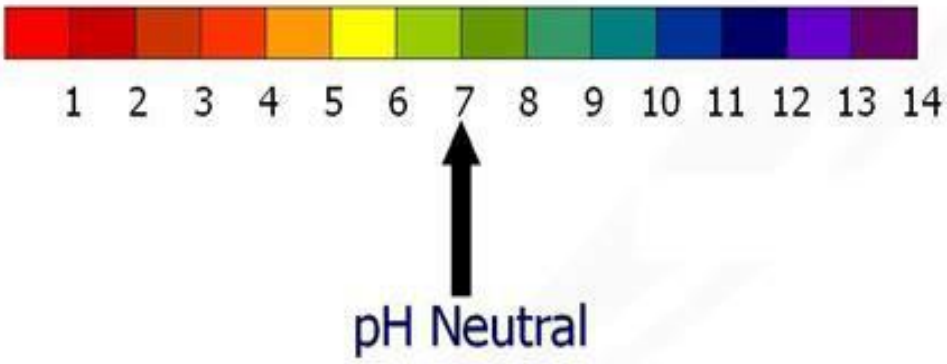
Subject: Science

Level: Form 3 Chemistry

Topic: Acids and Alkalis

Key points:

- Acids are substances that are sour and corrosive
- Alkalis are substances that are caustic and soapy to the touch.
- The acidity or alkalinity of a substance is determined using a pH scale.
- The pH scale is a scale of numbers from 0 to 14.
- On the pH scale acids are substances of pH 1-6, while alkalis are of pH 8-14.
- On the pH scale, strong acids have pH from 1-3, weak acids, 4-6, weak alkali pH 8-10, strong alkali pH 11 -14, 7 is neutral
- The pH chart below indicates the colour of universal indicator at each pH on the pH scale.
- Litmus paper is an indicator used to determine if a substance is an acid or an alkali.
- Acids turn blue litmus paper red.
- Alkali turn red litmus paper blue.
- Universal indicator paper or solution is also used to determine the pH of a substance.

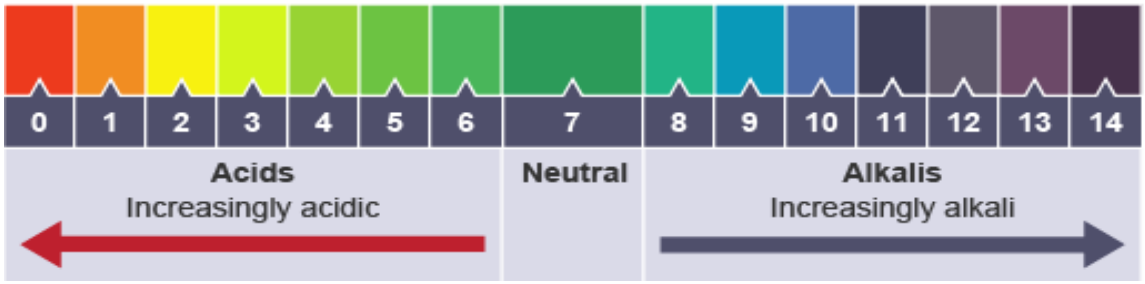


Activity 1

The formulae of several acids and alkali are given in the table below. Fill in the name of the acid or alkali, as well as any colour change with blue or red litmus paper.

Formula	Name	Colour change with blue litmus paper	Colour change with red litmus paper
H_2SO_4			
HCl			
CH_3COOH			
NaOH			
KOH			
$Ca(OH)_2$			

