

ANSWERS TO TOP 100+ CHEMISTRY QUESTIONS

A mole can be described as the unit of measurement for the amount of substance in SI units. One mole of a substance is equal to 6.023×10^{23} of particles.

1 mole of oxygen has 6.023×10^{23} ions.

3 moles of oxygen = $3 \times 6.023 \times 10^{23}$

= 1.8×10^{24}

Let the total weight of the compound be X g.

Now, 20% of X has to be 800 g.

So,

$$\begin{aligned} X &= \frac{800}{20\%} \\ &= \frac{800 \times 100}{20} \\ &= 4000 \text{ g.} \\ &= 4 \text{ kg.} \end{aligned}$$

Thus, 4 kg of compound X is needed to release 800 g of oxygen.

Sulphur has 16 electrons.

When phosphorus accepts an electron, it has 16 electrons in all, whereas Cl^- and K^+ has 18 electrons.

Thus, ${}_{15}\text{P}^-$ has the same number of electrons as in ${}_{16}\text{S}$.

Tantalum is the element with atomic number 73 and symbol "Ta". Tl is the symbol for Thallium-81, Te for Tellurium-52, and Th for Thorium-90.

Tantalum is used in the making of superalloys which are used in jet engine components.

Mass number, also called atomic mass number or nucleon number, is equal to the sum of neutrons and protons.

It is nearly equal to the atomic mass of the atom expressed in atomic mass units (AMU).

The elements are fluorine (F) with atomic number 9 and mass number 19. Fluorine has 9 electrons, 9 protons, and 10 neutrons.

The zigzag movement of the colloidal particles in solution is called the Brownian movement. The impact of the molecules of the dispersion medium on the molecules of the dispersed phase causes this movement.

Cataphoresis, on the other hand, is the movement of colloidal particles towards the oppositely charged electrodes when an electric current is passed through the solution.

Tyndall effect is the light scattering by colloidal particles present in a very fine suspension.

In an electrochemical cell, electrical energy is generated by a simultaneous chemical reaction.

The electrochemical cell consists of an anode and cathode in the setup. The oxidation reaction takes place at the anode and it's denoted with a negative sign. The reduction takes place at the cathode and it's denoted with a positive sign.

There is an inverted u-tube connecting the two vessels which maintain the electrical neutrality of the two solutions.

Sodium Hydroxide (NaOH) is a strong base and when it is added to Formic acid (HCOOH) which is a weak acid, the resultant solution is basic.

It can be explained as adding a strong base to a weak acid will result in a solution with its pH more than 7 that will be a basic solution rather than being a neutral one.

Similarly, when a strong base is added to strong acid, the resultant solution will be a neutral one.

An atom is the smallest unit of all the matter in the universe. As per different atomic theories, an atom has been observed and defined in different categories based on its size, mass, and sub-particles.

Every atom has a unique mass and atomic radii. All atoms have atomic orbitals filled with electrons and when they combine to form bonds, new molecular orbitals are formed.

Smelting is the process of heating an ore with carbon in the absence of air to melt and extract the base metal. This process is used to extract metals like iron, gold, and silver from their ores.

Roasting is carried out for the ores to remove unwanted Sulphur or carbon.

The reduction is the final step of smelting where the ore is reduced and the metal is extracted. It is carried out at an extreme high temperature.

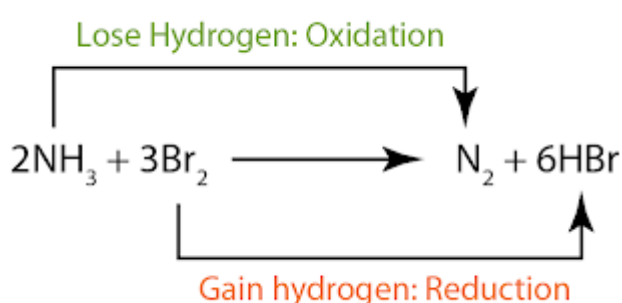
A Lewis base is a chemical species that has its outermost orbital filled with an electron lone pair not involved in any bonding and it can donate that lone pair in the solution. Ammonia is a Lewis base as it has a lone pair and it can donate it to form ammonium ion.

Similarly, a Lewis acid is a chemical species with an empty orbital that can accept an electron lone pair.

Both Lewis acid and base accept/donate lone pair to form a Lewis adduct with each other.

Reduction is defined as the gain of electrons in a chemical species. We can also say that when an electropositive element is separated from a chemical compound, it leaves a negative charge on the remaining part which reduces the compound.

1. Oxidation is the process of losing hydrogen.
2. Reduction is the process of gaining hydrogen.
3. For example, ethanol can be oxidised to ethanal:



- a. Ammonia loses hydrogen. Ammonia is oxidised to become nitrogen. This is an oxidation process.
- b. Bromine gains hydrogen. Bromine is reduced to become hydrogen bromide. This is a reduction process.

