CHEMISTRY

1. MATTER IN OUR SURROUNDINGS

1. Anything that occupies space and has mass is called matter.
2. The matter around us exists in three states :Solids, Liquids, Gases.
3. The force of attraction between the particles is maximum in solids, intermediate in liquids and minimum in gases.
4. The space in between the constituent particles and kinetic energy minimum in the case of solids, intermediate in liquids and maximum in gases.
5. The arrangement of particles is most ordered in the case of solids, in the case of liquids, layers of particles can slip and slide over each other, while in gases there is no order , particles just move about randomly.
6. The states of matter are Inter-convertible; the state of matter can be changed by changing temperature and pressure.
7. On increasing the temperature of solids, the kinetic energy of the particles increases which overcomes the forces of attraction between the particles, thereby solid gets converted into a liquid.
8. Melting: Change of solid state of a substance into liquid is called melting.
9. Melting point: The temperature at which a solid melts to become a liquid at atmospheric pressure is called its melting point. Melting point of ice is 0^0C.
10. On heating a liquid like water, the kinetic energy of its particles increases thus causing the liquid change to a gas.
11. Boiling: The change of a liquid substance into gas on heating is called boiling.
12. Boiling is bulk phenomenon, particles from the bulk of the liquid changes into vapour state.
13. Boiling point: The temperature at which a liquid boils and changes rapidly into a gas at the atmospheric pressure is called its boiling point. Boiling point of water is 100^o C.
14. On cooling a gas like steam (or water vapour), the kinetic energy of its particles is lowered down, causing them to move slowly and bringing them closer, forming a liquid.
15. Condensation: The process, in which a gas, on cooling, turns into a liquid at a specific temperature is called condensation or liquification.
16. When a liquid is cooled down by lowering its temperature, its particles lose the kinetic energy and come to a stationary position, causing the liquid to turn into solid.
17. Freezing: The change of a liquid substance into solid by lowering its temperature is called freezing.
18. Freezing point: The temperature at which the state of a substance changes from a liquid to a solid is called the freezing point of that substance.
19. Fusion: The process of melting, that is, change of solid state into liquid state is also known as fusion.

20. Latent heat: The heat energy that is required to change the state of a substance without causing any raise in the temperature of the substance is called latent heat. Since, the heat energy is hidden in the bulk of the matter, it is called latent heat.
21. Latent heat of fusion is the amount of heat energy required to change 1Kg of solid into liquid at its melting point.
22. Sublimation is the change of solid state directly into gases state without going through liquid state.
23. Water vapour at 373 K has more energy than water at the same temperature because particles in steam have absorbed extra energy in the form of latent heat of vaporisation.
24. The process of conversion of a substance from the liquid state to the gaseous state at any temperature below its boiling point is called evaporation or vaporisation.
25. Solid CO_2 gets converted directly to gaseous state on decrease of pressure to 1 atm without coming into liquid state. This is the reason that solid carbon dioxide is also known as dry ice.
26. The perspiration or sweating in our body keep the body temperature constant by taking away the extra heat from body as the latent heat of vaporisation.
27. Absorption of energy from the surroundings makes the surroundings cold.
28. Gases can be liquefied by applying pressure and reducing the temperature. When a high pressure is applied to a gas, it gets compressed and if the temperature is lowered, the gas is liquefied.
29. Evaporation is surface phenomenon; particles present at surface gain enough energy to overcome the forces of attraction present in the liquid and changes into vapour state.
30. The rate of evaporation depends upon the surface area exposed to the atmosphere, the temperature, the humidity and the wind speed.
31. Surface area: The rate of evaporation increases on increasing the surface area of the liquid.
32. Temperature: The rate of evaporation increases with an increase in temperature.
33. Humidity: Decrease in the humidity increases the rate of evaporation.
34. Wind speed: An increase in the wind speed increases the rate of evaporation.
35. Latent heat of vaporisation is the heat energy required to change 1kg of liquid into gas at atmospheric pressure and boiling point.
36. Particles of matter intermix on their own with each other. This intermixing of particles of two different types of matter on their own is called diffusion.
37. Crystal of potassium permanganate is placed in a beaker of water and intermixing of the particles of gases (or vapours) produced by burning the incense stick are examples of diffusion
38. The random or zigzag movement of microscopic particles in a fluid, as a result of continuous bombardment from molecules of the surrounding medium, is known as Brownian motion.

39. Dust moves randomly because the random moving particles of air colloide with dust particles.

40.

SOLID	LIQUID	GAS
Constituent particles are very closely packed.	Constituent particles are less closely packed.	Constituent particles are far apart from each other.
Force of attraction between particles is very strong.	Force of attraction between particles is less strong.	Force of attraction between particles is negligible.
Force of attraction between particles is very strong.	Kinetic energy between particles is more than that in solids.	Particles have maximum kinetic energy.
Have definite shape and volume.	Do not have definite shape but definite volume.	Neither have definite shape nor definite volume.
Have high density and cannot be diffused.	Density is lower than solids and can diffuse.	Density is least and can easily diffuse.
Incompressible.	Almost incompressible.	Highly compressible.

