Water – *Mark scheme*

1. (a) water came into contact with rocks / ground / soil 1

ignore mountains; erode gets first mark

ions or compounds or chemicals **or** they dissolved / soluble / leached / reacts / forms a solution 1

*do **not** accept gets picked up*
*accept water dissolves them from the rocks for **2** marks*

(b) (i) calcium **or** magnesium 1

*accept Ca^{2+} **or** Mg^{2+} **or** Ca **or** Mg*
*do **not** accept Ca^{+} alone*

(ii) answers must involve both calcium and magnesium

totals required for 2 marks

Ridgway: Ca + Mg = 53 1

Homeland: Ca + Mg = 27 1

accept there is (almost) twice as much
*Magnesium and Calcium in Ridgway water for **1** mark*

(iii) equal volumes / quantities / amounts of water 1

add soap with / shaking / mixing / agitation 1

*same amounts of soap = max **2***
*do **not** accept just add*
*do **not** accept solid soap*

the harder sample (Ridgway) needs 2 × more soap to give lather **or** the less hard sample (Homeland) needs half as much soap to give lather can get twice as much scum with harder (Ridgway) sample 1

[8]

2. (a) scale – (solid) formed when <u>heat</u> decomposes dissolved calcium / magnesium compounds owtte 1

allow: scale is formed when <u>hard</u> water is heated / boiled (to leave magnesium / calcium compounds)

scale is calcium carbonate / $CaCO_3$ or magnesium carbonate / $MgCO_3$

ignore evaporate

scum – (ppt) formed when soap reacts with calcium /magnesium (ions) owtte 1

allow scum is formed when <u>hard</u> water reacts with soap

scum is calcium stearate / magnesium stearate

(b) calcium (ions) / Ca^{2+} / magnesium (ions) / Mg^{2+} 1

replaced by hydrogen ions / H^{+} / sodium ions / Na^{+} 1

[4]

3. **two** methods and **1 linked** explanation **or 1** method and **two** explanations, **1** linked = **3** marks

no linking of method and explanation then max **2** marks

ignore references to removal of hardness

METHOD 1:

filter

ignore screening / sedimentation

explanation 1:

remove insoluble substances / remove solids / small bits / dirt / mud/ soil / sand / silt

METHOD 2:

precipitate / flocculate / add eg. alum

allow other named substances

explanation 2:

removes (some) soluble material as solids / removes (some) metal ions

METHOD 3:

add chlorine / chlorine dioxide / ozone

explanation 3:

sterilise / kill bacteria / microorganisms / microbes 3

ignore 'remove bacteria'
ignore disinfect

[3]

4. (a) weak 2

***not** slightly*

alkaline / base

mark independently

(b) contains Ca^{2+} / Mg^{2+} / named calcium compound / correct formula 1

*do **not** accept reference to soap **not** calcium / magnesium*

(c) build up of fur / scale / forms $CaCO_3$/ precipitate formed 1

***not** 'scum'*

wastes energy / less efficient / takes longer to boil 1

(d) (i) sample B 1

contains (calcium) sulphate / SO_4^{2-} 1

not softened by boiling / does not contain many HCO_3^- ions / cannot precipitate $CaCO_3$ 1

(ii) by use of ion-exchange / washing soda / distillation 1

***not** detergent / soap*

(e) strengthen bones, teeth / taste 1

***not** good for you / healthier*

[10]