

## pH and indicators

1. What colour will litmus paper turn when it is dipped in each of the substances below?

Substance	Litmus paper
Table salt dissolved in water	no change
Apple juice      acid	red
Vinegar          acid	red
Liquid soap     base	blue
Lemon juice      acid	red

2. Answer the questions, using the information in the table below.

Fruit	pH	Fruit	pH
Lime	2.5	Tomato (juice)	4.4
Grapefruit	3.5	Banana	4.5

a) Which is the most acidic fruit?

lime

b) Which is the least acidic fruit?

banana

c) How many times less acidic is the banana than the lime?

100 x

d) How many times more acidic is the lime than the grapefruit?

10 x

$\begin{matrix} 10 & 10 \\ 4.5 & \xrightarrow{3.5} & 2.5 \end{matrix}$

3. An apple has a pH of 3, while a carrot has a pH of 5.

a) Which of these two foods is more acidic?

apple

b) How many times more acidic is it?

100 x

$\begin{matrix} 10 & 10 \\ \swarrow & \searrow \\ 3 & 4 & 5 \end{matrix}$

4. What colour does neutral litmus paper turn if it is dipped in . . .

a) soapy water?      \_\_\_\_\_

blue

b) rain water?      \_\_\_\_\_

red

c) distilled water?      \_\_\_\_\_

no change

→ \* slightly acidic

5. You find a bottle containing an unidentified liquid. By using universal indicator paper, you determine that the pH of this liquid is 11. Therefore you have to neutralize it before disposing of it. Which of the following methods can be used to neutralize the liquid?

A) Add a solution of NaOH

C) Add distilled water

B) Add a solution whose pH is 4

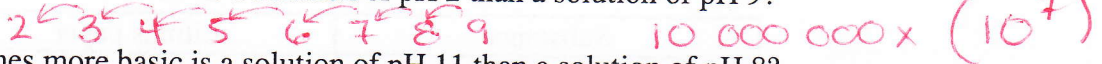
D) Add a solution whose pH is 8

pH 11 ∴ a base → add an acid.

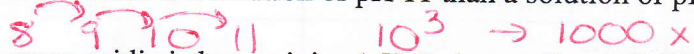
6. Rain has a pH of about 5, while the pH of seawater is about 8. How many times more acidic is rainwater than seawater?



7. How many times more acidic is a solution of pH 2 than a solution of pH 9?



8. How many times more basic is a solution of pH 11 than a solution of pH 8?



9. How many times more acidic is lemon juice (pH 2) than coffee (pH 5)?



10. The following table gives the pH value of four liquids. Which liquid is strongly acidic?

Liquid	pH
Tap water	6.8
Lemon juice	2.3
Human blood	7.3
Liquid bleach	11

- A) Tap water      **B) Lemon juice**      C) Human blood      D) Liquid bleach

11. Identify the following pH as either acid, base or salt:

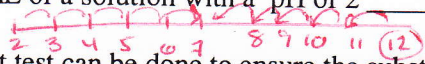
pH 6	pH 8	pH 14	pH 2	pH 11	pH 7
A	B	B	A	B	S

12. You have 2 substances and you want to neutralize each. Explain what you must add to each to neutralize it.

A) 50 mL of a solution with a pH of 9 50 ml pH 5



B) 25 mL of a solution with a pH of 2 25 ml pH 12



C) What test can be done to ensure the substance is neutralized? litmus paper

13. The pH of certain substances was taken using a universal indicator. The following results were recorded. Which substances are basic?

pH	3	11 ✓	10 ✓	3	4	9 ✓
solution	Cola	Cleaning liquid	Antacid	Grape juice	Vinegar	Window cleaner

- A) cola, grape juice and vinegar  
**B) cleaning liquid, antacid and window cleaner**  
 C) cola, grape juice and vinegar  
 D) they are all acidic

\* assume same concentration

14. Use the table below to answer the questions.

pH	1	2	3	4	5	6	7	8	9	10	11	12	13
Ind A	Yellow				orange						Red		
Ind B	red	blue		yellow									
Ind C	Blue						green	yellow					
Ind D	red								purple			blue	
Ind E	colorless									blue		dark blue	

- Which indicator would you use to find a strong acid B, a strong base D and a neutral solution C?
- Which indicator gives the best information about acids, bases or neutral solutions? C
- What color would indicator D give if a substance that has a pH of 5 is used? red
- What color would indicator B give if it has a pH of 9? yellow
- What is the pH of a substance if it becomes yellow with A and yellow with B? 4
- What is the pH of a substance if it becomes purple with D and colorless with E? 8
- What is the pH of a substance if it becomes purple with D and dark blue with E? 11
- ~~14~~ What is the pH range if indicator A turns orange? 5-10

15. The following table gives the colours of an acid-base indicator after it is added to solutions with the pH value ranging from 2 to 12. A few drops of the indicator are added to a highly acidic solution. What will the color of the indicator be?

PH	2	3	4	5	6	7	8	9	10	11	12
Colour	Yellow			Green			Blue		Violet		

A) yellow

B) green

C) blue

D) violet

16. The following table gives the colours of the indicators methyl orange and bromothymol blue in solutions whose pH values vary from 0 to 14.

Methyl Orange	Colour	Red	Orange	Yellow										
	pH	1	3	5	7	9	11	13						
Bromothymol Blue	Colour	Yellow			Green				Blue					
	pH													

A solution turns yellow when methyl orange is added; it also turns yellow when bromothymol blue is added. What could the pH of this solution be?

4.5-6