Section A:

1. Which ion do acids produce in aqueous solutions?
   Tick one box.
   H^+ ☐
   OH^- ☐
   H^- ☐

2. Which ion do alkalis produce in aqueous solutions?
   Tick one box.
   H^+ ☐
   OH^- ☐
   H^- ☐

3. Add labels to this pH scale to show the pH of acidic, alkaline and neutral solutions.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

4. Which colour would Universal Indicator turn when added to an alkaline solution?
   Tick one box.
   Red/orange ☐
   Green ☐
   Purple/blue ☐

5. Which colour would Universal Indicator turn when added to an acidic solution?
   Tick one box.
   Red/orange ☐
   Green ☐
   Purple/blue ☐

Section B

6. Lots of different everyday substances can be classified as acids, bases or salts. Car batteries contain sulfuric acid, some cleaning products contain sodium hydroxide and table salt contains sodium chloride.

    a. Explain how Universal Indicator could be used to identify each of these substances.

_____
_____
_____
_____
_____
_____

    b. Describe another way that the pH of each substance could be measured.

_____
_____

    c. Explain the difference between a base and an alkali.

_____
_____

Sodium chloride can be made from a reaction between sodium hydroxide and hydrochloric acid.

    d. Name this type of reaction.

_____

    e. Write a balanced chemical equation for this reaction.

_____ (aq) + _____(aq) → _____ (aq) + _____ (l)

    f. What does the state symbol (aq) mean?

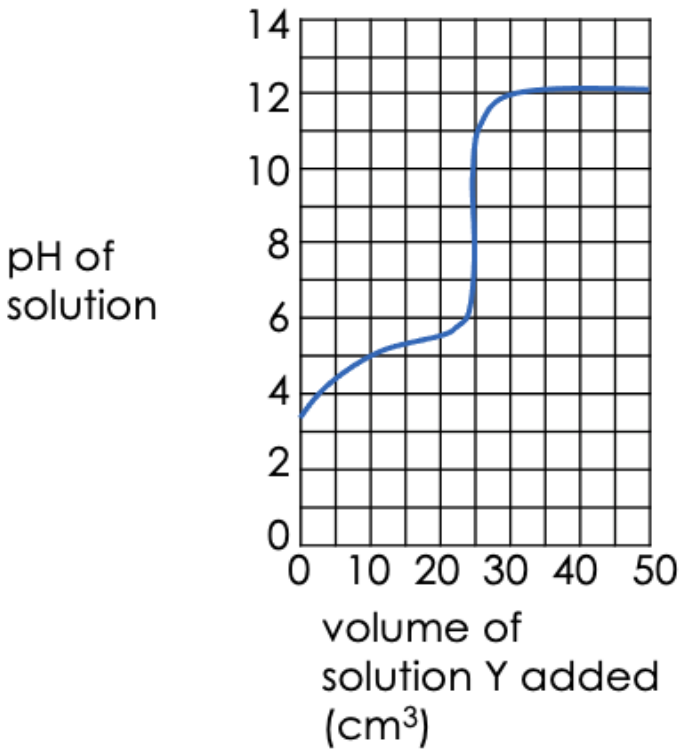
_____

g. Describe how the salt could be separated from the other product of this reaction.

h. A scientist wants to make sodium sulfate instead of sodium chloride. Which acid should they use?

i. Determine the chemical formula of sodium sulfate.

7. A student added solution Y to a beaker containing solution X. The graph shows how the pH of the resulting solution changed.



a. What was the pH of solution X before solution Y was added to it?

b. Was solution Y acidic, alkaline or neutral? Explain your answer.

c. What volume of solution Y was needed to completely react with solution X?

8. Explain what happens when an acid reacts with an alkali in terms of ions and molecules.

9. Complete the word equation for each reaction and write a balanced symbol equation.

   a. Barium hydroxide + hydrochloric acid →

   b. Sulfuric acid + sodium hydroxide →

   c. Lithium hydroxide + nitric acid →

10. Calculate the relative formula mass of each of the salts in Q9.

Section C

11. Sodium hydroxide reacts with hydrochloric acid.
    a. What is the alkali in this reaction?
    b. Write a word equation for this reaction.
    c. Write a balanced symbol equation for this reaction.
    d. Write the ionic equation for neutralisation.
    e. Name the salt produced in this reaction.
    f. Calculate the relative formula mass of this salt.
    g. Calculate the percentage by mass of sodium in this salt.
    h. Compare the physical properties of the elements that make up this salt with the properties of the salt as a compound.
    i. Identify the type of bonding in this salt.
    j. Draw a diagram to show how this bonding takes place.