AST 5.4

Chemistry 1
Quiz ALT5

Name _____
Period _____ Date _____

AST 5.4 (Bond Energy) ____/

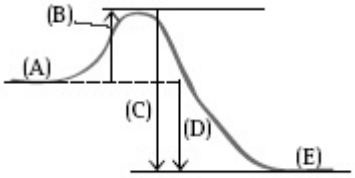
Multiple Choice *Identify the choice that best completes the statement or answers the question.*

___ 1. What do you know about a chemical reaction if the value of ΔH is positive?
A. The reaction is exothermic.
B. The reaction is endothermic.
C. The reaction is isothermic.
D. The reaction cannot occur at room temperature.

___ 2. Which of the following statements is true?
A. Energy is required to break bonds because bond breaking is an exothermic process.
B. Energy is released when bonds are broken because bond breaking is an exothermic process.
C. Energy is required to break bonds because bond breaking is an endothermic process.
D. Energy is released when bonds are broken because bond breaking is an endothermic process.

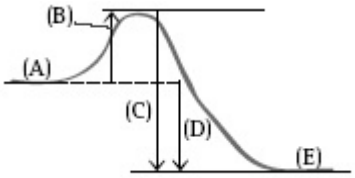
___ 3. Which of the following is not shown on an energy exchange diagram?
A. The energy for bond breaking.
B. The energy for bond forming.
C. The net energy change of the reaction.
D. The number of bonds broken and made.

___ 4. Which letter on the energy diagram represents the chemical energy of the reactants?



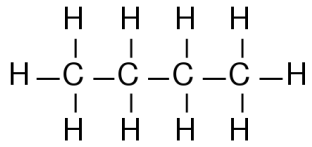
A. Letter A
B. Letter B
C. Letter C
D. Letter D

___ 5. Which statement about the reaction illustrated in the diagram is true?



A. The reaction is endothermic.
B. No heat is required to start the reaction.
C. The energy required to break the bonds is more than the energy released upon forming new bonds.
D. The energy required to break the bonds is less than the energy released upon forming new bonds.

___ 6. What is the total energy required to break all the bonds in 1 mol butane, C_4H_{10}?

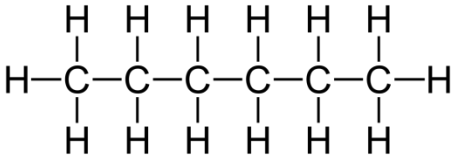


Bond	C–H	C–C	O–H	C–O	C=O	O=O
Average bond energy (kJ/mol)	413	347	467	358	799	495

Show Calculation and then select the best answer from A to D below:

A. 5170 kJ
B. 4130 kJ
C. 1050 kJ
D. 760 kJ

___ 7. What is the total energy required to break all the bonds in 1 mol hexane, C_6H_{14}?



Bond	C–H	C–C	O–H	C–O	C=O	O=O
Average bond energy (kJ/mol)	413	347	467	358	799	495

Show Calculation and then select the best answer from A to D below:

A. 760 kJ
B. 1740 kJ
C. 5780 kJ
D. 7517 kJ

Short Answer *Use complete sentences and show calculations if you do them! Include units.*

8. The balanced chemical reaction for the combustion of methane is:

$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

The Lewis Dot diagram for every reactant and product in the combustion of methane is:

Use the average bond energies in the table from Question 7 to calculate the change in enthalpy (ΔH) for the reaction. For full credit you must show your calculations not just the answer.

Answer Key

NP (2)

1. B PT=1
2. C PT= 1
3. D PT=1
4. A PT=1
5. D PT=1

P(3)

6. A PT=2—1 for correct answer and 1 for showing units and calculation
   10(H-C) + 3(C-C) = 10(413) + 3(347) = 5171 kJ/mol
7. D PT=2—1 for correct answer and 1 for showing units and calculation
   14(H-C) + 5(C-C) = 14(413) + 5(347) = 7517 kJ/mol

HP (4)

8. 4 points: 1 for bonds broken, 1 for bonds formed, 1 for delta H and 1 for units
   Bonds broken: 4(C-H) + 2(O=O) = 4(413) + 2(495) = 1652+ 990 = 2642 kJ.
   Bonds formed: 4(O-H) + 2(C=O) = 4(-467) + 2(-799) = -1868kJ + (-1598)=-3466kJ
   Delta-H = 2642 kJ + (-3466kJ) = -824 kJ

AST 5.4 - Release or Absorption of Energy Rubric

4 **Highly Proficient**	**3** **Proficient**	**2** **Nearly Proficient**	**1** **Developing**
• Meets all requirements in the proficient column, and can: • Calculate the net energy in a chemical reaction using bond energies.	• Given data, draw energy diagrams (or...molecular-level drawings, graphs showing relative energies of products/reactants, representations showing conservation of energy) • Be able to explain activation energy and how it fits into an energy diagram • Interpret energy diagrams to predict forward/reverse reactions (exo- and endo-) • Use a diagram/model to show bonds forming/breaking, energy transfer, energy transforming from potential to kinetic • Describe relationships between: net change of energy, energy transfer, total energy in a closed system, the release or absorption of energy	• Compare and contrast endothermic and exothermic • Given an energy diagram, can label and describe the pieces/parts of conservation of energy in a system	• Compare and contrast endothermic and exothermic