

Chapter: Acids, Bases and Salts

Chemistry mcqs

Multiple Choice Questions:

1) As to the Arrhenius theory, an acid is a

- (a) Proton donating specie
- (b) Proton accepting specie
- (c) Hydroxyl donating specie
- (d) Lone pair donating specie

Explanation:

Arrhenius acid is a chemical that emits protons when ionized in water.

2) In Arrhenius's theory, a base is a

- (a) Proton donating specie
- (b) Proton accepting specie
- (c) Hydroxyl donating specie
- (d) Lone pair donating specie

Explanation:

A chemical that, when ionized in water, produces the Hydroxyl ion.

3) In line with the Bronsted-Lowery theory, an acid is a

- (a) Proton donating specie
- (b) Proton accepting specie
- (c) Hydroxyl donating specie
- (d) Lone pair accepting specie

Explanation:

Bronsted-Lowery acid is a chemical with the ability to give protons.

- 4) **A base, in the Bronsted-Lowery theory, is a**
- (a) Proton donating specie
 - (b) Proton accepting specie**
 - (c) Lone pair donating specie
 - (d) Lone pair accepting specie

Explanation:

Bronsted-Lowery base is a chemical with proton-accepting properties.

- 5) **In accordance with Lewis's Law, an acid is a**
- (a) Proton donating specie
 - (b) Proton accepting specie
 - (c) Lone pair donating specie
 - (d) Lone pair accepting specie**

Explanation:

Lewis acid is a chemical that has an electron-deficient core and can accept an electron pair to fill that hole.

- 6) **In Lewis's idea, a base is a**
- (a) Proton donating specie
 - (b) Proton accepting specie
 - (c) Lone pair donating specie**
 - (d) Lone pair accepting specie

Explanation:

Lewis bases are substances that have a lone pair of electrons and the capacity to give it

- 7) **Salt arises from the substitution of**
- (a) Hydrogen atom in acid**
 - (b) Hydroxyl ion in base
 - (c) Both a and b
 - (d) None of them

Explanation:

Salt is an acid in which a metal atom has taken the place of the hydrogen atom.

8) Salt is created when an acid's hydrogen atom is replaced with a

- (a) **Metal atom**
- (b) Non-metal atom
- (c) Both and b
- (d) None of them

Explanation:

Salt is an acid in which the hydrogen atom has been replaced by a metal atom.

9) Solutions composed of salt

- (a) Acidic
- (b) Basic
- (c) **Neutral**
- (d) None of them

Explanation:

Salt solution has a pH of 7, and we are aware that solutions with a pH of 7 are referred to as neutral solutions.

10) Salts are created when two substances react

- (a) Acid and base
- (b) Acid and metal oxide
- (c) Acid and metal atom
- (d) **All of the above**

Explanation:

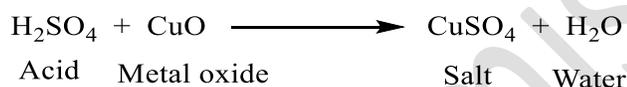
Salt Synthesis Techniques:

There are five different ways to create salt. The following five techniques are listed in order:

- In the first approach, salt and water are created when an acid and a base react, for example.



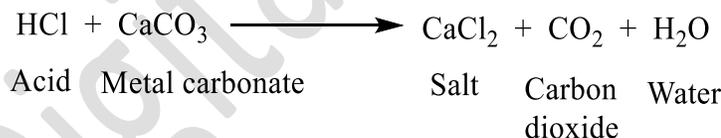
- In the second process, salt and water are created when metal oxide and acid react, for example.



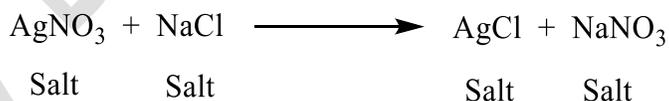
- Thirdly, the reaction between an acid and a metal atom produces salt and hydrogen gas, for example.



- In the fourth process, salt, carbon dioxide, and water are produced as a result of the reaction between acid and metal carbonate. e.g.



- The fifth approach, for example, causes the creation of salts via the reaction of salts and salt.



