



NATIONAL OPEN UNIVERSITY OF NIGERIA

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Course Title: Introductory Practical Chemistry Summary

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CHM191: INTRODUCTORY PRACTICAL CHEMISTRY SUMMARY

An experiment that determines the relative amounts of components in a sample is called **Quantitative Analysis**

The following are methods of performing quantitative analysis

- Gravimetric method
- Instrumentation method
- Spectrophotometric method
- Titrimetric (volumetric) analysis

Titrimetric analysis is otherwise called **volumetric analysis**

Volumetric analysis is the determination of concentrations of solutions by titrating the solution with another solution whose concentration is known

Volumetric analysis involves weighing, preparing a solution and **titrating**

The following are precautionary measures to take while working in the laboratory

- Wear a lab coat or an apron when working in the laboratory
- Be familiar with the layout of the laboratory especially where fire extinguishers, blankets or the first aid box are
- Never work alone in the laboratory
- Check the glassware before using. It should not have any cracks or imperfections
- Always wear safety glasses or goggles in the laboratory
- All chemicals must be handled with caution
- Never taste anything unless specifically directed to do so
- Avoid inhaling vapours of any compound

Table 1: List of hazardous chemicals and their effects.

Hazardous Chemicals	Effects
Salts of Ag, Sb, Ti, V, $C_2O_4^{2-}$, F, MnO_4^- , H_2S	Most of these are very dangerous but only if swallowed. $AgNO_3$ causes caustic burns. Almost as poisonous as HCN. Exposure dulls the sense of smell.
SO_2 , NO_2 , Cl_2 , Br_2 , I_2 , HNO_3 , H_2SO_4 , HF	All are dangerous as well as unpleasant. When concentrated, all cause rapid destruction of the skin; HF is especially dangerous.
$HClO_3$, $HClO_4$ and their salts	Highly oxidizing.
Chlorinated alkanes, e.g. $CHCl_3$, CCl_4	Most of these are narcotics, causing mental confusion
Benzene	Toxic vapours causing dizziness and in suspected to be a cancer agent.
Benzoyl chloride	Irritant.
Ether, ethanol	Very highly inflammable
Nitrobenzene	Toxic vapours
Phenol	Burns the skin

Never heat a closed system; it will act as a _____
bomb

You are advised to carry out unauthorized experiments in the laboratory
False

A **fume hood** is used for handling dangerous substances and for carrying out reactions in which noxious gases are evolved

A laboratory first aid box contains the following items

- Dettol
- Pure honey
- Band-aid
- Bandages
- Cotton

The most common accidents that occur in the chemistry lab are

- Cuts
- Burns
- Fires
- Poisoning
- Explosion

The most common accidents in the chemistry laboratory are **cuts** from broken glassware

If you have a cut, wash the wound well with **cold water** immediately

The burnt part of the body is washed with cold water and honey applied

A small fire in the beaker caused by the vapors of an inflammable liquid can be extinguished by covering it with a **watch glass**

If a person swallows a poisonous chemical, plenty of water or calcium hydroxide solution (lime water) should be given as soon as possible

In case of chemical spill in the eyes, flush eye(s) with large amounts of **cold water**

Table 2 Remedies for a few chemical reagents

Chemicals	Remedy
Acids like HNO_3 , H_2SO_4 , NaHCO_3 , HCl	Wash with NaHCO_3 or 2M ammonium carbonate (leaves no residue on clothes), and then apply Vaseline or a soothing cream.
Alkalines, e.g., NaOH , KOH etc.	Wash with 1M acetic acid, then apply Vaseline or a soothing cream
Bromine	Wash with 2M ammonia, keep the affected part dipped in NaHSO_3 till bromine is washed off, and then apply Vaseline.
Phenol	Wash with ethanol and then hospital treatment
Sodium	Apply Ethanol on a cotton wool pad.

