

• The term acid, in fact, comes from the latin term acere, which means 'Sour'. In everyday life we come across many compounds that chemists classify as acids.

• Common Acids are:

Acid	Occurrence
Tartaric acid	Grapes, tamarind, imli, unripe mango
Latic acid	Sour milk, curd
Formic acid	Ant's sting
Ascorbic acid	Citrus fruits, Amla
(vitamin C)	
Acetic acid	Vinegar
Tannic acid	Tea
Citric acid	Citrus fruits like orange and lemon
Oxalic acid	Spinach
Malic acid	Apple
Hydrochloric acid	Stomach

- **Organic acids** are naturally occurring acids and are mostly found in plants and animals. These acids are the compounds of carbon.
- **Mineral acids or inorganic acids** are synthesised from minerals found on earth.
- **Concentrated acid :** An acid that has a relatively high percentage of the acid dissolved in the aqueous solution is classified as a concentrated acid
- •. **Dilute acid :** An acid, which has a relatively low percentage of the acid dissolved in the aqueous solution, is classified as a dilute acid.
- **Strong acids** give a large number of hydrogen ions or gets completely dissociated when dissolved in water. Mineral acids are generally strong acids.
- Weak acids give very few hydrogen ions or gets partially ionised when dissolved in water. For example, citric acid, acetic acid and formic acid.

• Properties of acids

Physical properties :

- (i) *Acids are sour in taste* e.g. *lemon juice* is sour in taste as it contains an acid.
- (ii) Generally acids are good conductors of electricity.
- (iii) Mineral acids are corrosive in nature.

Chemical properties :

(i) Action of metals : Metals generally react with dilute acids to form their respective salt and hydrogen.

(ii) Action with metal oxides (Basic oxides): The oxides that can add an hydroxyl ion (OH⁻) to their molecules are called basic oxides. Metal oxides are generally basic oxides. These oxides get *neutralised* when they react with acids. These reactions are mostly carried upon heating e.g.

 $\begin{array}{l} \operatorname{Na_2O}(s) + 2\operatorname{HCl}(aq) \longrightarrow 2\operatorname{NaCl}(aq) + \operatorname{H_2O}(\ell) \\ \operatorname{Sodium \ oxide} & \operatorname{Hydrochloric} & \operatorname{Sodium} & \operatorname{Water} \\ \operatorname{(Basic \ oxide)} & \operatorname{acid} & \operatorname{Chloride} \end{array}$

(iii) Action with metal hydroxides (Basic hydroxides): Acids undergo neutralization reaction with basic hydroxides (metal hydroxides) to form salt and water (i.e. neutralisation reaction)

 $\begin{array}{c} 2\text{KOH}(aq) + \text{H}_2\text{CO}_3(aq) \longrightarrow \text{K}_2\text{CO}_3(aq) + 2\text{H}_2\text{O}(\ell) \\ \text{Pot.Hydroxide} \quad \text{Carbonic acid} \quad \text{Pot.Carbonate} \quad \text{Water} \end{array}$

(iv) Action with metal carbonates and metal hydrogen carbonates : Acids react with carbonates and hydrogen carbonates to form their respective salts, water and carbondioxide gas.

$$\begin{array}{ccc} \text{ZnCO}_{3}(s) + \text{H}_{2}\text{SO}_{4}(aq) &\longrightarrow \text{ZnSO}_{4}(aq) + \text{H}_{2}\text{O}(\ell) + \text{CO}_{2}(g) \\ & \underset{\text{carbonate}}{\text{Zinc}} & \underset{\text{acid}}{\text{Sulphate}} & \underset{\text{water}}{\text{Vater}} & \underset{\text{dioxide}}{\text{Carbon}} \end{array}$$

• Uses of Acids:

- (i) In batteries of cars and invertors. Sulphuric acid is used in automobile batteries.
- (ii) In manufacture of synthetic fibres and plastics.
- (iii) In preparing dyes, detergents, glucose from starch, fertilisers, explosives, etc.
- (iv) For descaling pipes and cleaning metal surfaces and sanitary wares.
- (v) Acetic acid is used in flavouring food items like pickles.
- Bases are compounds which taste bitter example milk of magnesia. Ammonium hydroxide, or ammonia water, is very irritating to the nose and the eyes. This substance, called a hydroxide, or a base, is often used in home for cleaning.
- Common Bases are:

Base	Occurrence
Sodium hydroxide	Soap
Calcium hydroxide	Lime water
Potassium hydroxide	Soap
Ammonium hydroxide	Window cleaning solution
Magnesium hydroxide	Milk of Magnesia

- **Concentrated base :** A base that has a relatively high percentage of the base in the aqueous solution is classified as a concentrated base.
- **Dilute base :** A base, which has a relatively low percentage of the base dissolved in the aqueous solution, is classified as a dilute base.

- **Strong bases** gives a large number of hydroxide ion or gets completely ionized when dissolved in water. For example, sodium hydroxide and potassium hydroxide.
- Weak bases give lesser number of hydroxide ions or gets partially ionized. When dissolved in water. For example, ammonium hydroxide.

• Properties of bases :

Physical properties :

- (i) They have a bitter taste.
- (ii) Soluble bases are good conductors of electricity.
- (iii) They are soapy liquids, slippery to touch.
- (iv) They are corrosive in nature. e.g. KOH, NaOH (caustic alkalies)

Chemical Properties :

(i) Reaction of metals with bases : Metals (e.g. Zn, Al, Sn) dissolve in NaOH (an alkali) to liberate hydrogen gas.

 $Zn + 2NaOH \longrightarrow Na_2ZnO_2 + H_2$ [Sod. Zincate]

(ii) Action with acids : Bases combine with acids to form salt and water only. It is a *neutralisation reaction*.

$$3\text{NaOH}(aq) + \text{H}_3\text{PO}_4(aq) \longrightarrow \text{Na}_3\text{PO}_4(aq) + 3\text{H}_2\text{O}(l)$$

Phosphoric acid Trisodium
phosphate

• Uses of Bases:

- Magnesium hydroxide and calcium hydroxide are used as antacid to neutralize acidity in the stomach.
- (ii) A clear solution of calcium hydroxide is known as lime water, and commonly used as laboratory reagent.
- (iii) Sodium hydroxide (caustic soda) is used in manufacturing of soap, synthetic fibres like rayon.
- Basicity of an acid does not depend upon the number of H atoms present but upon number of replaceable H atoms. For example, acetic acid (CH₃COOH) has four H atoms. But only one is replaced. It is monobasic in nature. Phosphoric acid (H₃PO₄) has three H atoms and all of them can be replaced. It is a tribasic acid.

For acids, we use the term basicity because H^+ ions of the acid can be replaced only when it reacts with a base. Similarly, the term acidity is used for bases because OH^- ions of the base can be replaced only when it reacts with an acid.

- When water is added to the acid or a base, it results in decrease in concentration of H⁺(H₃O⁺) or OH⁻ per unit volume. Such a process is known as **dilution.**
 - (i) Process of dissolving acids or bases in water is exothermic.
 - (ii) Care must be taken while mixing concentrated nitric acid or sulphuric acid with water. The acid must always be added to water with constant stirring. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns.
- A substance which gives different colour in acidic and basic media and helps to differentiate the two types is known as an Indicator. Natural indicators can be extracted from a wide variety of flowers, fruits, roots, leaves and other parts of plants
- Litmus (a natural dye) is one of the most common and naturally available indicator. It is extracted from lichens (combination of alga and tungus). When this litmus is added to an acidic

solution, it turns red and when added to a basic solution, it turns blue.

- **Tumeric powder** (*haldi*), which is used for flavouring food is also used as an natural indicator. Turmeric (*curcuma longa*) is a rhizomatous herbaceous perennial plant of ginger family. Turmeric stains turns red when washed with soap solution (basic media).
- China rose is obtained from a shrubby chinese rose (*Rosa Chinesis*). China rose indicator is prepared by keeping the *gudhal* petals in warm water for some time. The solution becomes coloured after some time and acts as an indicator. China rose indicator gives brown color in acidic media and green color in basic media.
- *Phenolphthalein* is a synthetic indicator. It turns colorless in acidic solutions and pink in basic solutions. If the concentration of indicator is particularly strong, it can appear purple.
- *Methyl orange* is also a synthetic indicator used more oftenly because of clear colour change. In a solution becoming less acidic, methyl orange moves from red to orange and finally to yellow with the reverse occuring for a solution increasing in acidity.
- Universal indicators : It is a mixture of indicators often sold readymade as solution which can indicate pH values, usually over a range of 3-11, by successive changes of colour. The universal indicator show different colours at different concentrations of hydrogen ions in solution. For measurement of hydrogen ion concentration in a solution we generally use a **pH Scale**.
- **pH Scale :** It is a scale that is used for measuring H⁺ion (Hydrogen ion) concentration of a solution.

