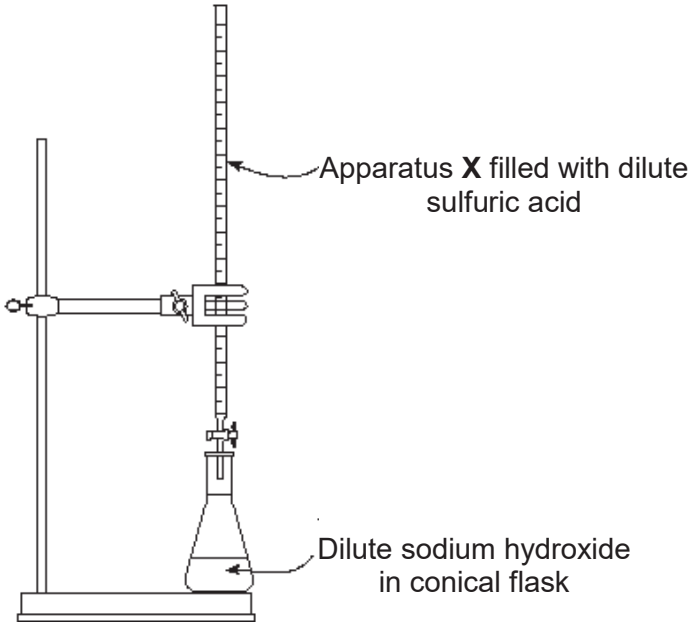
Section A

Answer **ALL** questions in the spaces provided.

1 The diagram below shows an experimental setup of a method of salt preparation. The dilute sulfuric acid was added drop wise into the dilute sodium hydroxide until the sodium hydroxide has been completely neutralised.



(a) Name apparatus **X** shown in the diagram above.

……[1]

(b) What is the method of salt preparation that is shown in the experimental setup above?

……[1]

(c) Write a balanced chemical equation for the reaction between sulfuric acid and sodium hydroxide in the salt preparation method shown above.

……[1]

(d) The experiment was repeated a second time, with a pH meter placed into dilute sodium hydroxide in the conical flask. The pH meter is able to track the changes in pH of the dilute sodium hydroxide as the reaction progresses.

The table below shows the pH values that the pH meter detected for the volumes of sulfuric acid that was added.

Volume of sulfuric acid added / cm^3	pH value in conical flask
0.00	13.0
5.00	13.0
10.00	13.0
15.00	12.6
20.00	13.0
25.00	11.2 and then 2.2
30.00	1.6
35.00	0.8
40.00	1.0
45.00	1.0
50.00	1.0

