Bond Energy and Reaction Energy

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

Breaking bonds absorbs energy. Forming bonds releases energy. Estimate the net change as energy needed to break bonds minus energy released when bonds form.

1 Which process requires an energy input in this model?

(1) Breaking a covalent bond

(2) Forming the same covalent bond

(3) Moving an unchanged formula to a new line

(4) Counting the atoms in a formula

2 A model reaction requires 450 kJ to break bonds and releases 600 kJ when bonds form. Calculate its net energy change. [1]

Answer and work

3 A reaction forms two bonds of the same kind. Forming one releases 200 kJ on the scale used. How much energy is released when both form?

(1) 100 kJ

(2) 200 kJ

(3) 400 kJ

(4) 600 kJ

4 Explain how the energy absorbed to break a particular bond compares with the energy released by forming the same bond in the model. [1]

Answer and work

Model Bond Ledger

Use the information below to answer the questions.

Use $H_2 + Cl_2 \rightarrow 2HCl$. The table gives approximate energies to break one mole of each type of bond. Forming the same bonds releases the corresponding amount of energy.

Bond	**Energy (kJ/mol of bonds)**
H–H	436
Cl–Cl	243
H–Cl	431

5 Which bonds are broken for one mole of reaction as written?

(1) One mole each of H–H and Cl–Cl

(2) Two moles of H–Cl

(3) One mole of H–Cl only

(4) Two moles each of H–H and Cl–Cl

6 Use the table to estimate the net energy change for one mole of reaction as written. Show the separate breaking and forming amounts. [1]

Answer and work

7 Which statement describes the bond-energy estimate?

(1) Bond breaking absorbs more than bond formation releases.

(2) Bond formation releases more than bond breaking absorbs.

(3) Both amounts are equal.

(4) Bond formation absorbs both amounts.

8 A student adds 679 kJ and 862 kJ to calculate the net energy change. Explain why the two amounts need different signs. [1]

Answer and work