The term pH stands for "potential" of "hydrogen". It is the *amount of hydrogen ions in a particular solution*.

For acids pH < 7For bases pH > 7

For neutral substances pH = 7

- Importance of pH in Daily Life
 - (i) **Blood pH :** For proper functioning our body needs to maintain blood pH between 7.35 and 7.45. Values of blood pH greater than 7.8 or less than 6.8 often results in death.
 - (ii) Acid rain : When pH of rain water is less than 5.6, it is called acid rain. Rain containing excess of acids is called an acid rain. Rain becomes acidic when pollutants like carbon dioxide, sulphur dioxide and nitrogen dioxide are released into the atmosphere and these oxides dissolve in rain drops to form carbonic acid, sulphuric acid and nitric acid, respectively. Acid rain causes huge damage to buildings, historical monuments, especially marble structures etc.
 - (iii) pH in our digestive system : We know that hydrochloric acid (HCl) produced in our stomach helps in digestion of food without harming stomach. However excess of acid causes indigestion and leads to pain as well as irritation. To get rid of this people use bases called "antacids". A popular antacid is "Milk of magnesia" which is insoluble magnesium hydroxide, Mg (OH)₂.

- (iv) **pH of the soil :** For their healthy growth plants require a specific pH. Farmers use fertilisers to improve crop yield. But excessive use of fertilisers makes the soil acidic. Plants do not grow well in either too acidic or too basic soil. If the soil is too acidic, basic quick lime (calcium oxide) or slaked lime (calcium hydroxide) is added to it. If the soil is too basic, organic matters that releases acids are added to it, to neutralise basic nature of soil.
- (v) pH change as the cause of tooth decay : Tooth decay starts when the pH of mouth is lower than 5.5. Tooth enamel, made up of calcium phosphate is the hardest substance in the body. It does not dissolve in water, but is corroded when the pH in mouth is below 5.5.
- (vi) Self defence by animals and plants through chemical warfare : We have already learnt that bee-sting leaves an acid (formic acid or methanoic acid, HCOOH) which causes pains and irritation. To get relief from it we apply a mild base like baking soda.
- Many factories wastes are acidic in nature. If it is allowed to flow into the water bodies, it causes huge damage to water plants and animals. Therefore, all factory waste should be neutralised by adding basic substances berfore releasing into the water bodies.
- Salts : A salt is an *ionic compound* which dissociates to yield a positive ion other than hydrogen ion (H⁺) and negative ion other than hydroxyl ion (OH⁻) e.g.

$$(fused/aqueous solution) \longrightarrow Na^+ + Cl^-$$

- Classification of Salts
 - (i) Acidic Salt : If a polybasic acid (Example, H_2SO_4 , H_3PO_4 , H_2SO_3 etc.) is neutralised partly by a base, the salt formed is acidic.

$$H_2CO_3 + NaOH \longrightarrow NaHCO_3 + H_2O.$$

(ii) Normal Salt : In case the acid and base neutralise completely the salt formed is a normal salt.

$$\begin{array}{c} \mathrm{H_2CO_3} & + 2\mathrm{NaOH} \rightarrow & \mathrm{Na_2CO_3} + \mathrm{H_2O} \\ \mathrm{(Carbonic \ acid)} & & (\mathrm{Normal \ salt)} \end{array}$$

(iii) **Basic Salts :** This type of salts are formed by incomplete neutralization of a base with an acid or by partial replacement of hydroxy radicals of a diacids or triacidic base with an acid radical.

Pb(OH)NO₃ - Basic lead nitrate.

 $[Pb(OH)_2 + HNO_3 \longrightarrow Pb(OH)NO_3 + H_2O]$

(iv) **Double Salt** - Such a salt is formed by mixing saturated solution of two simple salts followed by crystallisation of the saturated solution.

 $\label{eq:example:FeSO_4(NH_4)_2SO_4.6H_2O-Mohr's salt-it is a mixture of FeSO_4 (Simple salt) and (NH_4)_2 SO_4 (Simple salt)$

(v) Complex salt - Such a salt is formed by mixing saturated solution of simple salts followed by crystallisation of the solution similar to double salts.

Potassium mercuric iodide - $K_2[HgI_4]$

Scholastic Aptitude Test (SAT) — CHEMISTRY Sodium hydroxide (NaOH) or Caustic soda : It is prepared on

sodium nydroxide (NaOH) or Caustic soda : It is prepared on commercial scale by the electrolysis of strong solution of sodium chloride (NaCl) also called **brine.** The process is called **chlor-alkali process.**

The overall reaction taking place is :

 $2\operatorname{NaCl}(aq) + 2\operatorname{H}_2\operatorname{O}(\ell) \longrightarrow \operatorname{H}_2(g) + \operatorname{Cl}_2(g) + 2\operatorname{NaOH}(aq)$

Chlorine gas is given off at the anode, and hydrogen gas at the cathode. Sodium hydroxide solution is formed near the cathode.

Uses :

- (i) Sodium hydroxide is most used base in the laboratory.
- (ii) It is used in many industries, mostly as strong chemical base in manufacture of pulp and paper, textiles, drinking water, soap and detergents etc.

(iii) It is used as a *drain cleaner*.

• **Baking soda, sodium hydrogen carbonate, (NaHCO₃) :** It is produced using sodium chloride as one of the raw materials.

 $NaCl + H_2O + CO_2 + NH_3 \longrightarrow NH_4Cl + NaHCO_3$ When heated the following reaction occurs

$$2 \text{ NaHCO}_3 \xrightarrow{\text{heat}} \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$$

Uses :

- (i) In baking powder : The most practical use of baking soda is as a *leavening agent in baking*. In combination with a liquid and an acid, baking soda undergoes a chemical reaction that releases bubbles of carbon dioxide. Trapped in butter these carbon dioxide bubbles enable the baked food to rise.
- (ii) As an antacid : The cause of acidity is presence of excess HCl in stomach. Baking soda reacts with acid due to its alkaline nature and neutralizes acidity (i.e. acts as an antacid).

 $NaHCO_3 + HCl \longrightarrow NaCl + H_2O + CO_2$

- (iii)In fire extinguishers : It is used in *soda-acid fire exinguisher*: In soda acid fire extinguishers, CO_2 , formed by the action of H_2SO_4 on baking soda, expells water from the fire extinguisher which exinguishes the fire.
- During summer, the milkmen usually add a very small amount of baking soda to fresh milk. It acts as a preservative. Actually in hot weather milk is expected to decompose and release lactic acid which is likely to make milk sour. Baking soda (NaHCO₃) reacts with acid to form salt and water. In this way it neutralises the acid and the milk does not become sour.
- Washing soda, Na₂CO₃. 10H₂O, Sodium carbonate : Sodium carbonate can be obtained by heating baking soda; recrystallisation of sodium carbonate gives washing soda. It is also a basic salt.

 $Na_2CO_3 + 10H_2O \longrightarrow Na_2CO_3 \cdot 10H_2O$ Sodium carbonate Hydrated sodium carbonate (Washing soda),

Uses :

- (i) Sodium carbonate (washing soda) is used in glass, soap and paper industries.
- (ii) It is used in the manufacture of sodium compounds such as borax.
- (iii) It is used for removing permanent hardness of water.

Bleaching powder : Calcium hypochlorite is a chemical compound with formula $CaOCl_2$. It is a yellowish powder with smell of chlorine. It is widely used for water treatment and as a bleaching agent (bleaching powder). It is a yellow white solid which has a strong smell of chlorine.

Manufacture of bleaching powder : It is manufactured by the following method.

