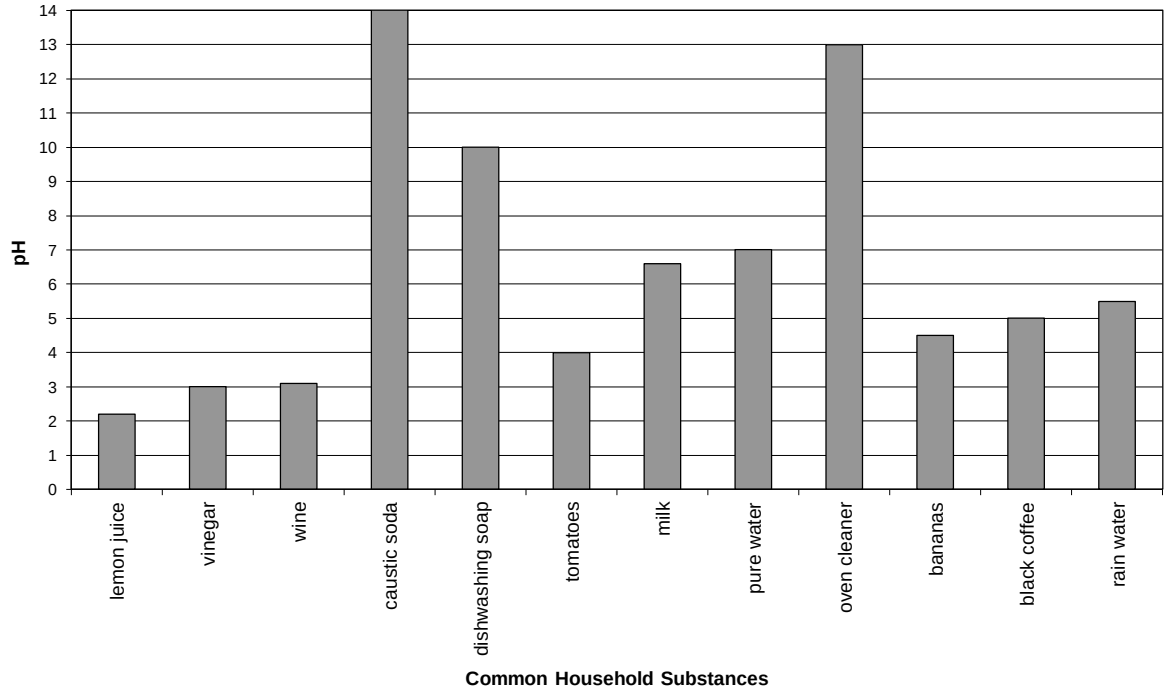
Grade 8 Natural Science Worksheet

Physical Sciences - chemistry, acids

Acids and Bases

Acids and bases are found all over our homes. Scientists use the pH scale to measure how acidic or basic a liquid is. Not all acids are dangerous, we even have acids in our bodies. In fact, bases can be just as dangerous. Any liquid which has a pH that is on either extreme of the pH scale can be considered very dangerous.

Graph showing the pH of some common household substances



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Use the above graph to answer the following questions:

1. Categorise the household substances as either acidic solutions, alkaline solutions or neutral solutions.

Acids	Bases	Neutral

[12]

2. Why do you think that rainwater has a much lower pH than pure water? [2]

3. Identify the most dangerous acid and the most dangerous base. [2]

4. Record these liquids from the graph on the diagram representing the pH scale. [3]

The pH scale

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

5. Your teacher has provided you with a selection of the substances in the graph that have been suitably diluted. Investigate the properties of acids and bases and write your observations in the table below.

