

GCSE Chemistry (9 – 1)

Potable water and water treatment

Name:

Group:

Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.



For markers use	
Question	Mark
1	/6
2	/8
3	/11
4	/6
Total	/31
%	
Grade	

Information

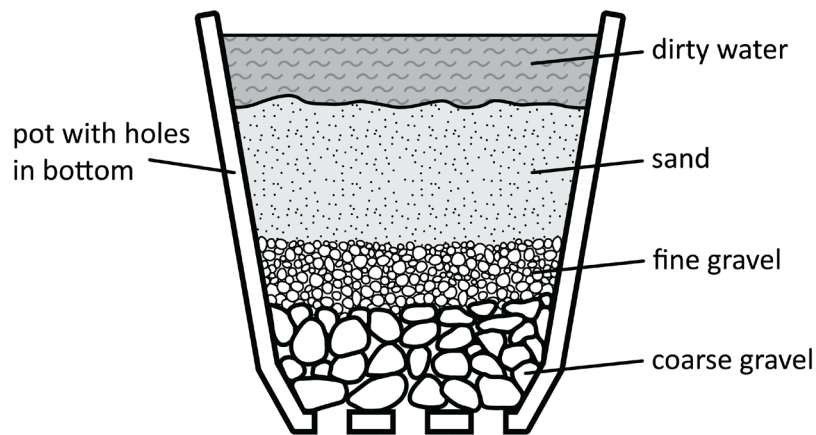
- The maximum mark for this paper is 31 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



1. Water is essential for life on Earth, but as natural water sources often contain dangerous bacteria and pollutants, they must be treated to become potable.

Circle the letter of the correct answer for each of the following questions.

- a) The diagram shows water passing through layers of sand and gravel.



Which statement correctly describes this process?

- A** This is sterilisation, which removes dissolved salt.
- B** This is sterilisation, which kills microbes.
- C** This is filtration, which removes dissolved salt.
- D** This is filtration, which removes solid particles.

(1 mark)

- b) Which process is used to produce drinking water from sea water?

A	B	C	D
Distillation	Crystallisation	Chlorination	Filtration

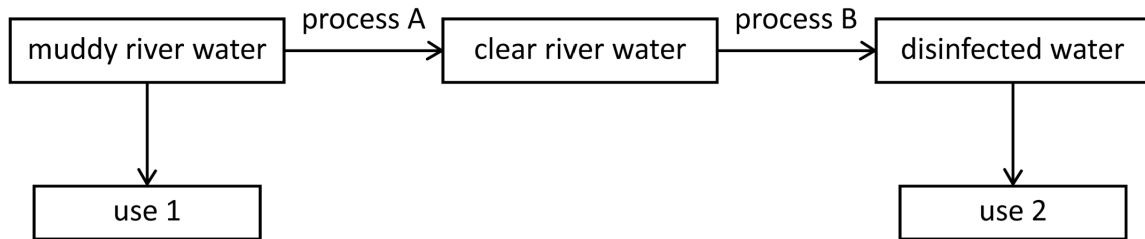
(1 mark)

- c) In the treatment of waste water, what is the specific purpose of the screening process?

- A** To kill harmful bacteria and microbes.
- B** To remove large solid objects like grit and twigs.
- C** To remove dissolved salts and chemicals.
- D** To separate the liquid effluent from the solid sludge.

(1 mark)

d) The diagram shows the uses and treatment processes of muddy river water.



Which row identifies uses 1 and 2 and processes A and B?

	Use 1	Use 2	Process A	Process B
A	drinking	watering crops	chlorination	filtration
B	watering crops	drinking	filtration	chlorination
C	drinking	drinking	filtration	chlorination
D	watering crops	watering crops	drinking	chlorination

(1 mark)

e) During the sedimentation stage of waste water treatment, waste water separates into two distinct components. What are they called?

