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Paper :. Basic Lab calculation

QNo (1):- How to prepare solution by using parts and percent concentration?

(AN S):-What is concentration.

The concentration of a solution expresses the amount of solute present in a given amount of solution. The terms concentrated and dilute are just relative expressions. A concentrated solution has more solute in it than a dilute solution; however, this does not give any indication of the exact amount of solute present. Therefore, we need more exact, quantitative methods of expressing concentration.

Concentration Units The following are the six methods to calculate the concentration of a solution: 1. Percent by Mass

2. Percent by Volume
3. Molarity or Molar Concentration (M)
4. Molality or Molal Concentration (m)
5. Mole Fraction (X)
6. Normality

•Percent by Mass (weight)

Percent concentration (by mass), or % m/m, is the mass of solute divided by the mass of solution, all multiplied by 100. Therefore, percent by mass can be expressed as:

Percent by mass= mass of solute ÷ mass of solution ×100.

Or percent by mass =mass of solute÷mass of solute+mass of solvent ×100.

• Percent by Volume

For liquid solutions, % v/v is used to express their concentrations.

Percent concentration by volume is defined as the volume of the solute per 100 parts by volume of solution..

. Therefore, percent by volume can be expressed as: percent by volume=

Volumeof solute volume of solution×100...

• Molarity or Molar Concentration (M)

Molarity refers to the number of moles of solute per liter of solution:

M= moles liter solution...

Since chemists want to know how molecules interact,

they prefer to express concentration in definite numbers of molecules.

• Molality or Molal Concentration (m)

The molality, m, of a concentration of a solution is the number of moles in exactly 1 kilogram of solvent.

Molality may be calculated by dividing the moles of solute in a solution by the mass of the solvent in kilograms

. Molality = moles of solute kilograms of solvent..

•Mole Fraction (×)

The mole fraction, (X), of a component in a solution is equal to the number of moles of that component divided by the total number of moles of all components present.

It represents the ratio of the components in solution.

Mole fraction of A =XA = moles A moles ÷A +moles B +moles C+...

• Normality Normality

Normality Normality \could be defined as the number of gram equivalents

of a solute present per liter of the solution at any given temperature and it is expressed as N In general,

NA =#eq A#L soln The Normality of the solution can also be expressed

in terms of mass and equivalent mass, normality =mass of solute equivalent mass of the

Solute E X volume of solution in litters (v)

terms of weight, normality of the substance can be expressed as,

Normality = wg E g equiv Xv (liter) = w equiv /LWxv.....

_____QNo(2):- Define basic unit, derived units, suspension, ionic solution and super saturated solution.?

(ANS):-

Basic unit:

base unit is a unit adopted for measurement of a base quantity. A base quantity is one of a conventionally chosen subset of physical quantities, where no quantity in the subset can be expressed in terms of the others.

Derived unit:

derived unit is a SI unit of measurement comprised of a combination of the seven base units.

Suspension:

A suspension is a heterogeneous mixture in which the solute particles do not dissolve, but get suspended throughout the bulk of the solvent, left floating around freely in the medium.

Ionic solution:

Any substance which, when dissolved in water, separates into pairs of particles (ions) of opposite charge. For example, sodium chloride (common salt) when dissolved in water forms positive ions of sodium and negative ions of chloride.

Super saturated solution:

solution of a chemical compound in a liquid will become supersaturated when the temperature of the saturated solution is changed. In most cases solubility decreases with decreasing temperature; in such cases the excess of solute will rapidly separate from the solution as crystals or an amorphous powder.

_____QNO(3):-Write a note on dilution ratio and concentration of dilution with example ?

(ANS) :_

Dilution Ratio:

the dilution ratio is the ratio of solute to solvent. It is often used for simple dilutions, one in which a unit volume of a liquid material of interest is combined with an appropriate volume of a solvent liquid to achieve the desired concentration. The diluted material must be thoroughly mixed to achieve the true dilution. For example, in a 1:5 dilution, with a 1:5 dilution ratio, entails combining 1 unit volume of solute (the material to be diluted) with 5 unit volumes of the solvent to give 6 total units of total volume.

