



5B



AQUACULTURE SYSTEMS

DIAGRAM LABELLING

- 1 Find the part of the text describing the diagram.

NB. All the information about the contents of the chart is usually concentrated in one short section of the text.

- 2 Take a couple of minutes to read that section of the text in detail and make sure that you understand it.
- 3 Look at the information already given in the diagram.
- 4 Label the diagram using words directly from the text.



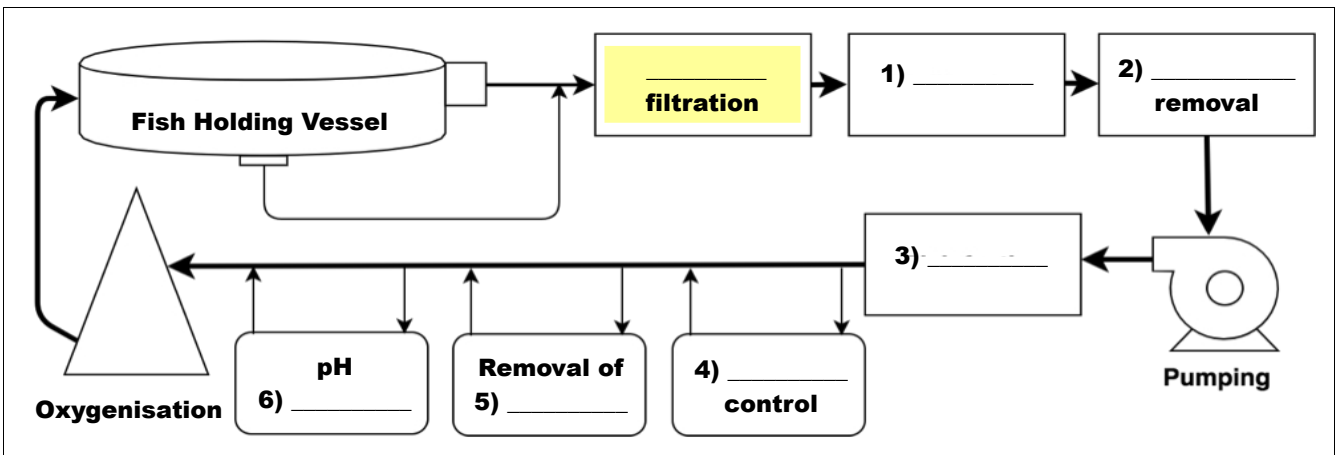
suggested time
9 minutes

TASK

Look at the text on "Recirculating Aquaculture Systems" on the following page and label the flow diagram below.

Choose NO MORE THAN THREE WORDS from the passage for each answer.

Write your answers in boxes 1 – 6 on your answer sheet.



Example SOLIDS

1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

Recirculating Aquaculture Systems

1 Recirculating aquaculture systems (RAS) are used in home aquaria and for fish production where water exchange is limited and the use of biofiltration is required to reduce ammonia toxicity. A series of treatment processes is utilized to maintain water quality in intensive fish farming operations. Each of these processes can be completed by using a variety of
5 different methods and equipment, but regardless all must take place to ensure a healthy environment that maximizes fish growth and health.

After leaving the fish holding holding vessel, solid waste excreted by fish must also be treated, this is done by concentrating and flushing the solids out of the system. Solids
10 filtration reduces bacteria growth, oxygen demand, and the proliferation of disease. A process known as biofiltration is then necessary to convert ammonia excreted by the fish into nitrate. Ammonia is a waste product of fish metabolism and high concentrations are toxic to most finfish. Nitrate is less toxic than ammonia, and can be removed by a denitrifying biofilter or by water replacement. It is often necessary to extract excessive amounts of dissolved carbon dioxide as well as high levels can prove toxic to fish.

15 To prevent disease, the water is subject to disinfection. The use of an Ultra Violet (UV) or ozone water treatment system reduces the number of free floating virus and bacteria in the system water. Heating and cooling may also be necessary as all fish species have a preferred temperature above and below which that fish will experience negative health effects and eventually death. In order to filter out fine particles a protein fractionator may be used,
20 before any necessary adjustment is made to the the water's pH. Before returning the processed water to the holding vessel, oxygenisation of the system water is a crucial part to obtaining high production densities. Fish require oxygen to metabolize food and grow, as do bacteria communities in the biofilter.

25 Combining plants and fish in a RAS is referred to as aquaponics. In this type of system ammonia produced by the fish is not only converted to nitrate but is also removed by the plants from the water. In an aquaponics system fish effectively fertilize the plants, this creates a closed looped system where very little waste is generated and inputs are minimized. Aquaponics provides the advantage of being able to harvest and sell multiple crops. Contradictory views exist on the suitability and safety of RAS effluents to sustain plant growth under aquaponics condition. Future conversions, rather 'upgrades', of
30 operational RAS farms to semi-commercial Aquaponic ventures should not be deterred by nutrient insufficiency or nutrient safety arguments. Incentivizing RAS farm wastes through semi-commercial aquaponics is encouraged. Nutrients locked in RAS wastewater and sludge have sufficient and safe nutrients to sustain plant growth under aquaponics condition.