GCSE

S24-3445U40-1G

MONDAY, 6 NOVEMBER 2023 – FRIDAY, 22 DECEMBER 2023

APPLIED SCIENCE (Double Award)

TASK BASED ASSESSMENT – UNIT 4 (3445U40)

PACK B

RESOURCE FOLDER FOR USE WITH ACTIVITY 2

FOUNDATION TIER

Introduction

Cymru Water Services Ltd monitors the quality of water in Welsh river estuaries (where the river joins the sea) as part of a project to determine whether estuary water can be used as a source for producing drinking water.

One of the tests that it carries out involves adding aluminium sulfate solution to a sample of estuary water. This causes any small solid particles to join together and settle at the bottom of the test bottle. The solid is then filtered off, dried and weighed. Clean water contains fewer small solid particles.

The estuary water is sampled away from the sea, every 500 m, up to 2500 m.

The testing process is outlined below.

Apparatus

- 100 cm^3 glass sample bottle with sealable lid
- 100 cm^3 estuary water samples
- aluminium sulfate solution in dropping bottle
- filter paper
- 250 cm^3 beaker
- filter funnel and stand
- access to a drying oven
- electronic balance

Method

1. Add 5 drops of aluminium sulfate solution to 100 cm^3 of estuary water in a sample bottle. Secure the lid and shake well for 2 minutes.

2. Measure and record the mass of a piece of filter paper, using an electronic balance.

3. Place the filter paper into the filter funnel. Place a 250 cm^3 beaker under the filter funnel.

4. Pour the estuary water sample slowly into the filter paper, ensuring that all the solids are emptied from the sample bottle.

5. Remove the filter paper from the filter and place in a drying oven for 24 hours to completely dry.

6. Remove the dried sample from the drying oven and measure and record the mass of the filter paper plus the solids. Calculate and record the mass of the solids, in milligrams (mg).

7. Repeat steps 1 to 6 for two more water samples taken from the same location.

8. Repeat steps 1 to 7 for the samples at each of the other locations.

The results from one of these monitoring visits are shown in **Table 1**.

Table 1

Distance from the sea (m)	Mass of solid (mg)		
	sample 1	sample 2	sample 3
0	1.7	1.6	1.7
500	2.0	1.9	2.0
1000	2.5	5.2	2.3
1500	3.8	3.8	3.7
2000	6.7	6.6	6.8
2500	14.5	14.6	14.6

In addition to the solids in the estuary water, the salt (sodium chloride) needs to be removed. The concentration of salt in water is called salinity. The salinity of seawater is measured in parts per thousand (ppt). The variation of the mean salinity of the water in the estuary being monitored against distance from the sea is shown below in **Table 2**.

Table 2

Distance from the sea (m)	Mean salinity (ppt)
0	35
500	30
1000	18
1500	5
2000	1
2500	0

Figure 1 below shows a food web in a typical estuary. Any estuary water extracted for use as drinking water will need to be treated to remove any potential biological hazards.

Figure 1