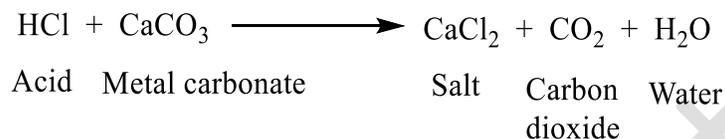
11) Reaction of an acid and metal carbonate will lead to the formation of

- (a) Salt
- (b) Acid
- (c) Base
- (d) Salt and CO₂**

Explanation:

Reaction of an acid and metal carbonate:

Salt, carbon dioxide, and water are formed as a result of the reaction between an acid and a metal carbonate, for example.



12) The result of the reaction between salt and salt is the creation of

- (a) Salts
- (b) Acids
- (c) Hydrogen gas
- (d) All of the above

Explanation:

Reaction of Salt + Salt:

Salts, such as, are created through the reaction between salts and salt e.g.



13) Acid and metal atom interaction results in the production of

- (a) Salt
- (b) Salt and CO₂
- (c) Salt and hydrogen gas
- (d) None of them

Explanation:

Reaction of an acid with metal atom:

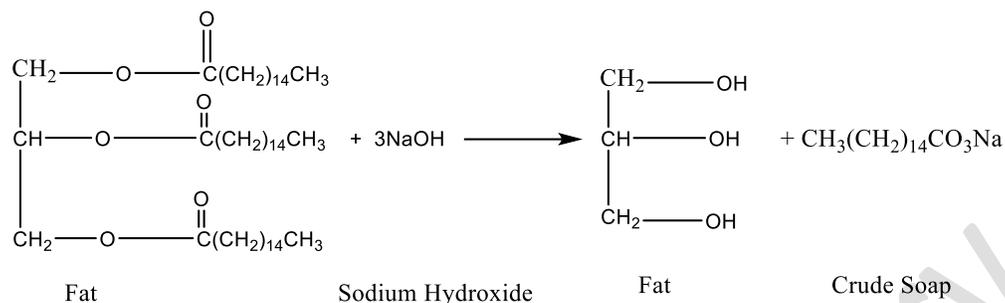
Salt and hydrogen gas, for example, are produced as a result of the reaction between an acid and a metal atom.

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Explanation:



17) Arrhenius first put forward his theory in

- (a) 1880
- (b) 1885
- (c) **1887**
- (d) 1889

Explanation:

Arrhenius put forth the Arrhenius theory of acids and bases in 1887.

18) Bronsted and Lowery put up the Bronsted-Lowery idea in

- (a) 1920
- (b) 1921
- (c) **1923**
- (d) 1930

Explanation:

J.N. Bronsted and T.M. Lowery proposed the Bronsted-Lowery hypothesis of acids and bases in 1923.

19) Lewis hypothesis was first outlined by G.N. Lewis in

- (a) 1930
- (b) 1935
- (c) 1940
- (d) **1923**

Explanation:

G.N. Lewis proposed the Lewis theory of acids and bases in 1923.

20) At 25 °C, $[H^+]$ and $[OH^-]$ concentrations are

- (a) $[H^+] > [OH^-]$
- (b) $[H^+] < [OH^-]$
- (c) $[H^+] = [OH^-]$
- (d) None of them

Explanation:

Experimental evidence shows that the hydrogen and hydroxyl ion concentrations are similar at 25 °C.

$$K_w = [H^+] [OH^-]$$

$$\text{At } 25 \text{ }^\circ\text{C } [H^+] = [OH^-]$$

$$K_w = (1 \times 10^{-7}) (1 \times 10^{-7}) = 1 \times 10^{-14} \text{ at } 25 \text{ }^\circ\text{C}$$

We state that K_w is temperature dependent for this reason. This concentration will change if we alter the temperature by 25 °C.

21) The product of $[H^+]$ and $[OH^-]$ is equal to

- (a) 1×10^{-7}
- (b) 1×10^{-14}
- (c) 1×10^{-6}
- (d) 1×10^{-12}

Explanation:

$$K_w = [H^+] [OH^-]$$

$$\text{At } 25 \text{ }^\circ\text{C } [H^+] = [OH^-]$$

$$K_w = (1 \times 10^{-7}) (1 \times 10^{-7}) = 1 \times 10^{-14} \text{ at } 25 \text{ }^\circ\text{C}$$

22) K_w is based on

- (a) Pressure
- (b) Volume
- (c) Concentration
- (d) Temperature**

Explanation:

Experimental evidence shows that the hydrogen and hydroxyl ion concentrations are similar at 25 °C.

$$K_w = [H^+] [OH^-]$$

$$\text{At } 25\text{ }^\circ\text{C } [H^+] = [OH^-]$$

$$K_w = (1 \times 10^{-7}) (1 \times 10^{-7}) = 1 \times 10^{-14} \text{ at } 25\text{ }^\circ\text{C}$$

We state that K_w is temperature dependent for this reason. This concentration will change if we alter the temperature by 25 °C.

