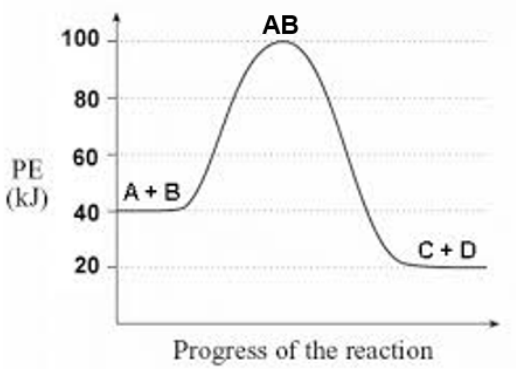
Name: _____ Period: _____ Assigned on Tuesday, November 18, 2025

**14.2 Specific Heat and Calorimetry** **Due Friday, November 21, 2025**

Use the energy diagram to the right to answer the following questions.




_____ 1. Is the overall reaction as shown exothermic or endothermic?

_____ 2. What is the activation energy, $E_a$, for the forward reaction?

_____ 3. What is the activation energy, $E_a$, for the reverse reaction?

_____ 4. What is the enthalpy change, $\Delta H$, for the forward reaction?

_____ 5. What is the enthalpy change, $\Delta H$, for the reverse reaction?

_____ 6. Is the reverse reaction exothermic or endothermic?

_____ 7. Which species (substance) is the activated complex?

_____ 8. Which species or group of species has the highest PE?

_____ 9. Which species or group of species has the weakest bonds?

_____ 10. Which species or group of species has the strongest bonds?

_____ 11. Which do you think would be faster at that the same temperature, the forward or reverse reaction?

Identify each of the following reactions as either endothermic or exothermic. Then, write the balanced thermochemical equation for each of the following reactions in **two styles**: a) Enthalpy change is included as a reactant or product; and b) Enthalpy change is listed as $\Delta H=$ following the equation.

_____ 12. 572 kJ of energy is required to decompose gaseous water into gaseous hydrogen and gaseous oxygen.

a) _____

b) _____

_____ 13. When methane gas ($CH_4$) is burned, it produces only gaseous products and 890.4 kJ of energy.

a) _____

b) _____

Perform the following calculations using your equations from above.

15. How much energy is required to decompose 13.0 g of water?

16. If 7839 kJ of energy is required to heat your soup, what mass of methane gas must be burned?

17. Are the following processes endothermic or exothermic?
   a. When solid KBr is dissolved in water, the solution gets cold.
   b. Natural gas ($CH_4$) is burned in a furnace.
   c. When concentrated sulfuric acid is added to water, the solution gets very hot.
   d. Water is boiled in a tea kettle.

18. The specific heat capacity of silver is 0.24 J/(g °C).

a. Calculate the energy required to raise the temperature of 150.0 g Ag from 273 K to 298 K.

b. Calculate the energy required to raise the temperature of 1.0 mol of Ag by 1.0°C (called the molar heat capacity of silver).

c. It takes 1.25 kJ of energy to heat a sample of silver from 12.0°C to 15.2°C. Calculate the mass of the sample of silver.

19. It takes 78.2 J to raise the temperature of 45.6 g lead by 13.3°C. Calculate the specific heat capacity (J/g$^{o}$C) of lead.

20. A 150.0 g sample of a metal at 75.0°C is added to 150.0 g of water at 15.0°C. The temperature of the water rises to 18.3°C. Calculate the specific heat capacity of the metal, assuming that all the heat lost by the metal is gained by the water.

21. A 110.0 g sample of copper (specific heat capacity = 0.20 J/(g K)) is heated to 82.4°C and then placed into a container of water at 22.3°C. The final temperature of the water and copper is 24.9°C. What is the mass of the water in the container, assuming that all heat lost by the copper is gained by the water?

22. A 10.0 g sample of iron pellets (specific heat capacity = 0.45 J/(g K)) is heated to 100.0°C. The hot iron is then dropped into 97.3 g of water at 22.0°C. Calculate the final temperature of the metal and water mixture, assuming no heat loss to the surroundings.

23. Are the following processes endothermic or exothermic?

a. When solid KBr is dissolved in water, the solution gets cold.

b. Natural gas ($CH_4$) is burned in a furnace.

c. When concentrated sulfuric acid is added to water, the solution gets very hot.

d. Water is boiled in a tea kettle.