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NM-ASR NEW MEXICO ASSESSMENT OF SCIENCE READINESS

PRACTICE TEST ANSWER KEY

Grade 11 English & Spanish Science

Item Number	Item Type	Key	Standards
1	SA	D; A	SEP Planning and Carrying Out Investigations, DCI ESS2.C The Roles of Water in Earth's Surface Processes, CCC Structure and Function, **PE: HS-ESS2-5**: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
2	SA	B; D	SEP Using Mathematics and Computational Thinking, DCI PS2.B Types of Interactions, CCC Patterns, **PE: HS-PS2-4**: Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
3	SA	A; D	SEP Asking Questions and Defining Problems, DCI LS3.A Inheritance of Traits, CCC Cause and Effect, **PE: HS-LS3-1**: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
4	SA	*See p. 4*	SEP Constructing Explanations and Designing Solutions, DCI PS1.B Chemical Reactions, ETS1.C Optimizing the Design Solution, CCC Stability and Change, **PE: HS-PS1-6**: Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.
5	CL	D	SEP Developing and Using Models, DCI ESS2.D Weather and Climate, CCC Energy and Matter, **PE: HS-ESS2-6**: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
6	CL	A	SEP Using Mathematics and Computational Thinking, DCI ESS3.D Global Climate Change, CCC Systems and System Models, **PE: HS-ESS3-6**: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
7	CL	A; C	DCI ESS3.D Global Climate Change, CCC Systems and System Models, **PE: HS-ESS3-6**: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
8	CL	A; D	DCI ESS2.D Weather and Climate, CCC Energy and Matter, **PE: HS-ESS2-6**: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
9	CL	A	SEP Analyzing and Interpreting Data, DCI ESS2.A Earth Materials and Systems, **PE: HS-ESS2-2**: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
10	CL	B; A	SEP Analyzing and Interpreting Data, DCI ESS2.A Earth Materials and Systems, CCC Stability and Change, **PE: HS-ESS2-2**: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
11	CL	B	SEP Constructing Explanations and Designing Solutions, DCI ESS3.C Human Impacts on Earth Systems, CCC Stability and Change, **PE: HS-ESS3-4**: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
12	CL	B; C	SEP Constructing Explanations and Designing Solutions, DCI ESS3.C Human Impacts on Earth Systems, CCC Stability and Change, **PE: HS-ESS3-4**: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

☐ = Written response SA = Stand Alone Item CL = Cluster Item

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Item Number	Item Type	Key	Standards
13	SA	A; C	SEP Obtaining, Evaluating, and Communicating Information, DCI LS4.A Evidence of Common Ancestry and Diversity, CCC Patterns, **PE: HS-LS4-1**: Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
14	SA	A; D	SEP Developing and Using Models, DCI PS1.C Nuclear Processes, CCC Energy and Matter, **PE: HS-PS1-8**: Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
15	SA	D; C	SEP Constructing Explanations and Designing Solutions, DCI ESS3.B Natural Hazards, CCC Cause and Effect, **PE: HS-ESS3-1**: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
16	SA	*See p. 5*	SEP Developing and Using Models, DCI LS1.C Organization for Matter and Energy Flow in Organisms, CCC Energy and Matter, **PE: HS-LS1-7**: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed, resulting in a net transfer of energy.
17	CL	C	SEP Planning and Carrying Out Investigations, CCC Systems and System Models, **PE: HS-PS3-4**: Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
18	CL	D	DCI PS3.B Conservation of Energy and Energy Transfer, CCC Systems and System Models, **PE: HS-PS3-1**: Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
19	CL	A; A	SEP Planning and Carrying Out Investigations, DCI PS3.B Conservation of Energy and Energy Transfer, CCC Systems and System Models, **PE: HS-PS3-4**: Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
20	CL	C; B	SEP Using Mathematics and Computational Thinking, DCI PS3.B Conservation of Energy and Energy Transfer, CCC Systems and System Models, **PE: HS-PS3-1**: Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
21	CL	B; D	SEP Constructing Explanations and Designing Solutions, DCI PS2.A Forces and Motion, CCC Cause and Effect, **PE: HS-PS2-3**: Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.
22	CL	A	SEP Analyzing and Interpreting Data, DCI PS2.A Forces and Motion, CCC Cause and Effect, **PE: HS-PS2-1**: Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
23	CL	D; A	SEP Analyzing and Interpreting Data, DCI PS2.A Forces and Motion, CCC Cause and Effect, **PE: HS-PS2-1**: Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
24	CL	A	SEP Constructing Explanations and Designing Solutions, DCI PS2.A Forces and Motion, CCC Cause and Effect, **PE: HS-PS2-3**: Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