The word Polymer is a Greek word meaning many (poly) and units (mer). The process by which polymers are formed called as polymerization.

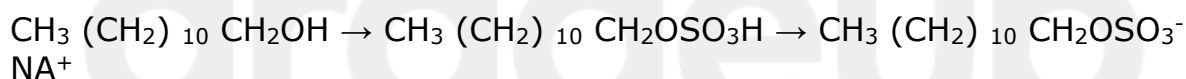
Polymerization is either an additional reaction or a condensation polymerization.

Additional polymerization is the process where the same or different monomers add to form a long chain polymer. The mechanism of the reaction is a free radical mechanism. Polythene and Buna-S are formed as a result of addition polymerization.

Synthetic detergents are cleansing agents that do not contain a soap but have all the properties of soap. They can work in hard water as well.

Synthetic detergents are of three types- anionic, cationic, and non-ionic detergents. Anionic detergents are formed when long-chain alcohols are treated with Sulphuric acid and then neutralized with alkali to form the sodium salt of long-chain sulphonated alcohols.

Lauryl alcohol \rightarrow (Sulphuric acid) \rightarrow lauryl Hydrogen Sulphate \rightarrow (NaOH) \rightarrow Sodium laurylsulphate (anionic detergent)



Amino acids are the organic compounds that contain an amine and a carboxylic acid group attached to a sidechain. Amino acids and proteins are the building blocks of living forms.

Glycine is the simplest and smallest amino acid which is the smallest in size as the R-group is hydrogen.

Copper being weakly electropositive, is not very reactive. It resists the action of most of the common chemical reagents like air, H_2O , acids, and alkalies. Non-oxidizing acids like HCl and dilute H_2SO_4 do not affect copper in absence of air/ O_2 .

As per VSEPR (Valence Shell Electron Pair Repulsion) theory, the Bond angle is defined as the angle between the bonds formed by three atoms of a molecule. There is no direct relationship between the bond angle and formula of a compound but there are several factors that impact the shape of the molecule.

Bond angle changes with change in the number of bonding atoms, number of lone pairs, and radii of bonding atoms.

The bond angle of a linear-shaped Beryllium fluoride molecule is 180° between Be-F.

The reason that boiling points of water are very high is due to the hydrogen bonding between hydrogen and oxygen atoms. The bond requires a lot of energy to break and thus the boiling point is exceptionally high.

Carbon tetrachloride is non-polar and water being polar makes it impossible for the new bonds to form. This way CCl_4 is insoluble in water but mixes with benzene.

The distillation process is used for those metals which are easily volatile. The adulterate metal is heated in a retort and its vapors are separately condensed in a receiver. The non-volatile impurities are left behind in the retort, which is used for the purification of Cd, Zn, Hg, etc.

Unbiunium atoms have 121 electrons and its shell structure is 2,8,18,32,32,18,8,3. Ubu is also known as eka-actinium which is a hypothetical chemical element. This element is having a temporary IUPAC name and symbol until the element is discovered, confirmed and a permanent name is decided.

Sheet silicate is an important group of minerals which includes the chlorite, micas, serpentine, talc, and clay minerals. These sheets are a buildup of regular or irregular sequences of tetrahedral layers which are connected about three oxygens to a plane network, and of octahedral layers with water and various cations between the different packets.

Anions in Egyptian blue are $\text{Si}_4\text{O}_{10}^{4-}$ i.e. $\text{Si}_{2n}\text{O}_{5n}^{2n-}$ hence it is a sheet silicate.

A has 3 valence electrons; thus, it forms A^{3+} . B has 6 valence electrons; thus, it forms B^{2-} . Thus, the compound formed is A_2B_3 .

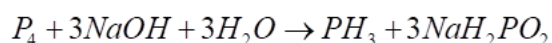
The heat of neutralization is defined as the heat evolved when an acid and a base react to form salt and water.

The heat of combustion can be defined as the amount of energy released when a substance is burned in the presence of oxygen.

The heat of formation can be defined as the amount of heat absorbed when a mole of a compound is obtained from its basic elements, each substance is in its normal physical state.

A fuel cell is an electrochemical cell which helps to convert the chemical energy of a fuel and an oxidizing agent into electricity through a pair of redox reactions.

Evaporation is a process of vaporization in which water converts from a liquid to a gaseous state or forms vapor. It is a primary pathway that water moves to a complete water cycle in our natural environment. Evaporation can occur at any temperature. Evaporation occurs very quickly on the surface of the moon due to low gravity on the moon, the escape velocity is small.



PH_3 is less basic than NH_3 .

Mass of solute, urea = 6gm

Mass of solvent, water = 500gm

Percentage by mass = ?

Mass of solution = Mass of solute + Mass of solvent

= 6gm + 500gm = 506gm

Mass percentage of urea in the solution = $\frac{\text{mass of solute}}{\text{mass of solution}} \times 100$

$$= \frac{6}{506} \times 100 = 1.186\%$$

Valency is the combining power of an element to form a compound. Those elements which have the same number of electrons in the valence shell are placed in the same group of the periodic table.

