

2022 STAAR Grade 8 Science Rationales

Item #	Rationale	
2	Option F is correct	Both lithium (Li) and sodium (Na) are in Group 1 of the Periodic Table (located in the first column of the Periodic Table). Elements in the same group have the same number of valence electrons that determine their bonding behavior. Both Li and Na have 1 valence electron in their outer energy level (or electron shell).
	Option G is incorrect	The number of neutrons compared to the number of protons does not explain why the elements are chemically similar. Most stable isotopes have fewer protons than neutrons.
	Option H is incorrect	Li and Na each have a different number of energy levels. Li has two energy levels (or electron shells) and is classified in Period 2 of the Periodic Table, while Na has three energy levels and is classified in Period 3. Periods are indicated by rows in the Periodic Table.
	Option J is incorrect	If both atoms contained equal numbers of protons, they would be the same element.

2022 STAAR Grade 8 Science Rationales

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4	Option G is correct	The Isoptera is the insect identified when the dichotomous key is used. 7-2.8 (.7 (te)-6.4 (d)c.1751.9 (n)-ly. .7 (a)-A -2 (c.7 (e)

2022 STAAR Grade 8 Science Rationales

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6	Option J is correct	Based on Newton's third law, for every action, there is an opposite and equal reaction. Therefore, interacting forces occur as action-reaction pairs. In this scenario, the bird is exerting a downward force on the fence post, while the fence post is exerting an upward force on the bird.
	Option F is incorrect	This is not an action-reaction pair. For this to be an action-reaction pair, it would have to refer to the force of the bird on the wires and the force of the wires on the bird (not the force of the wires on the fence post).
	Option G is incorrect	This is not an action-reaction pair. For this to be an action-reaction pair, it would have to refer to the force of the wires on the fence post and the force of the fence post on the wires (not the force of the fence post on the bird).
	Option H is incorrect	This is not an action-reaction pair. For this to be an action-reaction pair, it would have to refer to the force of the fence post on the bird and the force of the bird on the fence post (not the force of the bird on the wires).

2022 STAAR Grade 8 Science Rationales

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7	Option C is correct	Planting a crop that requires fewer supplemental nutrients to grow would result in less fertilizer use and fewer nutrients in agricultural runoff that can flow into nearby waterways. Excess nutrients from fertilizers in agricultural runoff can negatively affect nearby waterways by causing harmful algal blooms.
	Option A is incorrect	Plants produce oxygen through photosynthesis. Plants would not produce less oxygen unless photosynthesis is disrupted. If less oxygen is produced, it could increase the negative effects of water quality. Low oxygen levels in the water bodies can have negative effects on many types of aquatic organisms.
	Option B is incorrect	Although plants produce carbon dioxide during respiration, the carbon dioxide produced by plants does not have a negative effect on water quality.
	Option D is incorrect	Plants convert sunlight (solar energy) into chemical energy through photosynthesis. Needing less solar energy will not decrease the negative effects of water quality.

2022 STAAR Grade 8 Science Rationales

Item #	Rationale	
8	Option G is correct	The native grass population will decrease since buffelgrass is competing against it for the same resources.
	Option F is incorrect	The native grass population will not increase since the buffelgrass is outcompeting it for space and water.
	Option H is incorrect	The buffelgrass would not develop traits like those of the native grasses since the native grass population is competing for the same resources and the buffelgrass is outcompeting the native grasses.
	Option J is incorrect	Since the buffelgrass is successful in its competition against the native grasses, it will continue to survive and reproduce. Therefore, the buffelgrass offspring would not develop traits like other invasive species if they are currently fit to survive as is.

2022 STAAR Grade 8 Science Rationales

Item #	Rationale	
9	Option C is correct	Speed is a measure of distance over time. Student 1 travels 40 meters in 60 seconds. Student 2 travels 20 meters in 60 seconds. After an additional 30 seconds (90 seconds total), student 1 would travel



2022 STAAR Grade 8 Science Rationales

Item #	Rationale	
14	Option H is incorrect	There are 14 atoms of oxygen balanced on i14o8-4.9 (nsd(148ic)-2 (t)/2 Tc 1.on /MCID 402 138 0.96 ref2/TH .8 (c

2022 STAAR Grade 8 Science Rationales

Item #	Rationale	
16	Option H is correct	An energy pyramid represents feeding relationships in a community by showing the amount of energy transferred from one feeding position in a food web (trophic level) to the next

2022 STAAR Grade 8 Science Rationales

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18	Option G is correct	Both cell membranes and cell walls allow water to move into and out of cells.
	Option F is incorrect	The mitochondria produce energy for cellular processes.
	Option H is incorrect	The nucleus contains the genetic material and directs protein synthesis within the ribosomes.
	Option J is incorrect	The nucleus controls growth and reproduction within the cell.

2022 STAAR Grade 8 Science Rationales

Item #	Rationale	
19	Option C is correct	The formation of a solid or precipitate by mixing two clear solutions indicates that a chemical (nonreversible) change has occurred.
	Option A is incorrect	The formation of steam, or water vapor from liquid water, is a change of state, which is a physical change.
	Option B is incorrect	Freezing is a physical change. The formation of a precipitate is a chemical change.