 $2\operatorname{Ca}(\operatorname{OH})_2 + 2\operatorname{Cl}_2 \longrightarrow \operatorname{CaOCl}_2 + \operatorname{CaCl}_2 + 2\operatorname{H}_2\operatorname{O}$

Uses:

- (i) Calcium hypochlorite is used for the disinfection of drinking water or swimming pool water.
- (ii) Calcium hypochlorite (known as 'bleaching powder') is also used for bleaching cotton and linen and used in the manufacture of chloroform.
- Plaster of Paris, CaSO₄ .1/2 H₂O : It can be obtained by heating gypsum (CaSO₄.2H₂O) i.e. by calcination of gypsum.

$$(CaSO_4. 2H_2O) + heat \longrightarrow (CaSO_4. \frac{1}{2}H_2O) + \frac{1}{2}H_2O$$

Plaster of paris is a white powder and on mixing with water it changes to gypsum once again giving a hard solid mass.

$$CaSO_4 + 2H_2O \rightarrow CaSO_4.2H_2O.$$

Uses : It is used

- (i) for interior decoration. As a false ceiling, studio sets etc.
- (ii) for making moulds or casts for toys, pottery, cermics etc.
- (iii) in surgical bandages for setting fractured bones.
- (iv) in setting up of air-tight apparatus by sealing the gaps.
- Plaster of Paris must be always stored in air-tight bags. In case moisture is present, it will slowly change into gypsum which is very hard. This means that it will no longer be useful either for setting fractured bones or in making moulds.
- **Hygroscopy :** The property of a substance to absorb moisture when exposed to atmosphere at ordinary temperature but do not dissolve in it is known as **hygroscopy** and such a substance is known as hygroscopic substance e.g. Anhydrous calcium chloride (CaCl₂), Conc.H₂SO₄, phosphorous pentoxide (P₂O₅), quick lime (CaO) etc.
- Aqua regia consists of 3 parts HCl to 1 part HNO₃, it is an Excellent oxidant, Can dissolve gold and platinum, it produces yellow fumes from the reaction of HCl and HNO₃ to produce nitrosyl chloride, NOCl, chlorine gas, Cl₂, and water, H₂O.

Exercise

DIRECTIONS : This section contains multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which only one is correct.

- 1. Ammonium hydroxide is a weak base because
 - (1) it has low vapour pressure
 - (2) it is only slightly ionised
 - (3) it is not a hydroxide of any metal
 - (4) it has low density
- 2. On passing excess of carbon dioxide through lime water
 - (1) milkiness of lime water increases
 - (2) there is no change in milkiness of lime water
 - (3) milkiness of lime water disappears
 - (4) None of the above is correct.
- 3. HCl gas changes the colour of
 - (1) dry litmus paper
 - (2) wet litmus paper

4.

- (3) Both dry and wet litmus paper
- (4) None of the above is correct
- Which of the following is an alkali?
 - (1) Ca(OH)₂ (2) KOH
 - $(3) Mg(OH)_2 \qquad (4) CaCO_3$
- 5. The poisonous effect of acid present in stings of bees and ants can be neutralised by use of a solution that contains
 - (1) acetic acid (2) formic acid
 - (3) sodium hydroxide (4) sodium chloride.

- 6. When the stopper of a bottle containing colourless liquid was removed, the bottle gave smell like that of vinegar. The liquid in the bottle could be
 - (1) hydrochloric acid
 - (2) sodium hydroxide solution
 - (3) acetic acid solution
 - (4) saturated sodium hydrogen carbonate solution
- 7. The colour of pH paper when put in distilled water changed to green. Now some common salt is added to water and pH paper is tested in this solution. The colour of pH paper in this case is likely to be
 - (1) green (2) yellow
 - (3) red (4) blue
- 8. A drop of liquid sample was put on pH paper. The colour of pH paper turned blue. The liquid sample could be
 - (1) lemon juice
 - (2) hydrochloric acid
 - (3) sodium hydrogen carbonate
 - (4) ethanoic acid.
- 9. Which of the following is not required to find the pH of a given sample ?
 - (1) pH paper (2) Litmus paper
 - (3) Universal indicator (4) Standard pH chart
- 10. Universal indicator solution is named as such because
 - (1) it is available universally
 - (2) it has a universal appearance
 - (3) it can be used for entire pH range
 - (4) All the above are correct

в-12	4		Scholastic Aptitude Test (SAT) — CHEMISTRY
11.	The pH of gastric juice that is released during digestion is	28.	Select the reaction that is called 'slaking of lime'
	(1) more than 7 (2) 7		(1) $CaCO_3 \longrightarrow CaO + CO_2$
~	(3) less then 7 (4) can't be predicted		(2) $CaO+2HCl \longrightarrow CaCl_2 + H_2O$
2.	Acids and bases are important because of		(3) $CaCO_3 + H_2O \longrightarrow Ca(OH)_2 + CO_2$
	(1) their use in industry (2) $(1 + 1) = 0$		(4) $CaO + H_{2}O \longrightarrow Ca(OH)_{2}$
	(2) their effects on human health (2) their effects on human health	29	Which of the following pairs of substances are chemically
	(3) their effect on farmer's crop	<i>2</i>).	same?
2	(4) All the above are correct.		(1) I ime water and milk of lime
3.	(1) N-OH		(1) Eine water and mink of fine (2) Deed burnt plaster and gangum
	$\begin{array}{ccc} (1) & \text{NaOH} \\ (2) & \text{NH} & (2) & \text{KOH} \\ (3) & \text{NH} & (4) & \text{NH} & (4) \\ \end{array}$		(2) Dead burnt plaster and gypsum (2) D (1) (1) (2)
4	(3) NH_4OH (4) None of these		(3) Both the above
4.	A sait derived from strong acid and weak base will dissolve	•	(4) None of the above is correct
	in water to give a solution which is	30.	Baking powder is
	$\begin{array}{c} (1) \text{acidic} \\ (2) \text{basic} \\ (4) \text{Numerical} \\ (4) N$		(1) a mixture (2) a compound
_	(3) neutral (4) None of these		(3) an element (4) a salt
•	Plaster of Paris is made from	31.	The chemical name of bleaching powder is
	(1) lime stone (2) slaked lime		(1) calcium chloride (2) calcium oxychloride
-	(3) quick lime (4) gypsum		(3) calcium chloroxide (4) none of these
).	Chemical formula of baking soda is	32.	Which of the following is not a hydrated salt?
	(1) $MgSO_4$ (2) Na_2CO_3		(1) Blue vitriol (2) Baking soda
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$		(3) Washing soda (4) Epsom salt
•	Washing soda has the formula	33	Select the one that does not give $CO_2(g)$ when treated with
	(1) $Na_2CO_3./H_2O$ (2) $Na_2CO_3.10H_2O$	55.	dil H-SO.
	(3) $Na_2CO_3.H_2O$ (4) Na_2CO_3		(1) Marble (2) Lime stone
	Plaster of Paris hardens by		(1) Matrice (2) Eine stone (2) Line stone (4) Paking sode
	(1) giving of CO_2	24	(5) Line (4) Daking Soua
	(2) changing into $CaCO_3$	34.	(1) does not invite in coloring
	(3) combining with water		(1) does not ionise in solution
	(4) giving out water		(2) ionises in solution
•	Which of the following is 'quicklime'?		(3) gives both hydrogen ions and hydroxyl ions in solution.
	(1) CaO (2) $\operatorname{Ca(OH)}_2$		(4) None of the above is correct
	$ (3) \text{CaCO}_3 \qquad (4) \text{CaCI}_2.6\text{H}_2\text{O} $	35.	Which of the following indicators is colourless in acidic
	Plaster of Paris has the formula		medium?
	(1) $CaSO_4.1/2H_2O$ (2) $CaSO_4.H_2O$		(1) Methyl orange (2) Turmeric powder
	(3) $CaSO_4.1.1/2H_2O$ (4) $CaSO_4.2H_2O$		(3) Litmus (4) Phenolphthalein
	Which of the following compounds is neutral to litmus ?	36.	An indicator that turns reddish-brown when dissolved in
	(1) NaNO ₃ (2) $CuSO_4.5H_2O$		soap solution is
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$		(1) litmus (2) china rose
	The pH is less than / of the solution of (1) F Cl		(3) turmeric powder (4) None of these
	(1) FeCl_3 (2) NaCN	37.	Which of the following is a strong acid:
	(3) NaOH (4) NaCl		(1) Acetic acid (2) Citric acid
•	A compound whose aqueous solution will have the highest		(1) Nitric acid (2) Child dela (3) Nitric acid (4) Tartaric acid
	pH—	38	The presence of which of the following acid causes
	(1) NaCl (2) Na ₂ CO ₃	56.	indigestion:
	$(3) \operatorname{NH}_4\operatorname{Cl} (4) \operatorname{NaHCO}_3$		(1) Citric agid (2) Ovelia agid
•	If pH of A, B, C and D are 9.5, 2.5, 3.5 and 5.5 respectively,		(1) Chine acid (2) Oxane acid (3) Hadra ablaria acid
	then strongest acid is	20	(3) Acetic acid (4) Hydrochloric acid
	(1) A (2) C	39.	When few drops of lemon are mixed with milk
	(3) D (4) B		(i) it turns sour
	Aqueous solution of which of the following salt will change		(ii) no change takes place
	the colour of red litmus to blue?		(iii) properties of milk are changed
	(1) Na_2CO_3 (2) $Na_2CO_3.10H_2O$		(iv) properties of milk remain same
	(3) Both of these (4) None of these		Which of the above statements is/are correct?
•	If the tartaric acid is not added in baking powder, sometimes		(1) (ii) & (iii) (2) (i) & (ii)
	the cake has a bitter taste. This bitter taste is due to which		(3) (i) & (iii) (4) (i) only
	of the following compounds present in cake?	40	Which of the following is a strong base?
	(1) $NaHCO_3$ (2) Na_2CO_3	ru.	(1) Ammonium hydroxide (NH OH)
	(3) CO_2 (4) All of these		(2) Sodium hydroxide (N_4OH)
	Which of the following is known as dead burnt plaster?		(2) Water (H Ω)
	(1) Ouick lime (2) Slaked lime		(3) water (11_20)