41. Rigidity can be expressed as the tendency of matter to resist a change in shape.
42. Compressibility is the ability to be reduced to a lower volume when force applied.
43. Fluidity is the ability to flow.

2. IS MATTER AROUND US PURE?

1. Anything which has mass and occupies space is called matter. It may be solid, liquid or gas.
2. A mixture is a material which contains two or more different kinds of particles (atoms or molecules) which do not react chemically but are physically mixed together in any proportion.
3. Mixtures are classified into Homogeneous mixture, Heterogeneous mixture
4. A solution is a homogeneous mixture of two or more substances. For example: Lemon water, sugar solution, soda water, etc.
5. Solvent is component of the solution in larger amount.
6. The component of the solution that is dissolved in the solvent and is usually present in lesser quantity is called the solute. For example: Salt, sugar, iodine etc.
7. Properties of solutions:
   (i) It is a homogeneous mixture.
   (ii) Particle size in a solution is less than 1 nm in diameter.
   (iii) Particles of a solution cannot be seen even with a microscope.
   (iv) A true solution does not scatter the light.
   (v) Solution is stable.

(vi) The solute particles cannot be separated from the mixture by the process of filtration.

8. The maximum amount of the solute which can be dissolved in 100 grams of a solvent at a particular temperature is known as its solubility in that particular solvent.
9. Solubility of solids in liquids increases with the increase in temperature, whereas solubility of gases in liquids decreases on increasing the temperature.
10. Solubility of gases in liquids increases on increasing the pressure, whereas the solubility of solids in liquids remains unaffected by the change in pressure.
11. Concentration of a Solution is defined as the mass of the solute in grams present in 100 grams of the solution.
12. Concentration of solution $= \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$
13. liquid solute in liquid solvent concentration can be expressed as:

    Concentration of solution $= \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100$

14. A solution, in which no more quantity of solute can be dissolved at a particular temperature, is called saturated solution.
15. A solution, in which more quantity of solute can be dissolved without raising its temperature, is called unsaturated solution.
16. Colloides are heterogeneous mixtures in which the particle size is too small to be seen with the naked eye, but it is big enough to scatter light
17. In colloidal solution particles are called the dispersed phase and the medium in which they are distributed is called dispersion medium.
18. The erratic random movement of microscopic particles in a fluid, as a result of continuous bombardment from molecules of the surrounding medium is called as Brownian motion
19. The process of separation of pure solid in the form of its crystals from solution is called crystallisation
20. The mixture of two or more metals and non-metals which cannot be separated into their components by physical methods is called alloy.
21. Non homogeneous systems in which solids are dispersed in liquids are called suspensions.
22. The scattering of light by particles in a colloid or in a very fine suspension is called as Tyndall effect it is also known as Willis–Tyndall scattering
23. Pure Substance: It may be defined as a material which contains only one kind of atoms or molecules. Pure substances are again of two typ es Elements, Compounds.
24. Pure substances which are made up of only one kind of atoms are known as elements.

25. Pure substances cannot be split up into two or more simpler substances by any of the usual chemical methods. For example: Iron, gold, silver, carbon, oxygen, nitrogen and sodium etc.
26. Elements are further grouped into the following three categories:
    (i) Metals, for example: Iron, copper, gold, sodium, silver, mercury, etc.
    (ii) Non – metals, for example: Carbon, oxygen, sulphur, nitrogen, hydrogen, etc.
    (iii) Metalloids: Boron, silicon, germanium, etc.
27. Metals are lustrous (shine).
28. Metals conduct heat and electricity.
29. Metals are generally malleable and ductile.
30. Metals are sonorous.
31. All metals are hard except sodium and potassium.
32. All metals are solids at room temperature except mercury which is a liquid.
33. Non-metals are dull in appearance.
34. Non-metals are poor conductors of heat and electricity except Graphite which is a good conductor of heat and electricity.
35. Non-metals are neither malleable nor ductile.
36. Non-metals are generally soft except diamond which is the hardest natural substance known.
37. Non-metals may be solids, liquids or gases at room temperature.
38. The elements that have properties intermediate between those of metals and non-metals are called metalloids.
39. Compound is a form of matter formed by combining two or more elements in a definite ratio by mass
40. Compound can be decomposed into its constituent elements by suitable chemical methods

    For example: Water (H_2O),decomposed into oxygen (O_2) and hydrogen (H_2).
41. Impure Substance defined as a material which does not contains only one kind of atoms or molecules. It is also named as mixture.