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Item Number	Item Type	Key	Standards
25	SA	A; C	SEP Planning and Carrying Out Investigations, DCI LS1.A Structure and Function, CCC Stability and Change, **PE: HS-LS1-3**: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
26	SA	C; A	SEP Using Mathematics and Computational Thinking, DCI ESS1.B Earth and the Solar System, CCC Scale, Proportion, and Quantity, **PE: HS-ESS1-4**: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
27	SA	D; C	SEP Using Mathematics and Computational Thinking, DCI PS4.A Wave Properties, CCC Cause and Effect, **PE: HS-PS4-1**: Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
28	SA	B; B	SEP Engaging in Argument from Evidence, DCI LS4.C Adaptation, CCC Cause and Effect, **PE: HS-LS4-5**: Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
29	SA	*See p. 6*	SEP Constructing Explanations and Designing Solutions, DCI ESS1.A The Universe and Its Stars, CCC Energy and Matter, **PE: HS-ESS1-2**: Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.
30	CL	C	DCI LS3.A Inheritance of Traits, CCC Cause and Effect, **PE: HS-LS3-1**: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
31	CL	D	SEP Engaging in Argument From Evidence, DCI LS3.B Variation of Traits, **PE: HS-LS3-2**: Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
32	CL	A; A	SEP Engaging in Argument From Evidence, DCI LS3.B Variation of Traits, CCC Cause and Effect, **PE: HS-LS3-2**: Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
33	CL	D; B	SEP Asking Questions and Defining Problems, DCI LS1.A Structure and Function, LS3.A Inheritance of Traits, CCC Cause and Effect, **PE: HS-LS3-1**: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
34	CL	A	SEP Constructing Explanations and Designing Solutions, DCI ETS1.B Developing Possible Solutions, **PE: HS-ETS1-3**: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
35	CL	D	SEP Constructing Explanations and Designing Solutions, DCI ETS1.B Developing Possible Solutions, **PE: HS-LS2-7**: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
36	CL	B; A	SEP Constructing Explanations and Designing Solutions, DCI LS2.C Ecosystem Dynamics, Functioning, and Resilience, **PE: HS-LS2-7**: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
37	CL	A, E; B, D	SEP Constructing Explanations and Designing Solutions, DCI ETS1.B Developing Possible Solutions, **PE: HS-ETS1-3**: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

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Session 1

Scoring Rubric and Sample Student Response for PBT Item #4: Open-Ended

Score	Description
4	The response demonstrates thorough use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response describes one way students could decrease the amount of CO_2 in ocean water by applying Le Chatelier's principle and describes one constraint on implementing the change described in part (a). The response • clearly applies science and engineering practices to provide an explanation or solution; • provides a coherent and accurate explanation or solution based on disciplinary core ideas; • reflects thorough understanding of complex ideas and crosscutting concepts; and • effectively applies and demonstrates complete understanding of the three dimensions.
3	The response demonstrates sufficient use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response may lack some detail or information, or the response may contain minor errors in applying and demonstrating understanding of science and engineering practices, disciplinary core ideas, and crosscutting concepts.
2	The response demonstrates limited use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response may lack multiple details or information, or the response may contain major error(s) in applying and demonstrating understanding of science and engineering practices, disciplinary core ideas, and crosscutting concepts.
1	The response demonstrates minimal use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems.
0	The response is inaccurate, is irrelevant, or contains no evidence of use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems.
Blank	No response.