23) K_w at 25 °C equals

- (a) 1×10^{-7}
- (b) 1×10^{-14}**
- (c) 1×10^{-12}
- (d) 1×10^{-5}

Explanation:

$$K_w = [H^+] [OH^-]$$

$$\text{At } 25\text{ }^\circ\text{C } [H^+] = [OH^-]$$

$$K_w = (1 \times 10^{-7}) (1 \times 10^{-7}) = 1 \times 10^{-14} \text{ at } 25\text{ }^\circ\text{C}$$

24) If $[H^+] > [OH^-]$, the resulting solution is

- (a) Neutral
- (b) Acidic**
- (c) Basic
- (d) None of them

Explanation:

Acid Solution:

An acidic solution is one in which the hydrogen ion concentration is higher than the hydroxyl ion concentration.

25) If $[H^+] < [OH^-]$, the resulting solution is

- (a) Neutral
- (b) Acidic
- (c) **Basic**
- (d) None of them

Explanation:

Basic Solution:

A basic solution is one in which the concentration of hydroxyl ions is higher than that of hydrogen ions.

26) The answer is when $[H^+] = [OH^-]$

- (a) **Neutral**
- (b) Acidic
- (c) Basic
- (d) None of them

Explanation:

Neutral Solution:

A neutral solution is one in which the concentrations of hydrogen and hydroxyl ions are equal.

27) Acid rain has a pH of

- (a) 3
- (b) **4**
- (c) 5
- (d) 6

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Explanation:

Acid Rain:

Acid rain is a term used to describe rain that contains sulphuric acid and nitric acid and has a pH of 4.

28) Salivary pH is

- (a) 2
- (b) 4
- (c) 6
- (d) 7

Explanation:

Saliva:

Salivary glands help us move food from our mouth to our stomach by secreting saliva in our mouths. Saliva's pH of 6 indicates that it has a mildly acidic composition.

29) Ammonia solution's pH is

- (a) 8
- (b) 9
- (c) 10
- (d) 11

Explanation:

Ammonia solution serves many functions in the chemical industry and is very practical. Ammonia solution has a pH of 11. Means that ammonia is a basic substance.

30) The culprit behind acid rain is

- (a) CO₂
- (b) SO₂
- (c) Oxides of nitrogen
- (d) **Both b and c**

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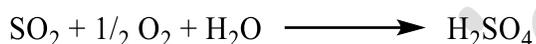
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Explanation:

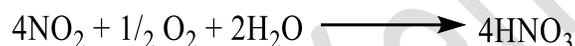
Acid Rain:

Acid rain is defined as rain with a pH of 4 and contains H₂SO₄ and HNO₃. The main contributors to acid rain are:

- Burning fossil fuels and smoking cigarettes releases SO₂ into the atmosphere
- Burning fossil fuels and smoking cigarettes releases NO_x (nitrogen oxides) into the atmosphere
- The SO₂ reacts with oxygen and water vapours in the atmosphere to produce H₂SO₄, which mixes with raindrops to form acid rain. The response is provided below.



- Acid rain forms when nitrogen oxides in the air combine with oxygen and water vapour to generate HNO₃, which then falls as rain. The response is provided below.



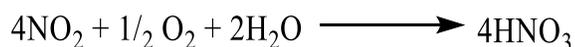
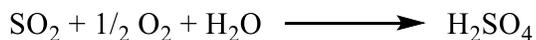
31) Using cigarettes produces

- (a) SO₂
- (b) NO_x
- (c) H₂
- (d) Both a and b

Explanation:

Smoke from cigarettes contains

- SO₂ and NO_x (nitrogen oxides).
- When these gases are inhaled, they combine with oxygen and water vapour to produce H₂SO₄ and HNO₃.
- Can pick up raindrops and release acid rain, for example.



32) Acid alters

- (a) Blue litmus paper to red
- (b) Red litmus paper to blue
- (c) No effect
- (d) Both a and b

Explanation:

Blue litmus paper:

Blue litmus paper turns red when placed in an acidic solution, changing the hue from blue to red.

