Name_____ Date_____ Block _____ **Reactions Study Guide**

Part 1: Balancing, Determining if a Reaction is Endothermic or Endothermic, Determining Type of Reaction

Balance the reaction, determine if endothermic or exothermic, and determine the type of reaction. (Hint: If you see a polyatomic ion like (NO_3) on both sides of the arrow (→) you can balance it as a whole unit)

Video Help: Types of rxn | Types of rxn with predicting | Balancing | Khan Balancing | Endo/Exo w/ diagrams

1. 1 Mg_3N_2 (s) + energy → 3 Mg (s) + 1 N_2 (g) — endo or exo — Rxn Type: decomp
2. 1 $K_2(CO_3)$ (aq) + 2 $Ag(NO_3)$ (aq) → 1 $Ag_2(CO_3)$ (s) + 2 $K(NO_3)$ (aq) + energy — endo or exo — Rxn Type: DR
3. 1 CH_4 (g) + 2 O_2 (g) → 1 CO_2(g) + 2 H_2O (l) + energy — endo or exo — Rxn Type: Combus
4. 2 Na(OH) (aq) + 1 $H_2(SO_4)$ (aq) → 1 $Na_2(SO_4)$ (aq) + 2 H(OH) (l) + energy — endo or exo — Rxn Type: DR
5. 2 Al (s) + 3 $Cu(NO_3)_2$ (aq) → 3 Cu (s) + 2 $Al(NO_3)_3$ (aq) + energy — endo or exo — Rxn Type: SR
6. 2 $KClO_3$ (s) + energy → 2 KCl (s) + 3 O_2 (g) — endo or exo — Rxn Type: decomp
7. 1 C_3H_8 (g) + 5 O_2 (g) → 3 CO_2(g) + 4 H_2O (l) + energy — endo or exo — Rxn Type: combus
8. 1 $K_2(SO_4)$ (aq) + 1 $Pb(OH)_2$ (aq) → 1 $Pb(SO_4)$ (s) + 2 K(OH) (aq) + energy — endo or exo — Rxn Type: DR
9. 6 Li (s) + 1 $Zn_3(PO_4)_2$ (aq) → 3 Zn (s) + 2 $Li_3(PO_4)$ (aq) + energy — endo or exo — Rxn Type: SR
10. 2 $Mg(NO_3)_2$ (s) + energy → 2 MgO (s) + 4 NO_2 (g) + 1 O_2(g) — endo or exo — Rxn Type: decomp

Part 2: Describe

11. What are indications of a chemical reaction?

① Color Δ ② gas formation ③ energy ④ precipitate (ppt)

12. How can a chemical reaction be made to occur faster? Explain.

① ↑Temp (faster particles) = more collisions & Better collisions
② ↑surface area (smaller particles) = more area for collisions
③ ↑concentration = more particles = more collisions
④ Catalyst = less E_a

Part 3: Determine if the following are soluble or insoluble and if a precipitate or an aqueous solution forms. Soluble/Insoluble/net ionic

13. $CaCO_3$ insoluble, precipitate, solid
14. Potassium iodide soluble, aqueous
15. NH_4OH soluble, aqueous
16. $PbSO_4$ insoluble, ppt, solid
17. Silver chloride insoluble, ppt, solid
18. $KC_2H_3O_2$ soluble, aqueous

Part 4: Determine Type, Predict Products, Balance & If double replacement determine the net ionic reaction

19. (DR) 2 $FeCl_3$ (aq) + 3 $Hg(NO_3)_2$ (aq) → 3 $AgCl_2$ (s) + 2 $Fe(NO_3)_3$ (aq)

(+2 -1) (+3 -1)

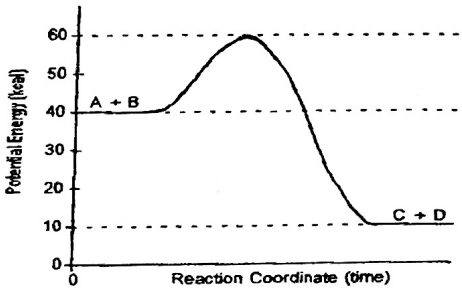
20. (SR) As + $BaSO_4$ → No Reaction

21. ___Zn + 2 HCl→ ___ $Zn^{+2}Cl_2^{-1}$ (aq) + ___ H_2 (g)
(SR)

