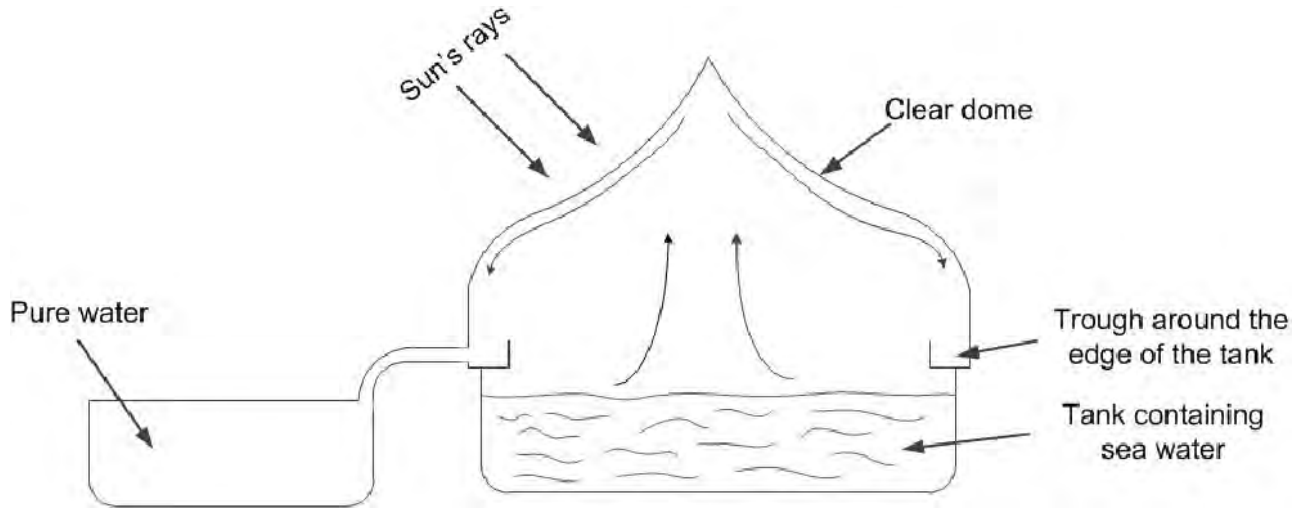
1(a). Chlorine is used in the treatment of drinking water.

Describe how you would test a sample of gas to show that it is chlorine.

[2]

(b). A solar still can be used to make sea water safe to drink.



The diagram shows a cross-section of a solar still. Describe how a solar still produces drinking water from sea water.

[2]

2. Cholera is a disease caused by drinking contaminated water.

During a cholera outbreak in Exeter in 1832 there were 402 deaths.

There were more outbreaks of the disease in 1848 and 1867.

There have been no cases of cholera in the city since chlorine was added to the water.

Describe and explain how the use of chlorine has helped tostop people in cities, such as Exeter, being affected by cholera.

[2]

3. Mauritius is a country of small islands surrounded by sea.
There is almost no fresh water in Mauritius.

Seawater cannot be used as drinking water because it contains a large amount of salt.

(a) The flowchart shows the stages in a process which produces drinking water from seawater.

(i) Which stage removes the salt from the seawater?

Explain your answer.

Stage ----------

Explanation ----------

---------- [3]

(ii) Explain why there are no harmful bacteria in the water **after stage 2**.

---------- [2]

(iii) Explain why **stage 3** is needed.