One of the important characteristics of a scientist is the habit of keeping good **record** of the work that has been done

The first few pages in a laboratory notebook should be left for making a list of **contents**

Heating increases the solubility of most substances

In **gravimetric** analysis, the precipitate is sometimes heated to a high temperature to convert it into a compound of constant composition

The procedure by which the precipitate is heated to a high temperature to convert it into a compound of constant composition is called **gravimetric analysis**

The **Bunsen burner** is widely used laboratory equipment for heating device in an inorganic chemistry laboratory

The Bunsen burner is used to attain moderately high temperature up to **600° c**

Boiling water bath are used for heating solutions up to **100 °c**

The simplest form of a water bath is a **beaker**

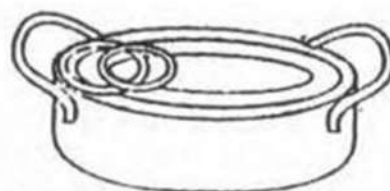


Fig. 2: A copper water bath

Electric ovens or drying ovens are very convenient heating devices up to about **300 °c**

Rapid evaporation can be achieved by heating the dish containing the solution directly on **wire gauze**

Precipitation is a process in which ions present in solution is converted into an insoluble compound called precipitate by the addition of another compound called precipitant or precipitating reagent

Precipitation is a process in which ions present in solution is converted into an insoluble compound

The ions present in solution is converted into an insoluble compound called **precipitate**

NB: Precipitation is usually carried out in test tube (in qualitative analysis) or in beakers (in quantitative analysis)

In qualitative analysis, precipitation is carried out in **test tube**

In quantitative analysis, precipitation is carried out in a **beaker**

Filtration is the process of separation of a solid (crystals or precipitate) from the liquid (mother liquor)

When filtration is carried out either under atmospheric pressure, it is referred to as **ordinary filtration**

When filtration is carried out either under reduced pressure, it is called **suction filtration**

Filters for filtering precipitate are the following

- Filter papers
- Sintered glass crucible
- Porcelain Buchner funnel

Filter paper is frequently used to filter precipitates in qualitative analysis

In qualitative analysis, **filter paper** is used to filter precipitates

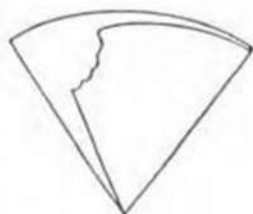


Fig. 3 A property paper filter

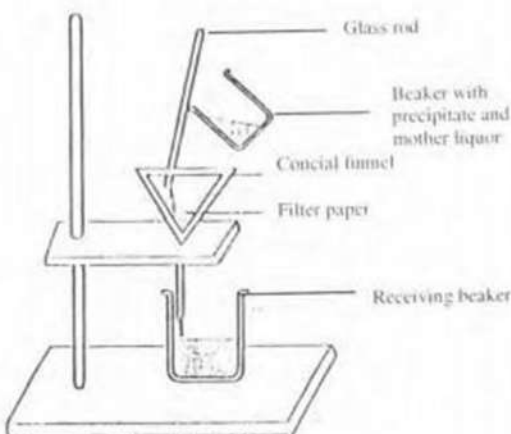


Fig. 4 Procedure for filtering a precipitate

The procedure above demonstrates filtration of a precipitate

Ordinary filtration is generally a slow operation (True/False)

True

Ordinary filtration is a slow operation that can be speeded up by use of **suction** filtration

The ignition of precipitate requires a higher temperature of up to **1200°C**

Cooling of precipitate is done in laboratory equipment called **desiccators**

A **desiccator** is an airtight container that contains a drying agent or desiccant such as anhydrous calcium chloride or silica

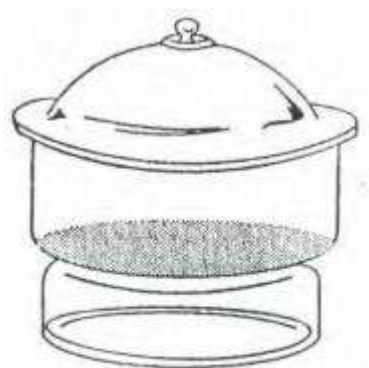


Fig. 9 A desiccator



Fig.5 A sintered glass



fig. 6 A Buckner funnel crucible

The **desiccant** absorbs moisture and keeps the air dry in the desiccators

The most commonly used volumetric analysis (flask) is the _____ capacity flask
250cm³

