

## C3 – Water Quiz

1. How is water made safe to drink?

Water is filtered to remove solids; flocculation to remove metal ions; add chlorine to kill bacteria.

2. What is hard water?

Water that contains  $\text{Ca}^{2+}$  and/or  $\text{Mg}^{2+}$  ions.

3. What is the effect of temporary hard water on a kettle?

Scale forms when the water is boiled. The scale builds up around the heating element and it takes longer to heat up the water as the efficiency of the heating element is reduced.

4. What is the difference between temporary and permanent hardness?

Temporary hard water contains  $\text{HCO}_3^-$  ions which form  $\text{CaCO}_3$  when water is boiled. Permanently hard water contains  $\text{SO}_4^{2-}$  ions which do not precipitate out when water is boiled.

5. How do you remove permanent hardness?

Distil the water. Add washing soda ( $\text{Na}_2\text{CO}_3$ ) to the water or pass the water through an ion exchange column.

6. What are the advantages of hard water?

Tastes better, strengthens bones and teeth and prevents heart diseases.

7. Why is lime scale a problem for heating elements?

Wastes energy; takes longer to heat up the water; reduces the efficiency as a result of lime scale coating the heating element.

8. How does washing soda soften permanently hard water?

Carbonate ions react with calcium /magnesium ions, forming a precipitate of calcium carbonate / magnesium carbonate therefore the water is softened because this removes the calcium / magnesium ions.

9. How does a water filter soften permanently hard water?

Sodium or hydrogen ions in the resin displace the magnesium or calcium ions in the water.

10. How do you show in an experiment that water has been softened?

Add soap to original sample and shake to form scum. Keep adding soap and shake until a permanent lather forms. Repeat with boiled sample and compare the amount of soap needed to form a stable lather.

11. How do you show in an experiment that water is hard?

Add soap solution and shake. If scum forms the sample is hard.

12. How does water become hard?

When streams and rivers flow over rocks that contain calcium and/or magnesium compounds these compounds become dissolved in the water so that the water contains calcium and/or magnesium ions.

13. What is the difference between scale and scum?

Scale is formed when heat decomposes dissolved calcium and/or magnesium compounds. Scale is calcium or magnesium carbonate. Scum is formed when hard water reacts with soap to form calcium or magnesium stearate.

14. Give a reason for and against adding chlorine to drinking water.

Kills harmful bacteria so prevents diseases. Chlorine can react with substances in water and form toxic compounds. It also does not taste nice

15. What is the purpose of silver and carbon in a water filter?

Carbon absorbs chlorine and improves the taste. Silver prevents the growth of bacteria.

16. Give a reason for and against adding fluoride to drinking water.

Fluoride reduces tooth decay and prevents heart diseases. It can lead to Fluorosis (white streaks on teeth), weakening of bones and potentially bone cancer.