Sample Student Response:

$CO_2 + H_2O + CaCO_3 \rightleftarrows Ca^{2+} + 2\ H^+ + 2\ CO_3^{2-}$

a. They could solve the problem by removing calcium ions or adding calcium carbonate to ocean water. Either of these have the effect of shifting the reaction toward the products and decreasing the amount of CO_2 (while also increasing the amounts of calcium and carbonate ions available for shell/skeleton making).

b. The students would have to consider the costs of their solution, materials, energy requirements, and the reality of scaling up their design, the students would need to test their solution to see if it would work OR any other plausible constraint.

Session 2

Scoring Rubric and Sample Student Response for PBT Item #16: Open-Ended

Score	Description
4	The response demonstrates thorough use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response describes two differences between the air flowing into the room and the air flowing out of the room and explains the reason for both differences. The response also identifies one input and one output of cellular respiration that are not described in part (a) and describes how to add these to the model. The response also explains how cellular respiration releases stored energy that powers the human body. The response • clearly applies science and engineering practices to provide an explanation or solution; • provides a coherent and accurate explanation or solution based on disciplinary core ideas; • reflects thorough understanding of complex ideas and crosscutting concepts; and • effectively applies and demonstrates complete understanding of the three dimensions.
3	The response demonstrates sufficient use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response may lack some detail or information, or the response may contain minor errors in applying and demonstrating understanding of science and engineering practices, disciplinary core ideas, and crosscutting concepts.
2	The response demonstrates limited use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response may lack multiple details or information, or the response may contain major error(s) in applying and demonstrating understanding of science and engineering practices, disciplinary core ideas, and crosscutting concepts.
1	The response demonstrates minimal use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems.
0	The response is inaccurate, is irrelevant, or contains no evidence of use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems.
Blank	No response.

Sample Student Response:

a. Air flowing into the room has more oxygen than air flowing out of the room. Air flowing into the room has less carbon dioxide/water than air flowing out of the room. This is because cellular respiration uses up oxygen and produces carbon dioxide/water.

b. Inputs: energy, glucose/sugar/food
Outputs: water (sweat)/carbon dioxide, energy (ATP)/thermal energy/heat
Inputs could be added with an arrow going toward the human. Outputs could be shown with an arrow going away from the human.

c. Cellular respiration breaks bonds in food and oxygen molecules and forms bonds in carbon dioxide and water. The bonds in the output molecules have less energy than the bonds in the input molecules and that energy is used for life.

Session 3

Scoring Rubric and Sample Student Response for PBT Item #29: Open-Ended

Score	Description
4	The response demonstrates thorough use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response uses evidence from the diagram to describe one way the universe is changing and explains how the evidence supports the change. The response also describes how the cosmic microwave background radiation is another piece of evidence that supports the change described in part (a). The response • clearly applies science and engineering practices to provide an explanation or solution; • provides a coherent and accurate explanation or solution based on disciplinary core ideas; • reflects thorough understanding of complex ideas and crosscutting concepts; and • effectively applies and demonstrates complete understanding of the three dimensions.
3	The response demonstrates sufficient use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response may lack some detail or information, or the response may contain minor errors in applying and demonstrating understanding of science and engineering practices, disciplinary core ideas, and crosscutting concepts.
2	The response demonstrates limited use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems. The response may lack multiple details or information, or the response may contain major error(s) in applying and demonstrating understanding of science and engineering practices, disciplinary core ideas, and crosscutting concepts.
1	The response demonstrates minimal use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems.
0	The response is inaccurate, is irrelevant, or contains no evidence of use of the three dimensions to make sense of scientific phenomena and/or to design solutions to problems.
Blank	No response.

Sample Student Response:

a. The universe is expanding/getting larger/full of objects that are getting farther and farther apart. The diagram shows that (all distant) galaxies are moving away from Earth. This is supported by the diagram, which shows that (all distant) galaxies are moving away from Earth/the light from all distant galaxies is shifted to longer wavelengths.

b. The universe was very hot and the radiation shows that now it's very cold. The universe getting bigger explains this because the same amount of energy is spread over more space.