familiarize you with the process of converting raw scores to scale scores. The scale scores for these tests will almost certainly be different from the scale scores on the ACT you take.

Scoring the Science Reasoning Tests

The raw score on the Science Reasoning test is the number of correct answers. There are no Science Reasoning subscores. Use the chart below to convert the raw score for each Science Reasoning test to a scale score.

The highest possible raw score is 40; the lowest is 0. The highest possible scale score is 36; the lowest is 1. In the chart below, a raw score of 40 yields a scale score of 36; a raw score of 0 yields a scale score of 1. A raw score of 26 yields a scale score of 23.

Science Reasoning Scale Scores

Raw Score	Scale Score	Raw Score	Scale Score	Raw Score	Scale Score	Raw Score	Scale Score
40	36	33	27	17–18	18	4	9
39	35	31–32	26	15–16	17	3	8
—	34	29–30	25	14	16	2	7
38	33	28	24	12–13	15	—	6
—	32	26–27	23	10–11	14	—	5
37	31	24–25	22	9	13	1	4
36	30	22–23	21	7–8	12	—	3
35	29	20–21	20	6	11	—	2
34	28	19	19	5	10	0	1