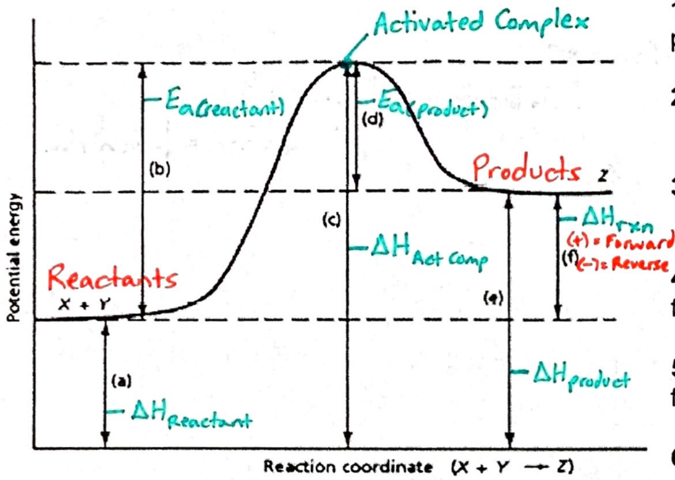
ANSWER KEY - Honors

Potential Energy Diagrams Practice

Name:______________________________



Endothermic

1. Which letter (a–f) represents potential energy (ΔH) of the products? ___e___

2. Which letter (a-f) represents potential energy (ΔH) of the activated complex? ___c___

3. Which letter (a-f) represents potential energy (ΔH) of the reactants? ___a___

4. Which letter (a-f) represents activation energy (E_a) of the forward reaction (reactants)? ___b___

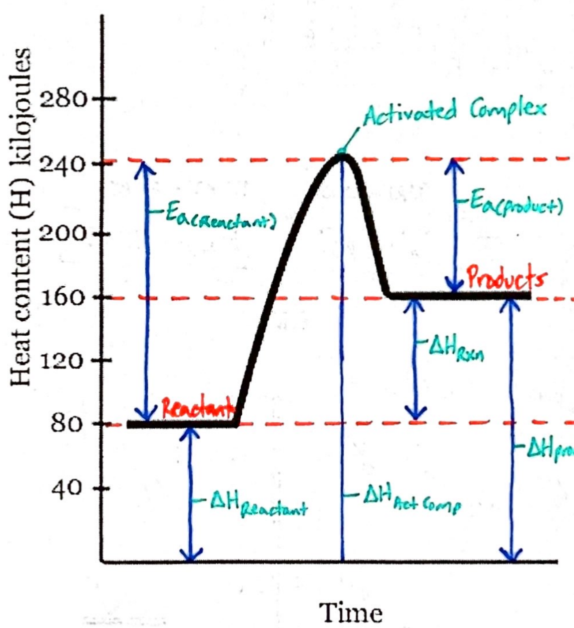
5. Which letter (a-f) represents heat of reaction (ΔH_{Rxn}) of the forward reaction? ___f___

6. Is the forward reaction endothermic or exothermic? ___Endothermic___

7. Which letter (a-f) represents activation energy (E_a) of the reverse reaction (products)? ___d___

8. Which letter (a-f) represents heat of reaction (ΔH_{Rxn}) of the reverse reaction? ___f___

9. Is the reverse reaction endothermic or exothermic? ___Exothermic___



10. The potential energy (ΔH) of the reactants in the forward reaction is about ___80 kJ___ kilojoules (kJ).

11. The potential energy (ΔH) of the products in the forward reaction is about ___160 kJ___ kilojoules (kJ).

12. The potential energy (ΔH) of the activated complex in the forward reaction is about ___240 kJ___ kilojoules (kJ).

13. The activation energy (E_a) of the forward reaction (reactants) is about ___160 kJ___ kilojoules (kJ). (240)−(80)= 160 kJ

14. The forward reaction is ___Endothermic___ (endothermic or exothermic).

15. The potential energy (ΔH) of the reactants in the reverse reaction is about ___80 kJ___ kilojoules (kJ).

16. The potential energy (ΔH) of the products in the reverse reaction is about ___160 kJ___ kilojoules (kJ).

17. The potential energy (ΔH) of the activated complex in the reverse reaction is about ___240 kJ___ kilojoules (kJ).

18. The activation energy (E_a) of the reverse reaction (products) is about ___80 kJ___ kilojoules (kJ). (240)−(160) = 80 kJ

19. The reverse reaction is ___Exothermic___ (endothermic or exothermic).

PART C – REACTION RATES (KINETICS)

Place an "X" next to each action that would most likely INCREASE the reaction rate.

