

## KS3 Acids and Bases

Question Paper

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

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Time: **39 minutes**

Marks: **57 marks**

Comments:

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1.

Michelle added some universal indicator solution to four liquids.

Michelle uses the pH chart to fill in her table of results.

**pH chart**

<b>pH</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>colour</b>	red			orange			green	blue			purple			

(a) The table below shows some of Michelle's results.

Complete Michelle's table of results below.

Use the pH chart to help you.

liquid	colour of universal indicator solution	pH
milk	green	
rain water		5
hydrochloric acid	red	
bleach		11

2 marks

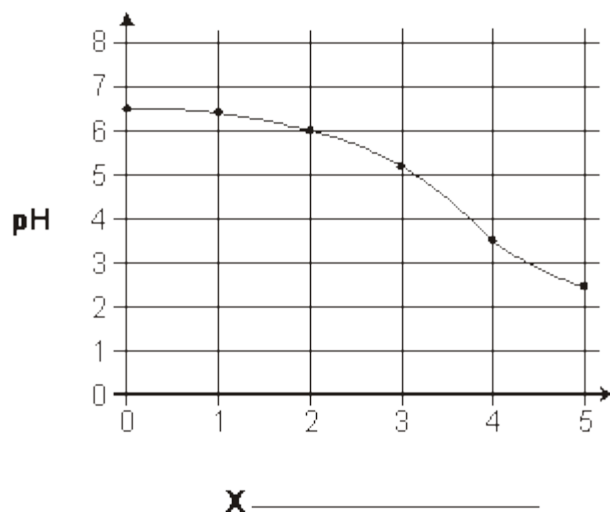
(b) Explain why using acids can be dangerous.

.....  
.....

1 mark

(c) Michelle measured the pH of some milk stored at room temperature for five days.

The graph of Michelle's results is shown below.  
One of the axes has been labelled.



1 mark

(i) Write the axis label for the graph at **X**.

(ii) Use the graph. How does the pH of the milk change over the five days?

.....

1 mark  
maximum 5 marks

2.

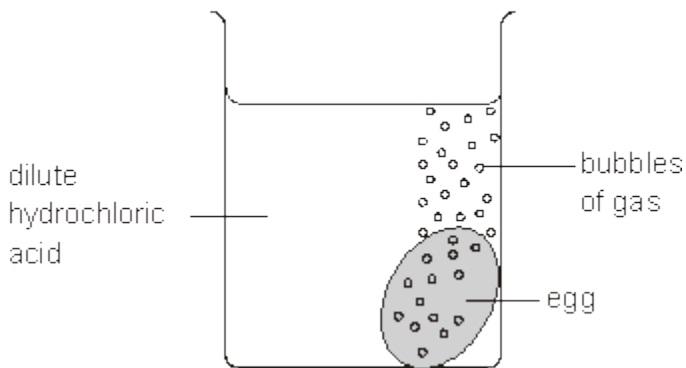
(a) The table below shows the pH of four acidic liquids.

acidic liquid	pH
grapefruit juice	3.1
ethanoic acid	3.0
lemonade	4.4
dilute hydrochloric acid	1.0

Which of these liquids is the **least** acidic?

1 mark

- (b) Emilio cooked an egg until it was hard-boiled. He put the egg in a beaker of dilute hydrochloric acid as shown.



- (i) The egg shell reacted completely with the acid. After two days the pH of the liquid in the beaker was 2.5.

How did the **acidity** of the liquid in the beaker change? Use the table above to help you.

.....

1 mark

- (ii) Emilio put another hard-boiled egg in some ethanoic acid. It took longer for the shell to react completely.

Use the table opposite to suggest a reason for this.

.....  
 .....

1 mark

- (c) The chemical formulae for four acids are shown in the table below.

<b>sulphuric acid</b>	<b>hydrochloric acid</b>	<b>nitric acid</b>	<b>ethanoic acid</b>
$\text{H}_2\text{SO}_4$	$\text{HCl}$	$\text{HNO}_3$	$\text{CH}_3\text{COOH}$

- (i) Give the **name** of the element that is present in all four acids.

