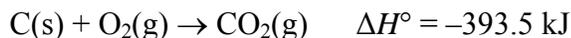


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Multiple-Choice Questions

Circle the letter for the choice that best completes the statement or answers the question.

- Which of the following is true regarding the standard enthalpy of reaction?
 - It is the enthalpy change of a chemical reaction at 0 °C and 100 kPa.
 - It is the enthalpy change of a chemical reaction at 0 °C and 0 kPa.
 - It is the enthalpy change of a chemical reaction at 25 °C and 100 kPa.
 - It is the enthalpy change of a chemical reaction at 100 °C and 25 kPa.
- To determine the enthalpy change of a reaction, you can
 - carry out a calorimetry lab
 - find reactions that have equations that add up to the target equation and use the enthalpies of reaction of those reactions
 - use the standard molar enthalpies of formation for the substances in the equation of the reaction
 - All of the above.
- According to Hess's law of heat summation, which of the following statements is true?
 - The enthalpy change is independent of the number of intermediate steps.
 - The enthalpy change depends on the pathway of the process.
 - The enthalpy change is independent of the pathway of the process.
 - Both A and C.
- A sample of natural gas consists of 5.0 mol methane and 1.0 mol ethane. Which of the following statements is **true**?
 - When ethane burns, it releases more heat per mole than methane.
 - When ethane burns, it uses less oxygen per mole than methane.
 - When burned, the heat released per mole of mixture will be equivalent to that of methane.
 - When burned, the heat released per mole of mixture will be less than that of methane, but more than that of ethane.
- Which is true about the following reaction?



- The enthalpy change is greater than the total enthalpy change of the formation of carbon dioxide via the following process:



- The enthalpy change is the same as the total enthalpy change of the formation of carbon dioxide via the following process:



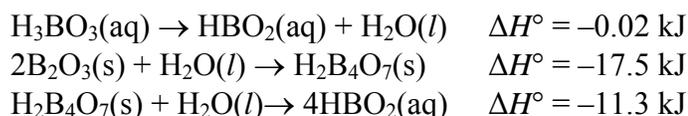
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- c) The enthalpy change is less than the total enthalpy change of the formation of carbon dioxide via the following process:



- d) There is not enough information to compare the enthalpy changes.

6. Given the target equation $2\text{H}_3\text{BO}_3(\text{aq}) \rightarrow \text{B}_2\text{O}_3(\text{s}) + 3\text{H}_2\text{O}(\text{l})$ and the following equations:



the enthalpy change of reaction for the target equation is:

- a) -28.8 kJ
 b) -14.4 kJ
 c) 14.4 kJ
 d) 28.8 kJ
7. The enthalpy of reaction for the following equation, $\text{FeO}(\text{s}) + \text{CO}(\text{g}) \rightarrow \text{Fe}(\text{s}) + \text{CO}_2(\text{g})$, is:
 a) 776 kJ
 b) -776 kJ
 c) 11.0 kJ
 d) -11.0 kJ
8. What is the principal source of electricity in Alberta?
 a) coal
 b) natural gas
 c) hydroelectric power
 d) nuclear energy
9. Which of the following is a renewable resource?
 a) uranium
 b) natural gas
 c) biomass
 d) coal
10. Which of the following is **not** one of the major energy sources in Canada today?
 a) coal
 b) oil
 c) solar energy
 d) natural gas

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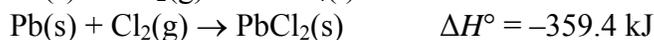
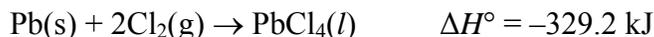
11. Which of the following uses the greatest amount of energy in the typical household?
- space heating
 - water heating
 - electrical appliances
 - lighting
12. What is the definition of “useful energy”?
- the ideal energy content of fuel
 - the amount of energy a fuel can produce
 - energy that is used to maintain and build power plants
 - energy that is delivered to a consumer in usable form
13. An electric kettle uses 860 kJ of electrical energy to heat 1600 g of water from 18 °C to 98 °C. What is the efficiency of the kettle for heating water?
- 0.624%
 - 160%
 - 1.60%
 - 62.4%
14. Which of the following uses of natural gas is the most efficient?
- used directly, such as in cooking devices
 - used to produce electricity in a power plant
 - transformed into another form of energy before reaching its final destination
 - as part of a chain of transformations between several different forms of energy
15. Which of the following methods for producing electrical energy is considered to be the cleanest?
- natural gas
 - hydroelectric
 - crude oil
 - propane

Numerical Response Questions

For each numerical response question, record the answer in the following response box.

16.	
17.	
18.	
19.	
20.	

16. What is the enthalpy change for the reaction $\text{PbCl}_2(\text{s}) + \text{Cl}_2(\text{g}) \rightarrow \text{PbCl}_4(\text{l})$, given

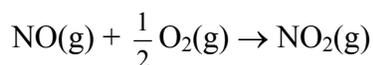


17. Rank the following compounds from most to least thermochemically stable.

- a) $\text{CO}_2(\text{g})$
- b) $\text{NaCl}(\text{s})$
- c) $\text{C}_2\text{H}_2(\text{g})$
- d) $\text{O}_2(\text{g})$

18. Given that the molar enthalpy of combustion for propan-1-ol, $\text{C}_3\text{H}_7\text{OH}(\text{l})$, is -2021 kJ/mol , what is the molar enthalpy of formation for propan-1-ol? (Assume that the water in the products condenses into its liquid state.)

19. How much energy is released in the production of 2.37 g of nitrogen dioxide according to the following equation?



20. A propane stove is 25.0% efficient. Given that the molar enthalpy of combustion of propane is -2043.9 kJ/mol in an open system, how much water could be heated by $50.0 \text{ }^\circ\text{C}$ by the combustion of 0.0235 g of propane?

