 Sewage treatment

Specification reference

* C10.1.3 Waste water treatment

Aims

In this activity students will make a model to show what happens to waste water.

Learning outcomes

After completing this activity, students should be able to:

* list what is removed from waste water before it can be released
* state the main processes in sewage treatment
* state uses of sewage slurry
* explain why waste water should be treated before it is released into the environment
* describe the main processes in sewage treatment
* explain uses of sewage slurry
* explain in detail how and why waste water is processed before it is released into the environment
* evaluate the use of sewage slurry
* distinguish between aerobic and anaerobic bacteria and of their importance in treating waste water.

Teacher notes

Do not use actual sewage water for this experiment. Such water contains harmful microorganisms. The pondweed may contain microorganisms so advise students to wash their hands at the end of the experiment.

Students will need access to the internet to research the answer to Student follow up question 3.

Answers

1 a stage 3 (*1 mark*)

b stage 4 (*1 mark*)

c stage 6 (*1 mark*)

2 The flow chart must have these stages:

* pumping station
* screening
* primary sedimentation
* biological treatment (aerobic bacteria)
* secondary sedimentation
* sterilisation/chlorination/disinfectant (Cl2/O3/UV)
* discharge of effluent (*5 marks*)

3 a effluent (*1 mark*)

b fertiliser or as a source of renewable energy (biogas) (*1 mark*)

4 chlorine or ozone (*1 mark*)

5 Sewage is the waste water from houses and factories. Sewerage are the pipes and system that carries this waste water to the sewage treatment plant (*2 marks*)

Student follow-up answers

1 Aerobic bacteria work best in the presence of oxygen. The tank is aerated by bubbling air through the waste water. Such bacteria feed on remaining organic matter in the water and any harmful microorganisms still present, breaking them down. (*3 marks*)

2 a Anaerobic bacteria work best in the absence of oxygen; around 30 days are required at a temperature of about 35−55 °C. (*2 marks*)

b methane is released (1) which can be burnt to make electricity (1) (*2 marks*)

3 Eutrophication results in an increase in the number of algae and bacteria in the water (1). Algal blooms prevent sunlight reaching water plants, which die (1). Bacteria, as living organisms, remove oxygen from the water (1), which decreases the biodiversity in the water as animals and plants may die (1). It also decreases the pH of the water and causes water-borne diseases like typhoid, cholera, and dysentery to be more prevalent (1). (*5 marks*)

Equipment

* stand and clamp
* three beakers
* stirring rod
* filter funnel
* filter paper
* ‘pond water’ (made from water, flour, sand, stones and pond weed)
* pipette
* water purification tablet