.....

1 mark

- (ii) Give the **names** of the two **other** elements present in sulphuric acid.

1. ....

1 mark

2. ....

1 mark

(iii) How many atoms are there in the formula  $\text{HNO}_3$  (nitric acid)?

.....

1 mark  
maximum 7 marks

**3.** Paul had four substances:

**citric acid**

**copper sulphate**

**indigestion tablet**

**sugar**

He dissolved 1 g of each substance in  $20 \text{ cm}^3$  of distilled water.  
He used universal indicator to find the pH of each solution.

(a) (i) Sugar solution does **not** change the colour of green universal indicator.

What does this tell you about sugar solution?  
Tick the correct box.

It is an acid.

It is an alkali.

It is neutral.

It is sweet.

1 mark

(ii) Suggest the pH of citric acid.

.....

1 mark

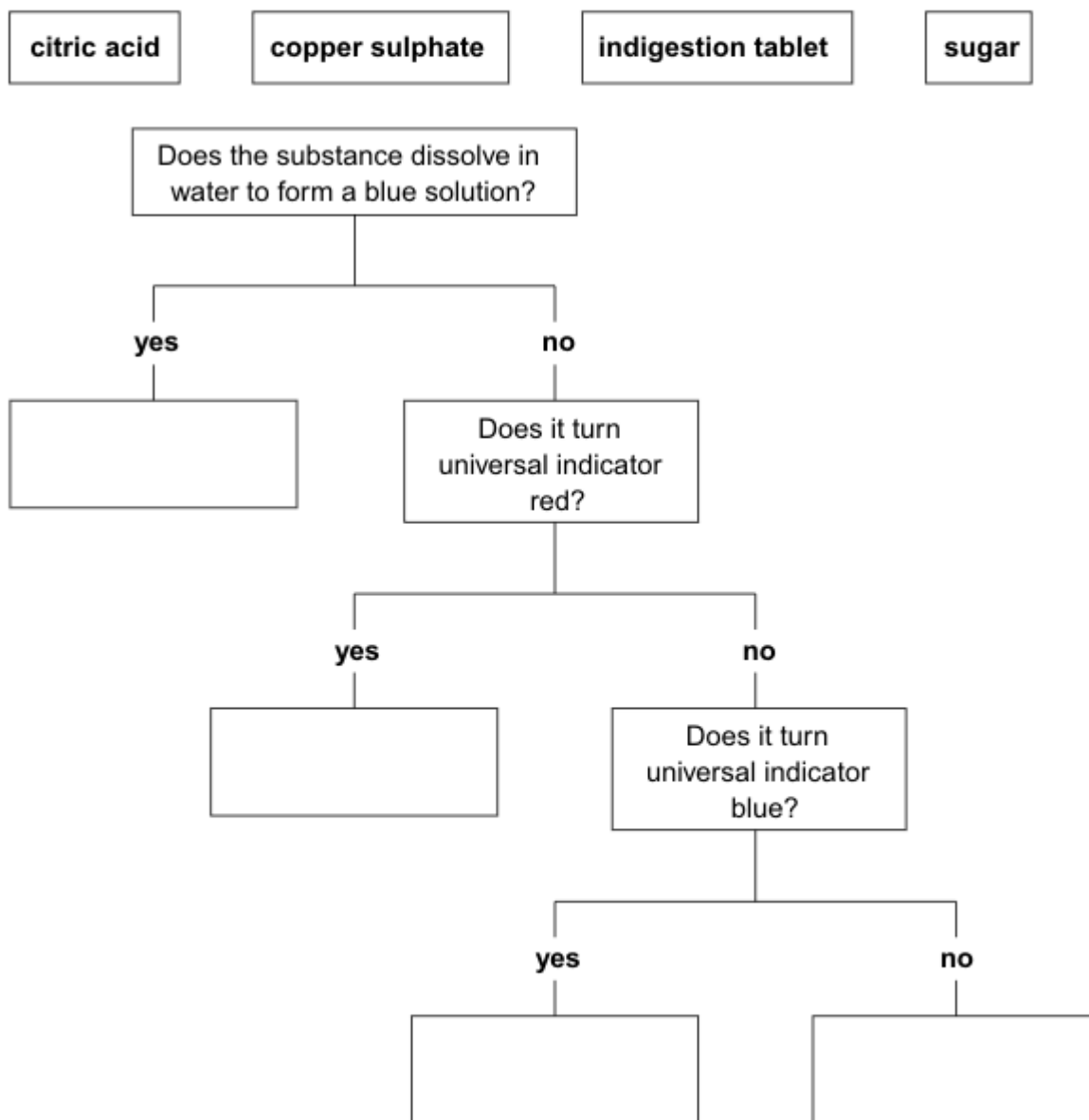
(iii) Indigestion tablets neutralise acid in the stomach.

