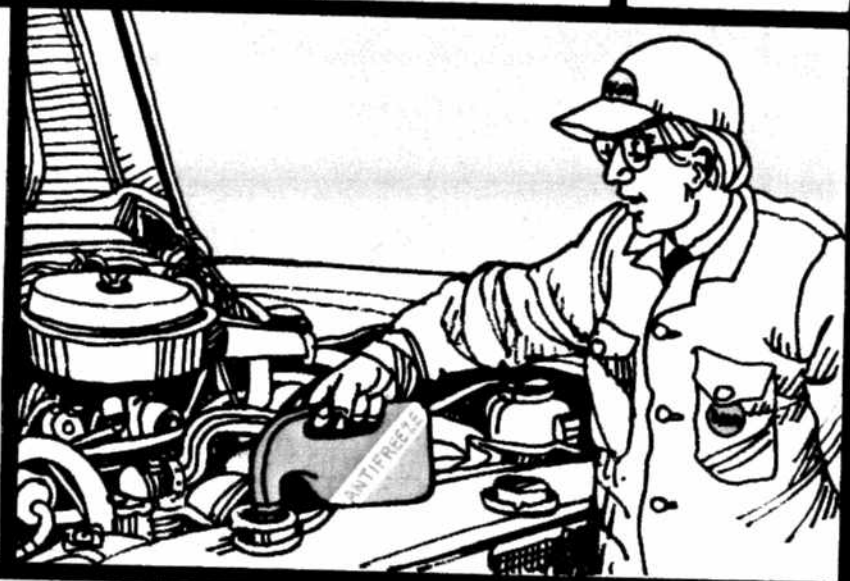


DO DISSOLVED SOLUTES CHANGE THE FREEZING AND BOILING POINTS OF WATER?

10



antifreeze: a solution added to car radiators

AIM | Do dissolved solutes change 10 | the freezing and boiling points of water?

Most automobile engines are cooled with water. In the wintertime it is very cold in most parts of the country. If the water freezes, it can ruin the engine.

Car owners add antifreeze to the car's water. This prevents the water from changing to ice. The same antifreeze also protects the engine from boiling over in the hot summer.

How does antifreeze work?

Antifreeze is a liquid solution. It has solutes dissolved in a liquid.

Certain (not all) dissolved solutes change the boiling point and freezing point of water.

DISSOLVED SOLUTES MAKE IT HARDER FOR WATER TO FREEZE AND TO BOIL.

This means that the water needs *more cold* to freeze and *more heat* to boil. The water freezes at a temperature *lower* than 0°C (32°F). It boils at a temperature *higher* than 100°C (212°F).

Adding more solutes lowers the freezing temperature and raises the boiling temperature even more. **BUT THERE IS A LIMIT.** After a certain amount of solute has been added, no more changes take place.

SOLUTES CHANGE BOILING AND FREEZING POINTS

Certain solutes

raise the boiling temperature,
and
lower the freezing temperature of water.

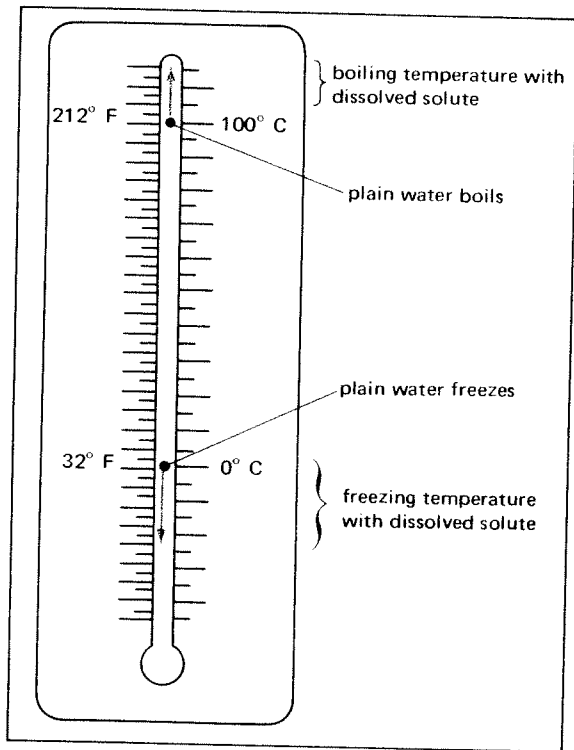


Figure A

HOW DOES SALT CHANGE THE BOILING POINT OF WATER?

Purpose: To show how adding salt changes the boiling point of water

What To Use 2 Pyrex beakers
2 ring stands and clamps
2 thermometers
water
salt
2 Bunsen burners

