Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Exploring Chemical Bonding & Energy

**Part I:** Working with Magnets

*Instructions:* Take a pair of ceramic magnets and play with them for a few minutes. Then answer the questions below.

1) Put the magnets together. If you lift up one magnet, what happens to the other magnet? Does it move up as well or fall to the ground?

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2) Based on your answer to the previous question are the magnets attracted to or repelling each other?

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3) Pull the magnets apart. Describe any sensory experiences that you had while pulling the magnets apart. Was it easy or difficult to pull them apart?

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4) Did you have to add energy to the magnets to pull them apart or did energy come from the magnets into the surroundings?

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5) Move the magnets far enough apart, so that they do not move toward each other. Then hold them by their ends and slowly move them toward each other until you feel the attractive force between the two magnets. What do you think will happen when you let go of the magnets?

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6) Be careful that you do not get your fingers in between the magnets. Let go of the magnets. Describe any sensory experiences you had after releasing the magnets. Did you have to push the magnets together or did they come together on their own?

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7) Did you have to add energy to the magnets to put them together or did energy come from the magnets into the surroundings?

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While the magnetic force you have experienced is distinct from the electrostatic forces that dictate bonding between atoms, the same principles apply.

* In order to separate two objects that are bonded, energy must be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* When two separate objects form a bond, energy must be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

8) Now acquire 4 dominoes. Place all four dominoes between the two magnets, so that the dominoes are stuck sandwiched between the two magnets. Now pull the magnets apart. Note the amount of energy you used to pull the magnets apart (i.e. effortless, easy, moderate, challenging, impossible).

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9) Take 3 dominoes and repeat the process. Now pull the magnets apart. Note the amount of energy you used to pull the magnets apart (was it easier, harder, or the same as the previous attempt?).

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10) Take 2 dominoes and repeat the process. Now pull the magnets apart. Note the amount of energy you used to pull the magnets apart (was it easier, harder, or the same as the previous attempt?).

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11) Take 1 domino and repeat the process. Now pull the magnets apart. Note the amount of energy you used to pull the magnets apart (was it easier, harder, or the same as the previous attempt?).

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12) Which situation was the easiest to separate? Would you consider this the strongest or weakest bond (attraction)?

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13) Which situation was the hardest to separate? Would you consider this the strongest or weakest bond (attraction)?

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14) Go back to 4 dominoes between the magnets. Pull the magnets apart and then return them to sandwich the dominoes. Now with the help of a partner hold the magnets in place and then remove 3 dominoes. After the magnets come together pull the magnets apart.

Note the difference in energy between the 4 domino bond and the 1 domino bond. Chemical reactions involve adding energy to break bonds and then energy is released to form a different, usually stronger bond. The difference in the work required to break and make bonds produces the net energy of reaction.