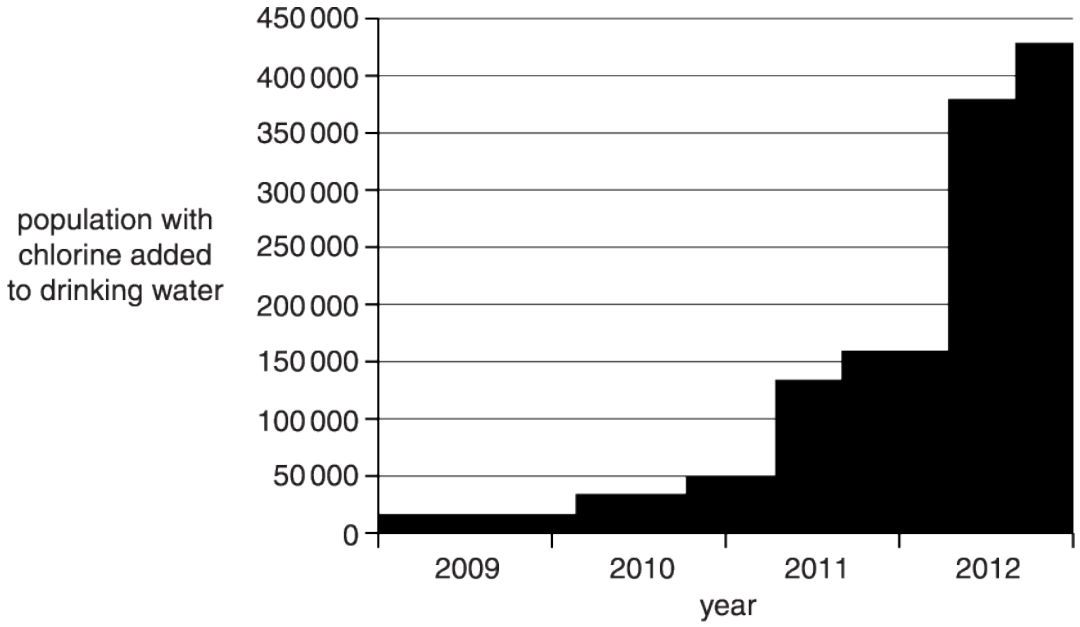
---------- [1]

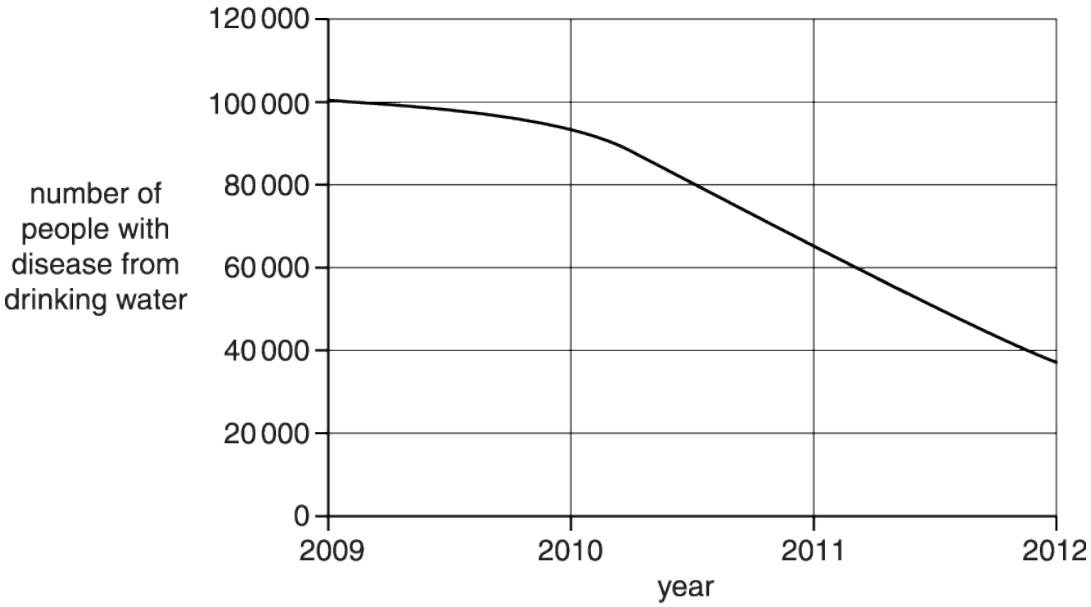
4. In remote parts of a developing country, the drinking water causes diseases that kill people.

In one area people started to add chlorine to drinking water from 2009.

A charity raised the money to pay for this.

Look at the graphs.





Describe in detail what the two graphs tell you.

What conclusions can you make about the effectiveness of adding chlorine to drinking water in this area?

The quality of written communication will be assessed in your answer.