What does this tell you about indigestion tablets?

.....

1 mark

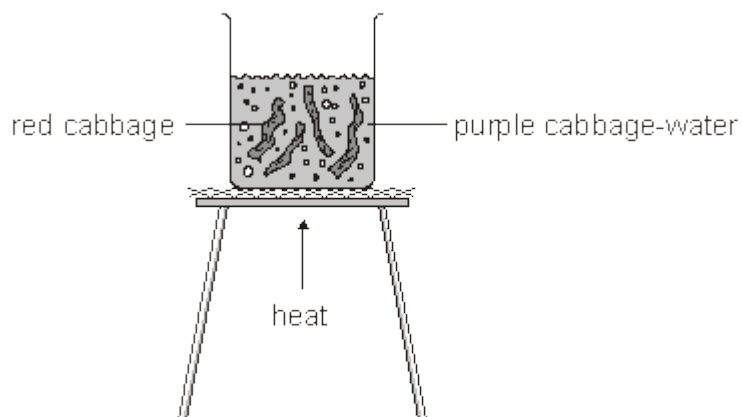
(b) Complete the flow chart below with the names of the substances in the boxes.



3 marks  
maximum 6 marks

4.

Sharna boiled some red cabbage in water. The cabbage-water turned purple.



- (a) (i) Sharna separated pieces of cabbage from the cabbage-water.

Which method did she use?

Tick the correct box.

chromatography	<input type="checkbox"/>	filtration	<input type="checkbox"/>
condensation	<input type="checkbox"/>	freezing	<input type="checkbox"/>

1 mark

- (ii) Sharna wanted to find out if the purple cabbage-water contained more than one **coloured** substance.

Which method did she use?

Tick the correct box.

chromatography	<input type="checkbox"/>	filtration	<input type="checkbox"/>
condensation	<input type="checkbox"/>	freezing	<input type="checkbox"/>

1 mark

- (b) Sharna mixed the purple cabbage-water with some other liquids. She wrote the colours of the mixtures in a table as shown below.

	colour of cabbage-water mixed with liquid	Is the liquid acidic, alkaline or neutral?
liquid 1	red	acidic
liquid 2	blue	alkaline
liquid 3	purple	neutral

Use the information in the table to answer parts (i) and (ii) below.

- (i) Sharna mixed cabbage-water with colourless washing-up liquid. The mixture turned **blue**.

What does this tell you about the washing-up liquid?

.....

1 mark

- (ii) Sharna then mixed cabbage-water with lemon juice.  
Lemon juice is **acidic**.

What colour was the mixture?

.....

1 mark

- (c) What is the name of a chemical which changes colour when it is mixed with acids or alkalis?