Table **1**

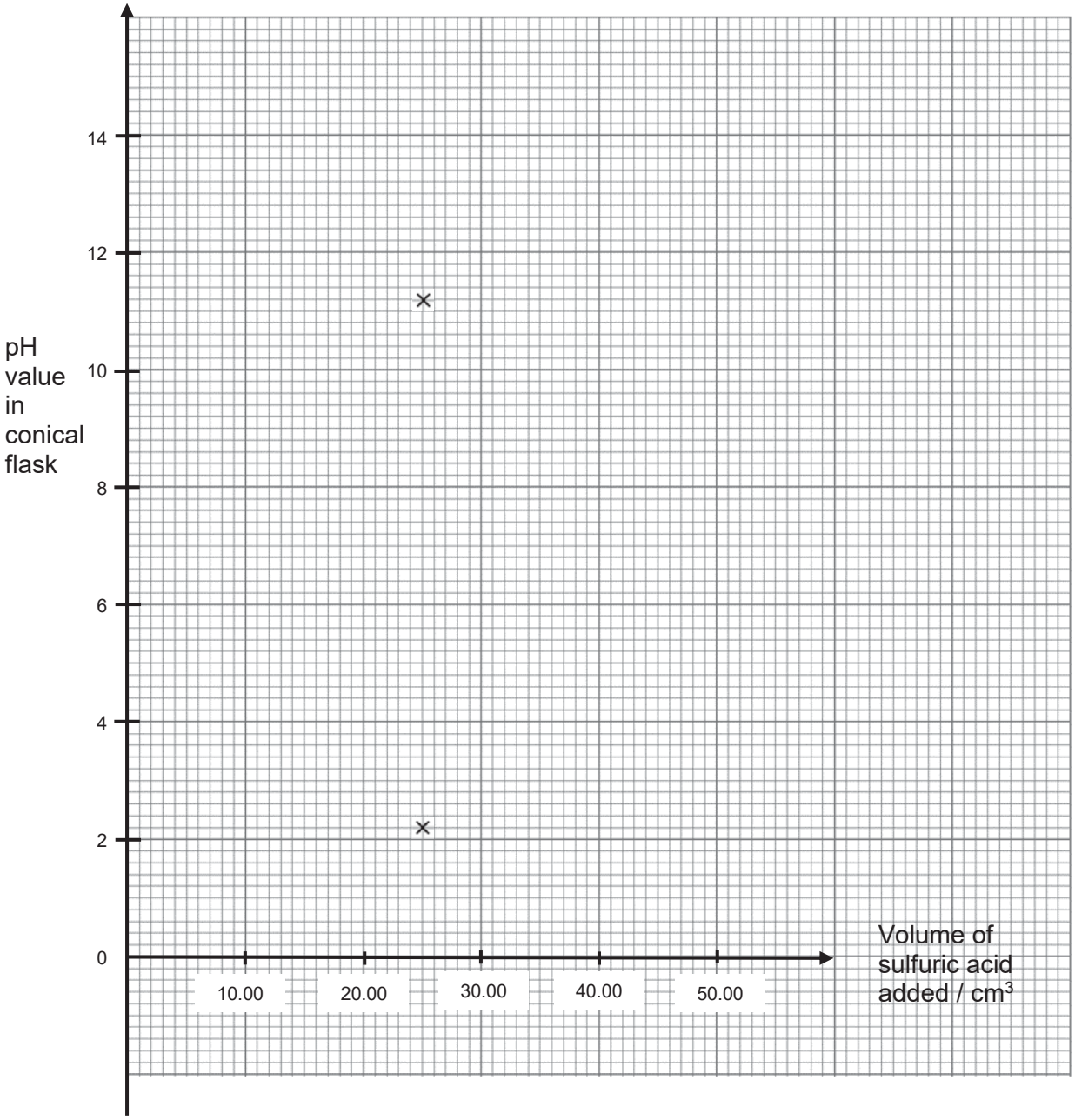
(i) Describe how the pH value in the conical flask changes as more acid is added.

……..

……..[1]

(ii) A graph of pH value against volume of sulfuric acid added/cm^3 is plotted using the values in the table above. Two of the points have been plotted for you on the next page.

Plot the remaining points and complete the graph by drawing a curved line of best fit on the grids provided on the next page.



[2]

(e) By referring to the graph above, suggest the volume of sulfuric acid needed to completely neutralise the dilute sodium hydroxide. Show how you have obtained your answer on the graph.

Volume of sulfuric acid needed = …… [1]

2 Large hydrocarbon molecules can be converted into smaller molecules through the process of cracking.

(a) Explain why cracking is important.

……

……[1]

(b) A hydrocarbon, undecane, $C_{11}H_{24}$, undergoes cracking to obtain ethene, hydrogen and another product.

Complete the balanced chemical equation for the cracking of undecane below.

$C_{11}H_{24} \rightarrow 2C_2H_4 + H_2 +$ …… [1]

(c) Draw the full structural formula of ethene produced from the cracking of undecane, showing all atoms and bonds present.

[1]

(d) Ethene produced from the cracking reaction above is widely used for different purposes. Calculate, in grams, the mass of ethene that can be obtained from the cracking of 1 kg of undecane.

Mass of ethene: ……[2]

(e) Describe a test that can be used to confirm that hydrogen gas is one of the products from the cracking of undecane. State the observation of the test.

Test: ……..

……[1]

Observation: …….

……[1]