1. _____ Lowering the temperature of the reactants. ↓T = ↓ Rxn Rate
2. __X__ Dissolving two solids in water before mixing them together. ↑ Surfac Area = ↑ Rxn Rate
3. _____ Diluting an aqueous solution of HCl with water before adding a piece of magnesium. ↓ Conc = ↓ Rxn Rate
4. __X__ Grinding a solid into fine particles. ↑ Surface Area = ↑ Rxn Rate
5. __X__ Adding an enzyme catalyst. ↓ E_a = ↑ Rxn Rate

PART D – CREATING A POTENTIAL ENERGY DIAGRAM

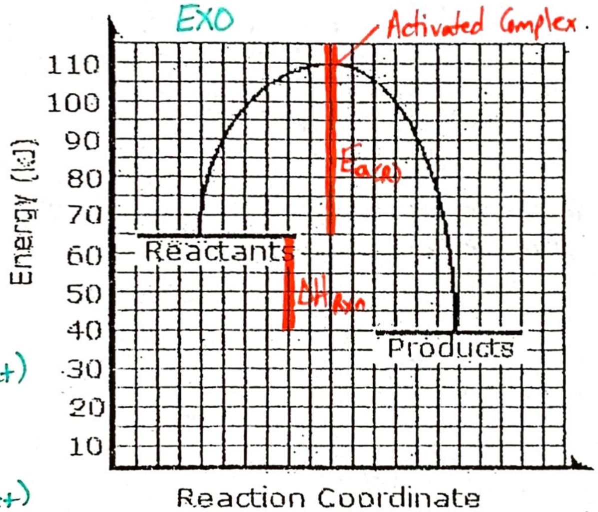
NOTE: For each example, Activation Energy ***(E_a)*** is for the ***forward*** reaction, and will always drop down to the reactants.

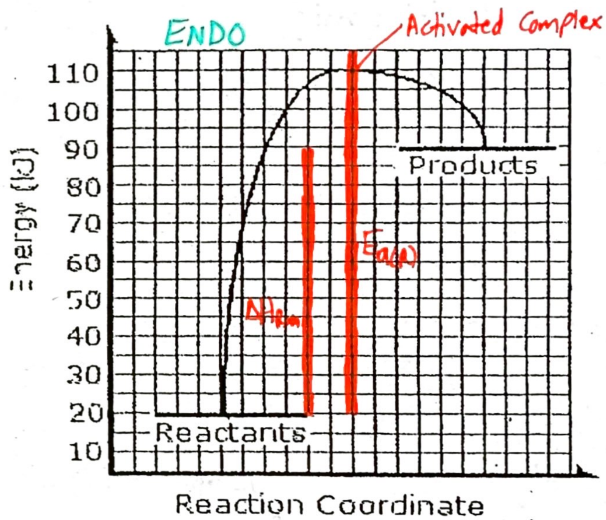
NOTE: For each reaction, ΔH is the enthalpy of the reaction ***(ΔH_{Rxn})*** of the ***forward*** reaction.

For the following graphs, draw arrows and calculate the values of ΔH and E_a.

* ΔH_{Rxn} = $(\Delta H_{prod}) - (\Delta H_{React})$

* E_a = $(\Delta H_{AC}) - (\Delta H_{React})$





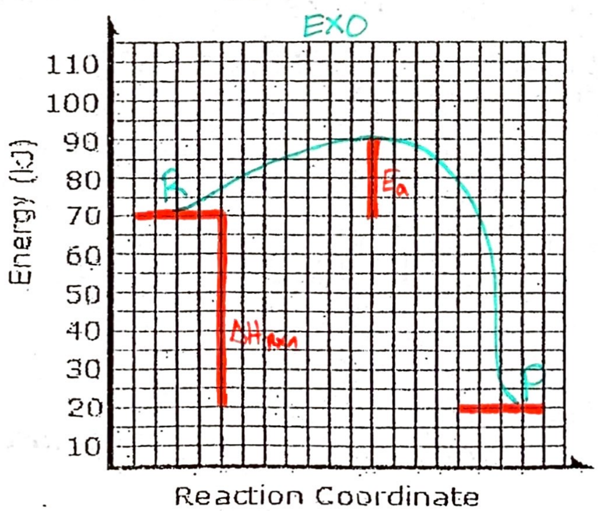
1) ΔH_{Rxn} = 40 kJ − 65 kJ E_a = 110 kJ − 65 kJ (React)

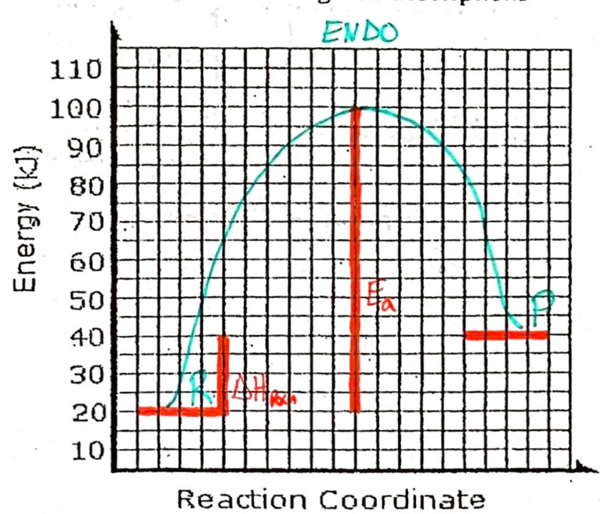
ΔH_{Rxn} = −25 kJ $E_{a(R)}$ = 45 kJ

2) ΔH_{Rxn} = 90 kJ − 20 kJ E_a = 110 kJ − 20 kJ (React)

ΔH_{Rxn} = 70 kJ $E_{a(R)}$ = 90 kJ

On the following graphs draw a reaction coordinate for a reaction that fits the given descriptions





3) ΔH = -50 kJ, Ea = 20 kJ

4) ΔH = 20 kJ, Ea = 80 kJ