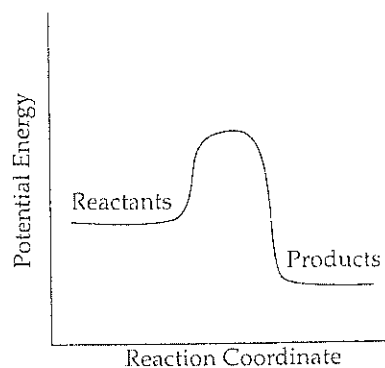


AP Chem Unit II - Thermodynamics

Practice Exam

Y
13

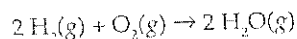
1



Which of the following is true of the reaction shown in the diagram above?

- (A) The reaction is endothermic because the reactants are at a higher energy level than the products.
- (B) The reaction is endothermic because the reactants are at a lower energy level than the products.
- (C) The reaction is exothermic because the reactants are at a higher energy level than the products.
- (D) The reaction is exothermic because the reactants are at a lower energy level than the products.
- (E) The reaction is endothermic because the reactants are at the same energy level as the products.

2



Based on the information given in the table below, what is ΔH° for the above reaction?

Bond	Average bond energy (kJ/mol)
H-H	500
O=O	500
O-H	500

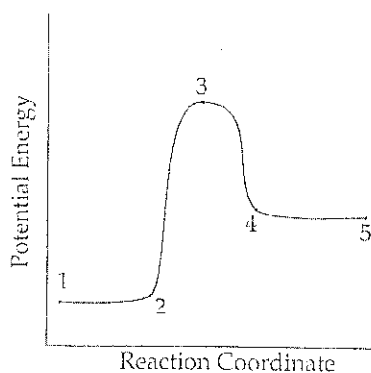
- (A) -2,000 kJ
- (B) -1,500 kJ
- (C) -500 kJ
- (D) +1,000 kJ
- (E) +2,000 kJ

3

Which of the following is true of a reaction that is spontaneous at 298 K but becomes nonspontaneous at a higher temperature?

- (A) ΔS° and ΔH° are both negative.
- (B) ΔS° and ΔH° are both positive.
- (C) ΔS° is negative, and ΔH° is positive.
- (D) ΔS° is positive, and ΔH° is negative.
- (E) ΔS° and ΔH° are both equal to zero.

4



Which point on the graph shown above corresponds to activated complex or transition state?

- (A) 1
- (B) 2
- (C) 3
- (D) 4
- (E) 5

5

If an endothermic reaction is spontaneous at 298 K, which of the following must be true for the reaction?

- I. ΔG is greater than zero.
- II. ΔH is greater than zero.
- III. ΔS is greater than zero.

- (A) I only
- (B) II only
- (C) I and II only
- (D) II and III only
- (E) I, II, and III

6

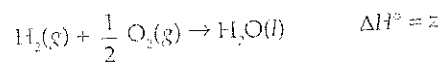
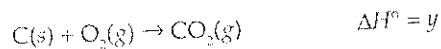
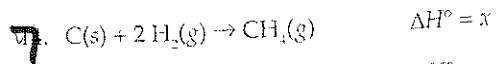
The addition of a catalyst will have which of the following effects on a chemical reaction?

- I. The enthalpy change will decrease.
- II. The entropy change will decrease.
- III. The activation energy will decrease.

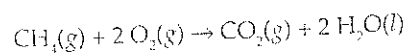
- (A) I only
- (B) II only
- (C) III only
- (D) I and II only
- (E) II and III only

Unit 11 Practice Exam

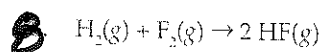
2/3



Based on the information given above, what is ΔH° for the following reaction?

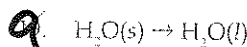


- (A) $x + y + z$
- (B) $x + y - z$
- (C) $z + y - 2x$
- (D) $2z + y - x$
- (E) $2z + y - 2x$



Gaseous hydrogen and fluorine combine in the reaction above to form hydrogen fluoride with an enthalpy change of -540 kJ . What is the value of the heat of formation of $HF(g)$?

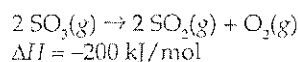
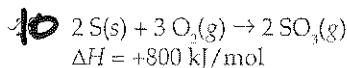
- (A) $-1,080 \text{ kJ/mol}$
- (B) -540 kJ/mol
- (C) -270 kJ/mol
- (D) 270 kJ/mol
- (E) 540 kJ/mol



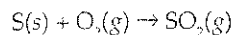
Which of the following is true of the reaction shown above at room temperature?

- I. ΔG is greater than zero.
- II. ΔH is greater than zero.
- III. ΔS is greater than zero.

- (A) II only
- (B) III only
- (C) I and II only
- (D) I and III only
- (E) II and III only

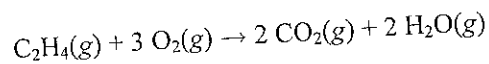


Based on the information given above, what is ΔH for the following reaction?

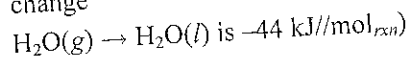


- (A) 300 kJ
- (B) 500 kJ
- (C) 600 kJ
- (D) $1,000 \text{ kJ}$
- (E) $1,200 \text{ kJ}$

11

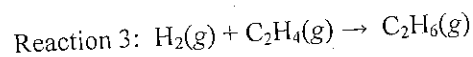
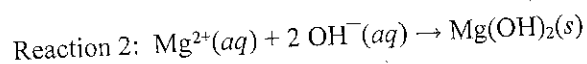
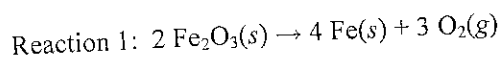


For the reaction of ethylene represented above, ΔH is $-1,323 \text{ kJ/mol}_{rxn}$. What is the value of ΔH if the combustion produced liquid water $H_2O(l)$, rather than water vapor $H_2O(g)$? (ΔH for the phase change



- (A) $-1,279 \text{ kJ/mol}_{rxn}$
- (B) $-1,323 \text{ kJ/mol}_{rxn}$
- (C) $-1,367 \text{ kJ/mol}_{rxn}$
- (D) $-1,411 \text{ kJ/mol}_{rxn}$

12. For which of the following processes would ΔS have a negative value?

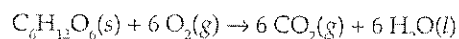


- (A) Reaction 1 only
- (B) Reactions 1 and 2 only
- (C) Reactions 1 and 3 only
- (D) Reactions 2 and 3 only

1.

Substance	Absolute Entropy, S° (J/mol·K)	Molecular Weight
$C_6H_{12}O_6(s)$	212.13	180
$O_2(g)$	205	32
$CO_2(g)$	213.6	44
$H_2O(l)$	69.9	18

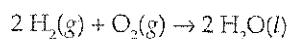
Energy is released when glucose is oxidized in the following reaction, which is a metabolism reaction that takes place in the body.



The standard enthalpy change, ΔH° , for the reaction is $-2,801$ kJ at 298 K.

- Calculate the standard entropy change, ΔS° , for the oxidation of glucose.
- Calculate the standard free energy change, ΔG° , for the reaction at 298 K.
- What is the value of K_{eq} for the reaction?

2



The reaction above proceeds spontaneously from standard conditions at 298 K.

- Predict the sign of the entropy change, ΔS° , for the reaction. Explain.
- How would the value of ΔS° for the reaction change if the product of the reaction was $H_2O(g)$?
- What is the sign of ΔG° at 298 K? Explain.
- What is the sign of ΔH° at 298 K? Explain.