Tick the correct box.

filtrate

indicator

non-metal

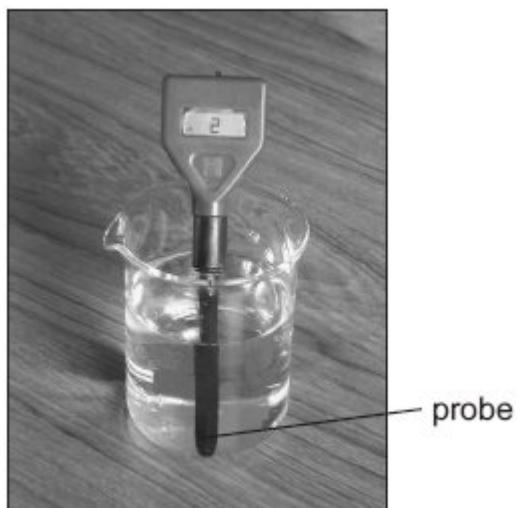
solution

1 mark

maximum 5 marks

5.

Molly used a pH sensor to test different liquids. She dipped the probe of the sensor into each liquid and recorded the pH value in a table.





- (a) In the table below, tick **one** box for each liquid to show whether it is **acidic**, **neutral** or **alkaline**. One has been done for you.

liquid	pH value	acidic	neutral	alkaline
alcohol	7			
dilute hydrochloric acid	2	✓		
distilled water	7			
vinegar	3			
sodium hydroxide solution	11			

2 marks

- (b) Between each test Molly dipped the probe into distilled water.

- (i) Why did she do this?

.....  
 .....

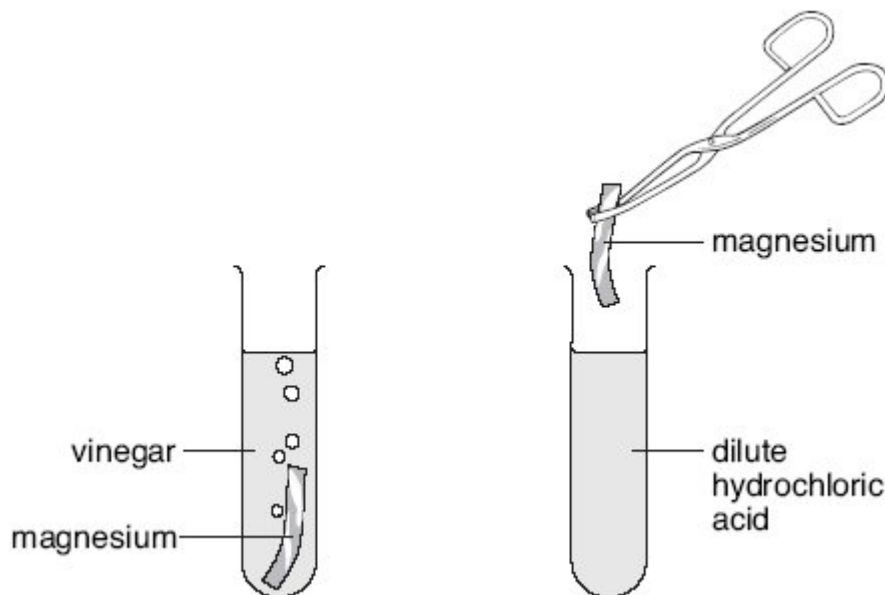
1 mark

- (ii) Which other liquid in the table could Molly use between tests to have the same effect as distilled water?

.....

1 mark

- (c) Molly put a piece of magnesium into a test-tube containing 20 cm<sup>3</sup> of vinegar. She put another piece of magnesium into a test-tube containing 20 cm<sup>3</sup> of dilute hydrochloric acid.



(i) Molly thought that magnesium would react more vigorously with hydrochloric acid than with vinegar.

What information in the table made Molly think this?

.....  
.....

1 mark

(ii) How would Molly be able to tell if a more vigorous reaction took place with hydrochloric acid than with vinegar?

.....  
.....

1 mark

(d) (i) Complete the word equation for the reaction between magnesium and hydrochloric acid.

magnesium + hydrochloric acid → ..... + .....

2 marks

(ii) After some time this reaction stopped. Why did the reaction stop?

.....  
.....

1 mark

maximum 9 marks

6.

Table 1 below shows the colour of universal indicator in acidic, neutral and alkaline solutions.