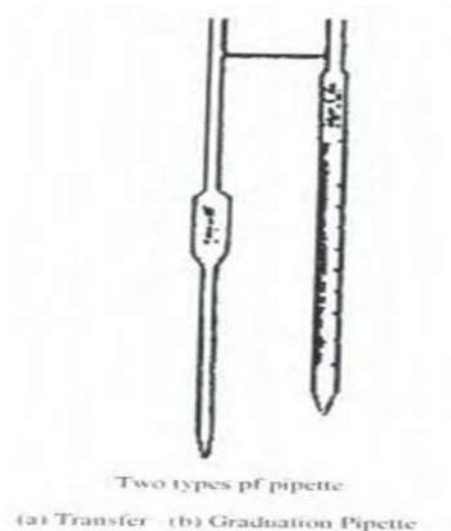
Pipettes are used for transferring liquids or solutions from one container to another container

There are of _____types of pipettes
Two

The two types of pipette are **transfer** and **graduated** or measuring pipette

A measuring pipette is also called **graduated** pipette

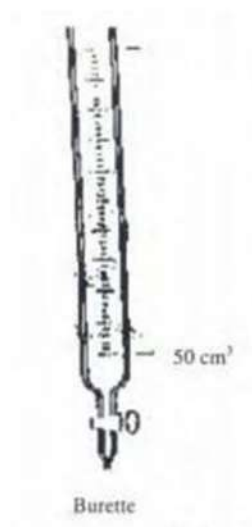
Graduated pipette is used for delivering liquids of definite volume (which are usually not up to the round figure value of 10, 20cm³)



A **burette** is a long glass tube fitted with a tap or stopcock through which the liquid contained in it is delivered through a small opening at one end

A **burette** is designed to measure acutely the volume of liquid delivered during a titration

The burette readings can be reported to _____ decimal places
Two



A spoon like equipment used to take the required amount of compounds from the reagent bottle or pack is known as **spatula**

Weighing an object is a practice common in a chemistry laboratory (True/False)

True

The result of weighing an object is the **mass** in weight of the object

The base unit of a measurement of mass is **kilogram**

NB: Kilogram is abbreviated as kg

The laboratory apparatus used for weighing objects is called a **balance**

The following are different types of balance used for weighing objects

- analytical balance
- balm balance
- top loading balance

The base unit of volume is **cubic metre** or **cm³**

NB: The value equivalent of these units is $1000\text{cm}^3 = 1\text{dm}^3 = 1\text{ litre} = 1000\text{m}^3$

Concentration of a substance refers to the amount or quantity of the substance either wholly in relation to another substance

The unit of mole is **mol**

A **mole** is the amount of substance which contains as many elementary units as there are atoms in 12.0g of carbon — 1

NB: The number of elementary units in a mole of a substance is equal to 6.02×10^{23} particles

6.02×10^{23} is called **Avogadro number**

The mole of an element or compound is the atomic, ionic, or molecular/formular mass of the substance expressed in grams (if solid)

$$\text{Mole} = \frac{\text{Mass measure in grams}}{\text{Molar mass in grams per mole}}$$

The **molarity** of a solution is defined as the number of moles of solute in one cubic decimeter (dm³) or one litre (L) of solution

The number of moles of solute in one cubic decimeter (dm³) or one litre (L) of solution is **molarity**

$$\text{Molarity} = \frac{\text{Moles of solute}}{\text{Volume of solution in 1 dm}^3}$$

The **molality** of a solution is defined as the number of moles of solute in one kilogram (kg) of solution

The number of moles of solute in one kilogram (kg) of solution is **molality**

The weight in grams of a substance
Formula weight in grams of the substance

Normality is the number of gram-equivalent weight of solute in 1 dm³ of solution

The number of gram-equivalent weight of solute in one cubic decimeter of solution is **normality**

$$\text{Normality} = \frac{\text{Equivalent weight of solute}}{\text{Volume of solution in dm}^3}$$

The ratio of the weight of solute to the total weight of solute plus solvent multiplied by 100 is called **Percentage of weight**

$$\text{wt/wt}\% = \frac{\text{wt of solute} \times 100}{\text{wt of solute} + \text{wt of solvent}}$$