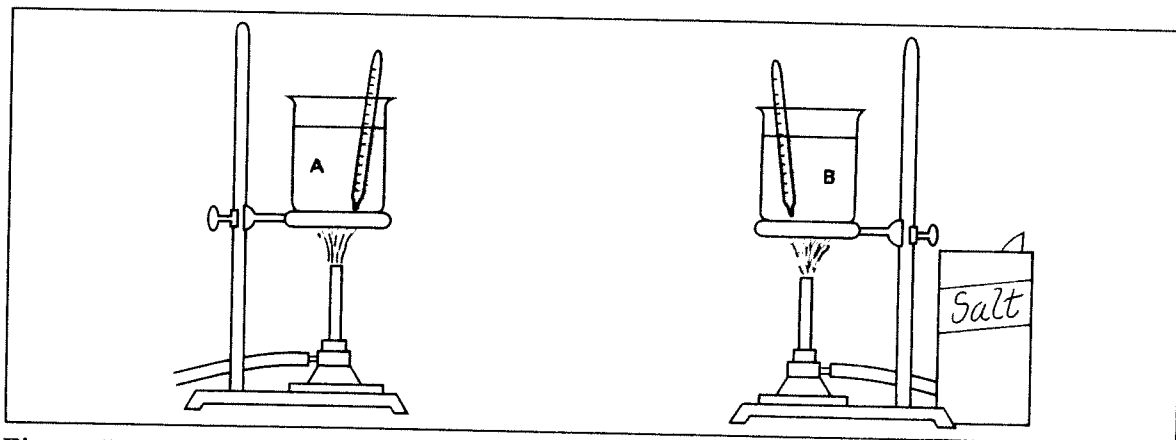


Figure B

What To Do

1. Fill both beakers half full with water. Label one beaker A and the other B.
2. Stir a teaspoon of salt into beaker B only.
3. Set the beakers on the ringstands and place the thermometers in the water. Light the burners.
4. Observe the temperature at which the water boils in each beaker.

Put your observations on the chart below.

Boiling Point	
PLAIN TAP WATER	
SALT WATER	

What You Saw and Learned

1. The tap water boiled at _____ °C, _____ °F.
2. The salt water boiled at _____ °C, _____ °F.
3. The salt water boiled at a _____ temperature than the tap water.
higher, lower
4. Water boils at a _____ temperature when a solute is added.
higher, lower
5. Is salt water a solution? _____
6. Which part is the solute? _____
7. Which part is the solvent? _____
8. Do *all* dissolved solutes raise the boiling point of water? _____

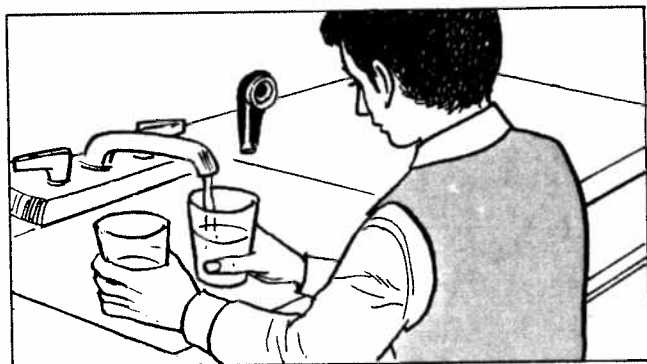


Figure C

TRY THIS AT HOME

Get two small, plastic containers of the same size. Fill them half full with tap water.

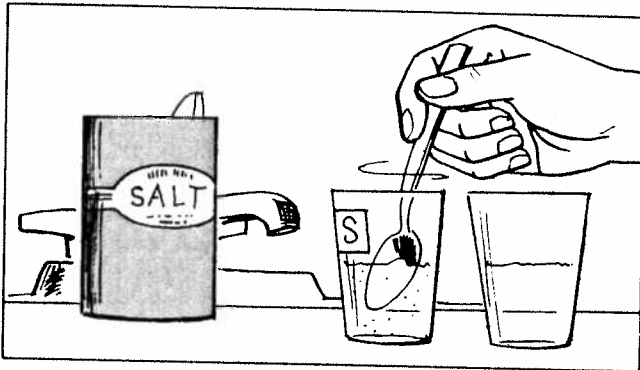


Figure D

Dissolve a tablespoon of salt into one of the containers.

Label this container S.

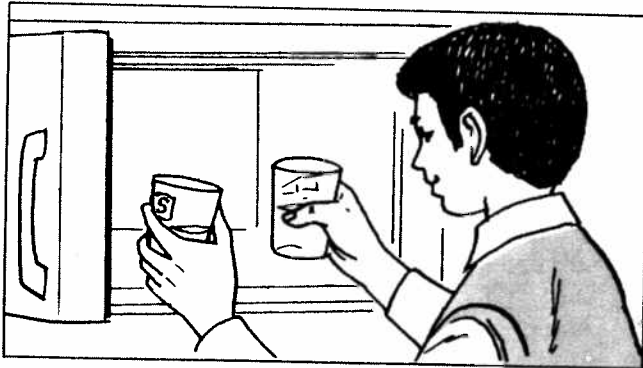


Figure E

Place the containers in your freezer.

Check them every half hour.

Which one freezes first?

What You Saw and Learned

1. The plain tap water froze _____ than the salt water.
faster, slower
2. The salt water froze _____ than the plain tap water.
faster, slower
3. Dissolved salt makes water _____ to freeze.
easier, more difficult

TRUE OR
FALSE

Write T on the line next to the number if the sentence is true.
Write F if the sentence is false.

Adding solutes to water:

1. _____ makes the water more difficult to freeze.
2. _____ lowers the freezing point.
3. _____ raises the freezing point.
4. _____ makes it easier to boil.
5. _____ raises the boiling point.
6. _____ lowers the boiling point.

**FIND THE
HIDDEN
WORDS**

TEMPERATURE has a total of eleven letters. If we take parts of this word or move some of the letters around, they make up other words. Some of the words you have learned in this book. How many of these hidden words in *TEMPERATURE* can you find?

TEMPERATURE

1. A drink served hot or iced (3 letters) _____
2. Water faucet (3 letters) _____
3. The opposite of false (4 letters) _____
4. Small rug near the door (3 letters) _____
5. Anything that has weight and takes up space (6 letters) _____

REACHING OUT

How could *antifreeze* have helped this situation? Explain. _____



Figure F