**WATERSTEP'S BLEACH MAKER INSTRUCTIONS**
**8/9/16**

**Overview:**
WaterStep's Bleach Maker generates a bleach solution to be used as a general purpose disinfectant. The production of a strong effective disinfectant made on site, easily and at low cost, will promote improved sanitation and hygiene. This will reduce diarrheal diseases, which are a major health problem of the developing parts of the world.

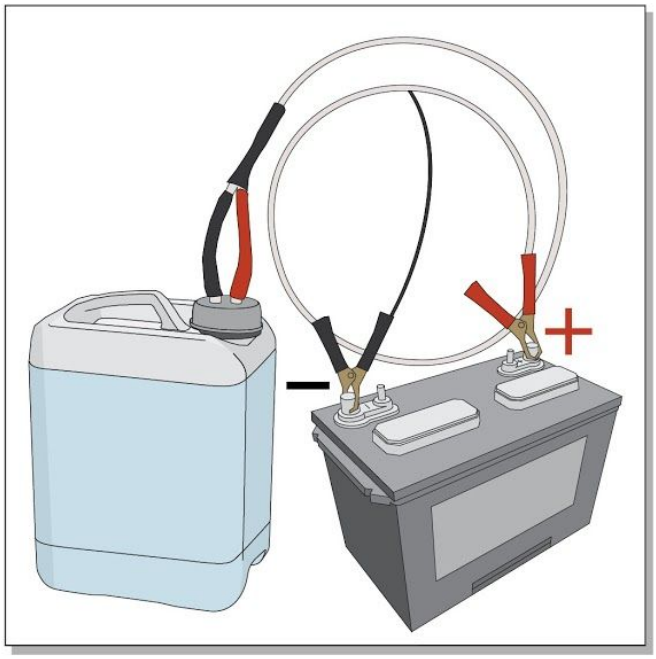
Bleach is a proven disinfectant for water. A small quantity of bleach can be added to a container of water and after waiting 30 minutes, the water can safely be consumed. WaterStep's Bleach Maker can be used most effectively in communities without water storage or distribution systems.

**Precautions:**

- Use in a well-ventilated area or outdoors. Do not inhale the fumes from the bleach generator.
- Do not drink the bleach solution.
- Keep the bleach solution out of eyes.
- Store the bleach solution in a cool place, out of direct sunlight.
- Discard the bleach solution after 14 days of storage.
- Store the bleach solution away from children

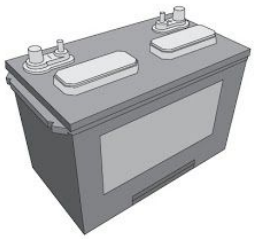
The bleach solution produced by this generator is not as concentrated as bleach purchased in stores.

WaterStep
Save Lives with Safe Water
625 Myrtle Street
Louisville, KY 40208
+1-502-568-6342
WaterStep.org



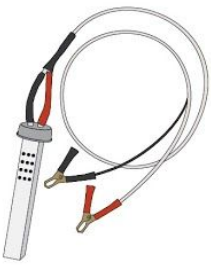
**Needed Parts:**

- 12 volt car battery, fully charged
- 6 liters of clean water, at room temperature, approximately 20 degrees Centigrade
- A watch or clock
- 350 milliliters salt (equals 500 grams or 1½ cups)



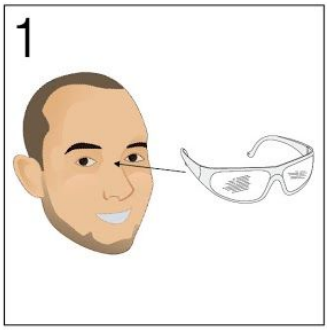
**Supplied Parts:**

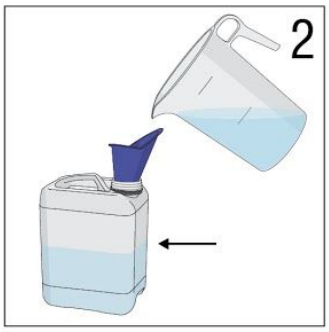
- Three 1 milliliter syringes
- Bleach generator electrode package - device with battery cables attached
- 1 liter measuring cup
- Funnel
- Safety glasses
- Set of measuring spoons and cups
- 5 liter jerrycan with solid cap
- Test kit – includes tester and 2 bottles of reagent

