11. How many grams of $NaNO_2$ are needed to make 150 ml of 3.0 M $NaNO_2$ solution?

$150\ mL \times \frac{1\ L}{1000\ mL} \times \frac{3.0\ mol}{1\ L} \times \frac{69\ g}{1\ mol} =$

Ans: 31 g

12. What volume of 1.3 M $CaCl_2$ solution can be made using 3.6 g $CaCl_2$?

$3.6\ g \times \frac{1\ mol}{111\ g} \times \frac{1\ L}{1.3\ mol} \times \frac{1000\ mL}{1\ L} =$

Ans: 25 mL (or 0.025 L)

13. 17.5 mL of 3.00 M HCl is place in a 100.0 mL volumetric flask and water is added up to the mark. What will be the molarity of the diluted HCl?

$M_f = \frac{(MV) + (MV)}{V_T} = \frac{(3.00)(17.5) + (0)}{100.0} =$

Ans: 0.525 M

14. What volume of 1.3 M HBr should be added to 55 mL of 5.0 M HBr to make the total concentration 4.5 M?

$\frac{(1.3)(X) + (5.0)(55)}{(X + 55)} = 4.5$

$1.3x + 275 = 4.5(x + 55)$

$1.3 + 275 = 4.5x + 247.5$

$27.5 = 3.2x$

Ans: 8.6 mL

15. Calculate the boiling point for a solution of 75 g K_2O in 0.50 L water.

$75g \times \frac{1\ mol}{94.2\ g} = 0.796\ mol$

$m = \frac{mol}{kg} = \frac{0.796\ mol}{0.50\ kg} = 1.592\ m$

$\Delta t_b = (K_b)(m)(i) = (0.51)(1.592)(3) = 2.4\ ^\circ C$

$100^\circ + 2.4^\circ =$

Ans: 102.4 °C

16. Some room temperature water (A) has some KBr mixed in and it all dissolves (B). Some more KBr is added and it all settles to the bottom (C). After vigorous shaking, however, about 1/2 of the KBr dissolves (D). This is then cooled down to 5°C and some of the dissolved KBr recrystallizes out (E). This is then heated to 75°C, and all the KBr quickly dissolves (F). This is then cooled back down to room temp with no KBr recrystallizing out (G). A single granule of KBr is added and a bunch of crystals form throughout the container (H). Indicate whether the solution was **uns**aturated, **sat**urated, or **sup**ersaturated at each point in time:

A uns. B uns. C uns. D sat. E sat. F uns. G sup. H sat.

17. You are given what appears to be a clear, colorless liquid in a sealed flask. You are asked to determine whether it is a solution, a colloid or a suspension. What would you do, and what would it show?

test for Tyndall effect: if there's a beam of light, it's a colloid. if not, it's a solution.

18. You are given two beakers each of what contains what appears to be water. One contains water; the other contains a solution of $LiNO_3$ in water. Describe at least three distinct ways you could differentiate which liquid is which.

1) Allow to evaporate (salt will be left behind) 2) Check density by weighing equal volumes 3) Add more $LiNO_3$ until saturated (the water beaker will require more $LiNO_3$ to become saturated)

Ans (IRO +2): sat sat sat uns uns uns uns sup 0.525 0.788 8.6 25 31 100.8 102.4