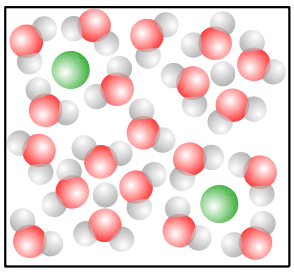
Aufgabenart: Textaufgaben (Englisch)
Fokus: Sachverständnis, produktive Verwendung der englischen Fachsprache

Please work on the following tasks!

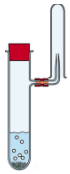
Sections „Acids“ and „Alkalis“

T1 Explain if gaseous hydrogen chloride is an acid according to the definition by Arrhenius.

T2  Describe what is shown in the picture. Then explain how hydrochloric acid and hydrogen chloride are connected.

T3 The indicator bromothymol blue was added to three aqueous solutions in the test tubes shown right. Explain which kind of solution (neutral, acidic, alkaline) is in each test tube.

T4 The indicator phenolphthalein was added to the aqueous solutions from T3. Referring to the different colours, explain what can be shown by the indicator phenolphthalein.

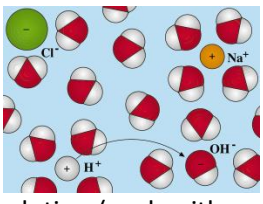
T5  Explain which kind of liquid is in the test tube, if the solid is zinc and the collected gas is hydrogen. Also name the compounds which are in the test tube at the end of the experiment.

T6 „It is easy to make alkaline solutions with alkali metals.“ Comment on this statement.

T7 In the 1980s the topic “acid rain” was discussed quite often. Acid rain is produced by sulfur dioxide from industrial emissions and by nitrogen oxides emitted by cars. Since combustion gas desulfurization plants and catalysts in cars were introduced, there is much less acid rain. Explain the formation of acid rain using reaction equations.

Section „Acid meets alkali“

T1 Describe what is shown by the picture using suitable terms. Then set up a reaction equation which described the processes shown in the picture.



T2 If you add 20 mL hydrochloric acid to 20 mL sodium hydroxide solution (each with c= 0.1 mol/L), you get a solution of table salt with the concentration of c= 0.05 mol/L. Explain which reaction takes place and why the concentration of the salt solution is c= 0.05 mol/L.

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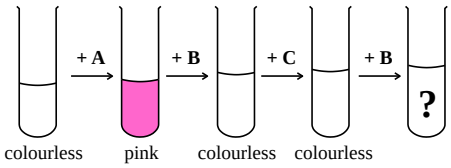
T3 In the first test tube in the right picture there is water and some of the indicator phenolphthalein. In the next steps the solutions A, B, C and B were added, which lead to the described colours.
Explain which of the solutions A, B and C is acidic, neutral or alkaline and name the colour of the solution in the last test tube.



T4 Explain why lime ($CaCO_3$) is used to fight against the damages acid rain can do to forests.

Section „The pH-scale“

T1 Describe the amounts of hydrogen ions and hydroxide ions in an acid, a neutral and in an alkaline solution.

T2 „That´s easy, if *pH-neutral* is written on a package of soap, it doesn´t contain any hydrogen-ions and hydroxide ions in excess.“ What do you think about this statement?

Section „Titrations“

T1 35 mL of an unknown acid are titrated with a sodium hydroxide solution with the concentration of c=0.2 mol/L. Following the calculation in the Flash tool, calculate the concentration of the acid if a) 35 mL sodium hydroxide solution were needed and if b) 8.75 mL sodium hydroxide solution were needed.

T2 Two students have to find out the concentration of acid in a sample of Coke using a titration with sodium hydroxide solution. The first student needs 12 mL sodium hydroxide solution with a concentration of c= 0.1 mol/L. The other student takes sodium hydroxide solution from a different container and needs only 6 mL sodium hydroxide solution. Find reasons for these different results.

T3 Nitric acid, hydrochloric acid and sulfuric acid are titrated with barium hydroxide solution $Ba(OH)_2$ (aq) with a concentration of c= 1 mol/L. Using reaction equations, explain why only half as much barium hydroxide solution is needed for the titration of sulfuric acid than for the other two titrations.

Section „Acids and your body“

T1 In an advertisement for a shampoo for little children you can find the following text:
„ *No more tears* can be daily used for the hair of little children. The product is pH-neutral and doesn´t burn in your kids´ eyes, because its pH is the same as the physiological pH of tears.“
What must be the pH of the advertised shampoo? Give reasons for your answer.

T2 Mike is packing his backpack for his summer camp. He puts in a piece of soap, as it doesn´t take too much room and can´t run out in his bag. After three weeks he comes back with hair which is not shiny anymore and very brittle. Explain why this has happened.

T3 Anorectic patients often have strongly damaged teeth and an irritated esophagus. Using your knowledge about acids, explain why this is so.

T4 Describe why enamel can be easily damaged by acids and how toothpaste containing fluoride can strengthen enamel and make it less sensitive to acids.

T5 Antacida help against heart burn (acid reflux). Many of them contain a mixture of aluminium hydroxide and magnesium hydroxide (Maaloxan®). Explain how antacida work.