New York Science

MS. Chemical Reactions

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A Performance Expectations MS.PS1.CR

1. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. MS.PS1.2
2. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. MS.PS1.5
3. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy during a chemical and/or physical process. MS.PS1.6

B Science and Engineering Practices MS.CR.SEP

1. Developing and Using Models MS.CR.SEP.1
   - a. Develop a model to describe unobservable mechanisms. (MS-PS1-5) MS.CR.SEP.1A
2. Analyzing and Interpreting Data MS.CR.SEP.2
   - a. Analyze and interpret data to determine similarities and differences in findings. (MS-PS1-2) MS.CR.SEP.2A
3. Constructing Explanations and Designing Solutions MS.CR.SEP.3
   - a. Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MSPS1-6 MS.CR.SEP.3A
4. Scientific Knowledge is Based on Empirical Evidence MS.CR.SEP.4
   - a. Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS1-2) MS.CR.SEP.4A
5. Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena MS.CR.SEP.5
   - a. Laws are regularities or mathematical descriptions of natural phenomena. (MS-PS1-5) MS.CR.SEP.5A

C Disciplinary Core Ideas MS.CR.DCI

1. PS1.A: Structure and Properties of Matter MS.CR.DCI.PS1.A
   a. (NYSED) Each substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2) (Note: This Disciplinary Core Idea is also addressed by MS-PS1-3.) MS.CR.DCI.PS1.A.1
2. PS1.B: Chemical Reactions MS.CR.DCI.PS1.B
   a. (NYSED) Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different particles and these new substances have different properties from those of the reactants. (MS-PS1- 2),(MS-PS1-5)(Note: This Disciplinary Core Idea is also addressed by MS-PS1-3.) MS.CR.DCI.PS1.B.1
   b. The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS1-5) MS.CR.DCI.PS1.B.2
   c. (NYSED) Some chemical reactions release energy, others absorb energy. (MS-PS1-6) MS.CR.DCI.PS1.B.3
3. ETS1.B: Developing Possible Solutions MS.CR.DCI.ETS1.B
   a. A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (secondary to MS-PS1-6) MS.CR.DCI.ETS1.B.1
4. ETS1.C: Optimizing the Design Solution MS.CR.DCI.ETS1.C
   a. Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design. (secondary to MS-PS1-6) MS.CR.DCI.ETS1.C.1
   b. The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (secondary to MS-PS1-6) MS.CR.DCI.ETS1.C.2

D Crosscutting Concepts MS.CR.CC

1. Patterns MS.CR.CC.1
   a. Macroscopic patterns are related to the nature of microscopic and atomiclevel structure. (MS-PS1- 2) MS.CR.CC.1A
2. Energy and Matter MS.CR.CC.2
   a. Matter is conserved because atoms are conserved in physical and chemical processes. (MSPS1-5) MS.CR.CC.2A
   b. The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS1-6) MS.CR.CC.2B