Percentage by volume is defined as the ratio of the volume of solute to the total volume of solute plus solvent multiplied by 100

$$\text{Vol / vol}\% = \frac{\text{volume of solute (cm}^3\text{)} \times 100}{\text{Volume of solute} + \text{volume of solvent (cm}^3\text{)}}$$

Percentage weight by volume is defined as the number of grams of solute in one hundred (100) cm³ of solution multiplied by 100

$$\text{Wt / vol \%} = \frac{\text{weight of solute in gram}}{\text{Volume of solutions in cm}^3} \times 100$$

A **standard solution** is a solution of which the concentration is accurately known

NB: PRACTICE CALCULATIONS IN MODULE ONE, UNIT 2

A standard solution of a substance can be prepared if the substance can be obtained in **pure** state

A **standard** solution can be prepared if the substance can be obtained in pure state

When a substance is not available in pure form, a solution of approximate **concentration** is first prepared

sodium carbonate Na_2CO_3 (a base)

benzoic acid $\text{C}_6\text{H}_5\text{CO}_2\text{H}$ (an acid)

oxalic acid ($\text{H}_2\text{C}_2\text{O}_4$)

A substance which can be used to prepare a standard solution is called a **primary standard**

The following are examples of primary standard

- sodium carbonate, Na_2CO_3 (a base)
- benzoic acid, $\text{C}_6\text{H}_5\text{CO}_2\text{H}$ (an acid)

Substances which though hydrated but do not form efflorescence which can be used in the preparation of a standard solution are called **secondary standard**

An example of secondary standard is oxalic acid ($\text{H}_2\text{C}_2\text{O}_4$)

HCl and HNO_3 are suitable acids as primary standards

False

It is impossible to use a solution of sulphuric acid (H_2SO_4) as a primary standard because **it is volatile and corrosive liquid**

A **primary standard** is a substance that can be used to prepare a solution whose concentration is accurately known

A substance that can be used to prepare a solution whose concentration is accurately known is **primary standard**

Sulphuric acid cannot be used as a primary standard because

- It cannot keep its concentration over a long time due to its volatility
- It is highly corrosive
- It takes in moisture from the atmosphere

Titration is the procedure by which a solution of known concentration is added to another solution until the chemical reaction between the two solutes is complete

A procedure by which a solution of known concentration is added to another solution until the chemical reaction between the two solutes is complete is called **titration**

A solution whose concentration is known is called **standard solution** or **titrant**

In the process of titration, the point at which stoichiometrically equivalent quantities of substances have been brought together is known as **equivalence point** of titration

The end of the equivalence point is usually done by using what is called an **indicator**

An organic substance (a dye) which changes color in the titrated solution when an amount of the standard solution (titrant) added is equivalent is known as **indicator**

There are _____ types of titrimetric analysis
Four

All these are types of titrimetric analysis

- Acid-Base titration
- Oxidation-Reduction titration

- Precipitation titration
- Complexometric titration

Direct titration is when standard solution directly reacts with the substance being determined

When a standard solution does not react with the substance being determined, it is referred to as **indirect titration**

When you determine the amount of the elements or compounds present in a sample, it is referred to as **quantitative analysis**

Titration is the procedure by which a solution of known concentration is added to another solution until the chemical reaction between the two solutes is complete

In titration, when the standard solution (titrant) is slowly added from a burette to a solution which contains a known mass of solute, the latter solution is commonly referred to as the **unknown**

The point at which stoichiometrically equivalent quantities of substances have been brought together is known as the **equivalence point** of titration

NB: The equivalence point of titration signifies when the reaction must have come to completion

The moment at which the indicator changes the color of the titrated solution is called the **end point** of the titration

NB: The experimentally determined position of the stoichiometric point of the titration is called the **end point** while the actual theoretical stoichiometric point of the titration is the **equivalence point**

All these are indicators

- methyl orange
- Phenolphthalein
- bromothymol blue
- litmus paper

An indicator that is colorless in acidic solution but change to pink in basic solution is **phenolphthalein**

The ph of a solution is a measure of the **hydrogen ion** concentration in the solution