Corrosion is a natural process that causes the conversion of a refined metal into a more chemically stable form such as oxide, hydroxide, or sulfide, which is the gradual destruction of materials by chemical or an electrochemical reaction with their environment. Corrosion decreases the electrical conductivity of metals.

Pickles are generally stored in glass vessels and plastic vessels because glass and plastics do not react with the ingredients of pickles.

Inter-granular corrosion occurs by the presence of impurities at the grain boundaries or by the depletion of an alloy at those boundaries. A lesser amount of iron in aluminum, where the solubility of iron is low which can segregate in the grain boundaries and causes inter-granular corrosion. Depletion of chromium results in inter-granular corrosion of stainless steel.

In an adiabatic process, no heat transfer takes place between gas and its surroundings.

i.e.; $\Delta Q = 0$

From the explanation of specific heat, $C = \frac{\Delta Q}{m\Delta T} = 0$

For the isothermal process, $\Delta T = 0$

$\therefore C = \frac{\Delta Q}{m\Delta T} = \infty$

According to molecular orbital theory, NO_2 contains an unpaired electron.

$$NO_2 = 5 + 2(6) = 17$$

NO_2 does not follow the octet rule for one of its nitrogen atoms but the two oxygen atoms in this molecule follow the octet rule. There is a persistent radical character on nitrogen due to the presence of an unpaired electron.

Heating a liquid mixture to form vapors and then cooling the vapors to get pure component is called distillation. It separates the component substances from a liquid mixture by selective evaporation and condensation.

Milk and water cannot be separated through the distillation process.

We find the total mass of the solution:

$$\begin{aligned} \text{Total mass} &= 6\text{gm sodium hydroxide} + 50\text{gm water} \\ &= 56\text{gm} \end{aligned}$$

By using the mass percentage formula,

$$\text{Mass percentage} = \frac{\text{grams of solute}}{\text{grams of solution}} \times 100$$

$$\Rightarrow \frac{6 \text{ gm NaOH}}{56 \text{ gm solution}} \times 100$$

$$\Rightarrow 0.0174 \times 100$$

$$\Rightarrow 10.74\% \text{ NaOH}$$

Chemical behavior of an element is particularly determined by the element's configuration and its outermost valence electrons. An element's location in the periodic table largely depends upon its electrons; the number of valence shell electrons determines its group and the type of its orbital in which valence electrons exists determines the element's block.

During radioactive decay, the Gamma rays emitted from the nuclei along with alpha and beta particles. They do not have any mass and no electric charge which means no change in the atomic number or mass number when Gamma rays are emitted.

Nitrogen is sprayed over potato chips to avoid potato chips getting rancid, while it prevents the contact of potato chips to air to prevent oxidation.

If a liquid material is given energy, it changes its phase from liquid to vapor, and the energy absorbed in this process is known as the heat of vaporization. It is about $2.26 \times 10^6 \text{ JKg}^{-1}$ which is equal to 40.08 KJ/mol. The opposite process of vaporization is known as condensation.

In an octahedral molecule, there are six hybrid orbitals that are directed towards the corners of a regular octahedron with a bond angle of 90° . According to this geometry, the number of X-M-X bonds at 180° .

Hydronium ion is the common name for the aqueous cation H_3O^+ . This ion is produced by the protonation of water. When an Arrhenius acid is dissolved in water, the Arrhenius acid molecules in solution give up a proton resulting in a positive ion.

It does not exist in a free state and is extremely reactive. It is very acidic.

Tribasic acid contains three replaceable hydrogen atoms per molecule. It means this acid can donate three H^+ ions to a base in an acid-base reaction. For example, Orthoboric acid H_3BO_3 , Phosphorus acid H_3PO_3 .

HNO_3 , H_2SO_4 is oxyacids, HCl is a hydracid and H_2SO_4 is also a dibasic acid.

Usually, the grape juice consists of 70 to 80% water and many dissolved solids including organic and inorganic compounds like sugar, organic acids, phenolic compounds, nitrogenous compounds. The principal organic acids found in grapes are tartaric, malic, and to a small extent, citric. They are an important component of juice and wine.

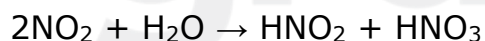
Acetic acid is present in the vinegar.

Carbonic acid is a dibasic acid and hence forms one acid salt or one normal salt, whereas Hydrochloric acid is a monobasic acid and forms only one normal salt.

When lead carbonate to react with hydrochloric acid, it produces a salt that is insoluble in the solution. Hence the reaction does not proceed.

Dil. HCl is a stronger acid than highly concentrated acetic acid as it produces a high concentration of hydronium ion compared to that of concentrated acetic acid.

