

Assignment on Antimicrobials

Subject - Inorganic Pharmaceutical Chemistry

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Antimicrobial —:

There are several terms employed in describing antimicrobial activity. Since some of these terms refer to specific aspects of this activity, it is necessary to become acquainted with their definition and general usage —

Antiseptic

This term is generally applied to any agent which either kills or inhibits the growth of microorganisms, i.e. bacteria, fungi, protozoans etc. The term is reserved, however, for those agent used against micro-organisms growing on man specifically or living tissue in general.

Germicide

The terms germicide refers to a more specific action in that it describe agents which kill microorganisms. Hence, this ending can be applied to the names of various classes of microorganisms to provide terms for more specific agents. e.g. bactericide, fungicide etc.

Those agents which do not kill microorganisms but function primarily by inhibiting their growth can be described by terms using the suffix -static (from the Greek word stasis, meaning "standing still").

Disinfectant

This term refers to the same type of activity as the term germicide, above. Its usage differs in that it is applied to those agents most appropriately used on inanimate objects, e.g. instruments, equipment, etc.

Sterilization

This refers to the use of a disinfectant or other procedure to render an object completely free of microorganism, which are much too stringent for use on animal or human tissue.

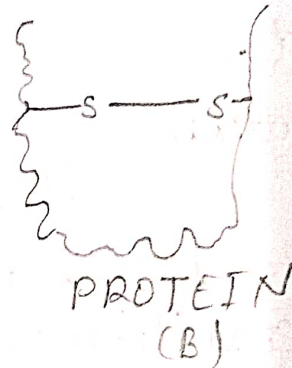
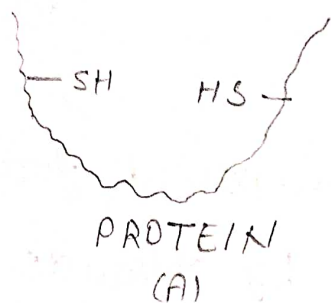
The terms antiseptic and germicide may be further modified according to their area and type of use. For example external agents may be whether they are used topically or internally. Internal agents may be further subdivided into those that are absorbed (systemic) and those that not absorbed (nonsystemic).

Mechanism

The mechanism of action of inorganic antimicrobial agents can be divided into three general categories: oxidation, halogenation, and protein precipitation.

It is an important to note that in contrast to certain organic compounds known as antibiotics

These agents will interact in a similar fashion with all protein, and in high enough concentration will affect host protein as well as microbial protein

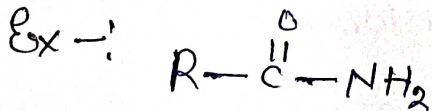


Oxidation

These compounds capable of functioning as antimicrobial agents through oxidative mechanisms are generally nonmetals and certain types of anions. Most common among these are hydrogen peroxide, metal peroxides, permanganates, halogens, and certain oxo-halogen anions.

halogenation

This is a reaction occurring with antiseptics of the hypohalite type and, in particular, hypochlorite, OCl^- .



Protein Precipitation

This type of mechanism involves the interaction of proteins with metallic ions having large charge / radius ratios or strong electrostatic fields.

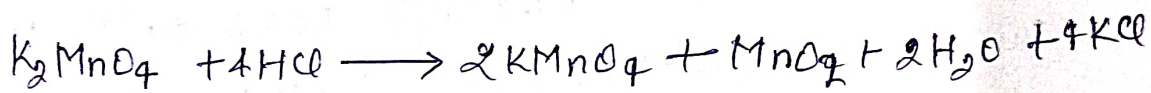
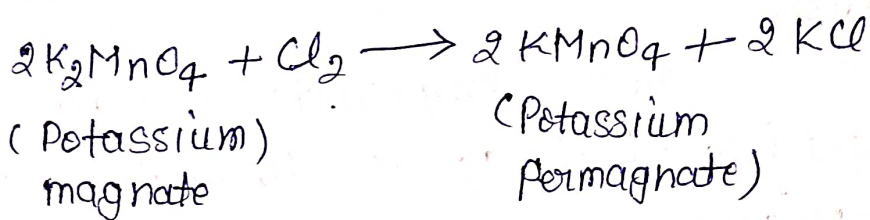
Example - : $Cu(II)$, $Ag(I)$, $Zn(II)$, Aluminum (III) in Groups IIIA

Potassium permanganate (KMnO_4): Mol. wt. 158.04

Potassium Permanganate U.S.P. is an odourless, dark purple Crystalline Compound.

preparation

It can be prepared from potassium manganate which is oxidized by chloride or under acid condition.



properties of Potassium Permanganate

Physical

1. Potassium permanganate occurs in the form of monoclinic prisms, almost opaque with a blue metallic lustre.

Chemical

1. The above reaction can be performed in an acidic or a basic medium.

Storage

It is stored in highly closed containers.