	<b>acidic</b>			<b>neutral</b>	<b>alkaline</b>		
	←				→		
<b>colour of indicator</b>	red	orange	yellow	green	blue	dark blue	purple

table 1

Ramy tested different liquids with the indicator solution.  
His results are shown in table 2 below.

liquid	colour of indicator solution
Milk	green
lemonade	orange
water	green
fruit juice	red
washing-up liquid	blue

**table 2**

(a) Use Ramy's results to answer the following questions.

(i) Give the name of **one** acidic liquid in **table 2**.

.....

1 mark

(ii) Give the name of **one** neutral liquid in **table 2**.

.....

1 mark

(b) Ramy dissolved some bicarbonate of soda in distilled water.  
This produced an alkaline solution.

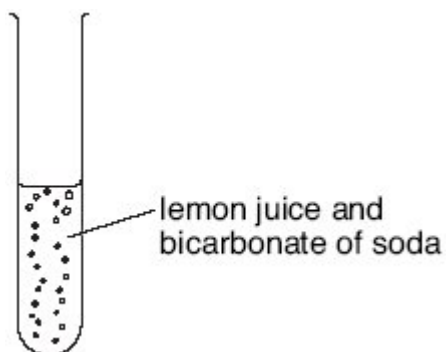
(i) Ramy added the indicator to the alkaline solution.

Suggest what colour the indicator became.  
Use **table 1** to help you.

.....

1 mark

(ii) Ramy added lemon juice to the solution of bicarbonate of soda.



How could he tell that a gas was produced?

.....

1 mark

(c) Ramy mixed an acid with an alkali and tested the mixture with the indicator solution.

The indicator solution turned green.

What is the name of the reaction between an acid and an alkali?

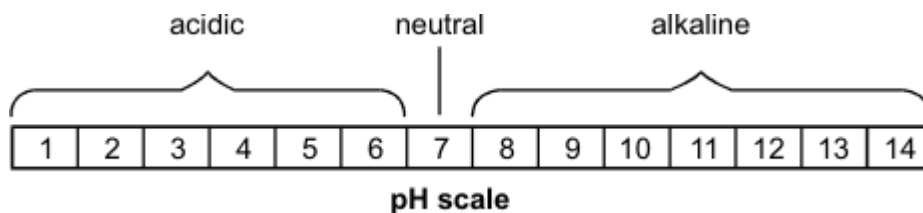
Tick the correct box.

- condensation
- crystallisation
- evaporation
- neutralisation

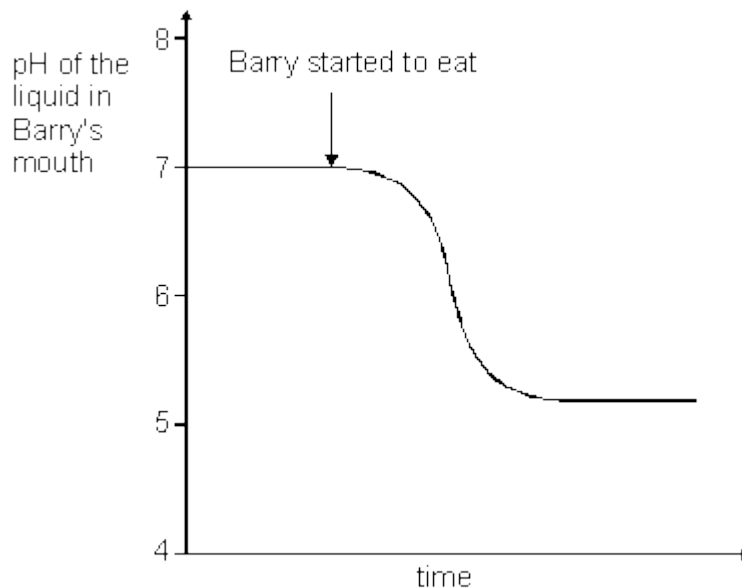
1 mark  
maximum 5 marks

7.

The pH scale shown below is used to measure how acidic or alkaline a solution is.



