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Solution 1
(a) Yellow.
(b) Blue.
(c) Green.
Solution 2
(a) Red.
(b) Red.
Solution 3
Litmus.
Solution 4
Phenolphthalein.
Solution 5
Base.
Solution 6
Base.
Solution 7
When Hydrochloric acid reacts with an active metal (like zinc), we observe that gas filled bubbles are formed on the surface of the metal. Pass the gas formed through soap solution. Then, bring a burning candle near the gas filled soap bubble. If the gas present in bubble burns with a 'pop' sound, then its hydrogen gas.
Solution 8
Carbon dioxide (CO_2) gas is evolved during the reaction. We pass this gas through lime water which turns milky because of the CO_2 passing through it. If we keep on passing the gas through the milky lime water, it would become clear again.
Solution 9
Hydrochloric acid (HCl) and Sulphuric acid (H_2SO_4) are strong acids.
Acetic acid (CH_3COOH) and Citric acid ($C_6H_8O_7$) are weak acids.
Solution 10
(a) Citric acid - Lemon.
(b) Oxalic acid - Tomatoes.
(c) Lactic acid - Sour milk or curd.
(d) Tartaric acid - Tamarind.
Solution 11
Ant sting and Nettle leaf sting.
Solution 12
On diluting an acid,the concentration of hydronium ions (H_3O^+) in it decreases.
Solution 13

(a)	Sulphuric acid	+	Zinc	$\longrightarrow$	Zinc sulphate	+	Hydrogen
	H_2SO_4	+	Zn	$\longrightarrow$	$ZnSO_4$	+	H_2
(b)	Hydrochloric acid	+	Magnesium	$\longrightarrow$	Magnesium chloride	+	Hydrogen
	2HCl	+	Mg	$\longrightarrow$	$MgCl_2$	+	H_2
(c)	Sulphuric acid	+	Aluminium	$\longrightarrow$	Aluminium sulphate	+	Hydrogen
	$3H_2SO_4$	+	2Al	$\longrightarrow$	$Al_2(SO_4)_3$	+	$3H_2$
(d)	Hydrochloric acid	+	Iron	$\longrightarrow$	Iron (II) chloride	+	Hydrogen
	2HCl	+	Fe	$\longrightarrow$	$FeCl_2$	+	H_2

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Solution 14

(a) $Zn\,(s) + 2HCl\,(aq) \rightarrow ZnCl_2 + H_2$
(b) $Na_2CO_3\,(s) + 2HCl\,(aq) \rightarrow 2NaCl\,(aq) + CO_2\,(g) + H_2O\,(l)$
(c) $NaHCO_3\,(s) + HCl\,(aq) \rightarrow NaCl\,(aq) + CO_2\,(g) + H_2O\,(l)$
(d) $NaOH\,(aq) + HCl\,(aq) \rightarrow NaCl\,(aq) + H_2O\,(l)$
(e) $CuO\,(s) + 2HCl\,(aq) \rightarrow CuCl_2\,(aq) + H_2O\,(l)$

Solution 15
(a) Sour; blue; bed.
(b) Water.
(c) Hydrogen.
(d) Olfactory.
(e) Olfactory.

Solution 16
(a) An indicator is a 'dye' that changes colour when it is put in an acid or a base. The three most common indicators are: Litmus, Methyl orange and Phenolphthalein.
(b) Litmus.
(c) Red.

Solution 17
Those substances whose smell (or odour) changes in acidic or basic solutions are called olfactory indicators. Onion and vanilla extracts are olfactory indicators. When a basic solution like sodium hydroxide solution is added to a cloth strip treated with onions (or onion extract), then the onion smell cannot be detected.
Solution 18
(a) When an acid reacts with a metal, then a salt and hydrogen gas are formed.

$Zn\,(s)$	+	$2HCl$	$\rightarrow$	$ZnCl_2$	+	$H_2\,(g)$
Zinc		Hydrochloric acid		Zinc chloride		Hydrogen
(A metal)		(Dilute)		(A salt)		

(b) Hydrogen gas is liberated when an acid reacts with a metal. When reaction between an acid and a metal occurs, we observe formation of gas bubbles. When these gas bubbles are passed through soap solution, gas filled soap bubbles rise into the air. When a burning candle is brought near a gas-filled soap bubble, the gas present in the soap-bubble burns with a 'pop' sound. Only hydrogen gas burns making a 'pop' sound. This shows that hydrogen gas is evolved in the process.
Solution 19
When a concentrated acid is added to water for preparing a dilute acid, then the heat is evolved gradually and easily absorbed by the large amount of water (to which the acid is being added) however if water is added to concentrated acid, then large amount of heat is evolved at once. This heat changes some of the water to steam explosively which can splash the acid on our face or clothes and causeacid burns. Even the glass container may break due to the excessive heating.
Solution 20
When an acid reacts with a metal hydrogen carbonate, then a salt, carbon dioxide gas and water are formed.

