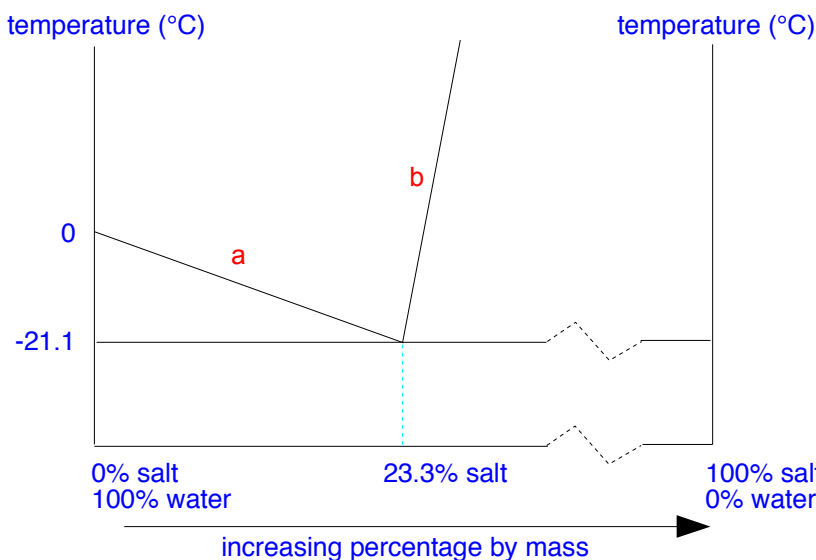


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SOLID-LIQUID PHASE DIAGRAMS - SALT SOLUTION

1. The following shows the phase diagram for mixtures of salt (NaCl) and water either side of 0°C.



- a) Mark on the diagram the areas where you would find: salt solution, a solid mixture of salt and ice, a mixture of ice plus salt solution, a mixture of solid salt plus salt solution.
- b) Explain briefly what line **a** represents.
- c) There is an upper limit on line **b**, and it will never reach the right-hand temperature axis.
- Explain why there will be an upper limit at atmospheric pressure.
 - Explain why there is a (different) upper limit even at very high pressures.
2. a) Using the phase diagram, describe and explain what would happen if you cooled a solution containing 23.3% of salt by mass.
- b) A saturated solution of sodium chloride at 60°C contains 27.0% of salt by mass. Suppose you cooled a solution containing 27.0% by mass of salt from 70°C to 20°C.
- At what temperature would you first see some salt crystals form?
 - At 20°C, there would obviously be a mixture of solid salt and salt solution in your container. How would you use the phase diagram to work out what the concentration of the salt solution was at 20°C?
 - If you continued to cool the mixture, at what temperature would the whole mixture freeze?

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c) Suppose you had a solution containing 7.0% by mass of salt, and you cooled it from 70°C to -30°C. Describe and explain how what you would see.