33) Acid transforms red litmus paper into

- (a) Blue
- (b) Yellow
- (c) Green
- (d) No effect

Explanation:

Red litmus paper won't change color when dipped in an acidic solution.

34) Base alters

- (a) Blue litmus paper to red
- (b) Red litmus paper to blue
- (c) No effect
- (d) Both a and b

Explanation:

A red litmus paper that has been dipped in basic solution becomes blue instead of red.

35) Base transforms blue litmus paper into

- (a) Red
- (b) Yellow
- (c) Purple
- (d) No effect**

Explanation:

Blue litmus paper won't change color when dipped in basic solution, though.

36) Which one is skin-corrosive?

- (a) Acid
- (b) Base
- (c) Both a and b**
- (d) None of them

Explanation:

Both acid and base can corrode skin because the base has a pH greater than 7 and acid has a pH lower than 7. Additionally, solutions with a pH of 7 are ineffective and safe for the skin.

37) Lewis theory holds that a base gives an acid a lone pair of electrons by

- (a) Ionic bond
- (b) Covalent bond
- (c) Coordinate covalent bond**
- (d) None of them

Explanation:

Coordinate Covalent Bond:

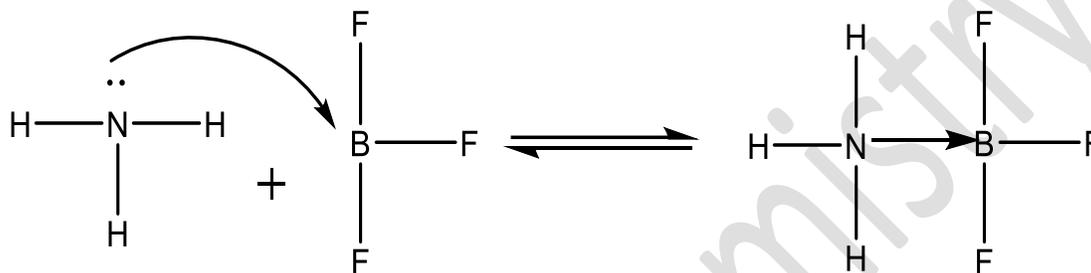
A [coordinate covalent bond](#) is created when a pair of an electron is transferred from an electron-rich core to an electron-deficient centre. A circumstance occurs according to Lewis' thesis.

38) The coordinate covalent bond is depicted as follows:

- (a) Single headed arrow
- (b) Double headed arrow
- (c) Both a and b
- (d) None of them

Explanation:

Coordinate covalent bond illustration:



39) An indicator is

- (a) Organic compounds
- (b) In-organic compounds
- (c) Both a and b
- (d) None of them

Explanation:

Organic Compounds:

We are aware that organic compounds refer to hydrocarbons or their derivatives. Because the indicators are hydrocarbon derivatives, they are referred to as organic substances.

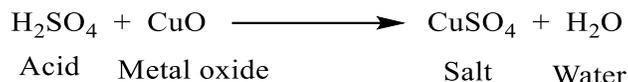
40) From the list of substances, select the one that is salt.

- (a) HCl
- (b) NaOH
- (c) CaCO₃
- (d) CuSO₄

Explanation:

Salt:

We are aware that the reaction between the acid and metal oxide can also produce salts. As a result, CuSO_4 is a salt in the scenarios above because it is produced by the reaction of CuO and H_2SO_4 (sulfuric acid) (Metal oxide).



41) Which of the following substances cannot be categorized as an Arrhenius acid?

- (a) HNO_3
- (b) H_2CO_3
- (c) CO_2
- (d) H_2SO_4

Explanation:

Arrhenius theory:

This idea states that Arrhenius acid is a chemical that produces a proton when ionized in water. While carbon dioxide doesn't contain any hydrogen atoms. So, upon ionization, it does not produce a proton. Because of this, it is not categorized as Arrhenius acid.

42) NH_3 is not a base, according to

- (a) Lewis theory
- (b) Bronsted-Lowery theory
- (c) Arrhenius theory
- (d) All of these

Explanation:

Arrhenius Theory:

The term "Arrhenius base" refers to a chemical that, upon ionization in water, produces an OH^- ion. While ammonia doesn't contain OH^- . So, upon ionization, it does not produce an OH^- ion. Consequently, it is not categorized as an Arrhenius base.