The ph scale ranges from **0 to 14**

The ph scale ranges from _____
0-14

A solution with ph value less than 7 is _____
acidic

A solution with ph value exactly 7 is said to be _____
neutral

A solution with ph value greater than 7 is an _____ solution
alkaline

Pure water has a ph of _____
7

INDICATOR	COLOR in			pH RANGE
	Acid	Neutral	ALKALI	
1. Litmus	Red	Purple	Blue	6.0 – 8.0
2. Methylorange	Pink	Orange	Yellow	3.1 – 4.4
3. Phenolphthalein	Colorless	Colorless	Pink	8.3- 10.0
4. Bromothymol	Yellow	Blue	Blue	6.5 – 7.8

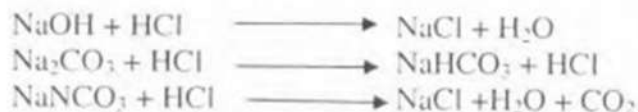
$$\text{Molar concentration} = \frac{\text{amount in mole} \times 1000\text{cm}^3}{\text{Volume}}$$

$$= \frac{0.025 \times 1000}{24.40}$$

$$= 1.03\text{mol dm}^{-3}$$

NB: NaOH cannot be used as a primary standard because it absorbs moisture from the atmosphere

Back titration is obtained when in an acid-base reaction; the amount of base added to a certain amount of the acid is in excess of the stoichiometric amount of the acid required leaving the base in excess and the resulting solution basic



Both reduction and oxidation take place at the same time (simultaneously) **True**

Oxidation and reduction reactions are referred to as _____
redox reaction

The oxidation state of hydrogen is _____
+1

The oxidation state of carbon is _____
+4

The oxidation state of oxygen is _____
-2

The oxidation state of chromium is _____
+7

NB: Hydrogen is in group 1 of the periodic table, so it has +1 oxidation state, oxygen is in group 6 so it has -2 oxidation state and carbon is in group 4 so it has + 4 oxidation state

The sum of the oxidation states of all elements in a neutral compound add to _____
zero

The oxidation state of an element in its natural state is Zero e.g. C1 2 P4

What is the oxidation state of C in $\text{H}_2\text{C}_2\text{O}_4$

$\text{H}_2\text{C}_2\text{O}_4 = 0$; $\text{H}_2\text{CO}_3 = 0$

$2(1) (\text{for H}_2) + \text{C} + 3(-2) = 0$

$2 + \text{C} - 6 = 0$

$\text{C} = +4$

what is the oxidation state of Cr in $\text{Cr}_2\text{O}_7^{2-}$

Remembering rule 2, $\text{Cr}_2\text{O}_7^{2-} = -2$

Remembering rule 1, $\text{O} = -2$

$\text{Cr}_2 + 7(-2) = -2$

$\text{Cr}_2 - 14 = -2$

$\text{Cr}_2 = 12$

$\text{Cr} = +6$

NB: When writing the oxidation number of an element, the plus sign (+) is very important as it is wrong to imply that 6 is the same as + 6

1 in $\text{IO}_4^- = +7$

N in $\text{NH}_4^+ = +3$

S in $\text{Na}_2\text{S}_2\text{O}_3 = +2$

Mn in $\text{KMnO}_4 = +7$

Oxidation and reduction occur simultaneously

True

In terms of electron transfer, oxidation can be defined as _____ of electrons

loss

In terms of electron transfer reduction is the _____ of electrons

gain

In terms of oxidation number, oxidation can be defined as _____ in the oxidation number

increase

In terms of oxidation number, reduction is the _____ in oxidation number

decrease

The standard reagents used in redox reactions are _____agents
oxidizing or reducing

The most widely used oxidizing agent in redox titrations is _____
potassium permanganate (KMnO₄)

Potassium permanganate cannot be used as a primary standard because
 it is difficult to obtain pure

True

Potassium permanganate cannot be used as a primary standard
 because _____

it is difficult to obtain pure

Potassium permanganate is an oxidizing agent

True

A substance that loses an electron is said to be _____
oxidized

A substance that gains an electron is said to be _____
reduced

Redox reactions are reactions which involve the simultaneous processes
 of _____and _____

reduction and oxidation

_____are reactions which involve the simultaneous processes of
 reduction and oxidation

Redox reaction

Chemical and physical processes are usually accompanied by heat gain
 and or _____

