

**O Level Combined Chemistry Structured**

**Acids and Bases Test 2.0**

Q1

Ammonia gas dissolves in water to form aqueous ammonia. Aqueous ammonia reacts with dilute sulfuric acid to produce a salt and water.

(i) Write the name and chemical formula of the salt produced. [1]

\_\_\_\_\_

(ii) State the name of the reaction between aqueous ammonia and sulfuric acid. [1]

\_\_\_\_\_

(iii) Write the ionic equation for the reaction between aqueous ammonia and sulfuric acid. [1]

\_\_\_\_\_

Q2

Calcium hydroxide reacts with ammonium sulfate to produce ammonia gas. The unbalanced chemical equation is shown below:



(a) Balance the chemical equation and give the state symbols. [2]

(b) State two observations of the above reaction.

.....

..... [2]

(c) Write the chemical name and formula of the salt formed, if ammonium nitrate is used, instead of ammonium sulfate.

Chemical name: .....

Chemical formula: ..... [2]

Q3

Sodium nitrate can be produced by the neutralisation of an acid and an alkali. The temperature of the solution increases during the reaction to prepare the salt.

(a) Name an acid and an alkali needed to prepare the salt.

..... [2]

(b) Explain why the temperature of the solution increases.

.....  
..... [1]

Q4

Three beakers containing three different colourless solutions had their labels removed. The three solutions are said to be hydrochloric acid, sodium carbonate and sodium chloride.

(a) Given only litmus papers and the three beakers of colourless solutions, [5]  
describe how the identity of solutions in each beaker can be identified.

.....  
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Q5

A single strand of hair consists of an inner cortex, surrounded by hair cuticles. Depending on the pH of the surroundings, the hair cuticles open or close. Fig. 8.1 shows the appearance of hair cuticles at different pH.

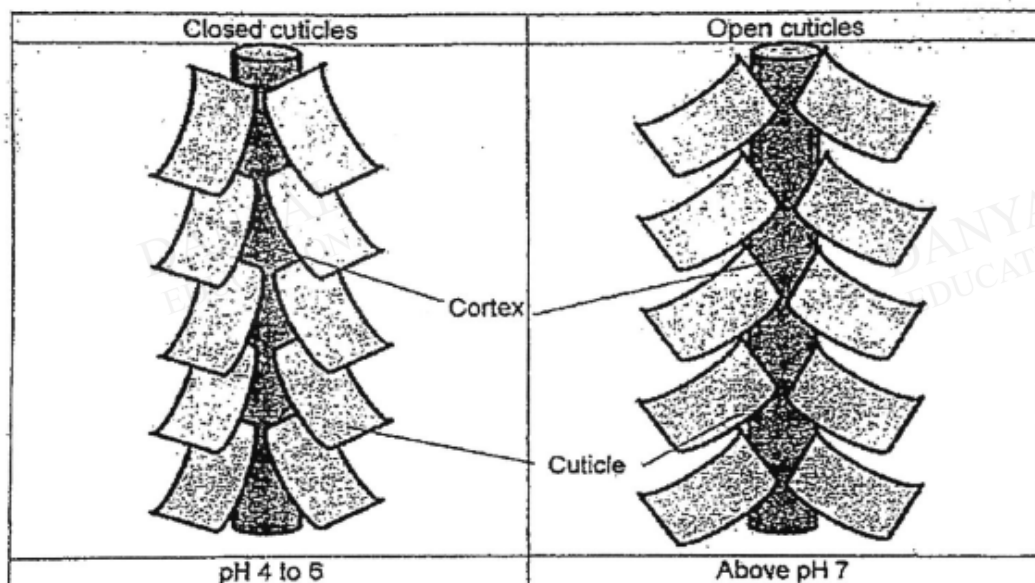


Fig. 8.1

Open cuticles will result in tangles. Conditioners are often used after shampooing to make hair more manageable and tangle free.

(a) Name the type of chemical reaction that has occurred when an acid reacts with a base or alkali.

..... [1]

(b) Are hair conditioners acidic or alkaline? Explain using the information from Fig. 8.1.

.....  
..... [2]

(c) Hair colours are applied directly to the hair cortex. Hair dressers usually use a relaxer on the hair to open the cuticles before applying the dye.

Predict the colour of the universal indicator when added to the relaxer. Explain using the information from Fig. 8.1.

.....  
..... [2]

**Answers**

**Atmosphere Test 2.0**

Q1

- (i) ammonium sulfate,  $(\text{NH}_4)_2\text{SO}_4$  [1]  
 (ii) neutralization [1]  
 (iii)  $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$  [1]

Q2

|     |  |                               |
|-----|--|-------------------------------|
| (a) | $\text{Ca}(\text{OH})_2(\text{aq}) + \dots(\text{NH}_4)_2\text{SO}_4(\text{aq}) \rightarrow 2\text{NH}_3(\text{g}) + \dots\text{CaSO}_4(\text{s}) + 2\text{H}_2\text{O}(\text{l})$<br>1m - state symbols; 1m - balancing | [2]                           |
| (b) | A pungent gas will be observed.<br>A white precipitate will form.  | 2m - Any two observations [2] |
|     | Effervescence will be observed.<br>Damp red litmus turns blue.   |                               |
| (c) | Chemical name: <u>Calcium nitrate</u>  | [1]                           |
|     | Chemical formulae: <u><math>\text{Ca}(\text{NO}_3)_2</math></u>  | [1]                           |

Q3

- a) The acid used is nitric acid, while the alkali used is sodium hydroxide.  
 b) The reaction between the acid and the alkali is an exothermic reaction, which releases heat energy to the surroundings.

Q4

**Dip litmus paper into the three solutions. [1]**

**The solution that turns blue litmus paper red contains hydrochloric acid [1]**

**Add the hydrochloric acid identified into the other two beakers [1]**

**The beaker that shows bubbles forming contains sodium carbonate solution [1]**

**The beaker with no visible change is sodium chloride solution. [1]**

Q5

|   |   |
|---|---|
| a | Neutralization  |
| b | Acidic. Conditioners cause the cuticles to close and hence pH of 4 to 6.                              |
| c | Blue or purple.<br>Relaxers cause the cuticles to open exposing the hair cortex and hence pH above 7. |

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