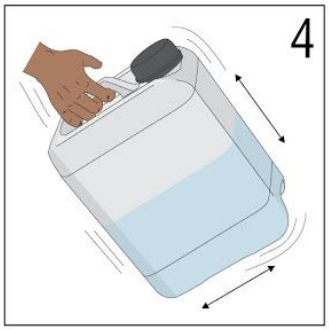


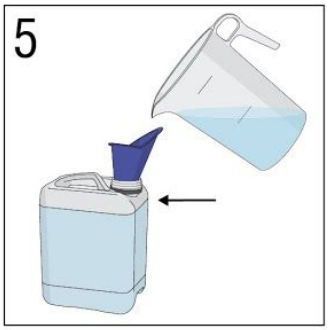
**BLEACH PRODUCTION - How to make the bleach**:

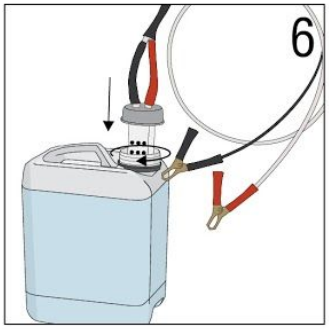
1. Put on safety glasses.
2. Using the funnel, fill jerrycan approximately ½ or more full of water.
3. Fill the measuring cup with salt to the 350 milliliter line and pour it into the jerrycan, using the funnel.
4. Screw on solid cap and shake container hard until the salt is dissolved.
5. Remove solid cap and using the funnel, fill the jerrycan to the “fill line” with water, 5 liters.
6. Insert generator electrode package and screw on the ring.
7. Connect red lead to positive (+) side of battery and connect black lead to negative (–) side.
8. Record the time, starting as soon as the battery is connected. Observe bubbles coming from the bleach generator electrodes. If you can’t see bubbles, hear a bubbling sound or smell chlorine see “troubleshooting”. Run the bleach generator for 75 minutes.
9. Unhook bleach generator leads from the battery. At this point you should have made 5 liters of bleach solution. Remove the electrode generator package from the jerrycan.