EBD_7042

(3) Lime stone (4) Gypsum

(4) Sulfuric acid (H_2SO_4)

- Acids are in taste while bases are
 in taste
 - (1) sweet, salty (2) sweet, sour
 - (3) sour, salty (4) sour, bitter
- 42. A base which dissolves in water is called
 - (1) soluble base (2) alkali
 - (3) acid (4) oxide
- 43. Choose the correct statement(s)
 - (i) Most of the acids are water soluble
 - (ii) Acids react with metallic oxides and hydroxides to form metallic salt and water only.
 - (iii) Acids react with metallic carbonates to form metallic salt and hydrogen gas and water
 - (iv) Acetic acid is used as a food preservative
 - (1) (i) & (ii) only (2) (iii) & (iv)
 - (3) (i), (ii) & (iv) (4) all the above
- 44. Acid rain is caused due to
 - (1) CO_2, O_2, SO_2 (2) CO_2, NO_2, H_2
 - (3) $SO_2 N_2, O_2$ (4) CO_2, SO_2, NO_2
- 45. The acidic soil which is not good for healthy growth of plants, is neutralized by
 - (1) ammonium hydroxide (NH_4OH)
 - (2) calcium oxide (CaO)
 - (3) sodium hydroxide (NaOH)
 - (4) magnesium hydroxide (Mg $(OH)_2$)
- 46. Acid contained in the sting of an ant is.....
 - (1) acetic acid (2) formic acid
 - (3) lactic acid (4) ascorbic acid
- 47. Natural indicator litmus is extracted from
 - (1) lichens (2) earthworms
 - (3) ants (4) algae
- 48. The industrial waste is in nature
 - (1) acidic (2) basic
 - (3) neutral (4) both (1) & (2)
- 49. When vinegar reacts with baking soda the gas evolved is
 - (1) hydrogen (2) oxygen
 - (3) carbon dioxide (4) nitrogen dioxide
- 50. When magnesium oxide (MgO) reacts with water to form magnesium hydroxide [Mg(OH)₂], a base it turns litmus to
 - (1) blue, red (2) blue, colourless
 - (3) red, blue (4) colourless, blue
- 51. While preparing copper sulphate crystals from copper sulphate solution, dilute sulphuric acid is used instead of concentrated sulphuric acid, because
 - (1) concentrated sulphuric acid is corrosive in nature
 - (2) dilute sulphuric acid makes large crystals
 - (3) concentrated acid is ineffective
 - (4) Both (1) & (2)
- 52. Which of the following gas is evolved on reaction of dilute hydrochloric acid with sodium sulphite?
 - (1) Carbon dioxide (2) Hydrogen
 - (3) Sulphur dioxide (4) Sulphur trioxide
- 53. On which of the following acid rain has adverse effects?
 - (1) Marble structures (2) Historical monuments
 - (3) Aquatic life (4) All of these

- 54. Which of the following is acidic salt(s)
 - (i) Sodium bisulphate (ii) Potasium chloride
 - (iii) Potassium bisulphite (iv) Sodium carbonate
 - (1) (i), (ii) and (iv) (2) (ii) and (iv)
 - (3) (i), (ii) and (iii) (4) (i) and (iii)
- 55. pH of human body varies within the range of
 - (1) 6.0 to 6.5 (2) 5.5 to 5.8
 - (3) 7.0 to 7.8 (4) 7.0 to 11.0
- 56. Calamine solution contains
 - (1) zinc hydroxide
 - (2) zinc carbonate
 - (3) sodium hydrogen carbonate
 - (4) magnesium hydroxide
- 57. Why bases are kept in glass bottles?
 - (1) Bases produce OH⁻ ions in aqueous solutions
 - (2) Basic solutions are conducting in nature
 - (3) Bases are corrosive in nature
 - (4) Basis have soapy texture
- 58. Which of the following statement regarding bases is false?
 - (1) Bases produce hydroxide ions when dissolved in water
 - (2) Bases are soapy to touch
 - (3) Bases are extremly corrosive in nature
 - (4) Basic solutions are non conducting in nature
- 59. Which of the following statement is true?
 - (1) Acids are bitter in taste
 - (2) Bases are sour in taste
 - (3) The reaction between acid and a base is exothermic reaction
 - (4) The reaction between an acid and a base is endothermic reaction.
- 60. Which of the following statement is false?
 - (1) China rose is a natural indicator
 - (2) Repeated cultivation by farmers makes soil acidic
 - (3) Ant or bee sting contains acetic acid
 - (4) Majorly factories waste are acidic in nature
- 61. Which of the following is the best explanation of statement; Ammonium hydroxide is a commonly used alkali
 - (1) It is a weak base insoluble in water
 - (2) It is a weak base soluble in water
 - (3) It is a strong base insoluble in water
 - (4) It is a strong base soluble in water
- 62. What happens when a solution of an acid is mixed with a solution of a base in a test tube ?
 - (i) The temperature of the solution increases
 - (ii) The temperature of the solution decreases
 - (iii) The temperature of the solution remains the same
 - (iv) Salt formation takes place
 - (1) (i) only (2) (i) and (iii)
 - (3) (ii) and (iii) (4) (i) and (iv)
- 63. During the preparation of hydrogen chloride gas on a humid day, the gas is usually passed through the guard tube containing calcium chloride. The role of calcium chloride taken in the guard tube is to
 - (1) absorb the evolved gas
 - (2) moisten the gas
 - (3) absorb moisture from the gas
 - (4) absorb Cl⁻ ions from the evolved gas

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- 64. A sample of soil is mixed with water and allowed to settle. The clear supernatant solution turns the pH paper yellowish-orange. Which of the following would change the colour of this pH paper to greenish-blue?
 - (1) Lemon juice (2) Vinegar
 - (3) Common salt (4) An antacid
- 65. If a few drops of a concentrated acid accidentally spills over the hand of a student, what should be done?
 - (1) Wash the hand with saline solution
 - (2) Wash the hand immediately with plenty of water and apply a paste of sodium hydrogenearbonate
 - (3) After washing with plenty of water apply solution of sodium hydroxide on the hand
 - (4) Neutralise the acid with a strong alkali
- 66. Sodium hydrogencarbonate when added to acetic acid evolves a gas. Which of the following statements are true about the gas evolved?
 - (i) It turns lime water milky
 - (ii) It extinguishes a burning splinter
 - (iii) It dissolves in a solution of sodium hydroxide
 - (iv) It has a pungent odour
 - (1) (i) and (ii) (2) (i), (ii) and (iii)
 - (3) (ii), (iii) and (iv) (4) (i) and (iv)
- 67. Common salt besides being used in kitchen can also be used as the raw material for making
 - (i) washing soda (ii) bleaching powder
 - (iii) baking soda (iv) slaked lime
 - (1) (i) and (ii) (2) (i), (ii) and (iv)
 - (3) (i) and (iii) (4) (i), (iii) and (iv)
- 68. To protect tooth decay we are advised to brush our teeth regularly. The nature of the tooth paste commonly used is (1) acidic (2) neutral
 - (1) acture (2) incutation (3) basic (4) corrosive
- 69. In an attempt to demonstrate electrical conductivity through an electrolyte, the following apparatus (Fig.) was set up. Which among the following statement(s) is (are) correct ?
 - (i) Bulb will not glow because electrolyte is not acidic
 - (ii) Bulb will glow because NaOH is a strong base and furnishes ions for conduction.
 - (iii) Bulb will not glow because circuit is incomplete
 - (iv) Bulb will not glow because it depends upon the type of electrolytic solution



- (1) (i) and (iii) (2) (ii) and (iv) (3) (ii) only (4) (iv) only
- 70. Which of the following statements is not correct?
 - (1) All metal carbonates react with acid to give a salt, water and carbon dioxide