2022 STAAR Grade 8 Science Rationales

Item #	Rationale	
20	Option J is correct	The sun is a closer distance to Earth than any other star, which results in it appearing brighter to people on Earth.
	Option F is incorrect	When the sun's light rays

2022 STAAR Grade 8 Science Rationales

Item #	Rationale	
26	Option H is correct	Selenium (Se) and sulfur (S) are both nonmetals found in Group 16 of the Periodic Table. They have similar chemical properties because they have the same number of electrons (6) in their outermost (valence) shell. Valence electrons in the outermost shell of an atom determines how it will bond with other atoms.
	Option F is incorrect	Silicon (Si) is a metalloid found in Group 14 of the Periodic Table, while sulfur (S) is in Group 16. Si contains 4 valence electrons in its outermost shell, while S contains 6 valence electrons. A difference in the number of valence electrons indicates that these two elements are chemically dissimilar.
	Option G is incorrect	Chlorine (Cl) is a nonmetal found in Group 17 of the Periodic Table, while sulfur (S) is in Group 16. Cl contains 7 valence electrons in its outermost shell, while S contains 6 valence electrons. A difference in the number of valence electrons indicates that these two elements are chemically dissimilar.
	Option J is incorrect	Phosphorus (P) is a nonmetal found in Group 15 of the Periodic Table, while sulfur (S) is in Group 16. P contains 5 valence electrons in its outermost shell, while S contains 6 valence electrons. A difference in the number of valence electrons indicates that these two elements are chemically dissimilar.

2022 STAAR Grade 8 Science Rationales

2022 STAAR Grade 8 Science Rationales

Item #	Rationale	
28	Option F is correct	On a speed versus time graph, when there is a positive slope, the object's speed is increasing. When there is no slope (flat line), the object's speed is constant, and when there is a negative slope, the object's speed is slowing down (decreasing).
	Option G is incorrect	The object is not at rest during the 3-second to 18-second time interval. A negative direction implies that the object is moving backward, which is not the case based on the speed versus time graph.
	Option H is incorrect	The object is not at rest during the 3-second to 18-second time interval.
	Option J is incorrect	The object is not moving at a constant speed during the zero- to 3-second time interval and from the 18-second to 23-second time interval. The object is also not at rest from the 3-second to 18-second time interval.

2022 STAAR Grade 8 Science Rationales

Item #	Rationale	
29	Option D is correct	Strong storm winds would cause the most weathering and erosion to the desert land area at point X.
	Option A is incorrect	The salinity of the seawater near the land area at point X is not likely to have a significant impact on the future rate of weathering and erosion.
	Option B is incorrect	

2022 STAAR Grade 8 Science Rationales

Item #	Rationale	
32	10, 10.0, or 10.00 is correct	Fluorine has an atomic number of 9. The stem provides the mass number of 19. To get the number of neutrons, the atomic number is subtracted from the mass number: $19 - 9 = 10$ neutrons

2022 STAAR Grade 8 Science Rationales

Item #	Rationale	
33	Option C is correct	<p>The student calculated the acceleration of Rocket 3 to be about 23.301 m/s². This is the largest acceleration of all the rockets recorded.</p> $F = ma$ $12.0 \text{ N} = (0.515 \text{ kg}) \times a$ $a = 23.301 \text{ m/s}^2$
	Option A is incorrect	<p>The student calculated the acceleration of Rocket 1 to be 22.727 m/s², which is not the largest acceleration of all the rockets recorded.</p> $F = ma$ $12.0 \text{ N} = (0.528 \text{ kg}) \times a$ $a = 22.727 \text{ m/s}^2$
	Option B is incorrect	<p>The student calculated the acceleration of Rocket 2 to be 18.779 m/s², which is not the largest acceleration of all the rockets recorded.</p> $F = ma$ $8.0 \text{ N} = (0.426 \text{ kg}) \times a$ $a = 18.779 \text{ m/s}^2$
	Option D is incorrect	<p>The student calculated the acceleration of Rocket 4 to be 16.771 m/s², which is not the largest acceleration of all the rockets recorded.</p> $F = ma$ $8.0 \text{ N} = (0.477 \text{ kg}) \times a$ $a = 16.771 \text{ m/s}^2$

2022 STAAR Grade 8 Science Rationales

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Item #	Rationale	
37	Option D is correct	Divergent boundaries move away from each other, causing ridges.
	Option A is incorrect	Convergent boundaries move toward each other, causing volcanoes, mountains, or trenches.
	Option B is incorrect	Subduction boundaries occur when one plate moves below another plate.
	Option C is incorrect	Transform boundaries slide past each other but do not cause ridges.

2022 STAAR Grade 8 Science Rationales

Item #	Rationale	
38	Option F is correct	Gravity is the force that causes the coin to fall toward the center of Earth. Gravity causes the coin to change direction while in the air and fall back down.
	Option G is incorrect	The coin's inertia would cause it to keep moving upward if the force of gravity was not acting on it to change its direction and move it back down. However, the inertia would not decrease on the way up and increase on the way down.
	Option H is incorrect	Action-reaction pairs refer to forces acting on different objects and not on the same object. Action-reaction pairs also do not cancel each other out. Forces can only cancel each other if they are acting on the same single object, not on different objects.
	Option J is incorrect	The coin will continue moving upward until the force of gravity acts on it. There is some air resistance (friction), but that does not cause the coin to change direction to be moving downward.

2022 STAAR Grade 8 Science Rationales

Item #	Rationale	
39	Option D is correct	A star produces its own light and rotates around its axis.
	Option A is incorrect	An asteroid does not produce its own light, but it could rotate around its axis.
	Option B is incorrect	A comet does not produce its own light, but it could rotate around its axis.
	Option C is incorrect	A planet does not produce its own light, but it ect