$NaHCO_3(s)$	+	$HCl(aq)$	$\rightarrow$	$NaCl(aq)$	+	$CO_2(g)$	+	$H_2O(l)$
Sodium hydrogen carbonate		Hydrochloric acid		Sodium chloride		Carbon dioxide		Water

Solution 21
(a) When dilute hydrochloric acid reacts with sodium carbonate, then sodium chloride, carbon dioxide and water are formed.
$Na_2CO_3(s) + 2HCl(aq) \rightarrow 2NaCl(aq) + CO_2(g) + H_2O(l)$
(b) CO_2 gas is liberated during the reaction.
When carbon dioxide gas formed in the form of brisk effervescence

is passed through lime water, it turns the lime water milky. If excess of carbon dioxide gas is passed through the milky lime water, the solution becomes clear again. This confirms the presence of carbon dioxide gas.

Solution 22

When an acid reacts with a base, then a salt and water are formed. When hydrochloric acid reacts with sodium hydroxide solution, then a neutralisation reaction takes place to form sodium chloride and water.

$$NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$$

Such a reaction is termed as neutralisation reaction.

Solution 23

Acids react with metal oxides to form salt and water.

For example: Copper (II) Oxide, a metal oxide reacts with dilute hydrochloric acid to form copper chloride and water.

$$CuO(s) + 2HCl(aq) \rightarrow CuCl_2(aq) + H_2O(l)$$

Solution 24

(a) Organic acids are acids present in plant materials and animals. These are naturally occuring acids.

A mineral acid (or inorganic acid) is an acid derived from one or more minerals of the earth.

(b) Organic acids: Citric acid, lactic acid;

Mineral acids: Hydrochloric acid, sulphuric acid.

(c) Uses of mineral acids in industry:

(i) Sulphuric acid is used in the manufacture of fertilizers, paints, dyes, detergents etc.

(ii) Nitric acid is used for making fertilizers, explosives, dyes and plastics.

(iii) Hydrochloric acid is used for removing oxide film from steel objects, in textile, food and leather industries.

Solution 25

A strong acid is one that completely ionises in water to form a large amount of hydrogen ions whereas a weak acid only partially ionises in water and thus produces a small amount of hydrogen ions.

HCl, H_2SO_4, HNO_3 are strong acids; CH_3COOH, H_2CO_3, H_2SO_3 are weak acids.

Solution 26

The acidic character of a substance is due to the presence of hydrogen ions [H^+(aq) ions] in its aqueous solution. HCl, H_2SO_4 etc show acidic properties because they produce hydrogen ions when dissolved in water. The solution of compounds like alcohol and glucose do not show acidic character because they do not ionize in water to produce hydrogen ions or any other ions in solution.

Solution 27

The reaction between an acid and a base to form salt and water is called a neutralisation reaction. When hydrochloric acid reacts with sodium hydroxide solution, then a neutralisation reaction takes place to form sodium chloride and water.

$$NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$$

Solution 28

Curd and other sour substances contains acids which can react with the metals of brass and copper vessels to form toxic (poisonous) metal compounds which can cause food poisoning and damage our health.

Solution 29

(a) Salt and water.

(b) Because dry HCl gas has no hydrogen ions (H^+ ions) in it which can impart acidic properties to it.

(c) Pink.
Solution 30
(a) The acidic behavior of an acid is due to the presence of hydrogen ions [H^+ (aq) ions] which are produced only when acids are dissolved in water. In the absence of water, acids do not produce hydrogen ions and hence do not show acidic behavior.
(b) The aqueous solution of an acid conducts electricity due to the presence of charged particles called 'ions' in it. These ions carry electric current.
(c) Distilled water does not conduct electricity because it does not contain any ionic compounds dissolved in it whereas rain water does.
Reason: When rain water falls on earth through the atmosphere, it dissolves an acidic gas 'carbon dioxide' from the air and forms carbonic acid (H_2CO_3). The carbonic acid provides some hydrogen and carbonate ions to the rain water. Due to the presence of these ions, rain water conducts electricity.

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Solution 31
(a) When an acid reacts with a metal carbonate, then a salt, carbon dioxide and water are produced.
Example: When dilute hydrochloric acid reacts with sodium carbonate, then sodium chloride, carbon dioxide and water are formed.

$$Na_2CO_3(s) + 2HCl(aq) \rightarrow 2NaCl(aq) + CO_2(g) + H_2O(l)$$

(b) (i) Lime water turns milky.