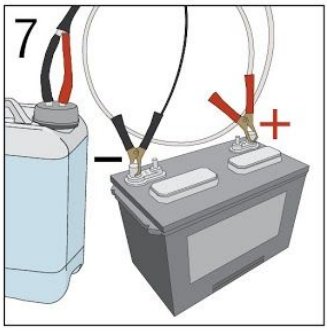


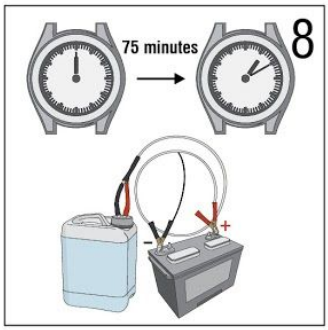



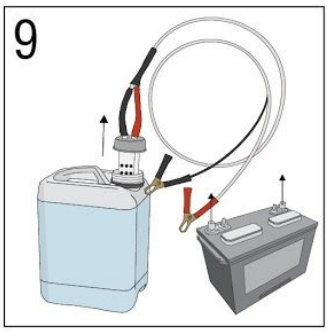


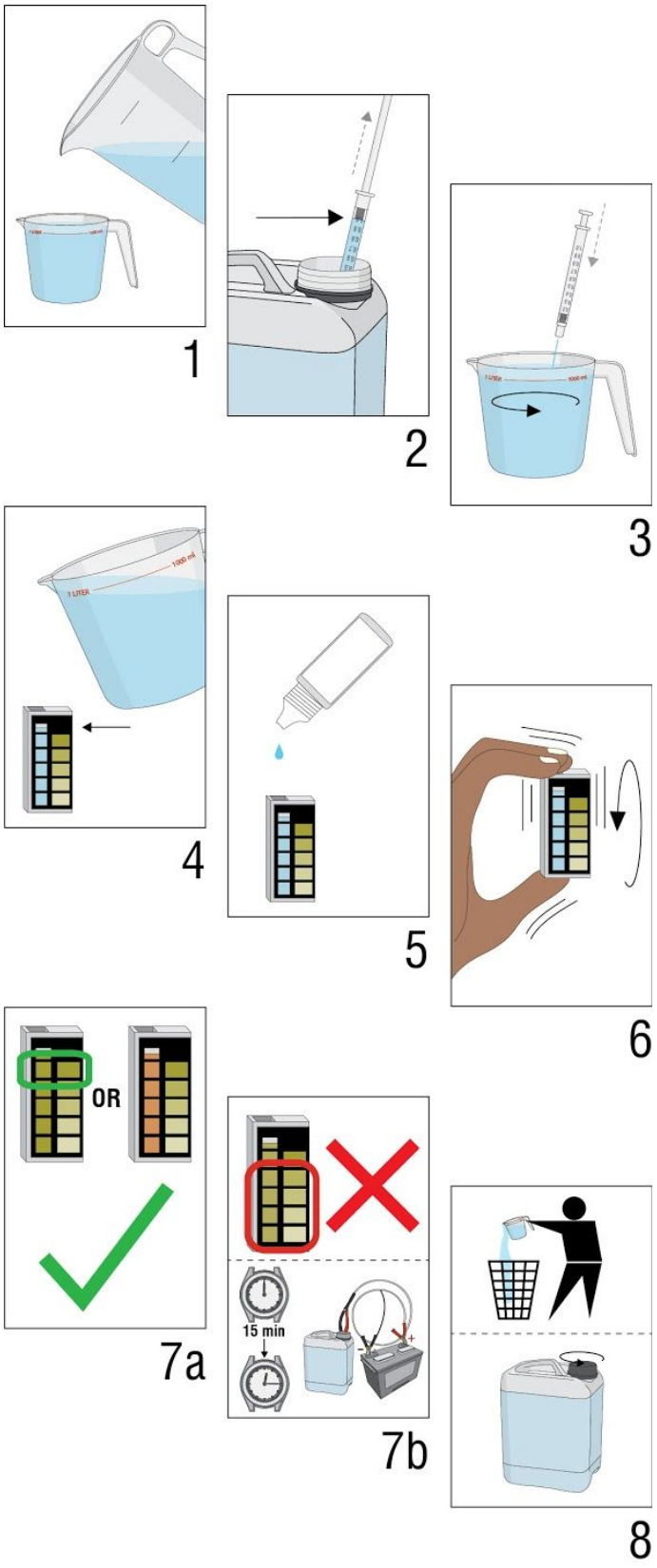



**SOLUTION TESTING - How to confirm the bleach is the proper strength:**

1. Fill measuring cup with clean water, to the 1000 milliliter line.
2. Stick the end of the syringe in the bleach solution. Pull the plunger back, filling the syringe to the 1 milliliter mark.
3. Push the 1 milliliter of bleach solution from the syringe into the 1000 milliliters of water in the measuring cup. Using the syringe, thoroughly stir the mixture.
4. Fill tester's water column with the mixture from the measuring cup.
5. Add 1 drop of reagent, from the test kit bottle, to the tester's water column.
6. Place your finger over the top of the tester's water column and gently rotate three times.
7. Compare the color of the water column to the color scale on the tester.
   a. If the water column's yellow color matches the yellow on the tester for 5 ppm or if it is orange, then the bleach solution is the required strength and ready to use.
   b. If the water column color is a lighter yellow and matches 4 ppm or less on the tester, the bleach solution is too weak. Run the generator for an additional 15 minutes and retest. If the solution is still reading less than 5 ppm after the additional 15 minutes, see “Troubleshooting”.
8. After producing bleach of the required strength, dispose of the water in the measuring cup. Close the jerrycan with the solid cap to transport and store the bleach solution

