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- 12. Write the formula for the binary compound that decomposes to the products H_2 and Br_2 .
- 13. Complete and balance this decomposition reaction. HI \rightarrow
- 14. Write and balance the equation for the formation of magnesium nitride (Mg₃N₂) from its elements.

15. Complete the equations for these single-replacement reactions in aqueous solution. Balance each equation. Write "no reaction" if a reaction does not occur.

- a. $Fe(s) + Pb(NO_3)_2(aq) \rightarrow$
- b. $Cl_2(g) + Nal(aq) \rightarrow$
- c. $Ca(s) + H_2O(l) \rightarrow$
- d. $Zn(s) + H_2SO_4(aq) \rightarrow$

16. Write the products of these double-replacement reactions. Then balance each equation.

- a. NaOH(aq) + Fe(NO₃)₃(aq) \rightarrow (iron (III) hydroxide is a precipitate)
- b. $Ba(NO_3)_2(aq) + H_3PO_4(aq) \rightarrow$ (barium phosphate is a precipitate)
- c. FeS(s) + HCl(aq) \rightarrow (hydrogen sulfide gas (H₂S) is formed)
- 17. Write a balanced equation for each reaction.
 - a. $KOH(aq) + H_3PO_4(aq) \rightarrow$ (water is formed)
 - b. AgNO₃(aq) + NaCl(s) \rightarrow (silver chloride is a precipitate)
 - c. Ca(OH)₂(aq) + H₃PO₄(aq) \rightarrow (water is formed)
 - d. $KI(aq) + Pb(NO_3)_2(aq) \rightarrow (Iead (II) iodide is a precipitate)$
 - e. $H_2SO_4(aq) + AI(OH)_3(aq) \rightarrow$ water is formed
- 18. Write a balanced equation for the complete combustion of each compound.
 - a. formaldehyde (CH₂O)
 - b. heptane (C₇H₁₆)
 - c. benzene (C₆H₆)
- 19. Write a balanced equation for the complete combustion of
 - a. glucose (C₆H₁₂O₆)
 - b. acetone (C_3H_6O)
 - c. pentanol (C₅H₁₂O)
- 20. What are the 5 types of chemical reactions?

- 21. Classify each reaction and balance the equations.
 - a. $C_3H_6(g) + O_2(g) \rightarrow CO_2(g) + H_2O(l)$
 - b. $AI(OH)_3(s) \rightarrow AI_2O_3(s) + H_2O(l)$
 - c. $Li(s) + O_2(g) \rightarrow Li_2O(s)$
 - d. $Zn(s) + AgNO_3(aq) \rightarrow Ag(s) + Zn(NO_3)_2(aq)$

22. Which of the five general types of reaction would most likely occur, given each set of reactants? What are the probable products?

- a. an aqueous solution of two ionic compounds
- b. a single compound
- c. two elements
- d. oxygen and a compound of carbon and hydrogen
- 23. Complete and balance an equation for each reaction.
 - a. $CaI_2(aq) + Hg(NO_3)_2(aq) \rightarrow (HgI_2 \text{ precipitates})$
 - b. Al(s) + Cl₂(g) \rightarrow
 - c. $Ag(s) + HCl(aq) \rightarrow$
 - d. $C_2H_2(g) + O_2(g) \rightarrow$
- 37. Balance the following equations:
 - a. $PbO_2(s) \rightarrow PbO(s) + O_2(g)$
 - b. $Fe(OH)_3(s) \rightarrow Fe_2O_3(s) + H_2O(l)$
 - c. $(NH_4)_2CO_3(s) \rightarrow NH_3(g) + H_2O(l) + CO_2(g)$
 - d. $CaCl_2(aq) + H_2SO_4(aq) \rightarrow CaSO_4(s) + HCl(aq)$
- 38. Write balanced chemical equations for the following combination reactions.
 - a. $Mg(s) + O_2(g) \rightarrow$
 - b. $P(s) + O_2(g) \rightarrow$ diphosphorus pentoxide
 - c. $Ca(s) + S(s) \rightarrow$
- 39. Write a balanced chemical equation for each decomposition reaction.
 - a. $Ag_2O(s) \rightarrow$

b. ammonium nitrate \rightarrow dinitrogen monoxide + water

40. Use the activity series of metals to write a balanced chemical equation for each single-replacement reaction.

- a. Au(s) + KNO₃(aq) \rightarrow
- b. $Zn(s) + AgNO_3(aq) \rightarrow$
- c. $AI(s) + H_2SO_4(aq) \rightarrow$
- 41. Write a balanced equation for each of the following double-replacement reactions.
 - a. $H_2C_2O_4(aq) + KOH(aq) \rightarrow$
 - b. $CdBr_2(aq) + Na_2S(aq) \rightarrow$ (cadmium sulfide is a precipitate)
- 42. Write a balanced equation for the complete combustion of each compound.
 - a. butene (C₄H₈)
 - b. propanal (C₃H₆O)
- 43. Balance each equation and identify its type.
 - a. $Hf(s) + N_2(g) \rightarrow Hf_3N_4(s)$
 - b. $Mg(s) + H_2SO_4(aq) \rightarrow MgSO_4(aq) + H_2(g)$
 - c. $C_2H_6(g) + O_2(g) \rightarrow CO_2(g) + H_2O(l)$
 - d. $Pb(NO_3)_2(aq) + Nal(aq) \rightarrow Pbl_2(s) + NaNO_3(aq)$