[6]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1	a		(blue) Litmus paper ✓ goes red then white / red then bleaches ✓	2	
	b		water evaporates (from sea water) by the heat of the sun ✓ water condenses (on the sides of the dome) and collects in the trough ✓	2	
			Total	4	
2			cholera is caused by bacteria (1) chlorine kills bacteria (1)	2	do not allow idea that chlorine stops bacteria entering the water / chlorine cleans / purifies the water allow micro-organisms instead of bacteria, but do not allow germs Examiner's Comments Most candidates knew that chlorine kills bacteria to gain one mark, but fewer related this to the disease cholera. Many weaker candidates wrote about chlorine purifying wateror making it cleaner, which gained no credit.
			Total	2	
3		i	Stage 2 / distillation ✓ water evaporates / becomes a vapour/gas (and then condenses)✓ salt is left behind ✓	3 (AO 3× 1.2)	ALLOW boils ALLOW for 'distillation separates soluble substances and water/a solvent' ✓ Examiner's Comments This question was well answered. Some candidates chose 'filtration' believing that this would filter out the salt, but most identified distillation correctly. Similarly the explanation of distillation was well understood, most stating that water evaporates and salt is left behind.

Question			Answer/Indicative content	Marks	Guidance
		ii	(distillation uses) high temperatures/heat/100°C ✓ bacteria are killed/die ✓	2 (AO 2× 1.2)	ALLOW ‘boiling’ IGNORE ‘remove’ bacteria ALLOW bacteria left behind with salt / do not evaporate <u>Examiner’s Comments</u> Again, this was well answered with most candidates recognising that the high temperatures used kill any bacteria, earning two marks. Some went on further to correctly state that any bacteria would remain behind with the salt and would not be collected in the water.

Question			Answer/Indicative content	Marks	Guidance
		iii	to kill bacteria / idea that bacteria may enter water later / keep water free of bacteria ✓	1 (AO 1.1)	ALLOW microbes / micro-organisms / pathogens for bacteria Examiner's Comments This question was interesting because it is different to the usual water treatment in the UK. In this case at stage 3 the water is already bacteria free. Candidates did not always engage fully with the context to realise this. 'Chlorine kills bacteria' was accepted as correct, but candidates who understood the process gave higher level answers than this, for example by pointing out that the chlorine is a precautionary measure to ensure that any bacteria entering the water during distribution are killed.  AfL 'Chlorine removes bacteria' is not enough to gain any marks. To be technical, the bacteria are still in the water, but they are dead. It is important that candidates learn that 'chlorine kills bacteria' in water. Key  AfL Guidance to offer for future teaching and learning practice.
			Total	6	

Question			Answer/Indicative content	Marks	Guidance
4			[Level 3] Describes both graphs in detail and links them together. Explains the cause for the reduction in disease or evaluates the effectiveness of adding chlorine. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) [Level 2] Links both graphs together and either gives extra detail of one graph or explains the cause for reduction. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) [Level 1] Describes one graph or explains the cause for the reduction in disease. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) [Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	This question is targeted at grades up to A/A* Indicative scientific points may include: Statements about graph 1 • number of people with chlorine added to water has increased • large increase in 2012 • quotes correct numbers from graph eg about 15 000 to over 400 000 Statements about graph 2 • graph shows a reduction in diseases • decrease is continual • slow decrease at start and faster decrease later • quotes correct numbers from graph eg 100 000 people with disease to less than 40 000 Linking graphs together • graph shows a reduction in diseases as chlorine put in drinking water of more people • increase in number of people with chlorine added to drinking water correlates with decline in disease Causes for reduction • chlorine is used to kill microorganisms • addition of chlorine to drinking water make a major contribution to public health Evaluates the effectiveness • although a large reduction there is still plenty of disease. • Large increase in chlorine added in 2012 but no large decrease in disease.

Question			Answer/Indicative content	Marks	Guidance
					Use the L1, L2, L3 annotations in Scoris; do not use ticks. Examiner's Comments Candidates found the first graph difficult to interpret. Some thought it showed the population rising and missed the link mark. Others thought that an increasing amount of chlorine had been added to the water. Disappointingly when they did interpret the graphs correctly they failed to describe either graph in detail and were limited to 2 marks. Very few evaluated the effectiveness. All these points indicate careless reading of the question. Some candidates discussed the disadvantages of chlorinating water. These are not relevant in situations where there is a high risk of death from water-borne disease.
			Total	6	