Use

It is used for treatment of various skin conditions like fungal infection of foot.

Basic acid

H_3BO_3 ; Mol. wt. 61.83

Synonym \rightarrow hydrogen borate

It is having not less than 99.5% of basic acid preparation \rightarrow

It is prepared by reacting Borax with mineral Acid ($H_2SO_4 + HCl$)
properties \rightarrow

* It is white crystalline solid

* It is colourless, having sweet taste

Storage \rightarrow

It is stored in tightly closed container & kept at cool place.

Use \rightarrow

* It is used as antiseptic for minor cuts or burns.

* Also used as insecticides

* Also useful in primary buffer solution.

* Boric acid is applied in a very dilute solution as an eye wash.

*

Hydrogen peroxide

(H_2O_2 ; Mol. Wt. 34.02)

Hydrogen peroxide U.S.P. Contains, in each 100ml, not less than 95g and not more than 105g of H_2O_2 . It is a clear, colourless liquid which may be colourless or may have an odor resembling that of ozone.

Note; It is not used on the skin in this preparation—

It is prepared by reacting Barite with Sodium peroxide with cool dil. Sulphuric acid.



Properties —

- * It is clear colourless liquid
- * It is odourless having bitter acidic taste.

Storage —

It is stored in light resistance container in cool dark place.

Use —

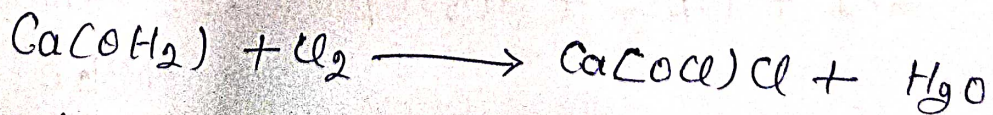
- * Used as antiseptic, Germicidal,
- * It is used to bleach, human hair.
- * It is also used for tooth whitening.

chlorinated lime $\text{CaOCl}(\text{Cl}) \cdot \text{H}_2\text{O}$

Chlorinated lime (bleaching powder or chlorine of lime) contains not less than 30% w/w of available chlorine. It consists of calcium chloro-hypochlorite, and is a complex chemical compound of indefinite composition, presumably consisting of varying proportions of $\text{Ca}(\text{OCl}_2)$, CaCl_2 , chlorine ions, $\text{Ca}(\text{OH})_2$ and H_2O in its molecular structure. It is relatively unstable chlorine carrier in solid form. Maximum available chlorine content approaches 39%.

Preparation —

Bleaching powder is prepared on commercial scale by the action of chlorine on pure, dry calcium hydroxide. The slaked lime is spread in lead chambers and chlorine is passed into the chambers from 12 to 24 hours to saturate the lime



properties —

- * It is white or grey powder
- * It has strong characteristic odour of chlorine

Storage →

It is stored in tightly closed containers in dry & cold place away from organic material & matter.

Use →

- * It has passed bacteriocidal action
- * It is used in manufacturing of chloroform
- * It is also in kitchen & bathroom surface to disinfectant.

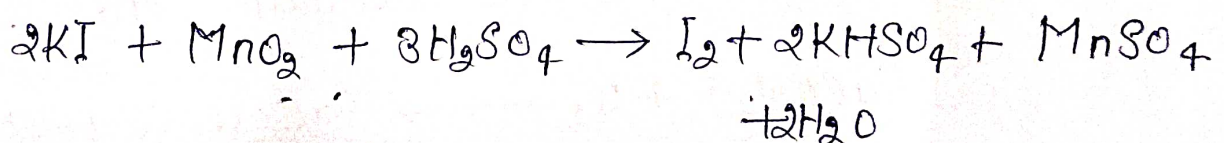
Iodine

I_2 126.9 Mol. wt.

It is having not less than 99.5% of I_2

Preparation →

In laboratory iodine can be prepared by heating potassium iodine or sodium with dil H_2SO_4 or with MnO_2 (magnese dioxide).



Properties →

- * It is having heavy blueish, black, as a gas.
- * It is insoluble in water, soluble in alcohol.

Storage—;

It is stored in tightly closed amber colour bottle in cool place.

Use—;

- * Used as disinfectant
- * Used in operation theatre.
- * also have antimicrobial agents.