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- (2) All metal oxides react with water to give salt and acid
- (3) Some metals react with acids to give salt and hydrogen
- (4) Some non metal oxides react with water to form an acid
- 71. Which of the following is(are) true when HCl (g) is passed through water?
 - (i) It does not ionise in the solution as it is a covalent compound.
 - (ii) It ionises in the solution
 - (iii) It gives both hydrogen and hydroxyl ion in the solution
 - (iv) It forms hydronium ion in the solution due to the combination of hydrogen ion with water molecule
 - (1) (i) only (2) (iii) only
 - (3) (ii) and (iv) (4) (iii) and (iv)
- 72. Identify the correct representation of reaction occurring during chloralkali process
 - (1) $2\text{NaCl}(l) + 2\text{H}_2\text{O}(l) \rightarrow 2\text{NaOH}(l) + \text{Cl}_2(g) + \text{H}_2(g)$
 - (2) $2\text{NaCl}(aq) + 2\tilde{H}_2O(aq) \rightarrow 2\text{NaOH}(aq) + Cl_2(g) + H_2(g)$
 - (3) $2\text{NaCl}(aq) + 2H_2O(l) \rightarrow 2\text{NaOH}(aq) + Cl_2(aq) + H_2(aq)$
 - (4) $2\text{NaCl}(aq) + 2H_2O(l) \rightarrow 2\text{NaOH}(aq) + Cl_2(g) + H_2(g)$

^{73.} Which one observations is correct according to effect of acids and bases on some indicators

	Test	Red	Blue	Phenol-	Methyl
	Sample	litmus	litmus	phthalein	orange
Ι	Dil. HCl	No effect	Turn red	No effect	Turn red
Π	Dil H ₂ SO ₄	Turn blue	No effect	Turn pink	Turn red
III	Ca(OH) ₂	No effect	Turn red	Turn pink	Turn red
IV	Mg(OH) ₂	Turn blue	Turn red	No effect	No effect

- (1) I observation is correct
- (2) II observation is correct
- (3) III observation is correct
- (4) IV observation is correct
- 74. Observe the experimental setup carefully



Which type of reaction is this ?

- (1) Isomerisation (2) Neutralisation
- (3) Saponification (4) Both (2) & (3)

75. Carefully observe the experimental setup shown below :









The above figure indicates -

- (1) Glucose is sweet in taste
- (2) Ethyl alcohol gives OH⁻ ions
- (3) H₂SO₄ releases H⁺ ions which is responsible for conduction of electric current
- (4) Both ethyl alcohol and H_2SO_4 are acids.
- 76. When electricity is passed through an aqueous solution of sodium chloride (called brine) :

NaCl (aq) $\xrightarrow{\text{electricity}}$ NaOH (aq) + X + Y

What is X, Y & where it will produced :

- (1) $X = O_2$ at cathode $Y = Cl_2$ at anode
- (2) $X = O_2$ at anode $Y = Cl_2$ at cathode
- (3) $X = H_2$ at cathode $Y = Cl_2$ at anode
- (4) $X = H_2$ at anode $Y = Cl_2$ at cathode

77. Which one of the combination is completely correct

	(A) Name of contents	(B) Chemical formula	(C) Use
1)	Lactic acid	CH ₃ —CH—COOH I OH	Used as a food preservative
2)	Citric acid	$C_6H_8O_7$	Present in lemon, orange etc
3)	Sulphuric acid	H_2SO_4	Commonly used in automobile batteries
4)	Sodium hydroxide	NaOH	Used for manufacturing of soaps
5)	Potassium hydroxide	КОН	Used for manufacturing of fertilizers

78. If we have 2 test tubes (A & B) containing HCl and CH₃COOH. On mixing both acids, which are having pH = 2 (HCl) and pH = 6 (CH₃COOH), pH of resultant solution will be



(ii)

Solution of washing soda

(iv) Stomach Juices

- (1) The pH will be less than 2
- (2) The pH will be more than 6
- (3) The pH will be between 2 to 6
- (4) The pH will be 7
- 79. What is correct for following ?
 - (i) Lemon Juice
 - (iii) Toothphaste
 - (v) Vinegar
 - (1) i, iv, v are acids and ii, iii are bases
 - (2) ii, iii are acids i, iv, v are bases
 - (3) i, iii, iv, v are acids and ii is a base
 - (4) i, ii, iii are acids and iv, v are bases
- 80. A student collected the samples of acids such as : hydrochloric acid, acetic acid and bases such as sodium hydroxide and magnesium hydroxide from the science laboratory. He put 10 drops of each of the above sample solution on a watch glass and tested with a 1–2 drops of the following indicators as given below; and recorded his observations :

(4)

В&

Sample solution	Red litmus solution	Blue litmus solution	Phenolphthalein solution	Methyl orange solution
A. HCl solution	No colour change	Changes to red	Colourless	Changes to red
B. CH ₃ COOH solution	No colour change	Changes to red	Changes tor red	Colourless
C. NaOH solution	Changes to blue	No colour change	Changes to light pink	remains as it is
D. Mg (OH) ₂ solution	No colour change	Changes to red	Changes to light pink	Colourless

The correct observation is made by a student :

(1) A & B (2) A & C

D

81. Observe the following experimental set-up



(3)

B & C

Statement – I : When (I) test tube and (II) test tube containing NaOH & HCl solution respectively are mixed together completely the colour of the solution changed to colourless.

3.

Statement -II : When test tube (III) & (IV) are mixed together completely, the resultant solution remains colourless.

- (1) Only (I) is correct
- (2) Only (II) is correct
- (3) Both (I) and (II) are correct
- (4) None of these



Matching Based MCQ

DIRECTIONS (Qs. 1 to 8) : Match Column-I with Column-II and select the correct answer using the codes given below the columns.

1.		Column I		Column II
	(A)	Acetic acid	(p)	Tomato
	(B)	Citric acid	(q)	Tamarind
	(C)	Tartaric acid	(r)	Orange
	(D)	Oxalic acid	(s)	Vinegar
	(E)	Lactic acid	(t)	Milk
	(1)	$A \rightarrow (s); B \rightarrow (r); C \rightarrow$	→ (q);	$D \rightarrow (p); E \rightarrow (t)$
	(2)	$A \rightarrow (r); B \rightarrow (s); C \rightarrow$	→ (q);	$D \rightarrow (t); E \rightarrow (p)$
	(3)	$A \rightarrow (s); B \rightarrow (r); C \rightarrow$	→ (p);	$D \rightarrow (q); E \rightarrow (t)$
	(4)	$A \rightarrow (s); B \rightarrow (q); C \rightarrow (q)$	\rightarrow (r);	$D \rightarrow (p); E \rightarrow (t)$
2.		Column I		Column II
	(A)	HC1	(p)	strong acid
	(B)	HCN	(q)	weak acid
	(C)	NaOH	(r)	weak base
	(D)	NH ₄ OH	(s)	strong base
	(E)	Distilled water	(t)	neutral

- (1) $A \rightarrow (s); B \rightarrow (r); C \rightarrow (q); D \rightarrow (p); E \rightarrow (t)$
- (2) $A \rightarrow (p); B \rightarrow (q); C \rightarrow (s); D \rightarrow (r); E \rightarrow (t)$
- (3) $A \rightarrow (s); B \rightarrow (r); C \rightarrow (p); D \rightarrow (q); E \rightarrow (t)$
- (4) $A \rightarrow (s); B \rightarrow (q); C \rightarrow (r); D \rightarrow (p); E \rightarrow (t)$

(-)	$A \rightarrow (3), D \rightarrow (q), C \rightarrow (1), D \rightarrow (p), L \rightarrow (l)$		
	Column I		Column II
(A)	KNO3	(p)	Nitric acid
			silver hydroxide
(B)	AgNO ₃	(q)	Hydrochloric acid,
			Magnesium hydroxide
(C)	MgCl ₂	(r)	Carbonic acid, Ammonium
			hydroxide
(D)	$(NH_4)_2CO_3$	(s)	Nitric acid, potassium
			hydroxide
(E)	NaCl	(t)	Hydrochloric acid and
			sodium hydoxide
(1)	$A \rightarrow (s); B \rightarrow (r); C \rightarrow$	→ (q);	$D \rightarrow (p); E \rightarrow (t)$
(2)	$A \rightarrow (p); B \rightarrow (q); C \rightarrow (q)$	\rightarrow (s)	; $D \rightarrow (r)$; $E \rightarrow (t)$

- (3) $A \rightarrow (s); B \rightarrow (r); C \rightarrow (p); D \rightarrow (q); E \rightarrow (t)$
- (4) $A \rightarrow (s); B \rightarrow (p); C \rightarrow (q); D \rightarrow (r); E \rightarrow (t)$

