

HELP

- 1 The Catalyst Chemical Company uses hazard labels on its chemical bottles. The glue was useless and they all fell off. Look at the information about each chemical shown below.

Dilute hydrochloric acid
Irritant solution
Wear eye protection
Catalyst Chemicals

Dilute phenol solution
Harmful solution
Wear eye protection
Wear gloves
Catalyst Chemicals

Sodium hydroxide pellets
Corrosive solid
Wear eye protection
Wear gloves
Catalyst Chemicals

Here are the three hazard labels that fell off.



A



B



C

Copy and complete the table to show which label belongs on each bottle.

Chemical	Symbol A, B or C?
dilute hydrochloric acid	
dilute phenol solution	
sodium hydroxide pellets	

- 2 The substances listed below are either acids or alkalis. For each substance, write down whether it is an acid or an alkali.
- a oven cleaner
 - b lemon juice
 - c car battery solution
 - d sodium hydroxide solution
 - e a cola drink
- 3 Copy and complete the following sentence about what indicators do. Indicators are useful because they ...

CORE

- 4** Litmus is a common indicator. You can have either blue litmus or red litmus. When you add an alkali to red litmus, it turns blue. When you add an acid to blue litmus, it turns red.

Copy and complete this table to show what happens when you add different substances to litmus. The first row has been done for you.

Substance	Effect on blue litmus	Effect on red litmus	Acid or alkali?
sodium carbonate solution	stays blue	turns blue	alkali
vinegar	turns red	stays red	
potassium hydroxide solution	stays blue		alkali
stomach contents	turns red		

- 5** Your clumsy friend has spilt a bottle of dilute hydrochloric acid (irritant) on the bench and it is dripping onto the floor.
- What must you do straight away to make people aware of the problem?
 - How should the spillage be made safe?
 - Suppose some of the acid got onto your hand. What would you do?
 - Why would this be necessary?
 - Why must you wear safety spectacles when handling dilute hydrochloric acid?

EXTENSION

- 6 a** Compare and contrast the terms 'base' and 'alkali'.

The table gives some information about bee stings, wasp stings and antidotes. Read it carefully.

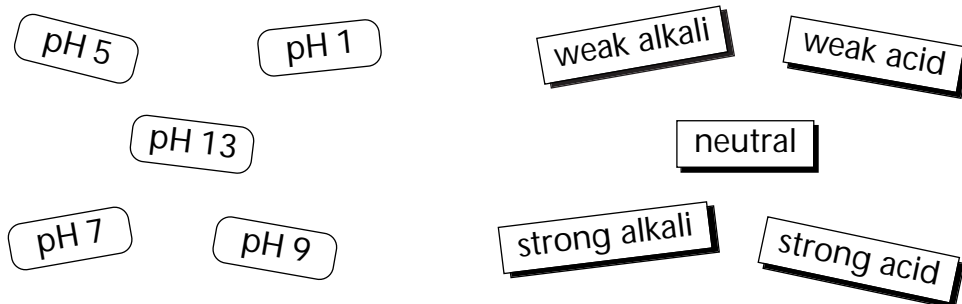
- b** What would be the best substance to rub onto a wasp sting?

- c** Explain why your substance would ease the pain of the sting.

Substance	Information
bee sting	contains an acidic irritant
wasp sting	contains an alkaline irritant
vinegar	a weak acid
baking soda	a weak alkali when dissolved

HELP

1 Write out each pH number along with its correct description.



2 Copy and complete the table. Use the pH numbers and colours from the lists below to fill in the gaps. Use each number or colour only once.

Solution	Description	pH number	Colour of universal indicator paper
hydrochloric acid	strong acid		
boric acid	weak acid		
sodium hydroxide	strong alkali		
sodium hydrogencarbonate	weak alkali		
distilled water	neutral		

pH numbers

1
5
7
9
14

Colours

purple
red
yellow
greenish blue
green

CORE

3 For each solution, choose its most likely pH value from the list in the box.

- a orange juice (medium strength acid)
- b baking powder (weak alkali)
- c paint stripper (very strong alkali)
- d car battery acid (very strong acid)
- e water (neutral)

1	4	7	9	14
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4 Some of the sentences below have a mistake in them. If the sentence is correct, write 'true'. If it has a mistake, rewrite it, correcting the error. Do not change the underlined part.

- a Neutral substances have a pH of 6.
- b Weak acids have a pH of less than 3.
- c Strong acids have low pH values.
- d High pH values mean weak alkalis.
- e A solution of pH 5 is a weak acid.

EXTENSION

5 You will need these words for this question.

alkali (or alkaline)

acid (or acidic)

solution

neutral

strong (or strongly)

weak (or weakly)

concentrated

dilute

Read the statements below about five different chemicals. Write a sentence about each chemical, using appropriate words from the list above. The first one has been done for you.

- a Sulphuric acid solution has a pH of 1. *Example: Sulphuric acid is a strong acid.*
- b Ammonia solution has a pH of 11.
- c A bottle of potassium hydroxide solution contained a lot of potassium hydroxide dissolved in a small amount of water.
- d Some hair shampoos have a pH of 7.
- e Rainwater consists mostly of water with only a small amount of added chemicals, and has a pH of 5.6. (*Hint: use two key words.*)

HELP

- 1 Copy and complete these sentences, choosing from the words below.

rises

base

acidic

neutral

falls

If you add a to an acid, you take away the acidity.

The pH and you get a solution.

