Solutions Worksheet

m/V %

1. Determine the percent composition of carbohydrates in Gatorade, given that a 590 mL bottle of Gatorade has 14 mg of carbohydrates.

2. That same bottle of Gatorade also contains 0.0186 percent sodium. What mass of sodium does that represent per bottle?

3. A 5.0 mL of a cough syrup contains 30 mg of pseudoephedrine. Calculate the percent mass of this active ingredient.

4. When 15 mg of sodium chloride is used to create an 8.0 percent saline solution, what volume of water is needed?

m/m %

5. A sample of brass is 35% zinc and 65 % copper. What mass of zinc would be needed to create 145 g of brass?

6. A standard Tylenol 611 mg tablet contains 325 mg of acetaminophen and 15 mg of caffeine. What are the percent masses of these ingredients?

7. A person buys a 14 K white gold ring. That means that the ring is 14 parts gold and 10 parts platinum. If the ring weighs 18.8 g, what is the percent composition of the ring?

8. A vitamin C tablet is weighed at 4.6006 g. The tablet was then crushed and titrated to determine that the amount of ascorbic acid (vitamin C) (mm = 176 g/mol) was 972 mg.

a) What is the percent mass of the vitamin C?
b) If the manufacturer insists each tablet contains 10000 mg, then what is the percent yield?

V/V %

9. A bottle of beer is 4.5% alcohol. How much alcohol is in a 355 mL bottle?

10. A 250 mL bottle of hydrogen peroxide contains 242.5 mL of water. Calculate the percent by volume of the solute.

11. What volume of acetic acid is needed to create a 4.5% solution of vinegar in a 2.0 L bottle?

12. The biochemistry class needs to make a final concentration of 2.00 % glycerol in a 20.0 μL sample for gel electrophoresis. What volume of water is needed (assuming no loss of volume) to prepare sufficient solution for a dozen trials?

ppm and ppb

13. In the UK, the carbon dioxide levels in classrooms are not supposed to exceed 1500 ppm. How many moles of carbon dioxide does this represent per litre of air? (density of air at 20°C = 1.20 kg/m^3)

14. Natural background levels of SO_2 in the air tend to be about 2 ppb; however, in major cities these levels can rise to 750 ppb. How many moles of SO_2 would be present in 22.4 L of air at those peak levels?

15. The mean annual concentration of benzene on an urban roadside is measured at 4.5 ppb. Calculate the number of breaths it would take to inhale 1.0 mg of benzene given that you have a lung capacity of 6.0 L.

16. In 1978, Lake Ontario contained lead contents of 120 ppm. If the lead content in the fish were measured at 2.4 mg/L, then how many litres of water would the fish have ingested? (density of water = 1.00 g/mL)

molar concentration (c)

17. What volume of water is needed to turn 348 moles of iron (III) chloride into a 1.76 mol/L solution?

18. How many moles of calcium nitrate are present in 36 mL of a 1.7 mol/L solution?

19. What mass of copper (II) sulphate pentahydrate is needed to create 250 mL of a 0.500 mol/L solution?

20. What volume of solvent is needed for 0.00225 mol of MgO in a 0.0555 mol/dm^3 solution?

21. What volume of water is needed to create 0.475 mol/L solution of sodium chloride using 3.75 g of salt?

22. A student dissolved 185 g of calcium chloride in 2.50 L of water. What is the concentration of chloride ions in solution?

23. What mass of sodium hydroxide is needed to create 2.25 L of a 0.25 mol/L solution?

24. What is the concentration of chloride ions when 33.52 g of $PbCl_4$ are dissolved in 157.25 L of water?

Dilutions

25. What is then new concentration when 25 mL of 8.25 mol/L NaCl is diluted with 60. mL of water?

26. What is then new concentration when 546 mL of 4.25 mol/L NaCl is diluted to 600. mL with water?

27. What volume of water is needed to dilute 40.0 mL of 1.25 mol/L $MgCl_2$ in order to get a 0.825 mol/L solution?

28. What is the final concentration when 12.2 mL is removed from a 250 mL beaker of 4.44 mol/L potassium phosphate solution and then diluted with 148.8 mL of water?

29. Determine the concentration of the solution at the end of each step.
a) 3.734 g of calcium chloride is dissolved in 125 mL of water
b) 15.3 mL of a) diluted to 250. mL
c) 163.9 mL of b) diluted with 84.2 mL

Stoichiometry

30. What is the concentration of sodium carbonate produced when 0.295 moles of sodium hydroxide are reacted with excess carbonic acid in 15.0 mL of solution?

31. What mass of aluminum is produced by the reaction of 63.3 mL of 1.88 mol/L aluminum nitrate with excess magnesium?

32. What volume of 1.35 mol/L $SnBr_4$ is needed when reacted with excess zinc to produce 21.53 g of tin.

33. When 5.00 grams of nickel is reacted with 25.0 mL of lead (IV) nitrate the products are nickel (III) nitrate and 0.39 g of lead. What was the concentration of the initial solution?

34. What is the mass of precipitate formed when 5.00 g of silver nitrate is dissolved in 0.150 L of a 0.0235 mol/L sodium chloride solution?

35. How many moles of precipitate are formed when 225.0 mL of 0.003469 mol/L strontium iodide is combined with 425.0 mL of 0.0006380 mol/L ammonium sulphate.

36. Determine the concentration of each chemical remaining in solution when 11.24 mL of 0.0288 mol/L barium sulphide is combined with 21.53 mL of 0.0482 mol/L iron (III) acetate.