Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_ Period:\_\_\_\_

**Review Unit 8: Energy Changes & Reaction Rates**

1. What is heat? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. State the law of conservation of energy.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. If heat energy is absorbed by a chemical system, a greater / equal / lesser amount of energy will be released by the surroundings.
2. Describe the direction of heat flow when a hot rock is placed into cool water.

Heat flows from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ making the

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cooler and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ warmer.

1. In an endothermic reaction, heat is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by the system.
2. In an exothermic reaction, heat is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by the system.
3. Label each of the following processes as *endo*thermic or *exo*thermic:

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_ solid ice melting into liquid

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_ liquid water evaporating into gas

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_ water vapor condensing into liquid

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_ liquid water freezing into solid ice

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_ solid carbon dioxide (dry ice) subliming into carbon dioxide gas

1. If you are holding a beaker in which an exothermic reaction is occurring, the beaker would feel

 warmer / cooler to the touch because the *system* is releasing energy to / absorbing energy from

 the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ which is your hand.

1. In a(n) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ reaction, the reactants are at a lower energy than the products.
2. In a(n) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ reaction, the products are at a lower energy than the reactants.
3. When chemical bonds are *formed*, energy is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_;

energy is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in order to *break* chemical bonds.

1. In an endothermic reaction, which has stronger bonds – reactants or products? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. In an exothermic reaction, which has stronger bonds – reactants or products? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. The potential energy diagram is for an **ENDOTHERMIC** / **EXOTHERMIC** reaction. *(circle one)*

 Label the **reactants**, the **products**, **activation energy** (***Eact*),** and **change in energy** (**Δ*E***) .



potential

 energy

 reaction progress

 ***Circle*** the correct statement.

 In an exothermic reaction, heat is absorbed from / released to the surroundings,

and the surroundings cool down / warm up.

 Touching the beaker with this reaction would feel cooler / warmer , and a thermometer would

show the temperature lowering / rising .

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 Label the **reactants**, the **products**, **activation energy** (*Eact*), and **change in energy** (Δ*E*) .

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1. Circle EACH of the following that could express a reaction rate in amount per time:

 mol/L g/s s/mol mol/min g/mol

1. Reactant particles must \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in order for a reaction to occur.
2. To be effective, a collision requires the proper \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of particles and it must occur with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to react.
3. Define activation energy: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Identify how **increasing** each of the following factors affects the a reaction rate:

 1) concentration of reactants effect on rate: increases *or* decreases

 2) temperature effect on rate: increases *or* decreases

 3) surface area of reactants (smaller particles) effect on rate: increases *or* decreases

 4) stirring effect on rate: increases *or* decreases

 5) catalyst effect on rate: increases *or* decreases

1. Explain why increasing the concentration of reactants increases the reaction rate.

 Higher concentrations cause more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. Explain why a reaction rate increases with an increase in temperature.

 Higher temperatures cause more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of greater \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. Reaction rates increase with smaller / larger particle sizes which provide less / more surface area of reactant available for collisions.
2. A catalyst is a substance that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the reaction rate.

 It works by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 Catalysts do not \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the reaction and are left \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.



**reaction progress**

1. Consider reactions **B** and **C** above.

 The different heights of reactions B and C represent the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the

 reaction.

 Reaction \_\_\_ is a catalyzed reaction, while Reaction \_\_\_ is an uncatalyzed reaction.

 Reaction B has a lower / higher activation energy and occurs at a slower / faster rate.

**HONORS QUESTION**





1. Consider a candle on a table that burns continuously without going out.

 Would you classify this system as OPEN, CLOSED, or ISOLATED? Explain.

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_