This is often confused with "dilution factor" which is an expression which describes the ratio of the aliquot volume to the final volume. Dilution factor is a notation often used in commercial assays.

Example:

For example, in a 1:5 dilution, with a 1:5 dilution factor, (verbalize as "1 to 5" dilution) entails combining 1 unit volume of solute (the material to be diluted) with (approximately) 4 unit volumes of the solvent to give 5 units of total volume. Note that some solutions and mixtures take up slightly less volume than their components.

Dilution concentration:

Dilution is the process of decreasing the concentration of a solute in a solution, usually simply by mixing with more solvent like adding more water to a solution. To dilute a solution means to add more solvent without the addition of more solute. The resulting solution is thoroughly mixed so as to ensure that all parts of the solution are identical.

The same direct relationship applies to gases and vapors diluted in air for example. Although, thorough mixing of gases and vapors may not be as easily accomplished.

Example:

For example, if there are 10 grams of salt (the solute) dissolved in 1 litre of water (the solvent), this solution has a certain salt concentration (molarity). If one adds 1 litre of water to this solution the salt concentration is reduced. The diluted solution still contains 10 grams of salt (0.171 moles of NaCl).

_____QNO(4):-How to calculate serial dilutions?

(ANS):-

Calculation of serial dilution:
A serial dilution is any dilution in which the concentration decreases by the same factor in each successive step.

In serial dilutions, you multiply the dilution factors for each step.

The dilution factor or the dilution is the initial volume divided by the final volume.
Df = Vi/Vf
Solution 2:
Solution 2

Remember that serial dilutions are always made by taking a set quantity of the initial dilution and adding it successively to tubes with the same volume. So you multiply each successive dilution by the dilution factor.

You would transfer 0.2 mL from Tube 1 to 3.8 mL of diluent in Tube 2 and mix. Then transfer 0.2 mL from Tube 2 to 3.8 mL of diluent in Tube 3 and mix. Repeat the process until you have four tubes.
The dilution factor after four dilutions is

DF=
1/20
×
1/20
×
1/20
×
1/20
=
1/160000
= 1:160 000

If the concentration of the original stock solution was 100 µg/µL, the concentration in Tube 4 would be

100 µg/µL ×
1/160000
= 6.25×10^{-4} µg/µL.....
_____QNO(5):-Explain pH and pOH with scale and examples.?
(ANS):-
PH:
is a scale used to specify the acidity or basicity of an aqueous solution. Acidic solutions (solutions with higher concentrations of H+ ions) are measured to have lower pH values than basic or alkaline solutions.
The pH scale is logarithmic and inversely indicates the concentration of hydrogen ions in the solution. This is because the formula used to calculate pH approximates the negative of the base 10 logarithm of the molar concentration[a] of hydrogen ions in the solution. More precisely, pH is the negative of the base 10 logarithm of the activity of the H+ ion.
Example:
For example, hydrochloric acid and lemon juice are very acidic and readily give up H+ when added to water. Conversely, bases are those substances that readily donate OH−. The OH− ions combine with H+ to produce water, which raises a substance's pH. Sodium hydroxide and many household cleaners are very alkaline and give up OH− rapidly when placed in water, thereby raising the pH.
POH:

pOH is a measure of hydroxide ion (OH-) concentration. It is used to express the alkalinity of a solution.

Aqueous solutions at 25 degrees Celcius with pOH less than 7 are alkaline, pOH greater than 7 are acidic and pOH equal to 7 are neutral.
How to Calculate pOH
pOH is calculated based on pH or hydrogen ion concentration ([H+]). Hydroxide ion concentration and hydrogen ion concentration are related:

$[OH^-] = Kw / [H^+]$

Kw is the self-ionization constant of water. Taking the logarithm of both sides of the equation:

$pOH = pKw - pH$

An approximation is that:

$pOH = 14 - pH$
While the approximation works well in many settings, there are exceptions for which the pKw value should be used instead.

Example:
Example: What is the pOH of a solution that has a hydroxide ion concentration of 4.82 x 10-5 M?

pOH = - log [4.82 x 10-5] = - (- 4.32) = 4.32. .....
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