

## FREEZING POINT DEPRESSION PROBLEMS

(nonelectrolytes)

Table of  $K_f$  values for solvents

Solvent	$K_f$ ( $^{\circ}\text{C}/\text{molal}$ )	Solvent	$K_f$ ( $^{\circ}\text{C}/\text{molal}$ )
Water	-1.86	Benzene	-5.12
Ethanol	-1.99	Naphthalene	-7.00
Chloroform	-4.68		

11. How many grams of silver would have to be dissolved in 1120 g of ethanol to lower the freezing point by  $0.25^{\circ}\text{C}$ ?
  12. What is the freezing point depression when 85.3 g of oxygen gas is dissolved in 1500 g of water?
  13. Ethylene glycol ( $\text{C}_2\text{H}_6\text{O}_2$ ) is the principal ingredient in antifreeze. How many grams of ethylene glycol will be needed to lower the freezing point of 2100 g of water by  $20^{\circ}\text{C}$ ?
  14. How many grams of diphenyl ( $\text{C}_{12}\text{H}_{10}$ ) must be dissolved in 655 g of benzene to lower the freezing point by  $3.20^{\circ}\text{C}$ ?
  15. Perylene ( $\text{C}_{20}\text{H}_{12}$ ) is a constituent of coal tar. How many grams of perylene must be dissolved in 66.9 g of chloroform in order to lower the freezing point by  $2.75^{\circ}\text{C}$ ?
  16. How much will the freezing point of 1050 g of benzene be lowered if 31.1 g of orcinol ( $\text{C}_7\text{H}_8\text{O}_2$ ) is dissolved in the benzene?
  17. What will the freezing point depression if 42.0 g of ibuprofen ( $\text{C}_{13}\text{H}_{18}\text{O}_2$ ) is dissolved in 975 g of naphthalene?
  18. If 13.4 of the pharmaceutical drug scopolamine ( $\text{C}_{17}\text{H}_{21}\text{NO}_4$ ) is dissolved in 50.3 g of water, how much will the freezing point be lowered?
  19. How many grams of pyrazole must be added to 451 g of benzene to lower the freezing point by  $5.00^{\circ}\text{C}$ ?
  20. If you lower the freezing point of 16.8 g of chloroform by  $2.50^{\circ}\text{C}$  by using chlorine gas, how many grams of chlorine gas must be dissolved in the chloroform?
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