List-I (Chemical) List-II (Formula) (A) Quick lime (p) NaHCO₃ (B) Caustic Soda $(q) Na_2CO_3$ (C) Washing Soda NaOH (r) (D) Baking Soda (s) CaO (1) $A \rightarrow (s), B \rightarrow (r), C \rightarrow (q), D \rightarrow (p)$ (2) $A \rightarrow (r), B \rightarrow (s), C \rightarrow (p), D \rightarrow (q)$ (3) $A \rightarrow (p), B \rightarrow (r), C \rightarrow (q), D \rightarrow (s)$ (4) $A \rightarrow (s), B \rightarrow (p), C \rightarrow (r), D \rightarrow (p)$ 5. Column -I Column -II (A) Bleaching powder (p) Constituent of glass (B) Baking soda (q) Production of H_2 and Cl_2 (C) Borax (r) Decolourisation (D) Sodium chloride (s) Antacid (1) $A \rightarrow (q), B \rightarrow (p), C \rightarrow (s), D \rightarrow (r)$ (2) $A \rightarrow (r), B \rightarrow (q), C \rightarrow (s), D \rightarrow (p)$ (3) $A \rightarrow (r), B \rightarrow (s), C \rightarrow (p), D \rightarrow (q)$ (4) $A \rightarrow (q), B \rightarrow (s), C \rightarrow (p), D \rightarrow (r)$ 6. Column -I Column -II (1) Plaster of Paris (p) $Ca(OH)_2$ (2) Gypsum (q) $CaSO_4.1/2H_2O$ (3) Bleaching Powder (r) CaSO₄.2H₂O (4) Lime Water (s) CaOCl₂ (1) $A \rightarrow (q), B \rightarrow (r), C \rightarrow (s), D \rightarrow (p)$ (2) $A \rightarrow (s), B \rightarrow (q), C \rightarrow (r), D \rightarrow (p)$ (3) $A \rightarrow (p), B \rightarrow (s), C \rightarrow (r), D \rightarrow (q)$ (4) $A \rightarrow (q), B \rightarrow (r), C \rightarrow (p), D \rightarrow (s)$ 7. Column -I Column -II (A) $H_2SO_4(aq)$ (p) turns red litmus blue (B) NaOH (aq)(q) turns blue litmus red (C) $CuSO_4.5H_2O(aq)$ (r) turns phenolphthalein pink (D) $Na_2CO_3(aq)$ (s) pH paper becomes red (E) $NaNO_3(aq)$ (t) pH paper becomes blue (v) pH paper becomes green (1) $A \rightarrow (q, s); B \rightarrow (p, r, t); C \rightarrow (q, s); D \rightarrow (p, r, t); E(v)$ (2) $A \rightarrow (q, v); B \rightarrow (p, r); C \rightarrow (q, s); D \rightarrow (t, r); E(s)$ (3) $A \rightarrow (q, s); B \rightarrow (p, r, t); C \rightarrow (q, s); D \rightarrow (p, r); E (v)$ (4) $A \rightarrow (s); B \rightarrow (p, q, t); C \rightarrow (r, s); D \rightarrow (p, r, t); E(v)$ 8. Column-I Column-II (A) Caustic soda (p) Manufacture of antacid (B) Sulphuric acid (q) Preservation of food (C) Calcium hydroxide (r) Manufacturing of soap (D) Acetic acid (s) Automobile batteries (1) A -(r); B -(s); C -(p); D -(q)(2) A - (q); B - (s); C - (p); D - (r)(3) A - (r); B - (p); C - (s); D - (q)(4) A - (s); B - (r); C - (p); D - (q)Statement Based MCQ 9. Consider the following statements :

(a) The hydronium ion (H_3O^+) is the strongest acid that can exist in aqueous solution.

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(b) Mixing concentrated acid or bases with water is a highly endothermic reaction.

Which of these statement(s) is/are correct ?

- (1) (a) only (2) (b) only
- (3) Both (a) and (b) (4) Neither (a) nor (b)
- 11. Consider the following statements :

10.

- (a) Bee stings contain ethanoic acid.
- (b) The white enamel on our teeth is made up of calcium sulphate.
- (c) Acidic nature of a substance is due to the formation of H⁺(aq) ions in solution.
- Which of these statement(s) is/are correct ?
- (1) (a) and (b) (2) (a) and (c)
- (3) Only (c) (4) Only (b)
- 12. Consider the following statements :
 - (a) Living beings carry out their metabolic activities with in an optimal pH range.
 - (b) There are a variety of strengths when you study acids and base.
 - Which of these statement(s) is/are correct ?
 - (1) (a) only (2) (b) only
 - (3) Both (a) and (b) (4) Neither (a) nor (b)
- 13. Consider the following statements :
 - (a) Washing soda on strong heating gives sodium oxide and carbon dioxide.
 - (b) Plaster of Paris is obtained by heating gypsum at 373 K.
 - (c) Bleaching powder is used for disinfecting drinking water.

Which of these statement(s) is/are correct ?

- (1) (a) and (b) (2) (b) and (c)
- (3) (a) and (c) (4) All are correct
- Consider the following statements :
- (a) Hydrogen chloride gas turns the red litmus blue.
- (b) Lactic acid is one of the mineral acids.
- (c) Milk of magnesia is a type of milk.
- Which of these statement(s) is/are correct ?

(1) (a) and (b) (2) (a) and (c)

14.

16

- (3) All are correct (4) All are incorrect
- 15. Consider the following statements :
 - (a) Solution of sodium hydrogen carbonate is alkaline in nature.
 - (b) Sodium hydrogen carbonate is used in fire extinguisher.
 - Which of these statement(s) is/are correct ?
 - (1) (a) only (2) (b) only
 - (3) Both (a) and (b) (4) Neither (a) nor (b)
 - Consider the following statements :
 - (a) When a base reacts with a metal, along with the evolution of hydrogen gas a salt is formed which has a positive ion composed of the metal and oxygen.
 - (b) Acidic and basic solution in water conduct electricity because they produce hydrogen and hydroxide ions respectively.
 - (c) Acids and bases neutralise each other to form corresponding salts and water.
 - Which of these statement(s) is/are correct ?
 - (1) (a) and (b) (2) (b) and (c)
 - (3) (a) and (c) (4) All are correct

(1) (a) only (2) (b) only (3) Both (a) and (b) (4) Neither (a) nor (

(a) Whether water acts as an acid or as a base depends on

(3) Both (a) and (b) (4) Neither (a) nor (b)

(b) Every liquid is either an acid or a base.

Which of these statement(s) is/are correct ?

the other species present.

- 17. Consider the following statements :
 - (a) We can determine the pH of a solution using a litmus paper.
 - (b) The colour of caustic soda solution turns pink when phenolphthalein is added.
 - Which of these statement(s) is/are correct ?
 - (1) (a) only (2) (b) only
 - (3) Both (a) and (b) (4) Neither (a) nor (b)
- 18. Consider the following statements :
 - (a) Tamarind contains tartaric acid.
 - (b) Guava contains citric acid.
 - (c) amla is rich source of vitamin B.
 - Which of these statement(s) is/are correct ?
 - (1) (a) and (c) (2) (a) and (b)
 - (3) (b) and (c) (4) All are correct

Passage Based MCQ

DIRECTIONS (Qs. 19 to 33) : Read the passage(s) given below and answer the questions that follow.

PASSAGE - 1

The strength of an acid depends on the concentration of the hydronium ions present in a solution. Greater the number of hydronium ion present. Greater is the strength of acid. However some acids do not dissociate to any appreciable extent in water. Therefore these acids will have a low concentration of hydronium ions. Those acids which dissociate to give two or more than two hydronium are called polybasic acids.

- 19. Which of the following is not the characteristics of an acid?
 - (1) Turns blue litmus to red.
 - (2) Turns phenolphalein pink from colourless.
 - (3) Decompose carbonates
 - (4) Oxy compounds of non-metals.
- 20. Strength of an acid can be explained on the basis of
 - (1) its concentration in solution
 - (2) its degree of ionisation
 - (3) (1) and (2) both required
 - (4) it is an inherent property of acid.
- 21. The basicity of phosphorous acid (polybasic) is -
 - (1) 1 (2) 2
 - (3) 3 (4) 4

PASSAGE - 2

If chlorine is passed for a considerable time over solid **slaked lime**, the product formed is bleaching power. Bleaching powder is represented as CaOCl₂,

 $Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$

It has greater available chlorine than sodium hypochlorite, NaClO (liquid bleach). It contains about 36% of available chlorine.

Bleaching powder deteriorates if left in contact with the air and smells of chlorine because of action of CO_2 in atmosphere.

It is widely used as a bleaching agent for bleaching clothes. It is used for disinfection of drinking water or swimming pool water. For use in outdoor swimming pools, CaOCl₂ can be used as a sanitizer in combination, with cyanuric acid stabilizer. Two stabilizer will reduce the loss of chlorine because of u.v. radiation.