Nitrous acid and nitric acid are formed when NO_2 reacts with water. Hence it called a double acid anhydride



Coagulation is the process in which colloidal particles adsorb the ions of an opposite charge to which present on the surface of the particle. The charge on the colloidal particles is neutralized and the repulsion between the two particles reduced which is achieved by the addition of an electrolyte.

Lyophilization is the process that is used for the purification of colloids.

The Peptization process is used for washing the precipitates, which converts a precipitate into a colloidal particle by adding a suitable electrolyte.

Tyndall effect refers to the scattering of light by colloidal particles, which makes the path of light visible through dispersion.

This is an isobaric adiabatic expansion against the constant external pressure, but overall pressure decreases (i.e., volume increases, the gas expands).

The final temperature T_2 is given by P-V-T relation as:

$$T_2 = T_1 \left[\frac{C_v + P_{ext} \frac{R}{P_1}}{C_v + P_{ext} \frac{R}{P_2}} \right]$$

For diatomic gas, we are having

$$C_v = \frac{5}{2} R$$

$$T_1 = 298 \text{ K}$$

$$T_2 = ?$$

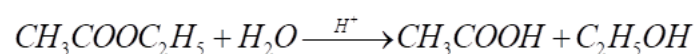
$$P_2 = 2.50 \text{ atm}$$

$$P_1 = 15 \text{ atm}$$

$$P_{ext} = 1 \text{ atm}$$

$$T_2 = 298 \left[\frac{\frac{5}{2} R + \frac{R}{15}}{\frac{5}{2} R + \frac{R}{2.5}} \right]$$

$$= 263.7 \text{ K} = 264 \text{ K}$$



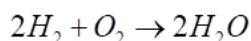
$$\text{Rate} = k [CH_3COOC_2H_5] [HOH]$$

Water is present in large excess; therefore, concentration of water will be almost constant.

Thus, rate law may be given as

$$\text{Rate} = k' [CH_3COOC_2H_5]$$

It is a pseudo-first-order reaction.

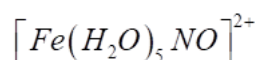


Total electrons involved = 4

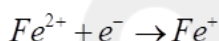
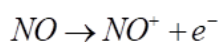
$$\therefore \Delta G^\circ = -nFE^\circ$$

$$= -475 \times 1000 = -4 \times 96500 E^\circ$$

$$E^\circ_{cell} = 1.23V$$



Brown ring is formed when NO_3^- containing solution is treated with $FeSO_4$ followed by addition of conc. H_2SO_4



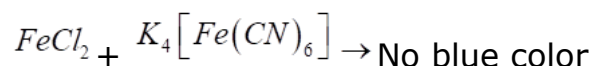
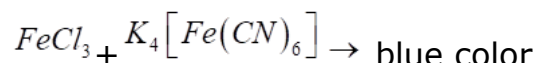
Thus, the Effective atomic number of Fe = Z-oxidation state + 2 × Coordination number

$$= 26 - 1 + 2 \times 6$$

$$= 26 - 1 + 12 = 25 + 12$$

$$= 37$$

Aqueous solution $FeCl_3$ is acidic due to the process of hydrolysis. When zinc is added, nascent hydrogen (which is more reactive) reduces $FeCl_3$ INTO $FeCl_2$. H_2 gas passed into set B does not reduce $FeCl_3$.



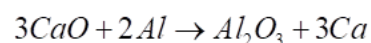
Energy in ground state = 13.6 eV

Energy absorbed = $1.5 \times 13.6 \text{ eV} = 20.4 \text{ eV}$

Energy in higher level = 34.0 eV

Energy emitted = $34.0 - 13.6 = 20.4 \text{ eV}$

Thus, KE to the emitted electron = 20.4 eV



$$\Delta G^\circ_f = \Delta G^\circ_f(\text{Al}_2\text{O}_3) - 3\Delta G^\circ_f(\text{CaO})$$

$$= -1582.4 - 3(-604.2)$$

$$= 230.2 \text{ KJ}$$

positive sign indicates that the reaction is nonspontaneous; thus, the student's suggestion is incorrect.

Let total mass = 100 g

$$\text{NH}_4\text{NO}_3 = x \text{ g}$$

$$(\text{NH}_4)_2\text{HPO}_4 = (100 - x) \text{ g}$$

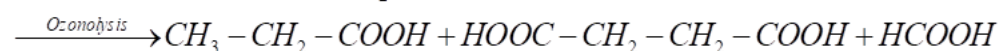
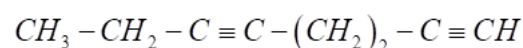
$$\% \text{nitrogen in } (\text{NH}_4\text{NO}_3) = \frac{28x}{80}$$

$$\% \text{nitrogen in } (\text{NH}_4)_2\text{HPO}_4 = \frac{28(100 - x)}{132}$$

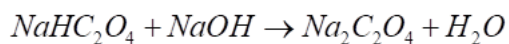
$$= \frac{28x}{80} + \frac{28(100 - x)}{132} = 33.81$$

$$x = 91.37\%$$

$$(\text{NH}_4)_2\text{HPO}_4 = 100 - 91.37 = 8.63\%$$



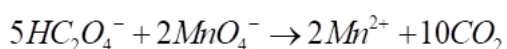
Negative type semiconductor (n-type) is obtained when there is an extra electron available for conduction. Si has four electrons in the valence shell, while As has five electrons in its valence shell. Thus, one extra electron makes an n-type semiconductor on doping Si with As.