- 2 a The sentences below describe how to get a neutral solution, starting from sodium hydroxide solution. They are in the wrong order. Rewrite them in the correct order.
- A When the solution becomes green, stop adding acid.
 - B Put 10 cm³ of sodium hydroxide solution into a small conical flask.
 - C Add drops of hydrochloric acid to the flask from a dropper, counting the drops.
 - D Write down the number of drops of acid added.
 - E Gently swirl the flask after each drop of acid.
 - F Add a few drops of universal indicator solution so that it just goes purple.
- b Copy and complete these sentences.
- i The name of this type of chemical reaction is ...
 - ii The colour of the neutral solution is ...

CORE

- 3 a In question 2, why is it important to count the number of drops?
- b How would you use this procedure to get a neutral solution that is not coloured?

- 4 a i** 'Tum-eaze' is a medicine for acid indigestion. Suggest the pH of stomach contents.
- ii** If 'Tum-eaze' neutralises excess stomach acid, what sort of substance must it contain?
- iii** What will happen to the amount of acid in the stomach contents after taking 'Tum-eaze'?
- b** Most plants grow best in soil that is just alkaline. In Derbyshire, some of the soil is quite acidic. Farmers spread lime on their fields. Explain why this helps their crops to grow better.

EXTENSION

- 5** You will need a sheet of graph paper for this question.

A pupil put 50 cm³ of alkali into a flask and added a little universal indicator solution. She added acid from a measuring cylinder, in 10 cm³ amounts. After each addition of acid, she matched the colour of the liquid in the flask against a colour chart and estimated the pH of the solution in the flask. She made sure everything in the flask was well mixed before she matched the colour.

Here are her results from just one attempt.

Volume of acid added in cm³	0	10	20	30	40	50
pH of solution in the flask	14	11	9	7.5	7	7

- a** Plot the results on a graph, putting pH on the vertical axis. Draw in a best-fit curve.
- b** What had happened to the alkali after 40 cm³ of acid had been added?
- c** What was the colour of the indicator in the flask:
- i** after 50 cm³ of acid had been added?
- ii** before any acid had been added?
- d** Describe what you think would happen to the graph if the pupil kept on adding acid until she had put in a total of 100 cm³.
- e** Can the pupil state, with total certainty, the volume of acid she needs to exactly neutralise 50 cm³ of the alkali? Explain your answer.
- f** What should she do to help her be more certain?

HELP

Question	Answer	Mark
1	Dilute hydrochloric acid C , dilute phenol solution A , sodium hydroxide pellets B <i>One mark each.</i>	3
2 a	Alkali	1
b	Acid	1
c	Acid	1
d	Alkali	1
e	Acid	1
3	Indicators are useful because they <u>change colour</u> , <u>showing whether a solution is an acid or an alkali</u> . <i>Underscores show answers; other text copied by pupils. Accept equivalent answers.</i>	1 1
Total for Help		10

CORE

Question	Answer	Mark
4	Vinegar: turns red, stays red, <u>acid</u> Potassium hydroxide solution: stays blue, <u>turns blue</u> , alkali Stomach contents: turns red, <u>stays red</u> , <u>acid</u> <i>Underscores show answers; other text copied by pupils.</i>	1 1 1, 1
5 a	Tell your teacher	1
b	<i>Award two marks for describing your departmental procedure as taught.</i>	2
c i	Rinse in lots of cold running water	1
ii	It removes the irritant <i>or</i> prevents the acid causing irritation.	1
d	Eyes are more delicate than skin so splashing an irritant into your eye could damage it.	1
Total for Core		10

EXTENSION

Question	Answer	Mark
6 a	A base is a substance that cancels an acid. An alkali is a base that is soluble.	1 1
b	Vinegar	1
c	Vinegar is an acid, so it cancels out the alkali in the sting. The alkali will no longer irritate the skin.	1 1
Total for Extension		5

HELP

Question	Answer	Mark
1	pH 1 strong acid pH 5 weak acid pH 7 neutral pH 9 weak alkali pH 13 strong alkali	1 1 1 1 1
2	Hydrochloric acid: strong acid, <u>1</u> , <u>red</u> Boric acid: weak acid, <u>5</u> , <u>yellow</u> Sodium hydroxide: strong alkali, <u>14</u> , <u>purple</u> Sodium hydrogencarbonate: weak alkali, <u>9</u> , <u>greenish blue</u> Distilled water: neutral, <u>7</u> , <u>green</u> <i>Underscores show answers; other text copied by pupils.</i>	1 1 1 1 1
Total for Help		10

CORE

Question	Answer	Mark
3 a	4	1
b	9	1
c	14	1
d	1	1
e	7	1
4 a	Neutral substances have a pH of <u>7</u> .	1
b	Weak acids have a pH of <u>less than 7</u> or <u>between 3 and 7</u> or <u>more than 3</u> . <i>Accept suitable alternatives.</i>	1
c	True	1
d	High pH values mean <u>strong</u> alkalis.	1
e	True <i>Underscores show answers; other text copied by pupils.</i>	1
Total for Core		10

EXTENSION

Question	Answer	Mark
5 b	Ammonia solution is a weak alkali <i>or</i> is weakly alkaline.	1
c	The potassium hydroxide solution is a concentrated solution. <i>Accept: ... is a strong alkali.</i>	1
d	Some hair shampoos are neutral.	1
e	Rainwater is a dilute solution, and is a weak acid. <i>Accept equivalent answers.</i>	1 1
Total for Extension		5