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- 22. How is bleaching powder prepared ?
 - (1) Reaction of Cl_2 with $Ca(OH)_2$
 - (2) Reaction of Cl_2 with CaO
 - (3) Reaction of Ca with HOCl
 - (4) Reaction of Ca with Cl_2/H_2O
- 23. How much amount of available chlorine is present in bleaching powder ?
 - (1) 32% (2) 36%
 - (3) 35% (4) 38%
- 24. Why bleaching powder smells of chlorine ?
 - (1) by action of H_2O in atmosphere on bleaching powder
 - (2) by action of O_2 in atmosphere on bleaching powder
 - (3) by action of SO_2 in atmosphere on bleaching powder
 - (4) by action of CO_2 in atmosphere on bleaching powder

PASSAGE - 3

Types of salts. There are three types of salts.

(i) Neutral salts are those salts which when dissolved in water form a neutral solution. These are formed by the reaction of strong acids with strong bases. Sodium chloride (NaCl) and sodium sulphate (Na_2SO_4) are two examples of neutral salt. The solutions of a neutral salt has no effect on litmus.

(ii) Acidic salts are those salts which when dissolved in water form an acidic solution. These are formed by the neutralisation reaction of a strong acid with a weak base. The solution of an acidic salt turns blue litmus to red. Two examples of acidic salts are ammonium chloride (NH_4Cl) and ammonium sulphate (NH_4)₂SO₄.

(iii) Basic salts are those salts which when dissolved in water form a basic solution. These are formed by the neutralisation reaction of a weak acid with a strong base. The solution of a basic salt turns red litmus to blue. Two examples of basic salts are sodium carbonate (Na_2CO_3) and sodium hydrogen carbonate $(NaHCO_3)$.

- 25. Common salt (NaCl) is
 - (1) normal salt (2) acidic salt
 - (3) basic salt (4) None of these
- 26. Which of the following is an acidic salt?
 - (1) $ZnSO_4$ (2) $Zn(NO_3)_2$
 - (3) NaCl (4) NaHSO₄
- 27. Which of the following is a basic salt?

	(1)	MgCl ₂	(2)	NaCI C-Cl
20	(3)	PD(OH)CI	(4)	Callar II
28.		Column I		Column II

- Nature of the salt
- (A) Sodium carbonate (p) Basic (NaHCO₃)
- (B) Sodium sulphate (q) Neutral (Na_2SO_4)
- (C) Ammonium sulphate (r) Acidic $(NH_4)_2SO_4$
- (1) A (p), B (q), C (r)

Name of salt

- (2) A (r), B (q), C (p)
- (3) A (q), B (p), C (r)
- (4) A (p), B (r), C (q)

PASSAGE - 4

Three different substances were taken and tested with litmus paper. The results are given below. Based on the results answer the questions 29 to 33.

Type of Litmus	X	Y	Z
Red litmus	turns blue	no change	no change
Blue litmus	no change	turns red	no change

29. What could be the substance X?

(1) An acid	(2) A base
-------------	------------

- (3) Water (4) Salt
- 30. What could be the substance Y?
 - (1) An acid (2) A base
 - (3) Water (4) Salt
- 31. What could be the substance Z?
 - (1) Water (2) Salt
 - (3) Either A or B (4) Either an acid or a base
- 32. How can you obtain the substance Z?
 - (1) By the reaction of X and Y
 - (2) By dissolving X in water
 - (3) By dissolving Y in water
 - (4) Cannot be said
- 33. How will the substance X behave with phenolphthalein?
 - (1) It turns pink (2) It remains colourless
 - (3) It turns blue (4) It turns red

Assertion Reason Based MCQ

DIRECTIONS (Qs. 34 to 43) : Following questions consist of two statements, one labelled as the **'Assertion'** and the other as **'Reason'**. You are to examine these two statements carefully and select the answer to these items using the code given below.

Code :

- Both A and R are individually true and R is the correct explanation of A:
- (2) Both A and R are individually true but R is not the correct explanation of A.
- (3) A is true but R is false
- (4) A is false but R is true.
- Assertion : Acetic acid is weak acid
 Reason : Acetic acid gets partially ionized in aqueous solutions
- Assertion : Formic acid is present in Ant's sting.
 Reason : The portion of body where ant bite is nibbed with dry baking soda.
- 36. Assertion : Many factories wastes are acidic in nature Reason : Generally bases are added to all factory wastes before discharging into the water bodies
- 37. **Assertion :** Tooth decay starts when the pH in the mouth is below 5.5.

Reason : The strength of an acid or an alkali is measured by a scale called the pH scale.

Assertion : In an acidic solution, the indicator phenolphthalein remains colourless.
 Reason : Phenolphthalein is an acid base indicator.

39. Assertion : Concentrated sulphuric acid can be diluted by adding water dropwise to acid.

Reason : Concentrated sulphuric acid has a strong affinity for water.

40. Assertion : An aqueous solution of Na₂CO₃ is basic in nature.

Reason : In aqueous solution, Na_2CO_3 gives Na^+ ions which behave as base.

41. Assertion : A solution of NH₃ in water turns blue litmus red.

Reason : In water, ammonia forms NH_4OH which dissociates to give NH_4^+ and OH^- ions.

42. Assertion : In summer season, a milk man adds a very small amount of baking soda to fresh milk.

Reason : Sodium hydrogen carbonate (NaHCO₃) present in baking soda neutralises lactic acid formed in the milk.

43. Assertion : H_3PO_4 and H_2SO_4 are strong acids.

Reason : They ionises completely in a aqueous solution to give H^+ ions.

Correct Definition Based MCQ

- 44. Which of the following is correct definition of Indicators?
 - Indicators are substances used to determine the acidic or basic nature of a particular substance as they change their physical state in different media
 - (2) Indicators are substances used to determine the acidic or basic nature of a particular substance as they change their color in different media.
 - (3) Indicators are substances used to determine exact pH of particular substance.
 - (4) Indicators are substances obtained by plants used to determine acidic or basic nature of a particular substance.
- 45. Which of the following is correct definition of neutral substances?
 - (1) The substances which are amphoteric in nature
 - (2) The substances which are neither acidic nor basic in nature
 - (3) The substances obtained by neutralisation reaction between acid and base
 - (4) The substances which are only slightly acidic in nature.
- 46. Which of the following is correct definition of strong bases?
 - (1) They give only small number of hydroxide ions when dissolved in water
 - (2) They give large number of hydrogen ions when dissolved in water
 - (3) They give large number of hydroxide ions when dissolved in water
 - (4) They give small number of hydrogen ions when dissolved in water

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Scholastic Aptitude Test (SAT) — CHEMISTR

- 49. On the basis of following features identify the correct substance
 - (I) It is sour in taste
 - (II) It occurs in vinegar solution
 - (III) It is used in food items like pickles, jams, sauces etc
 - (1) Formic acid (2) Acetic acid
 - (3) Lactic acid (4) Tartaric acid
- 50. On the basis of following features identify the correct substance
 - (I) It is sour in taste
 - (II) It occurs naturally in grapes, tamarind etc.
 - (III) It is a constituent of baking powder.
 - (1) Formic acid (2) Acetic acid
 - (3) Lactic acid (4) Tartaric acid
- 51. On the basis of following featues identify the correct base (I) It is non metal containing compound.
 - (II) It ionized only partially in aqueous solution
 - (1) $B(OH)_3$ (2) NH_4OH
 - (3) NaOH (4) Ba(OH)₂

- 47. Which of the following is correct definition of Aqua regia?(1) It is a mixture of three parts hydrochloric acid and one
 - part nitric acid(2) It is a mixture of three parts nitric acid and one part hydrochloric acid
 - (3) It is a mixture of three parts sulphuric acid and one part hydrochloric acid
 - (4) It is a mixture of three parts hydrochloric acid and one part sulphuric acid

Feature Based MCQ

- 48. On the basis of following features identify the correct group of materials
 - (I) They are corrosive in nature
 - (II) They have wide industrial applications
 - (III) They have sour toste
 - (IV) They furnish hydrogen or hydronium ions in aqueous solutions
 - (1) Acids (2) Bases
 - (3) Salts (4) Metals

Hints & SOGOTONS -

Exercise l

- 1. (2)
 2. (3)
 3. (2)
- 4. (2) Alkali is a base which are water soluble.
- 5. (3) Sodium hydroxide being a base neturalises the acid.
- 6. (3)
- (1) NaCl solution in water is neutral i.e., pH = 7, the same as that of distilled water as NaCl is a salt of strong acid and strong base.
- (3) The blue colour of pH paper indicates basic nature of solution. Only sodium hydrogen carbonate solution show basic nature, all others are acidic.
- **9.** (2) Litmus paper does not give any information about the pH values.
- **10.** (3) It can be for entire pH range.
- **11.** (3) Gastric juice is acidic.
- 12. (4)
- 13. (3) NH_4OH as it is not get completely ionized in aqueous solution.