$NaHC_2O_4$ behaves as acid and

$$1 H^+ = 1 OH^-$$

Thus, the equivalent weight of $NaHC_2O_4 = M$



$HC_2O_4^-$ is oxidized to CO_2 and thus change in oxidation number = +2 units

$$\text{equivalent mass} = \frac{M}{2}$$

Let A extracted into ether = x g

A left in water = (5-x) g

$$\text{Conc. of A in water} = \left(\frac{5-x}{50} \right)$$

$$\text{Conc. of A in ether} = \frac{x}{50}$$

Given,

$$\frac{C_A(\text{ether})}{C_A(\text{water})} = 20 = \frac{\frac{x}{50}}{\frac{5-x}{50}} = \frac{x}{5-x}$$

$$X = 4.8 \text{ g}$$

Oxygen enhances combustion. Liquid nitrogen has low mass and high enthalpy of combustion. Thus, we can say that liquid hydrogen and liquid oxygen are used as an excellent fuel for rockets.

Nylon thread is made up of polyamide thread. It is made from reacting carbon-based chemicals found in coal and petroleum in a high-pressure heated environment.

The procedure of dehydration of alcohol to alkene involves the following steps:

1. Formation of protonated alcohol
2. Formation of carbocation
3. Formation of ethene by the process of elimination of a proton

Monochlorination of toluene in the presence of sunlight gives benzyl chloride. On hydrolysis with aq. NaOH, benzyl chloride, shows nucleophilic substitution reaction which gives benzyl alcohol.

K shell ($n = 1$) can accommodate a total 2 electrons ($2n^2 = 2 \times 1^2 = 2$ electrons).

L shell ($n = 2$) can accommodate a maximum 8 electrons ($2n^2 = 2 \times 2^2 = 8$ electrons).

If K and L shells of an atom are fully occupied, then the total number of electrons in the atom will be $2 + 8 = 10$

Atomic mass of hydrogen atom = 1u

Atomic mass of oxygen = 16u

Molecular mass of Water (H_2O) = $1 \times 2 + 1 \times 16 = 18u$

the mass percentage of oxygen present in the Water (H_2O) = (mass of oxygen in Water (H_2O)/molecular mass of Water (H_2O)) $\times 100$

$$= \left(\frac{16}{18}\right) \times 100 = 88.89\%$$

A meso compound must have atleast 1 chiral centre and then it must have atleast one element of symmetry. Other options are correct.

Specific heat = $0.25 \text{ cal/g}^\circ\text{C}$

$$\text{Heat capacity} = 0.25 \times 28 \text{ cal / mol}^\circ\text{C}$$

$$C_p = 7 \text{ cal / mol}^{-1}\text{C}$$

$$C_p - C_v = R$$

$$C_v = C_p - R$$

$$= 5 \text{ cal / g}^\circ\text{C} = \frac{5}{28} = 0.18 \text{ cal / g}^\circ\text{C}$$

Number of octahedral voids per ion in lattice = 1

Hence,

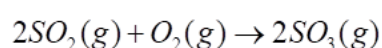
$$\text{The number of trivalent cations } (A^{3+}) = 1 \times \frac{1}{2} = \frac{1}{2}$$

Total number of tetrahedral voids per ion in lattice = 2

Hence,

$$\text{The number of divalent cations } (B^{2+}) = 2 \times \frac{1}{8} = \frac{1}{4}$$

Thus, formula is $\frac{A_1 B_1 O}{2 \quad 4}$ or $A_2 B O_4$.



$$O_2 = 1 \text{ mol of oxygen} = 32 \text{ g}$$

$$2SO_3 = 2 \text{ mol of } SO_3 = 160 \text{ g}$$

160g of SO_3 is formed by 32g of O_2

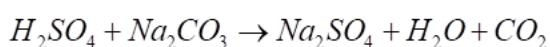
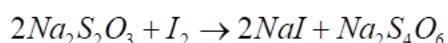
100g of SO_3 will be formed by $\frac{32}{160} \times 100$ or 20g of O_2

So, rate of disappearance of O_2 is 20 g min^{-1} .