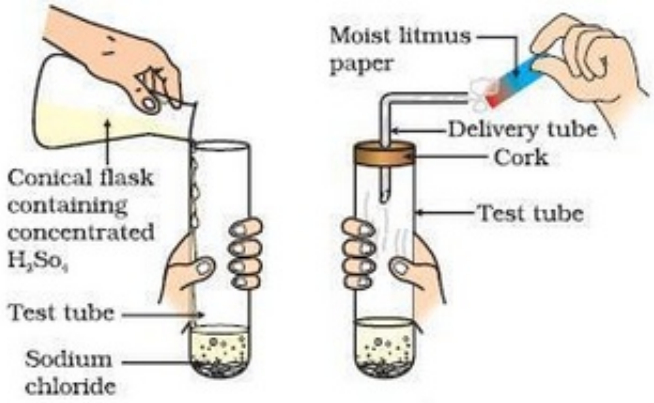
$$Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$$

Calciumhydroxide (Limewater) + Carbon dioxide → Calciumcarbonate (White ppt.) + Water (Makes limewater milky)

(ii) Lime water solution becomes clear.

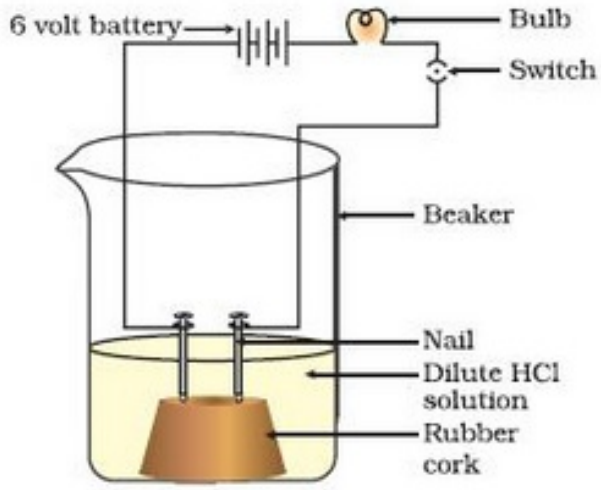
$$CaCO_3(s) + CO_2(g) + H_2O(l) \rightarrow Ca(HCO_3)_2(aq)$$

Solution 32
Activity:
Take about 1g solid NaCl in a clean and dry test tube and add some concentrated sulphuric acid to it. Fit a rubber cork with a small delivery tube in the mouth of the test tube. Concentrated sulphuric acid reacts with sodium chloride to form hydrogen chloride gas. The hydrogen chloride gas starts coming out of the open end of the glass tube.



Now, hold a 'dry' blue litmus paper in HCl gas. There is no change in colour of the 'dry' blue litmus paper. This shows that HCl gas does not behave as an acid in the absence of water. However, when we hold a 'moist' blue litmus paper in HCl gas, we will see that the 'moist' blue litmus paper turns red. This indicates that HCl gas shows acidic behavior in the presence of water as hydrogen ions are formed. This proves that acids produce ions only in aqueous solutions or in presence of water.

Solution 33
(a) Hydrogen.
(b) Activity:
Take solutions of glucose, alcohol, hydrochloric acid and sulphuric acid. Fix two nails on a cork, and place the cork in a 100 ml beaker. Connect the nails to the two terminals of a 6 volt battery through a bulb and a switch. Now pour some dilute HCl in the beaker and switch on the current. The bulb starts glowing. This shows that HCl solution taken in the beaker conducts electricity. If we replace hydrochloric acid with sulphuric acid and perform the experiment, the bulb would glow again. This shows that an aqueous solution of an acid conducts electricity due to the presence of charged particles called ions in it.



Now, if we take glucose solution in the beaker and switch on the current, the bulb would not glow. If we repeat the experiment by taking alcohol solution in the beaker, the bulb would not glow again. This shows that due to the absence of ions, glucose and alcohol solutions do not conduct electricity. From this activity, we conclude that the hydrogen containing compounds such as glucose and alcohol are not categorised as acids because they do not dissociate (or ionise) in water to produce hydrogen ions [H^+(aq) ions].

Solution 44
(a) X is carbon dioxide; Y is calcium carbonate; Z is calcium hydrogen carbonate.
(b) (i) $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$
(ii) $Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$
(iii) $CaCO_3(s) + CO_2(g) + H_2O(l) \rightarrow Ca(HCO_3)_2(aq)$

Solution 45
Baking soda solution. Being basic in nature, it neutralises excess acid in the stomach.

********** END **********