

AP Chemistry Holiday Break Assignment

Part One: For each of the following reactions, write a balanced equation for the reaction. Coefficients should be in terms of lowest whole numbers. Assume that solutions are aqueous unless otherwise indicated. Represent substances in solutions as ions if the substances are extensively ionized. Omit formulas for any ions or molecules that are unchanged by the reaction.

1. A solution of sodium hydroxide is added to a solution of lead (II) nitrate.
2. Excess nitric acid is added to solid calcium carbonate.
3. Zinc metal is placed in a solution of copper (II) sulfate.
4. A solution of acetic acid is added to a solution of barium hydroxide.
5. Ammonia gas is bubbled into a solution of hydrofluoric acid.
6. Ethyne is burned in air.
7. Lithium metal is strongly heated in nitrogen gas.
8. Concentrated hydrochloric acid is added to a solution of sodium sulfide.
9. Excess water is added to solid calcium hydride.
10. Solid sodium cyanide is added to water.
11. Sulfur dioxide gas is bubbled into an excess of a saturated solution of barium hydroxide.
12. Hydrogen sulfide gas is added to a solution of cadmium nitrate.
13. Small chunks of solid sodium are added to water.
14. Calcium metal is added to a dilute solution of hydrochloric acid.
15. Dinitrogen trioxide gas is bubbled into water.
16. Solid magnesium oxide is exposed to a stream of carbon dioxide gas.
17. Dilute hydrochloric acid is added to crystals of pure magnesium oxide.
18. Magnesium turnings are added to a solution of iron (III) chloride.
19. Ammonium chloride crystals are added to a solution of sodium hydroxide.
20. Chlorine gas is bubbled into a solution of sodium bromide.
21. Solid lithium oxide is added to excess water.
22. Sulfur trioxide gas is added to excess water.
23. Hydrogen sulfide gas is bubbled through a solution of mercury (II) chloride.
24. Iron (II) sulfide is heated strongly with oxygen gas.
25. Dilute sulfuric acid is added to solid calcium fluoride.
26. Hydrogen gas is passed over a hot piece of zinc oxide.
27. Lead foil is immersed in silver nitrate solution.
28. Sulfur trioxide gas is passed over solid barium oxide.
29. Magnesium metal is burned in nitrogen gas.
30. Carbon dioxide gas is bubbled through a solution of potassium hydroxide.

Part Two: The molecular weight and formula of a hydrocarbon are to be determined through the use of the freezing point depression method. The hydrocarbon is known to be 86% carbon and 14% hydrogen by mass. In the experiment, 3.72 grams of the unknown hydrocarbon were placed into 50.0 grams of liquid benzene. The freezing point of the solution was measured to be 0.06°C . The normal freezing point of benzene is 5.50°C and the freezing point depression constant for benzene is $5.12^{\circ}\text{C}/m$. Determine the molecular formula of the unknown hydrocarbon.

Part Three: Hydrogen peroxide slowly decomposes on its own into oxygen gas and water. Devise a method to rank the following substances on their ability to catalyze the decomposition of 3% hydrogen peroxide solution: iron(III) chloride, yeast, and potassium iodide. You have the following materials at your disposal: 24-Well plate; Graduated pipettes; Thermometer; 10-mL graduated cylinder; Spatula; Distilled Water; Balance; Timer