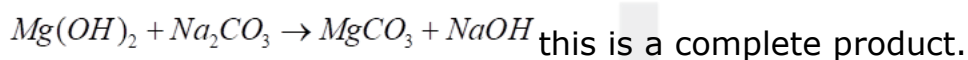
Lanthanides and actinides are called inner transition elements because they are a group of elements which belongs to the two bottom rows of the periodic table. Lanthanides and actinides belong to the f-block elements, which means that they have filled up their f-orbitals with electrons. 59, 95 and 102 are the atomic numbers of inner transition elements, because their last electron enters in f- orbital.

The *tetrathionate ion* is a sulphur containing oxo-anion that is obtained from the compound called tetra-thionic acid.

Iodine oxides thiosulphate ion into Tetrathionate ion.



When sodium carbonate reacts with sulfuric acid, the gas evolved is carbon dioxide which is colourless and seen by the formation of bubbles.



A silica garden can be created by adding crystals of various coloured salts in an aqueous solution of sodium silicate. This experiment results in the growth of a plant like forms in minutes to hours through the hollow tubes of metallic silicate. More the number of salts, more will be the precipitation occurs. Once the garden grown, we can replace the sodium silicate solution carefully with pure water.

Aspartic acid is a non- essential amino acid which plays an important role in the synthesis of proteins, amino acids and in the citric acid.

Lysine is a basic amino acid which contains a full positive charge. Its side chains contain nitrogen and resemble ammonia, which is a base and its pKa's are high enough to bind the protons through which it gains a positive charge.

Serine is a type of amino acid which have side chains that are polar but not charged. Serine is classified as a non- essential amino acid which is considered as conditional. However, it is considered as neutral.

Copper cannot liberate hydrogen from a dil. HCl solutions because it is situated below hydrogen in the reactivity series. Here both assertion and reason are false.

The chemical composition can be defined as the arrangement, ration of the chemical substance. It will vary if chemicals are subtracted or added from a substance. That is the ration of the substance changes. Any substance which has a clear and specific chemical composition and structure is known as a chemical. The chemical has a fixed composition. They also have a chemical name and formulae based on their composition.

The radioactive silver metallic elements is Uranium. The atomic number of Uranium is 92. It is a silver-grey metal. It has 92 protons, 92 electrons, and 6 valence electrons.

Uranium is weakly radioactive because all isotopes are unstable of this element. In nature, uranium is found as U-238, U-235, and U-234.

Uranium metal reacts with almost all non- metal elements, and reactivity increase with temperature. The uranium used in the military sector is in high-density penetrators. Depleted uranium is also used as a shielding material.

Kinetic molecular theory states if the temperature is increased the average speed of gas molecule increases. The kinetic molecular theory based on- Gases is continuous motion, travel in a straight line. Kinetic energy will be conserved. The molecules do not interact with each other. Collisions between particles with the wall of the container are perfectly elastic.

This theory also shows – Boyle's law, Charles' law, Avogadro's hypothesis, Dalton's law of partial pressure.

The scatter light beam passing through the solution and make its path visible called the Tyndall effect. Tyndall effect is the example of a colloidal solution. Mixtures compositions of which are not uniform through are called heterogeneous mixtures. The heterogeneous mixtures containing two phases called dispersed phase and dispersion medium respectively. The dispersed phase is that which is dispersed in another substance. The substance in which the dispersed phase is dispersed is called the dispersion medium.

A phosphodiester bond occurs when exactly two of the hydroxyl groups in phosphoric acid react with hydroxyl groups on other molecules to form two ester bonds, as in nucleic acid.

Oxidation state of P in $H_3PO_2 = 3 + x - 4 = 0$, $x = +1$

Oxidation state of P in $H_3PO_3 = 3 + x - 6 = 0$, $x = +3$

Oxidation state of P in $HPO_3 = 1 + x - 6 = 0$, $x = +5$

Thus, the increasing order of oxidation number of P is $H_3PO_2 < H_3PO_3 < HPO_3$

Molecular Orbital Theory (MOT) explains that when atoms combine to form molecules, their atomic orbitals also form molecular orbitals which are unique and have their individual properties. As per MOT, there are equal numbers of molecular orbits as the Number of atomic orbitals combined to form the molecule. MOT also overrides the Valence Bond Theory (VBT) as it justifies the wave nature of molecules and their orbitals properties. As per MOT, bond order can be fractions as well. For example, the Bond Order of O_2 is $\frac{1}{2}$ or 1.5.

Suspension is a heterogeneous mixture of a liquid and the particles of a solid. The solute particles do not dissolve in a suspension and can be seen by naked eyes. The solute particles are suspended in the liquid. Particles of the suspension are large enough to scatter the rays of light, and the path of ray is visible through it.

Few examples are a mixture of chalk and water, muddy water, a mixture of flour and water, a mixture of dust particles and air, fog etc.

Tourmaline shows different colours (mostly purple, black, blue) due to the manganese ions replacing Lithium and Aluminum ions in some sites. Topaz shows blue and brown colour due to imperfection in its atomic structure. Ruby's red colour is due to chromium ions, and sapphire shows colour due to titanium and iron ions.