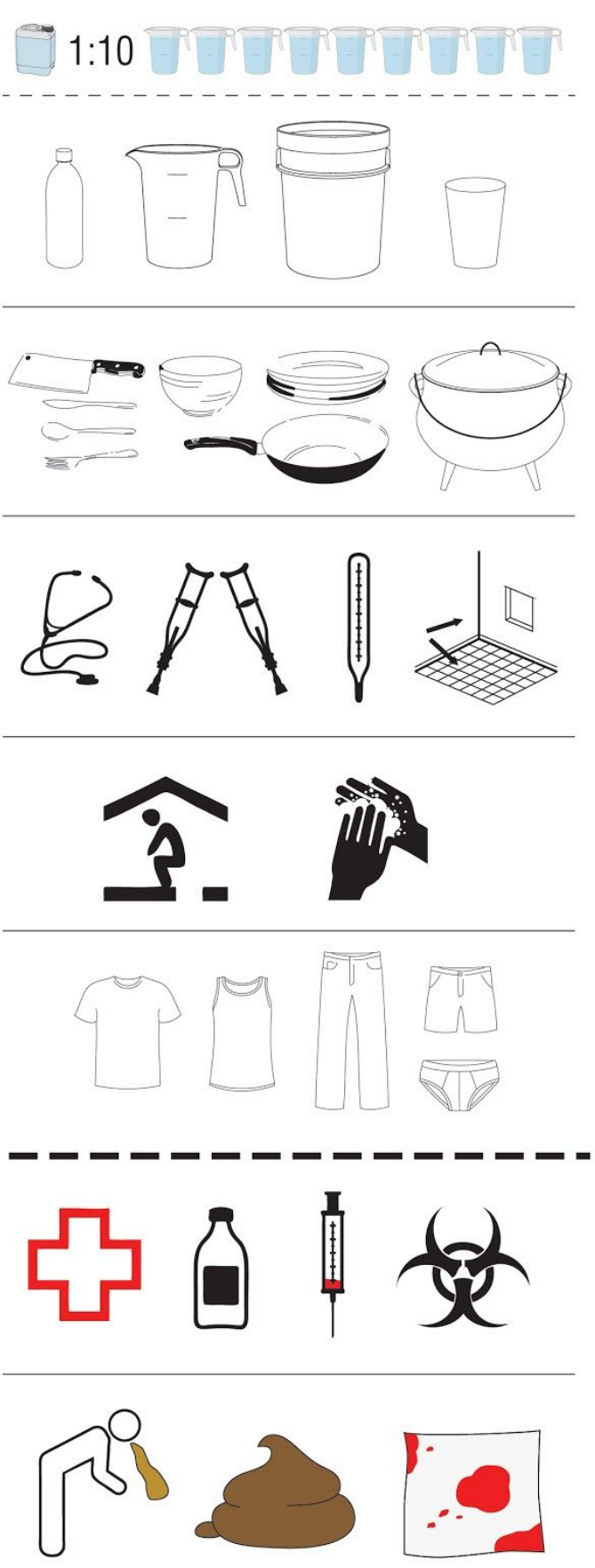
The bleach solution must be tested if it is to be used for sanitation purposes, to confirm that it is strong enough.

If the bleach is only used to disinfecting water, the test on this page is not necessary. The water that is disinfected is tested after the bleach is mixed in. See the following pages.



**For GENERAL SANITATION dilute the bleach solution 10 to 1 with clean water. Items to be disinfected should be first scrubbed with soap and water then washed in fresh disinfectant and allowed to air dry before use. Suggested items to be disinfected:**

- Drinking water containers.
- Cooking pots, pans, dishes and drinking cups.
- Surfaces used in food preparation.
- Floors and walls of hospital room or sickroom.
- Medical equipment—stethoscopes, thermometers, e
- Toilet facilities.
- Hands and skin.
- Protective clothing and bedding.



