Question

What concentration of NaCl must be added to cause a 1 ^{o}C decrease in the melting temperature of the ice on a road?

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B. 0.79 mol kg $^{-1}$

C. 0.54 mol kg $^{-1}$

D. 0.27 mol kg $^{-1}$

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Because NaCl is a monovalent salt There are two ions (Na^+ and Cl^-) dissolved for each mole of NaCl. Thus, the concentration of NaCl is ½ of the necessary 0.54 mol kg^{-1}.

$$\Delta T = K_f \boldsymbol{m}$$

$$\boldsymbol{m} = \frac{\Delta T}{K_f} = \frac{1\ (^{o}C)}{1.86\ K(kg\ mol^{-1})}$$

$$\boldsymbol{m} = 0.54\ mol\ kg^{-1}$$