A	B	C	D
Potable water and salt	Effluent and sludge	Oxygen and methane	Bacteria and viruses

(1 mark)

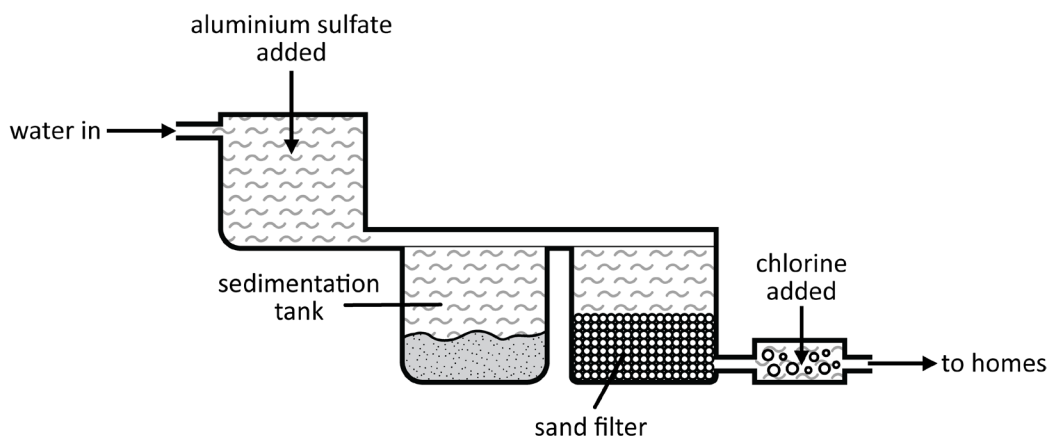
f) What are the useful by-products produced during the anaerobic digestion of the solid sewage sludge?

A	B	C	D
Oxygen and pure water	Carbon dioxide and nitrogen	Methane gas and fertiliser	Chlorine and hydrogen

(1 mark)

(Total for Question 1 is 6 marks)

2. Water from a reservoir is treated at a water works to make it potable.
The figure below shows a simplified model of a water treatment works.



- a) In the first stage, the water passes through a sedimentation tank and then through fine sand and gravel. Explain why the sand and gravel filters are necessary.

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(2 marks)

- b) After filtering, chlorine gas is bubbled into the water.

State why it is not safe to drink the water before this stage is completed.

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(1 mark)

- c) Aluminium sulfate, which is also called 'Alum' is added to the water to help fine particles clump together. This compound is made by reacting aluminium oxide with sulfuric acid.

Write a **balanced** symbol equation for this reaction.

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(3 marks)

- d) A student wants to check if a sample of untreated water contains aluminium ions (Al^{3+}).

Describe a test for aluminium ions.

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(2 marks)

(Total for Question 2 is 8 marks)

3. A sample of water is taken from a river. The water is cloudy and has a pH of 5.

a) Describe how the student would use universal indicator paper to find the pH of the water sample.

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(2 marks)

b) The student could also have used Litmus paper for this.

Identify **one** limitation of using Litmus paper for testing this sample of water.

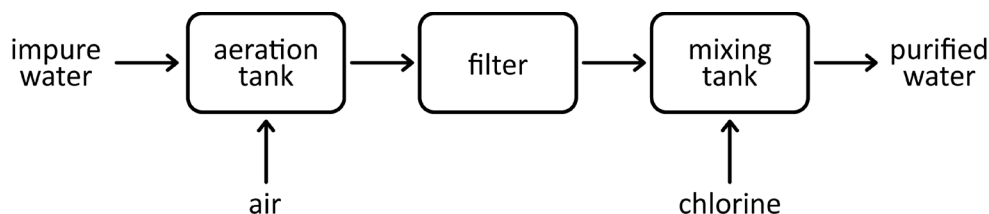
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(1 mark)

The diagram below shows the process used to turn the river water into potable drinking water.



During the aeration stage, air is bubbled through the water.

c) Name the gas that makes up the largest percentage of the air.

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(1 mark)

The filtration tank contains layers of sand and grit.

d) Explain how this stage removes insoluble solids from the river water.

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(2 marks)

e) Explain the purpose of the chlorination stage.

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(2 marks)

The student is given another clear liquid in a beaker. They need to do a test to prove that this liquid is water. They use anhydrous cobalt(II) chloride paper.

f) State the **colour change** that would be observed if water is present.

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(2 marks)

The student argues that because the test in part (f) was positive, the water must be pure.

g) Explain why the student is **incorrect**.

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(1 mark)

(Total for Question 3 is 11 marks)