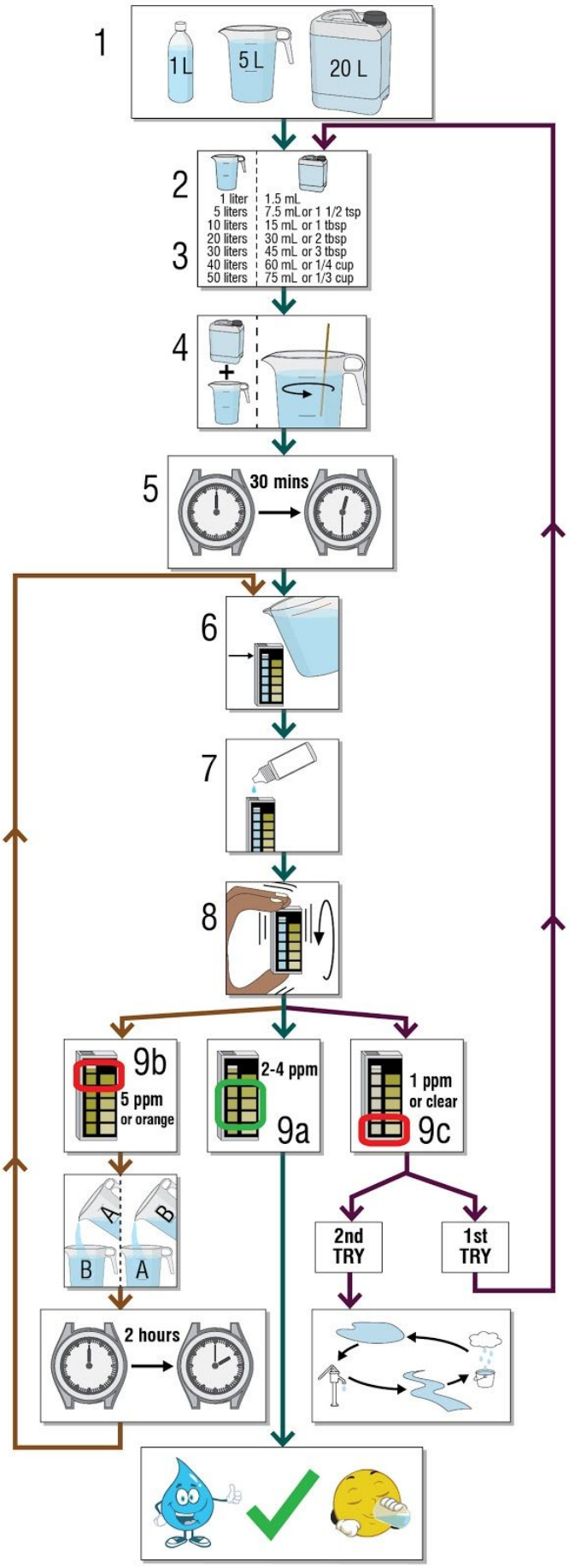

**For MEDICAL SANITATION use the bleach solution full strength. Heavily contaminated surfaces or infectious wastes should have full strength disinfectant poured over them and allowed to remain in contact for 30 minutes before clean up. Suggested items to be disinfected:**

- Medical waste.
- Spills of bodily fluids and feces.

**DISINFECTING WATER - How to use the bleach to disinfect water:**

1. Determine the amount of water to be disinfected.
2. If the water is cloudy or colored, filter it through a clean cloth, paper towel or coffee filter. If it cannot be filtered or if the water is very cold, add twice the amount recommended below.
3. Add 1 1/2 milliliter of bleach solution for each liter of water to be disinfected.
   a. 5 liters add 1 ½ teaspoon or 7.5 milliliter
   b. 10 liters add 1 tablespoon or 15 milliliters
   c. 20 liters add 2 tablespoons or 30 milliliters
   d. 30 liters add 3 tablespoons or 45 milliliters
   e. 40 liters add ¼ cup or 60 milliliters
   f. 50 liters add ⅓ cup or 75 milliliters
4. Mix the water and the bleach solution. If the container cannot be shaken, use a clean disinfected stick to stir.
5. Wait 30 minutes.
6. Fill tester's water column from the mixture.
7. Add 1 drop of reagent from the test kit bottle, to the tester's water column.
8. Place your finger over the top of the tester's water column and gently rotate three times.
9. Compare the color of the water column to the color scale on the tester.
   a. If the water column's yellow color matches the 2, 3 or 4 ppm on the tester, the water is ready to drink.
   b. If the water tests 5 ppm or is orange, pour the water from one clean container to another 5 times. Wait for an additional 2 hours and retest, go back to step 6.
   c. If the water tests for 1 ppm or is clear go back to step 3 and add more bleach. If the water tests 1 ppm or is clear a second time, do not use this water source. Find another water source and start over.

If your first try resulted in too much or not enough bleach, adjust the amount of bleach added so the test result is positive, 2, 3 or 4 ppm. After making several successful tests, it will not be necessary to repeat testing, provided the water comes from the same source and the container is the



same size. It is important to let the mixture sit for 30 minutes and then confirm that the mixture has a faint smell of chlorine.

Start over, repeating the testing procedure, when a new batch of bleach is produced.

**********

**MAINTENANCE AND TROUBLESHOOTING**

**Maintenance:**

- After use, rinse the bleach generator electrode package, jerrycan, measuring cups, funnel and tester with clean water.
- Keep the battery fully charged.
- After repeated usage, a white lime scale may build up on the electrodes. Soaking the electrodes in vinegar will remove this scale.

**TroubleShooting:**

**No bubbles, bubbling sound or chlorine smell:**

- Check to see if battery is hooked up correctly.
- Make sure salt was added.

**Low test reading:**

- Battery is weak.
- Insufficient time.
- Check to see if battery clamps are fastened securely to the battery terminals.
- Insufficient salt.
- Water is too cold.

**References:**

EPA - Emergency Disinfection of Drinking Water
CDC - Personal Preparation and Storage of Safe Water
CDC - Make Water Safe