All questions are for separate science students only

Q1.

A student investigated an aqueous solution of a salt.

The student identified that the salt solution contained only sodium ions and chloride ions.

(a) Describe a test to identify sodium ions.

Give the result of the test. **(chemistry only)**

Test for sodium ions _____

_____

Result _____

_____

(2)

(b) Describe a test to identify chloride ions.

Give the result of the test. **(chemistry only)**

Test for chloride ions _____

_____

Result _____

_____

(2)

The student determined the concentration of sodium chloride in the salt solution.

This is the method used.

1. Weigh an empty evaporating dish.
2. Add 25.0 cm^3 of the salt solution into the evaporating dish.
3. Heat the evaporating dish and contents.
4. Weigh the evaporating dish and contents.
5. Repeat steps 3 to 4 until there is no further change in mass.
6. Repeat steps 1 to 5 three more times.

(c) Why did the student heat the evaporating dish and contents until the mass did not change?

_____

_____

(1)

(d) How did the student calculate the mass of solid sodium chloride remaining after steps 1 to 5?

Tick (✓) **one** box.

Mass of 25 cm^3 of salt solution + mass of empty evaporating dish ☐

Mass of 25 cm^3 of salt solution − mass of empty evaporating dish ☐

Mass of evaporating dish and dry contents + mass of empty evaporating dish ☐

Mass of evaporating dish and dry contents − mass of empty evaporating dish ☐

(1)

(e) The student calculated the concentration of sodium chloride in the salt solution.

The table below shows the results.

Concentration of sodium chloride in g/dm^3			
Trial 1	**Trial 2**	**Trial 3**	**Trial 4**
35.2	34.6	36.4	33.8

The percentage by mass of sodium ions in sodium chloride is 39.3%.

Calculate the mean concentration of sodium ions in the salt solution.

_____

_____

_____

_____

_____

_____

_____

Mean concentration = _____ g/dm^3

(4)

(Total 10 marks)

Q2.

This question is about chemical analysis.

Potassium bromide is used in medicine.

A scientist tested a sample of medicine to show the presence of potassium ions and of bromide ions.

The sample is soluble in water.

(a) Plan a method the scientist could use to show that the sample of medicine contains potassium ions **and** bromide ions.

The scientist has:

- a Bunsen burner
- a metal wire
- test tubes
- a dropping pipette
- distilled water
- dilute nitric acid
- silver nitrate solution.

You should give the results of the tests. **(chemistry only)**

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

The scientist could also use an instrumental method to show the presence of potassium ions in the medicine.

(b) Which instrumental method could be used to show the presence of potassium ions in the medicine? **(chemistry only)**

_____

(1)

(c) Give **one** advantage of using this instrumental method instead of a chemical test. **(chemistry only)**

_____

_____

(1)

(Total 8 marks)

Q3.

This question is about water.

A student investigated pure water.

The student measured:

- the boiling point of pure water
- the pH of pure water.

(a) Complete the sentences.

Choose answers from the box.

0	4	7	10	25	100

Pure water has a boiling point of _____ °C.

Pure water has a pH of _____.

(2)

(b) What could the student use to measure the pH of pure water?

_____

_____

(1)

A different student investigated sea water.

Sea water contains dissolved solids.

This is the method used.

1. Measure a 50 cm^3 sample of the sea water.
2. Heat the sample until all the water has evaporated.
3. Measure the mass of solid that remains.
4. Repeat steps 1 to 3 three more times.

(c) Which **two** pieces of equipment were needed in this investigation?

Tick (✓) **two** boxes.

Balance ☐

Measuring cylinder ☐

Ruler ☐

Thermometer ☐

Timer ☐

(2)

(d) The table below shows the results.

Sea water sample	**Mass of solid that remained in grams**
1	1.73
2	1.70
3	1.75
4	1.78

Calculate the mean mass of solid that remained.

_____

_____

_____

Mean mass = _____g

(2)

(e) A 50 cm^3 sample of sea water from a different source contained 1.50 g of dissolved solids.

Calculate the mass of dissolved solids in 1000 cm^3 of this sea water.

_____

_____

_____

Mass = _____g

(2)

Sodium chloride is a dissolved solid in sea water.

Sodium chloride contains sodium ions and chloride ions.

(f) Complete the sentence.

Choose the answer from the box. **(chemistry only)**

crimson	**lilac**	**yellow**

The student tested sea water for sodium ions using a flame test.

The colour of the flame was _____.

(1)

(g) Complete the sentence.

Choose the answer from the box. **(chemistry only)**

brown	**green**	**white**

The student tested sea water for chloride ions by adding nitric acid and silver nitrate solution.

The colour of the precipitate formed was _____.

(1)

(Total 11 marks)

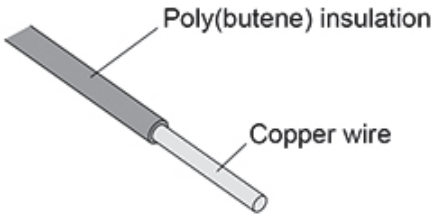
Q4.

This question is about copper wire and copper compounds.

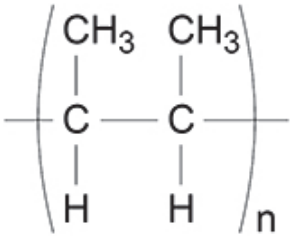
Copper is used to make electrical wires.

Figure 1 shows how copper electrical wire is insulated using an addition polymer called poly(butene).

Figure 1



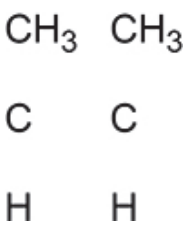
(a) The addition polymer poly(butene) has the displayed structural formula:



Poly(butene) is produced from the monomer butene.

Complete **Figure 2** to show the displayed structural formula of butene. **(chemistry only)**

Figure 2



(2)

Copper can be obtained by recycling scrap copper wire.

(b) Suggest why poly(butene) insulation must be removed from scrap copper wire before the copper is recycled.

_____

_____

(1)

(c) Describe how scrap copper wire can be recycled to make new copper water pipes.

_____

_____

_____

_____

(2)

(d) Suggest **two** reasons why recycling scrap copper is more sustainable than extracting copper from copper ores.

1 _____

_____

2 _____

_____

(2)

Copper sulfate is a compound of copper.

Copper sulfate solution contains copper(II) ions and sulfate ions.

(e) A solution can be added to copper sulfate solution to show the presence of copper(II) ions.

Name the solution added.

Give the result of the test. **(chemistry only)**

Name of solution added _____

_____

Result _____

_____

(2)

(f) Describe **one** test to show the presence of sulfate ions in copper sulfate solution.

Give the result of the test. **(chemistry only)**

Test _____

_____

Result _____

_____

(2)

(Total 11 marks)