Heat loss

The study of thermal changes is known as _____

Thermodynamics

Thermodynamics is also called_____

Thermochemistry

A process that is accompanied by a heat gain is said to be _____

Endothermic

A process that is accompanied by heat loss is_____

Exothermic

Examples of Endothermic reactions are

- The addition of ammonium chloride (NH_4Cl) to water
- The addition of sodium ethanoate (CH_3COONa) to water

The following are examples of exothermic reactions

- addition of concentrated acids to water
- neutralization reactions
- displacement reactions
- addition of NaOH or KOH pellets to water

The heat of reaction is measured by the use of_____

calorimeter

The_____of reaction is measured by the use of calorimeters

Heat

The instrument used to measure the heat of reaction is called a

calorimeter

The_____is the amount of heat required to raise the temperature of 1g of the substance through 1°C

specific heat capacity

_____is the amount of heat required to raise the temperature of one mole of substances through 1°C

Molar heat capacity

_____ reactions are reactions in which electrons are transferred from one ion or atom or molecule to another of these species in the particular reaction under consideration whether the reaction involves formation of ionic compounds or covalent compounds though it is less obvious in the latter.

Oxidation – reduction

Oxidation – reduction titration involves a change in the _____ for both substances being determined

oxidation state

Oxidation involves the _____ of electrons
loss

Reduction involves the _____ of electrons.
gain

The oxidation number is also called _____
oxidation state

The _____ of an element in a compound represents the amount of oxidation (i.e. the number of electrons gained) necessary to convert one atom of the element from the free elemental state which has zero value to that in the compound.

oxidation number or oxidation state

Both reduction and oxidation occur simultaneously.

True

Reduction and oxidation are called _____
Redox reaction

Red (uction) and **ox** (idation)----- > **Redox**

In the periodic table, the _____ formed from the elements in all the groups carry either positive or negative charges as their oxidation numbers.

ions

In the periodic table, the ions formed from the elements in all the groups carry either _____ or _____ charges as their oxidation numbers.

positive or negative

The ions formed from the elements in all the groups on the periodic table, carry either positive or negative charges as their_____.

oxidation numbers

In_____reactions, the reactants are identified by their names.

Acid-base

In acid-base reactions, the reactants are identified by their_____.
names

Redox reactions have_____different participants.

Two

Redox reactions have two different participants: **reducing agent** and **oxidizing agent**

Redox reactions have two different participants: the reducing agent and_____
oxidizing agent

The substance that accepts electrons is called_____
oxidizing agent

The substance that donates the electrons is the_____
reducing agent



Two things are noticeable from the equation:

- 1) Sodium donates one electron to form sodium ion, therefore it is the reducing agent.
- 2) Na moves from oxidation state of Zero to +1, therefore Na is oxidized.

SAQ3: What is the oxidation state of the underlined element in the following molecule or ion or compound.

- (i) $\underline{\text{I}}\text{O}_4^-$
(ii) $\underline{\text{N}}\text{H}_4^+$
(iii) $\text{Na}_2\underline{\text{S}}_2\text{O}_3$
(iv) $\text{K}\underline{\text{Mn}}\text{O}_4$

Answer

- (i) 1 in $\text{IO}_4^- = +7$
(ii) N in $\text{NH}_4^+ = +3$
(iii) S in $\text{Na}_2\text{S}_2\text{O}_3 = +2$
(iv) Mn in $\text{KMnO}_4 = +7$

There are two related definitions of oxidation. There is one involving electron transfer and the other involving the concept of oxidation state.