Rayon is the polymer made of natural cellulose occurring in wood pulp and is also called "Artificial Silk". Polyester, nylon, and polystyrene are artificially made polymers. Nylon 6 is obtained by heating caprolactam at high temperature with water. It is used to manufacture synthetic fabrics and ropes. Polyesters such as Dacron are produced when dicarboxylic acids and diols polycondense.

Gypsum is chemically known as Calcium Sulphate di-hydrate ($CaSO_4 \cdot 2H_2O$). It is used as a fertilizer and to make Plaster of Paris (POP). Cement is mainly composed of Calcium oxide (CaO) and Silica (SiO_2).

Steel is an alloy of iron and carbon. Pyrex Glass is the Borosilicate form of Glass which is harder than other glasses.

- * A primary pollutant is an air pollutant emitted directly from a source. The major primary pollutants are Oxides of Sulphur, Oxides of Nitrogen, Oxides of Carbon, Particulate Matter, Methane, Ammonia, Chlorofluorocarbons, Toxic metals.
- * A secondary pollutant is not directly emitted. It is formed when primary pollutants react in the atmosphere. Examples of secondary pollutants are: Ozone and Smog. Ozone is formed when hydrocarbons (HC) and nitrogen oxides (NO_x) combine in the presence of sunlight. Smog is made up of Smoke and Fog.
- * Petroleum includes not only crude oil but all liquids, gaseous and solid, hydrocarbons under surface pressure and temperature conditions, lighter hydrocarbons methane, ethane, propane and butane exist as gases. While Pentane exists in the form of liquids or solids.
- * Graphite is an allotrope of carbon each atom is covalently bonded to other 3 atoms. These layers slide over each other easily because of the weak van der Waals force between them.
- * The sheets of carbon become bonded by weaker molecular forces so that layers of graphite can slide over each other.
- * A greenhouse gas's effect on climate change depends on the fact that how much of these gases are present in the atmosphere and its global warming potential. Global warming potential of a gas describes the facts that how well the gas absorbs energy (preventing it from escaping to space), and how long the gas stays in the atmosphere.
- * Global warming Potential is maximum for Sulfurhexafluoride
- * Decreasing order of Global warming Potential:
Sulfurhexafluoride > Chlorofluorocarbon > Hydrochlorofluorocarbon > Nitrous oxide > CH₄ & Ozone > CO₂.

A mole can be described as the unit of measurement for the amount of substance in SI units. One mole of a substance is equal to 6.023×10^{23} of particles.

This value is also called Avogadro's number.

As we know, 1 mole of Magnesium = 24 g of Mg contains 6.023×10^{23} ions of Mg.

Therefore,

48 g of Mg contains,

$$\frac{(6.023 \times 10^{23} \times 48)}{24}$$
$$= 1.2 \times 10^{24}$$

The electronic configuration is described as the distribution of electrons of an atom in its atomic orbitals/shells.

It helps us understand the formation of chemical bonds and valency of atoms.

The electronic configuration of Sulphur (S) with atomic number 16 is 2, 8, 6.

Charles' law is an experimental gas law. It explains how gases expand when the heat is applied to the system. This law establishes a relationship between the volume and temperature of gases.

Charles' law states that change in volume is directly proportional to the change in temperature if pressure is kept constant.

$$V \propto T$$

$$V_1/T_1 = V_2/T_2$$

A sol is a colloid of very small solid particles in a liquid medium. Sols are very stable colloids and show the Tyndall effect. Some common examples of sol are blood, cell fluid, paint, ink, and mud.

Another type of colloids are emulsions, foam, and aerosols.

An emulsion is a colloid formed between two liquids.

Foam is formed when many gas particles are trapped in a liquid or solid medium.

An aerosol is a colloid where small particles of liquid or solid are dispersed in a gas medium.

Electro positivity of an element is described as its ability to lose electrons and form positive ions. On moving from left to right in a periodic table, the number of protons increases which creates a strong nuclear charge and makes it hard for electrons to be loosened. That's why the ability to lose electrons decrease on moving from left to right in a periodic

table and it grows more affinity to gain electron which increases its electronegativity.

Electronegativity is a measure of an atom's ability to attract shared electrons to itself. On the periodic table, electronegativity generally increases as you move from left to right across a period and decreases as you move down a group. As a result, the most electronegative elements are found on the top right of the periodic table, while the least electronegative elements are found on the bottom left

Ionization energy also increases on moving from left to right.

Aniline is the common name for an amine of benzene. It has the formula $C_6H_5NH_2$. It consists of an amino group attached to a phenyl group and is the simplest aromatic amine.

Its IUPAC name is Phenylamine and it's mostly used in the manufacture of chemicals such as polyurethane. Like most amines, it also smells fishy.

Zinc hydroxide is a weak base in nature and is slightly soluble in water. The nature of the compound is amphoteric.