- (1) NaNO₃ as it is a salt of strong acid and strong base. Ca(OH)₂ is a base CuSO₄.5H₂O is a salt of weak base and strong acid while NaHCO₃ is a salt of strong base and weak acid so they all effects litmus.
- 22. (1)
- 23. (2) Na_2CO_3 when react with water form strong base and weak acid. So its aqueous solution is highly basic and thus it has highest pH.
- 24. (4) Less the pH, more acidic is the solution. The pH of acid B is 2.5 which is minimum.
- **25.** (3) **26.** (2) **27.** (2) **28.** (4)
- **33.** (3)
- 34. (2) It gives H^+ ions which combine with water to produce H_3O^+ ions and CI^- ions

- **35.** (4) Phenolphthalein gives color in basic media. It gives pink colour.
- 36. (3)
- **37.** (3) As HNO_3 is a mineral acid.
- 38. (4)
- 39. (3) When lemon juice is mixed with milk the milk turns sour and changes into 'paneer'. The properties of milk are completely different from that of 'paneer'.
- 40. (2) Sodium hydroxide (NaOH) is a strong base while ammonium hydroxide (NH₄OH) is a weak base. Water is neutral in nature, neither acidic nor basic.
- **41. (4)** All acids are sour in taste, like tartaric acid in tamarind and acetic acid in vinegar while all bases are bitter in taste like baking soda.
- 42. (2) Bases soluble in water are called alkalis. Only the oxides of sodium, potassium, and calcium are soluble in water, so these form sodium hydroxide potassium hydroxide and calcium hydroxide. These are the strongest bases.
- **43. (3)** The third statement is wrong because acid reacts with metal carbonates to form metallic salt, carbon dioxide gas and water
- 44. (4) Acid rain is caused due to increased pollution in the air. The poisonous gases like sulphur dioxide, carbon dioxide and nitrogen dioxide react with water to form sulphuric acid, carbonic acid and nitric acid respectively.
- 45. (2) Acidic soil is harmful for the plants as the plants cannot grow well in it. So the soil is neutralized by adding a base, calcium oxide (CaO)
- **46.** (2) The sting of an ant contains formic acid. Its effect can be neutralized by rubbing moist baking soda on the affected part.
- **47.** (1) Natural indicator is obtained from lichens and is purple in colour. It turns acidic solution red and basic solution blue.
- **48.** (1) Usually the factory wastes are acidic in nature and are neutralized by adding basic substances. The acidic waste can kill fishes when released in water bodies.

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(3) Vinegar is acetic acid and baking soda is sodium hydrogen 49. carbonate (a base). Whenever an acid reacts with a metal carbonate it produces carbon dioxide gas.

 $CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$

- 50. (3) Bases turn red litmus to blue, magnesium hydroxide is also a base which turns red litmus blue.
- 51. (1) Due to the corrosive nature of concentrated acid, dilute acid is used. As the concentrated sulphuric acid can cause severe burns because it can get splashed while boiling.
- 52. (3) Acids on reaction with sulphites and bisulphites produces sulphur dioxide.

 Na_2SO_3 (aq) + 2HCl (aq) Sodium sulphite hydrochloric acid

2NaCl (aq)
$$+H_2O(l) +SO_2(g)$$

sodiumchloride water sulphuri dioxide

57. (3)

- 53. (4) Acid rain effects all of them. Acid rain corrodes historical monuments and marble structures. Acid rain alter the pH of water bodies by making it more acidic thus affects acquatic plants and animals.
- (4) Sodium bisulphate (NaHSO₄) and potassium bisulphite 54. (KHSO₃) both are acidic salts.

56. (2)

- 58. (4) Basic solutions are conducting in nature. Conduction depends on the number of hydroxide ions produced when dissolved in water.
- 59. (3) This reaction is exothermic i.e. Heat is evolved $HCl + NaOH \rightarrow NaCl + H_2O + Heat$
- Ant or bee sting contains formic acid 60. (3)
- 61. (2)

55.

(3)

- $HCl + NaOH \longrightarrow NaCl + H_2O + Heat$ 62. (4)
- 63. (3) **64.** (4)
- (2) Acid burns should be neutralised with mild bases like 65. NaHCO3. Neutralizing acid spills with strong bases, such as NaOH can cause a violent exothermic reaction, and the base itself can cause just as much damage as the original acid spill.
- 66. (2)
- (3) $\operatorname{NaCl} + \operatorname{H}_2O + \operatorname{CO}_2 + \operatorname{NH}_3 \longrightarrow \operatorname{NH}_4Cl + \operatorname{NaHCO}_3$ 67. Baking soda

$$2NaHCO_3 \xrightarrow{heat} Na_2CO_3 + H_2O + CO_2$$

$$Na_2CO_3 + 10 H_2O \longrightarrow Na_2CO_3.10 H_2O$$
Sodium carbonate Hydrated sodium carbonate

- 68. (3)
- 69. (3) NaOH being strong base furnish OH-ions in solution. Which are responsible for electrolytic condition

(washing soda)

- 70. (2)
- 71. (3) Though HCl gas is a covalent compound, in the aqueous solution it ionizes to form H^+ (aq) and Cl^- (aq) ions.

(4) 72. 73. (1)

- 74. $HCl + NaOH \longrightarrow NaCl + H_2O$ (2)
- (3) H⁺ ions here responsible for electrolytic conductance and 75. completes the circuit.
- 76. (3) 77. (2) 78. (3)
- Lemon juice contains citric acid. Stomach juice contains HCl 79. (1) vinegar contains CH₂COOH. Washing soda solution and toothpaste are basic.

80. (2)

Neutralisation reaction results into formation of salt and 81. (3) water which are neutral. Ν

$$IaOH + HC1 \longrightarrow NaCl + H_2O$$

Exercise 2

(1) HCl and NaOH are strong acid and strong base respectively (2) as they get completely dissociated in aqueous solution. HCN and NH₄OH are weak acid and weak base respectively as they get only partially ionized in aqueous solution. Distilled water is neutral.

5.

8.

(3)

(1)

- (4) 4. (1)(1) 7. (1)
- 9. KNO₃ solution is neutral. (1)
- Acid or base dilution is exothermic in nature. 10. (1)
- 11. Bee sting contains formic acid white enamel on our teeth is (3) made up of calcium phosphate.
- 12. (3) 13. (2)
- 14. (4) HCl is acid thus will not change colour of red litmus. Lactic acid is organic acid and milk of magnesia is antacid.
- 15. (3) 16. (2)
- 17. Phenolphthalein turns pink in basic media. (2)
- 18. (2)

23.

1.

2.

3.

6.

- 19. (2) It is a characteristic of bases.
- 20. Since for strong acids (Completely ionised) only (3) concentration is the measure of strength but for weak (incompletely ionised) acids both degree of ionisation and concentration will be required.
- Phosphorous acid is H_3PO_3 which has two replaceable H^+ 21. (2) ions.
- 22. (1) It is prepared by passing chlorine gas over slaked lime. $Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$

24. (4) It is because of action of
$$CO_2$$
 in atmosphere
 $2CaOCl_2 + 2CO_2 \longrightarrow 2CaCO_3 + 2Cl_2 + O_2$

26. (4) (2)

- As base turns red litmus blue. 29. 30. (1) Acid turns blue litmus red.
- 31. (3) Both salt and water are neutral towards litmus.
- 32. (1) Z is either water or salt, both of which can be obtained from the reaction between acid and a base. Since X is a base and Y is an acid. Z can be obtained from the reaction between X and Y.

27. (3)

28. (1)

- In basic medium phenolphthalein turns pink. 33. (1)
- 34. Strength of an acid depends upon the number of hydrogen (1) ions they furnish in aqueous solutions. Since acetic acid furnish only small amount of hydrogen ion in aqueous solutions this is considered as weak acid.
- 35. (3) The portion of body where ant bite is nibbed with moist baking soda.
- As factory wastes are acidic in nature there direct dischare 36. (1) into water bodies results into damage of aquatic life. Therefore before discharging of acidic waste is neutralised with addition of bases.

- 38. (1)
- 39. Concentrated sulphuric acid can be diluted by adding acid (4) dropwise to water. This will minimise the heat evolved during the reaction.
- 40. (3) In aqueous solution Na₂CO₃ forms NaOH (strong base) and carbonic acid (H_2CO_3) . Therefore, it is basic in nature. $Na_2CO_3 + 2H_2O \longrightarrow 2NaOH + H_2CO_3$ (Strong base) (Weak acid)
- (4) A solution of NH₃ in water turns red litmus blue since it is of 41. basic nature.

42. 43. (1) 44. (2) 45. (2) (1)46. (3) 47. (1) 48. (1) 49. (2) 50. (4) 51. (2)

⁽²⁾ 37.