Property	Acidic solution	Alkaline solution
The liquid tastes …		
The liquid feels …		
Reaction with bromothymol blue indicator		
Reaction with litmus paper		

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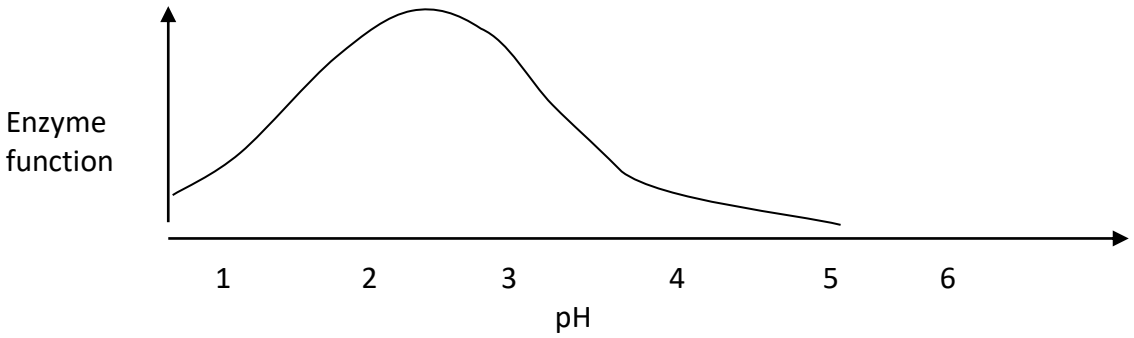
[8]

6. Pepsin is an enzyme that is released in the stomach and is responsible for breaking food proteins down.

Use the graph showing the function of pepsin at various pH-levels to answer the following questions:



6.1 Name the independent variable. [2]

6.2 Name the dependent variable. [2]

6.3 What pH would you estimate stomach acid is in order for pepsin to function most efficiently? (You can give a range.) [2]

6.4 If somebody is suffering from indigestion or acid reflux, what would you recommend they take? How effective do you think drinking milk will be? [2]

[35 marks]

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Suggested Solutions

<table>
<tr><th>Question number</th><th>Possible marks</th><th>Solution</th></tr>
<tr><td>1</td><td>12</td><td>1 mark (✓) for each correctly identified acid, base or neutral substance
<table>
<tr><th>Acids</th><th>Bases</th><th>Neutral</th></tr>
<tr><td>lemon juice</td><td>caustic soda</td><td>pure water</td></tr>
<tr><td>vinegar</td><td>dishwashing soap</td><td></td></tr>
<tr><td>wine</td><td>oven cleaner</td><td></td></tr>
<tr><td>tomatoes</td><td></td><td></td></tr>
<tr><td>milk</td><td></td><td></td></tr>
<tr><td>bananas</td><td></td><td></td></tr>
<tr><td>black coffee</td><td></td><td></td></tr>
<tr><td>rainwater</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>2</td><td>2</td><td>Rainwater has dissolved gases from air pollution and is not pure water.</td></tr>
<tr><td>3</td><td>2</td><td>Most dangerous acid = lemon juice.
Most dangerous base = caustic soda.</td></tr>
<tr><td>4</td><td>3</td><td>1 mark for each: – correct order ✓
– correct pH ✓
– neatness ✓
Household substances arranged in order:
Lemon juice, vinegar, wine, tomatoes, bananas, black coffee, rainwater, milk, pure water, dishwashing soap, oven cleaner, caustic soda.</td></tr>
<tr><td>5</td><td>8</td><td>
<table>
<tr><th>Property</th><th>Acidic solution</th><th>Alkaline solution</th></tr>
<tr><td>The liquid tastes</td><td>sour</td><td>nasty</td></tr>
<tr><td>The liquid feels</td><td>normal</td><td>slippery</td></tr>
<tr><td>Reaction with bromothymol blue indicator</td><td>yellow</td><td>blue</td></tr>
<tr><td>Reaction with litmus paper</td><td>red</td><td>blue</td></tr>
</table></td></tr>
<tr><td>6</td><td>8</td><td>6.1 Independent variable – pH. ✓✓ (2 marks)
6.2 Dependent variable – enzyme function. ✓✓ (2 marks)
6.3 pH range of 1 – 3. ✓✓ (2 marks)
6.4 Give an antacid or alkaline solution like bicarbonate of soda. ✓
Milk is actually slightly acidic and will therefore not provide much relief. ✓ (2 marks)</td></tr>
</table>