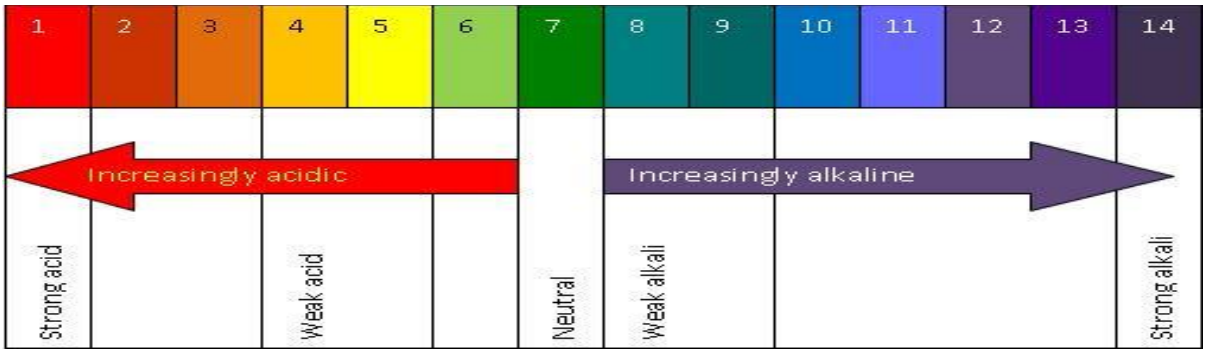
Activity 2



Several substances are listed in the table below. Fill in the pH and colour of a solution of each of the substances when universal indicator solution is added to each substance listed.

SUBSTANCE	**pH**	**Colour of substance in universal indicator solution**
Hydrochloric Acid		
Saliva		
Ammonia		
Baking soda		
Sodium hydroxide		
Coca cola drink		
Pure water		
Vinegar		
Bleach		
Orange juice		

Activity 3



Using the pH scale given above, complete the following statements.

1. A substance has a pH of 5. How would you describe it?

   _____.
2. What pH would you expect a strong alkali to have?

   _____.
3. Water is neutral. It will have a pH of _____.
4. A substance has a pH of 9.5. How would you describe it?

   _____.
5. Sulphuric Acid is a very strong acid. What pH would you expect it to have?

   _____.
6. A liquid is soapy to the touch, caustic and turns red litmus paper blue, this liquid is likely to be in what pH range? _____.
7. The labels have fallen off three bottles in the laboratory. The labels are “distilled water”, “lemonade” and “dilute sodium hydroxide”. All the bottles are identical. How will you identify the three solutions using universal indicator solution?

Answer Key:

Activity 1

The formulae of several acids and alkali are given in the table below. Fill in the name of the acid or alkali, as well as any colour change with blue or red litmus paper.

Formula	Name	Colour change with moist blue litmus paper	Colour change with moist red litmus paper
H_2SO_4	Sulphuric acid	Turns red	No change
HCl	Hydrochloric acid	Turns red	No change
CH_3COOH	Ethanoic acid	Turns red	No change
NaOH	Sodium hydroxide	No change	Turns blue
KOH	Potassium hydroxide	No change	Turns blue
$Ca(OH)_2$	Calcium hydroxide	No change	Turns blue

Activity 2

Several substances are listed in the table below. Fill in the pH and colour of a solution of each of the substances when universal indicator solution is added to each substance listed.

SUBSTANCE	**pH**	**Colour of substance in universal indicator solution**
Hydrochloric Acid	3	Light green
Saliva	7.4	Lime green
Ammonia	11	Violet
Baking soda	9	Light blue
Sodium hydroxide	13	Mauve(pale purple)
Coca cola drink	2	Yellow
Pure water	7	Green
Vinegar	3	Light green
Bleach	13	Mauve (pale purple)
Orange juice	3	Light green

Activity 3

1. Weak acid
2. 14
3. 7
4. Weak alkali
5. 1 or 2.
6. pH 8-14
7. Place a small amount of each solution in separate test tubes and add two or three drops of Universal Indicator solution to each.

Solution	Observation with Universal Indicator Solution
Sodium hydroxide	purple
Distilled water	green
Lemonade	Light green

References:

pH scale in keynotes:
https://classconnection.s3.amazonaws.com/167/flashcards/3314167/png/ph_scale-13ECCF5845965D15505.png

pH scale in activity 2:
https://hi-static.z-dn.net/files/d9f/ca393c9faf3ffff2173da0ee6394ff4d.png

pH scale in activity 3:
https://allaboutacidsandbases14.weebly.com/uploads/2/7/9/5/27957421/5505797_orig.png