Amphoteric is a compound that can act both as an acid and base. There are a few metals like zinc, lead, copper, and aluminum which form amphoteric oxides and hydroxides.

The anode mud is the impurity of metal which is collected at the anode during the electrolytic refining of metals like zinc and copper.

Electrolytic refining is the process where the crude metal is used as the anode going into the salt solution of the same metal and the pure metal being deposited upon the cathode.

Flux is the substance which fixes itself to gangue to convert it into slag. The slag is insoluble in water and rises to the surface and can be easily washed out.

Vinyl carbinol is a colorless liquid of pungent odor that is used in making resins and plasticizers which is highly irritating to mucous membranes and readily absorbed, and causes depression and coma.

Carbinol is the common name of Methanol, whose structure is CH_3OH

The structure of the Vinyl group is $(CH_2 = CH-)$

A combination of Carbinol and Vinyl is known as Vinyl carbinol, whose structure is $HO - CH_2 - CH = CH_2$

The intermolecular forces tend to keep the molecules together but thermal energy of the molecules tends to keep them apart. Three states of matter are the result of balance between intermolecular forces and the thermal energy of the molecules.

Generally, a gas behaves more like an ideal gas at higher temperature and lower pressure, as the potential energy due to intermolecular forces becomes less significant compared with the particles' kinetic energy, and the size of the molecules becomes less significant compared to the empty space between them.

Viscosity is a measure of resistance to flow which arises due to the internal friction between layers of fluid as they slip past one another while liquid flows.

Coefficient of viscosity is defined as tangential force required to maintain a unit velocity gradient between two parallel layers of liquid of unit area.

SI unit of coefficient of viscosity is newton-second per square meter: $\frac{Ns}{m^2}$
It is equivalent to Pascal - seconds.

Organic compounds can be defined as the compounds containing carbon and hydrogen atoms along with sub-elements such as oxygen, halogens, and nitrogen.

Organic compounds can be synthesized in the laboratory now but were earlier called as vital compounds as they were supposed to be found in living organisms only. Wohler and Kolbe were the first to synthesis organic compounds in the lab and now there are thousands of organic compounds that are synthesized in labs.

An atom has electronic shells where electrons are distributed and the electrons in the outermost shell participate in forming chemical bonds.

Each shell can contain a fixed number of electrons. K shell is the innermost shell and can contain 2 electrons. L shell comes after the K shell and can contain 8 electrons. The M shell comes afterward and contains 18 electrons when full.

If an element has only 1 electron in the M shell, then it will have its K and L shell filled. So total electrons are $2+8+1 = 11$.

The element is Sodium (Na) and its valency is 1.

In chemistry, Nucleons refer to the subatomic species which form the nucleus. Since protons and neutrons are a part of the nucleus, they are called nucleons. Neutrons are the subatomic species that are found in the nucleus of an atom with protons. Neutrons have no charge and they are electrically neutral.

Protons have a positive charge on them. An atom is electrically neutral if it has an equal number of electrons and protons.

Dipole-dipole forces are the intermolecular forces between the positive end of one polar molecule and the negative end of another polar molecule. Dipole-dipole forces have the strengths which range from 5 kJ to 20 kJ per mole. These are much weaker than ionic or covalent bonding and have a significant effect only when the molecules involved are close together.

So, for $CHCl_3$, the molecule is tetrahedral but the atoms around the C are not the same, which results in asymmetry and a polar molecule with a negative pole on the Cl side and a positive pole on the H side, these polar molecules will form dipole-dipole forces between each other.

The mole is the unit of measurement of the amount of the substance in SI units. One mole of any substance has 6.023×10^{23} particles.

One liter of water can be taken as 1000 gm water.

Molecular mass of water = 18

Mass of water given = 1000

No. of moles of water = $1000/18$

= 55.556 moles

If we have to find the number of molecules of water in 1000 ml water, then

No. of molecules = 6.023×10^{23}

As per the chemical formula, ethene C_2H_4 has a double bond between the carbon atoms which results in the sharing of 4 electrons thus making a double bond. Similarly, the electrons shared between the carbon-carbon atoms of ethene are 2 as there is a single bond.

1 mole of a compound contains 6.022×10^{23} atoms .

0.2 mole of the compound will contain $0.2 \times 6.022 \times 10^{23} = 1.204 \times 10^{23}$ atoms .

As per the law of conservation of mass, the total mass of reactants is equal to the mass of the product.

This way the above reaction explains that the mass remains the same throughout the experiment.

The gas equation is:

$$(P + an^2 / V^2) \times (V - nb) = nRT.$$

Here, the factor an^2 / V^2 accounts for the volume occupied by the gas molecules. 'a' has units of $\text{atm L}^2 / \text{mol}^2$. So, the factor 'a' in the equation accounts for the false assumption on the attraction force between the molecules.

The most viscous liquid is Glycerol, structural formula for glycerol is,