3. ATOMS AND MOLECULES

1. The process of combination of two or more elements to form new compounds is governed by certain laws called laws of chemical combination. These are: Law of conservation of mass, Law of constant proportions
2. Law of conservation of mass (by Lavoisier in 1744) states that mass can neither be created nor destroyed in a chemical reaction.
3. Law of constant proportions (by Proust in 1797) states that in a chemical substance the elements are always present in definite proportions by mass.
4. Law of constant proportions is also called as law of definite proportions

5. According to Dalton's atomic theory, all matter, whether an element, a compound or a mixture is composed of small particles called atoms.
6. Matter is made up of extremely small indivisible particles called atoms that can neither be created nor destroyed.
7. Atoms of the same substance are identical in all aspects, i.e., they possess same size, shape, mass, chemical properties etc.
8. Atoms of different substances are different in all aspects, i.e., they possess different size, shape, mass etc.
9. Atom is the smallest particle that takes part in a chemical reaction.
10. Atoms of different elements combine with each other in a simple whole number ratio to form compound.
11. The relative number and kinds of atoms are constant in a given compound.
12. The smallest tiny particle of matter which can't be divided further is called atom, i.e., an atom is the smallest building block of matter. For example: Sodium (Na), Hydrogen (H), Oxygen (O), etc.
13. IUPAC (International Union of Pure and Applied Chemistry) approves names of elements and compounds.
14. The abbreviation used for lengthy names of elements is termed as their symbols.
15. The symbol of an element is formed by writing only the first letter or first letter followed by the second or some other letter of English name or Latin name of the element.
16. While writing a symbol, the first letter is always capital and the second is always small.
17. Atomic mass of an element may be defined as the average relative mass of an atom of the element as compared with the mass of 1/12 th an atom of carbon (C-12 isotope) taken as 1 amu.
18. Atomic mass = $= \frac{\text{Mass of 1 atom of an element}}{1/12 \text{ of the mass of an atom of C} - 12}$
19. The atomic mass of an element expressed in grams is known as gram atomic mass.
20. A group of two or more than two atoms of the same or different elements that are chemically bonded together is called a molecule.
21. The number of atoms present in a molecule of an element or a compound is known as its atomicity. Atomicity of oxygen (O_2) is 2 ,while atomicity of ozone (O_3) is 3.
22. The molecules of an element are constituted by the same type of atoms.
23. A molecule of oxygen consists of two atoms of oxygen to form a diatomic molecule O_2.
24. Atoms of different elements join together in definite proportions to form molecules of compounds.

25. A molecule of water consists of two atoms of hydrogen and one atom of oxygen to form a triatomic molecule H_2O.

26. Ion is an electrically charged atom or group of atoms. It is formed by the loss or gain of one or more electrons by an atom or group of atoms.

27. Cation is positively charged ion and is formed by the loss of one or more electrons from an atom.

28. Anion is a negatively charged ion and is formed by the gain of one or more electrons by an atom.

29. Valency is defined by the combining power (or capacity) of an element.

30. Depending on their valency, elements can be classified as following

    Monovalent cation: Having cationic charge(valency)of +1.

    For example: Sodium ion (Na+).Potassium ion (K+), Hydrogen ion (H+).

    Monovalent anion: Having anionic charge (valency) of -1.

    For example: Chloride ion (Cl^-), Bromide ion (Br^-)

31. Divalent cation: Having cationic valency of 2.

    For example: Magnesium ion (Mg^{+2}), Ferrous ion (Fe^{+2}).

    Divalent anion: Having anionic valency of “2.

    For example: Oxide ion(O^{-2}) , Sulphide ion (S^{-2}).

32. Trivalent cations: Having cationic valency of 3.

    For example: Aluminium ion (Al^{+3}), Ferric ion (Fe^{+3}).

    Trivalent anion: Having anionic valency of -3.

    For example: Nitride ion (N^{-3}), Phosphate ion $\left(PO_4^{3-}\right)$etc.

33. In a chemical formula of a compound

    (i) The valencies or charges on the ions must be balanced.

    (ii) For a compound made up of a metal and a non-metal, the symbol of metal is written first.

    iii) In compounds formed with polyatomic ions, the ion is enclosed in a bracket before writing the number to indicate the ratio.

34. The number of times a molecule of a compound is heavier than the 1/12th of the mass of C-12 atom, is known as its molecular mass.

35. Formula unit mass is the sum of the atomic masses of all atoms in a formula unit of a compound.

36. Formula unit mass is used for those substances whose constituent particles are ions.

    For example, formula unit mass of ionic NaCl = 23 + 35.5 = 58.5 u.

37. A collection of 6.023×10^{23} particles is named as one mole.

38. 1 mole = 6.023×10^{23} particles = Mass of 1 mole particles in grams

39. The mass of 1 mole particles is equal to its mass in grams.

40. 1 mole molecule = gram molecular mass

    1 mole atom = gram atomic mass

41. Number of moles in a substance $= \frac{\text{Mass of substance in grams}}{\text{Gram molecular mass}}$

42. The number of particles present in one mole (i.e. 6.023×10^{23} particles) is called Avogadro's number or Avogadro's constant.