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43) Identify the Lewis base from the list below.

- (a) BF_3
- (b) HCl
- (c) AlCl_3
- (d) F^-

Explanation:

Lewis Base:

Lewis defined material as containing electron pairs. Lewis base is a compound that can give electrons to electron-deficient centers. Here, only F^- has a single electron pair. It is categorized as a Lewis base because of this.

44) The concentration of OH^- in a drain cleaner solution is 1×10^{-8} M. The answer is

- (a) Acidic
- (b) Basic
- (c) Neutral
- (d) Cannot be predicted

Explanation:

If $[\text{OH}^-] = 1 \times 10^{-8}$ M

Then it means that $[\text{H}^+] > [\text{OH}^-]$

$$1 \times 10^{-7} > 1 \times 10^{-8}$$

We also know that a solution is acidic when the concentration of hydrogen ions exceeds that of hydroxyl ions.

45) $\text{Mg}(\text{OH})_2$ is present in the milk of magnesia. It functions as an antacid. It balances out much stomach acid. What type of salt is produced by this reaction?

- (a) MgSO_4
- (b) MgCO_3
- (c) MgCl_2
- (d) MgO

Explanation:



46) Ammonia, which is a base since it

- (a) Ionizes in water to give OH^- ions
- (b) Contains OH group
- (c) Can accept an electron pair
- (d) Can donate an electron pair

Explanation:

Lewis defined material as a base if it can donate lone pair of an electron to an electron-deficient center. Ammonia has lone pair of electron and can easily donate to an electron-deficient center. That's why according to Lewis, ammonia is a base.

47)

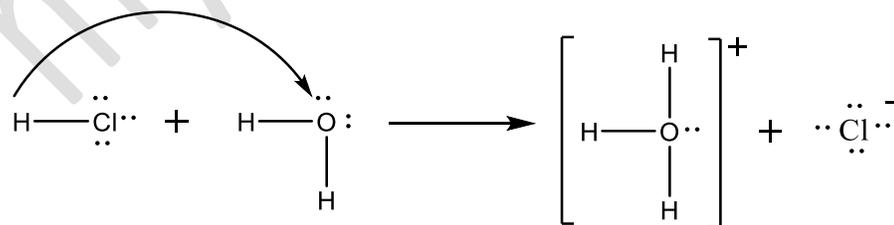
Take into account these reactions.



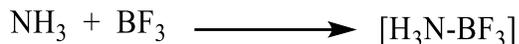
Which species serves as the reaction's acceptor of an electron pair?

- (a) H_2O
- (b) **HCl**
- (c) H_3O^+
- (d) None

Explanation:

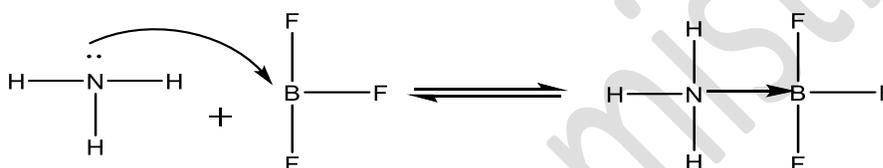


48) In the subsequent reaction, which species is giving a pair of electrons?



- (a) H
- (b) B
- (c) N
- (d) BF_3

Explanation:



49) Drain cleaning is done with a NaOH aqueous solution. What would be the concentration of H^+ ions in this solution if the OH^- ion concentration was $1 \times 10^{-5} \text{ M}$?

- (a) $1.0 \times 10^{-5} \text{ M}$
- (b) $1.0 \times 10^{-7} \text{ M}$
- (c) $1.0 \times 10^{-9} \text{ M}$
- (d) $1.0 \times 10^{-14} \text{ M}$

Explanation:

We know that $[\text{H}^+][\text{OH}^-] = 1 \times 10^{-14}$

So, if $[\text{OH}^-] = 1 \times 10^{-5}$ then $[\text{H}^+]$ would be

$$[\text{H}^+] = 1 \times 10^{-14} - [\text{OH}^-] = 1 \times 10^{-14} - 1 \times 10^{-5} = 1 \times 10^{-9}$$

50) A pH indicator is

- (a) Methyl violet
- (b) Methyl red
- (c) Phenol red
- (d) All of them

Explanation:

Methyl violet, methyl red, and phenol red are three of the eleven most widely used pH indicators.

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