*Use the following information to answer Questions 1 and 2.*

|  |
| --- |
| When solid potassium is placed in a beaker of water at room temperature, an immediate, violent reaction occurs:  2K(s) + 2H\_2O(l) --> 2KOH(aq) + H\_2(g) + ENERGY |

1. Sketch and label an energy pathway diagram for this reaction.

Your diagram should include:

* labelling of the X and Y axes
* general shape of the energy pathway
* labeling of the reactant plateau, the product plateau, the activation energy (Ea) and the change in enthalpy (ΔrH)   
  No specific numerical values are required.

|  |
| --- |
|  |

2. Refer to the diagram you drew in Question 1. When solid potassium is placed in a beaker of water at room temperature, what should happen to the temperature of the water?

|  |
| --- |
|  |

*Use the following information to answer Questions 3-6.*

|  |
| --- |
| Sucrose, commonly known as table sugar, will be hydrolyzed to fructose and glucose in the presence of the enzyme sucrase. The reaction equation for this hydrolysis is  The energy changes for this reaction are diagramed below.  The blue line represents the reaction progress with sucrase and the red line represents the reaction progress without sucrase. |

*3.* The enzyme sucrase will \_\_\_\_.

A.increase the reaction rate of the hydrolysis of sucrose.

B.provide an alternate pathway, with higher Ea, for the hydrolysis of sucrose

C.lower the value of ΔH.

D.change the reaction from exothermic to endothermic

4.Because it lowers the activation energy, the enzyme sucrase is classified as a \_\_\_\_\_\_\_.

**Answer**

|  |
| --- |
|  |

5. Describe how adding a catalyst to a reaction system affects the enthalpy change for the overall reaction.

**Answer**

|  |
| --- |
|  |

6. Identify which energy value is indicated by each of the numbers in the above energy pathway diagram.

**Answer**

|  |  |
| --- | --- |
| Number | Energy value |
|  | Change in enthalpy for both forward and reverse reaction |
|  | Uncatalyzed activation energy for the forward reaction |
|  | Uncatalyzed activation energy for the reverse reaction |
|  | catalyzed activation energy for the reverse reaction |
|  | catalyzed activation energy for the forward reaction |

*Use the following information to answer Questions 7-11.*

|  |
| --- |
| Dinitrogen pentaoxide, N2O5(g),  is a strong oxidizer that forms explosive mixtures with organic compounds and [ammonium](http://en.wikipedia.org/wiki/Ammonium) salts. At standard state, dinitrogen pentaoxide decomposes into [NO HYPERLINK "http://en.wikipedia.org/wiki/Nitrogen\_dioxide"2](http://en.wikipedia.org/wiki/Nitrogen_dioxide) and [O HYPERLINK "http://en.wikipedia.org/wiki/Oxygen"2](http://en.wikipedia.org/wiki/Oxygen) according to the following equation.  2N\_O\_5(g) + 219 kJ --> 4 NO\_2(g) + O\_2(g) |

*7. The above reaction is \_\_i\_\_ and the standard enthalpy of reaction is \_\_ii\_\_.*

The statement above is completed by the information in row\_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| **Row** | *i* | *ii* |
| **A.** | endothermic | rHo = + 219 kJ |
| **B.** | endothermic | rHo = - 219 kJ |
| **C.** | exothermic | rHo = + 219 kJ |
| **D.** | exothermic | rHo = - 219 kJ |

8. Calculate the standard **molar** enthalpy of reaction for dinitrogen pentaoxide.

**Answer**

|  |
| --- |
|  |

9.Sketch and label a chemical potential energy diagram for the above process. Indicate the enthalpy change using r as a subscript.

**Answer**

|  |
| --- |
|  |

10. When 10.0 mol of nitrogen dioxide is produced in the above reaction, the enthalpy change is \_\_\_\_kJ

**Answer**

|  |
| --- |
|  |

11.Is energy absorbed or released in the above reaction?

**Answer**

|  |
| --- |
|  |

*Use the following information to answer Question 12.*

|  |
| --- |
| Cyclopropane is an [anaesthetic](http://en.wikipedia.org/wiki/Anaesthetic) when inhaled. When the gas is mixed with oxygen there is a significant risk of explosion. Consequently, the use of cyclopropane as an anaesthetic was phased out as safer alternates were developed. Cyclopropane combusts according to the following reaction  2C\_3H\_6(g) + 9 O\_2(g) --> 6 CO\_2(g) + 6 H\_2O(g) Δ\_cH°= .3918.4 kJ |

12. Calculate the standard **molar** enthalpy of combustion for cyclopropane. Show all work for full marks.

**Answer**

|  |
| --- |
|  |

*Use the following information to answer Questions 13-16.*

|  |
| --- |
| Galvanizing is the process of coating an object with zinc. When exposed to oxygen, zinc forms an oxide coating that protects the metal from further corrosion. At standard state, this reaction is represented by the following equation.  Zn(s) + 1/2 O\_2(g) --> ZnO(s) + 350.5kJ |

**13.**Sketch and label a chemical potential energy diagram for the above process.Indicate the standard enthalpy of reaction using r as a subscript.

**Answer**

|  |
| --- |
|  |

14. The formation of zinc oxide is classified as an \_\_i\_(endothermic/exothermic) reaction, and the reactants have \_\_ii\_\_ (less/more) potential energy than the products.

**Answer**

|  |  |
| --- | --- |
| i |  |
| ii |  |

**15.** When the above reaction occurs, it is expected that the temperature of the surroundings will \_\_i\_\_ (decrease/increase). This change in temperature would indicate that the **surroundings** are undergoing a change in \_\_ii\_\_ (kinetic/potential) energy**.**

**Answer**

|  |  |
| --- | --- |
| i |  |
| ii |  |

**16.** Calculate the standard enthalpy of reaction when 25.0 g of zinc oxide is produced. Show all work for full marks.

**Answer**

|  |
| --- |
|  |

*Use the following information to answer Questions 17 and 18.*

|  |  |
| --- | --- |
| Welding utilizes a variety of fuels. Two such fuels identified for comparison are acetylene (ethyne C2H2(g)) and propylene (propene C3H6(g)). | |
| **Fuel** | **Molar enthalpy of combustion (kJ/mol)** |
| acetylene | -1 300.8 |
| propylene | -2 058.1 |

17.Calculate and compare the values of the enthalpy of combustion in kJ/g for each fuel.

**Answer**

|  |
| --- |
|  |

18. Describe two other factors that can be used to evaluate the fuel.   
**Answer**

|  |
| --- |
|  |