The most widely used oxidizing agent in redox titrations is **potassium permanganate**

The chemical name for KMnO_4 is **potassium permanganate**

Potassium permanganate cannot be used as a primary standard
True

The potassium permanganate solution intended for _____ titrations must be standardized prior to use.
redox

The potassium permanganate solution intended for redox titrations must be _____ prior to use.
Standardized

The _____ solution intended for redox titrations must be standardized prior to use.
potassium permanganate

Potassium permanganate can be standardised using the following standard reagents

- ammonium iron (II) sulphate

- sodium ethanedioate
- ethane dioic acid

ethanedioic acid is also called _____
oxalic acid

Which of the following is a good reducing agent?
oxalic acid

Potassium permanganate is an oxidizing agent.
True

Potassium permanganate is a _____ reagent.
self indicating

_____ is used when iodine requires an external indicator
Starch

Because of the intense colouration of _____ it is very difficult to read the meniscus of the solution in burette.
KMnO₄

The potassium permanganate solution intended for _____ must be standardised prior to use.
redox titration

A standard solution of Oxalic acid is a hydrated _____ that can be obtained in high purity in the laboratory.
dibasic acid

Oxidation-reduction reactions are reactions in which _____ are transferred from one ion to another
electrons

Oxidation-reduction reactions are also used in ----- like the acid-base reactions
titrimetric analysis

In redox titration involving potassium permanganate, if the contents of the conical flask turn brown, it means that _____ was added.
Insufficient acid catalyst

The equation for the redox reaction is, $X(aq) + 5C_2O_4^{2-}(aq) + 16H^+(aq) \rightarrow 2Mn^{2+}(aq)$

+ 10CO₂(g)+8H₂O(l). Identify the reactant X.

MNO-4

From the equation $\text{MNO}_4^-(\text{aq}) + 5\text{C}_2\text{O}_4^{2-}(\text{aq}) + 16\text{H}^+(\text{aq})$ the mole ratio between the reactant is ____

5moles

Potassium permanganate is a self-indicating reagent because of its different characteristic _____ in either the acidic or basic medium

Colour changes

Potassium permanganate can be used to estimate the _____ of a substance.

percentage purity

$\text{IO}_3^- + \text{SO}_3^{2-} \rightarrow \text{I}^- + \text{SO}_4^{2-}$ The oxidation state of oxygen in the product's equation is ____

+6

$\text{IO}_3^- + \text{SO}_3^{2-}$ the oxidation state of oxygen in the equation is ____

+4

$\text{CO} + \text{H}_2\text{SO}_4 \rightarrow \text{CO}_2 + \text{SO}_2 + \text{H}_2\text{O}$ The elements which undergo change in oxidation state from the reactants to the products are _____

C and S

Volumetric analysis involving iodine are usually referred to as _____

Iodimetry

In the _____, standard solutions of iodine are used to estimate directly the concentrations of some oxidizable species.

Direct method

In the _____ the excess iodine ion that is deliberately produced in a reaction involving say potassium iodide in an acid medium is made to react with another oxidizing agent.

indirect method

$2\text{I}^-(\text{aq}) \rightarrow \text{I}_2(\text{aq}) + 2\text{e}^-$. In this equation the liberated I_2 is now quantitatively determined by titration with standard _____ solution acting as reducing agent according to the equation below. $2\text{S}_2\text{O}_3^{2-}(\text{aq}) + \text{I}_2(\text{aq}) \rightarrow \text{S}_4\text{O}_6^{2-}(\text{aq}) + 2\text{I}^-$

Sodium thiosulphate

Of all the oxidizable species available for use, iodine titration are usually used with the ____

thiosulphate

The colour changes accompanying the varying change in oxidation states of iodine and its ion can be used to indicate the_____

end point

The most commonly used _____for iodine titration is starch solution.

external indicator

The starch solution forms a _____complex with the tri-iodide ion during the titration that is rapidly discharged at the end point.

blue black

Thus using starch as indicator, the colour variations of the solution depend on _____formation of the starch with iodide ion formed in the last stage of the titration.

complex

For this reason and in order to avoid complications in the end point detection, the starch indicator is added at the_____ colouration of the solution which is near the end point.

light yellow

Complete the colour change in iodometry analysis. _____(initially)→

Red-brown

_____colouration is observed at near end point of the iodometry titration.

Light yellow

Oxidation involves the-----of electrons

lost

The oxidation potentials of Na is_____

Na+ + e +2.71

The study of thermal changes in chemical and physical processes is known as_____

thermochemistry

The _____is the amount of heat released or observed for a given amount of reactants or products

heat of reaction

The only acid suitable for use in redox titration involving potassium permanganate is dilute_____