The graph below shows how the pH of the liquid in Barry's mouth changed as he ate a meal.



(a) (i) Use the **graph** to give the pH of the liquid in Barry's mouth before he started to eat.  
pH .....

1 mark

(ii) What does this pH tell you about the liquid in Barry's mouth before he started to eat?

Use the **pH scale** above to help you.  
Tick the correct box.

It was acidic.      It was alkaline.      It was colourless.      It was neutral.





1 mark

(b) Look at the **graph** above.  
What happened to the pH of the liquid in Barry's mouth as he ate the meal?

.....

1 mark

- (c) Barry chews special chewing gum after each meal. The chewing gum neutralises the liquid in his mouth.

What type of substance neutralises an acid?

Tick the correct box.

an acid

an alkali

an indicator

a solid

1 mark  
Maximum 4 marks

8.

- (a) Complete the word equation below for the reaction between calcium carbonate and hydrochloric acid.



1 mark

Limestone is mainly calcium carbonate. It is weathered by acids in the air or in soil.

- (b) In June 1990, a Year 9 class planned a long-term investigation into the chemical weathering of limestone by acids in soil.

They put limestone chippings of similar size in three nylon mesh bags. They buried the bags outside in soils of different pH.



sample A  
in soil of pH5



sample B  
in soil of pH7



sample C  
in soil of pH8

- (i) Chemical weathering took place in sample A, and the mass of the sample decreased.

Give the reason for the decrease in mass. Use the word equation above to help you.

.....  
.....

1 mark

- (ii) The pupils predicted that chemical weathering would **not** take place in samples B and C.

Give the reason for their prediction.

.....  
 .....

1 mark

- (iii) Some chemical weathering did take place in samples B and C. What could have changed the conditions in these soils to cause weathering to take place?

.....

1 mark

- (c) The table shows how the mass of each sample changed between the years 1990 and 2000.

year	mass, in g		
	sample A, at pH 5	sample B, at pH 7	sample C, at pH 8
1990	1000	1000	1000
1995	980	992	997
2000	960	984	995

In 2000, a year 9 class buried another identical 1000 g sample of limestone chippings in soil of pH 6.

- (i) Use the results in the table to predict an approximate value for the mass of this sample in 2010.

..... g

1 mark

- (ii) Why is it **not** possible to be certain what the mass of this sample will be in 2010?

.....  
 .....

1 mark

Maximum 6 marks

**9.**

Water from red cabbage can be used to find out if a liquid is acidic, alkaline or neutral.

Type of liquid added to the cabbage water	colour of the cabbage water
acidic	red
alkaline	blue
neutral	purple

John added three different liquids to the cabbage water.

(a) Use the information above to complete the table below.

Liquid added to the cabbage water	colour of the cabbage water	Is the liquid acidic, alkaline or neutral?
water	purple	
lemon juice		acidic
washing up liquid	blue	

3 marks

(b) What word describes chemicals which change colour in acids or alkalis?  
Tick the correct box.

filters	<input type="checkbox"/>	indicators	<input type="checkbox"/>
liquids	<input type="checkbox"/>	solids	<input type="checkbox"/>

1 mark

Maximum 4 marks

**10.**

pH paper is used to show whether a solution is acidic, neutral or alkaline.

One type of pH paper shows the following range of colours.

<b>colour of pH paper</b>	red	orange	yellow	green	blue	purple
<b>pH value</b>	0 - 4	5	6	7	8 - 10	11 - 14



Some solutions were tested with pH Paper. The results are shown below.

(a) Complete the following table by placing a tick in the correct column for each substance.

substance	colour of pH paper	acidic	neutral	alkaline
orange juice	red			
egg white	blue			
oven cleaner	purple			
milk	yellow			

4 marks

(b) Which substance was the most alkaline?

.....  
.....

1 mark

(c) Equal amounts of egg white and milk are mixed. What is the most likely pH of the mixture?

Tick the correct box.

pH2	pH6	pH7	pH14
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1 mark

Maximum 6 marks