22. ___C_2H_5OH + 3 O_2→ 2 CO_2 (g) + 3 H_2O (g)
(Combus)

Part 5: Potential energy path diagrams

Figure 1

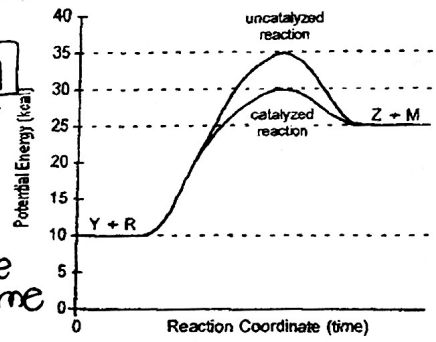


Questions 23-25 refer to Figure 1

23. Is the reaction endothermic or exothermic? exo
24. How much activation energy is needed? 60-40 = 20 kcal
25. What is the Δ H_{rxn}? 10-40 = -30 kcal

Questions 26-32 refer to Figure 2

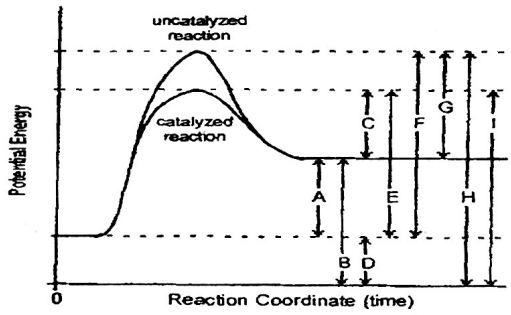
Figure 2



26. Is the reaction endothermic or exothermic? endo
27. What is the value of the activation energy of the uncatalyzed reaction? 25 kcal
28. What is the value of the activation energy of the catalyzed reaction? 20 kcal
29. What is the ΔH_{rxn} for the uncatalyzed reaction? 25-10 = 15 kcal
30. What is the ΔH_{rxn} for the catalyzed reaction? 25-10 = 15 kcal
31. How does ΔH for the catalyzed compare to ΔH for the uncatalyzed reaction? the same
32. What is the purpose of adding a catalyst? Speeds up the rxn b/c less activation energy needed

Questions 33-39 refer to Figure 3.

Figure 3



33. Potential energy of the reactants D
34. Potential energy of the products B
35. Activation energy of the catalyzed reaction. E
35. Activation energy of the uncatalyzed reaction F
39. Heat of reaction (ΔH). A

Part 6: Thermochemical equations

40. How many grams of nitrogen dioxide is produced with 513 kJ of heat is used in the following reaction:

$2N_2O_5$ + 110 kJ → $4NO_2$ + O_2

$\frac{513\text{ kJ}}{110\text{ kJ}} \cdot \frac{4\text{ mole } NO_2}{} \cdot \frac{46.01\text{ g } NO_2}{1\text{ mole } NO_2}$ = 858.296 g = 860 g

2 S.F. 2 S.F.

41. How much heat is released when 15.31 g of sulfur dioxide react in:

$2\ SO_2 + O_2 \rightarrow 2\ SO_3 + 198$ kJ

$\frac{15.31\text{ g } SO_2}{64.07\text{ g } SO_2} \cdot \frac{1\text{ mole } SO_2}{} \cdot \frac{-198\text{ kJ}}{2\text{ moles } SO_2}$ = -23.6568 kJ = -23.7 kJ

3 SF

42. How many moles of phosphoric acid is produced when 1157 kJ of heat is used in the following reaction:

P_4O_{10} + 6 H_2O → $4H_3PO_4$ + 424 kJ

$\frac{-1157\text{ kJ}}{-424\text{ kJ}} \cdot \frac{4\text{ mole } H_3PO_4}{}$ = 10.915 = 10.9 moles

3 SF