Sulphuric acid

Nitric acid would compete with the permanganate ion for the reducing agent because itself is a _____

strong oxidizing agent

Reduction reaction involves ----- of electrons
gain

Oxidation-reduction reactions involves a change in ----- of both substances being determined

oxidation state

Unlike acid-base reactions, redox procedure involves the use of-----

Catalyst or slight heat

When atoms of elements are in their free state their oxidation number is-----

Zero

In preparing a standard solution, two factors must be considered, namely:

- The solute must be pure
- The suitable solvent should be measure to a definite volume

A solution contains 1.2 Molar concentration, what volume of it must be diluted with water to give 600 mls of 0.5 Molar solution?

25 mls

In a chemistry laboratory a stoke bottle of acid solution reads, "1.25 specific gravity"; what does that mean?

1 cm³ of that solution weight 1.25 g

If 2 cm³ of a stoke solution contains 1 mole of an acid how would you prepare 1 molar concentration of that acid in 250 cm³ of water?

Dissolve 2 cm³ of the stoke solution in 248 cm³ of water

A substance which loses water of hydration upon exposure to atmosphere is called?

Efflorescence substance

A substance which takes in only moisture upon exposure to atmosphere is referred to as?

Deliquescent substance

A table of requirement for laboratory experiment contains the following except?
List of weight of each reagents

Give reason why water should not be added to acid during carrying out acid-base titration?

The dissolution of acid in water is exothermic which may cause explosion

The concentration of pure HCl 11.7 Molar if 20 cm³ of the acid is diluted to 250 cm³ to give concentration of 0.936 mol.dm³ substitute this values on this equation;
 $C_1V_1 = C_2V_2$

$$11.7 \times 20 = 0.936 \times 250$$

The point at which stoicheometrically equivalent quantities of substance have been brought together is known as?

Equivalence point of titration

Which of the following options is an indicator used for acid-base titration?

Methyl orange

In an acid base titration conducted by a student, the colour of the solution in the beaker changed from colourless to pink when phenolphthalein was used as an indicator, what went wrong?

The beaker was occupied by acid solution instead of base.

What is a PH of a solution?

It is the measure of hydrogen ions concentration in the solution

At neutralization point, the PH value is?

Seven

At complete neutralization point, the litmus paper colour turns?

Purple

Predict the colour of methyl orange when pH is 8?

Yellow

What is the colour of bromothymol when added to an acid solution?

Yellow

An indicator X was added to an acid solution in a beaker but no colour change was observed give the name of the indicator X?

Phenolphthalein

What is a strong acid?

Any acid that ionizes completely in solution

An example of a strong acid is?

H₂SO₄

What type of indicator will be suitable for use in a titration involving H₂SO₄ + NH₃(aq)?

Methyl orange

Which of these indicators will be suitable for use in a titration involving a weak acid and a strong base?

Phenolphthalein

What is the implication of adding a phenolphthalein as an indicator during the titration of HCl against Na₂CO₃?

The end point will appear when only half of Na₂CO₃ has been used

What is the importance of back titration?

To determine the concentration of a substance that is in excess after a chemical reaction.

A 25 ml solution of 0.5 M NaOH is titrated until neutralized into a 50 ml sample of HCl?

0.25 mol

A student used a hard tap water and performed an acid base titration. In few lines explain what would happen to his result?

The starting solution would be more alkaline therefore it would require more volume of acid than expected

Choose the most suitable water for use in acid base titration?

Deionised water

Both molarity and normality are measures of concentration. True or false?

True

During acid-base titration sulphuric acid would be dissociated into what ions?

2H⁺ + SO₄⁻

What is a titrand in titration analysis?

Unknown concentration of an analyte

What is a titrant in titration analysis?

Known concentration and volume of an analyte

When performing acid-base titration, one should first?

Rinse the burette twice with acid solution

The equation $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ is a ____?

Neutralization reaction

The following are advantages of acid base titration except?

Less accuracy and precision

