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Virtual World of Science Education

3D CHEMISTRY SIMULATIONS PORTFOLIO

Biology | Chemistry | Physics

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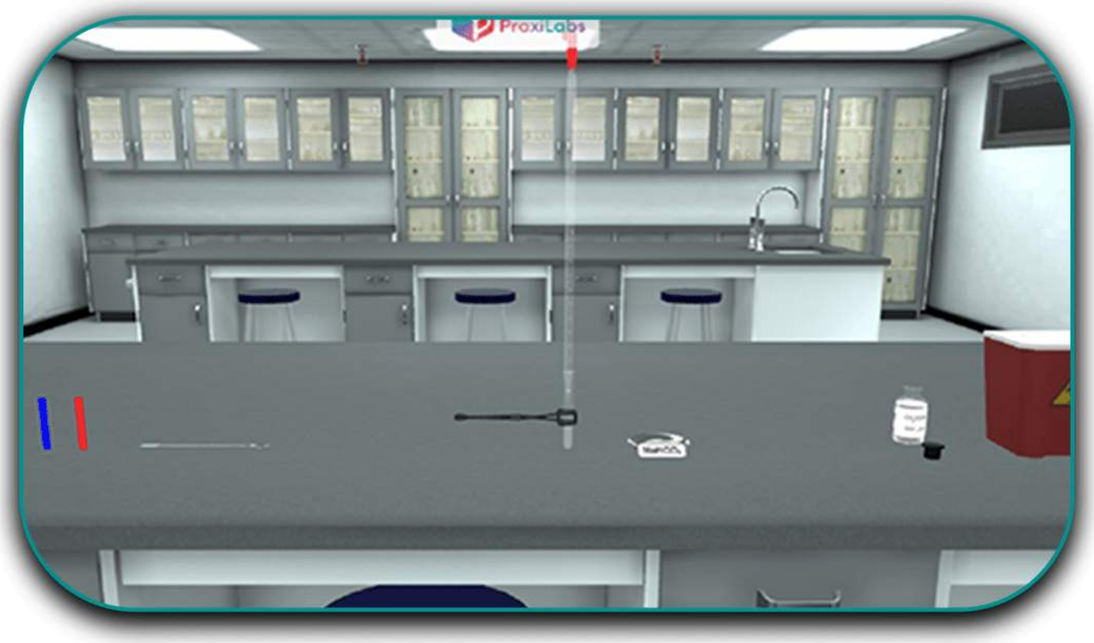
Organic Chemistry

Tests for Carboxylic Group



Learning Objectives (ILOs)

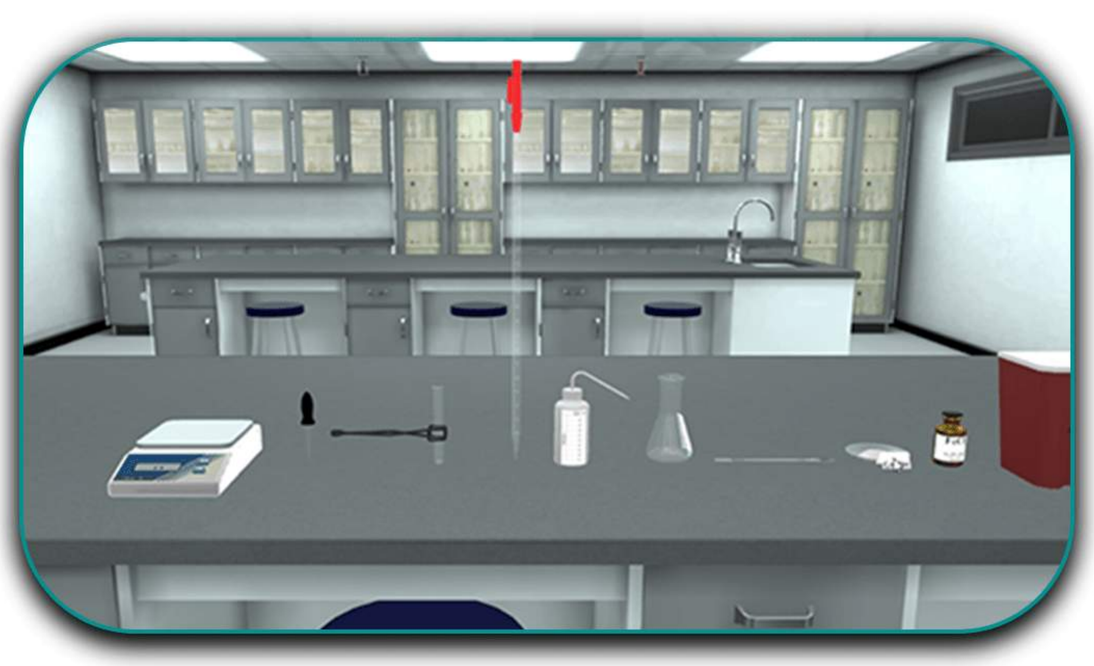
- Define and determine aliphatic and aromatic carboxylic acids theoretically through their chemical structure
- Classify carboxylic acids into aliphatic and aromatic
- Compare between carboxylic acids and other organic compounds in terms of chemical structures, properties and reactions
- Identify carboxylic acids experimentally
- Select the appropriate reagents to differentiate between carboxylic acids and other organic compounds

Tests for Hydroxyl Group

Learning Objectives (ILOs)

- Define and determine aliphatic alcohols theoretically through their chemical structure
- Classify organic compounds containing hydroxyl groups into aliphatic and aromatic
- Compare between alcohols and other functional groups in terms of chemical structures, properties and reactions
- Identify aliphatic alcohols experimentally
- Select the appropriate reagents to differentiate between alcohols and other organic compounds

Tests for Phenolic Group



Learning Objectives (ILOs)

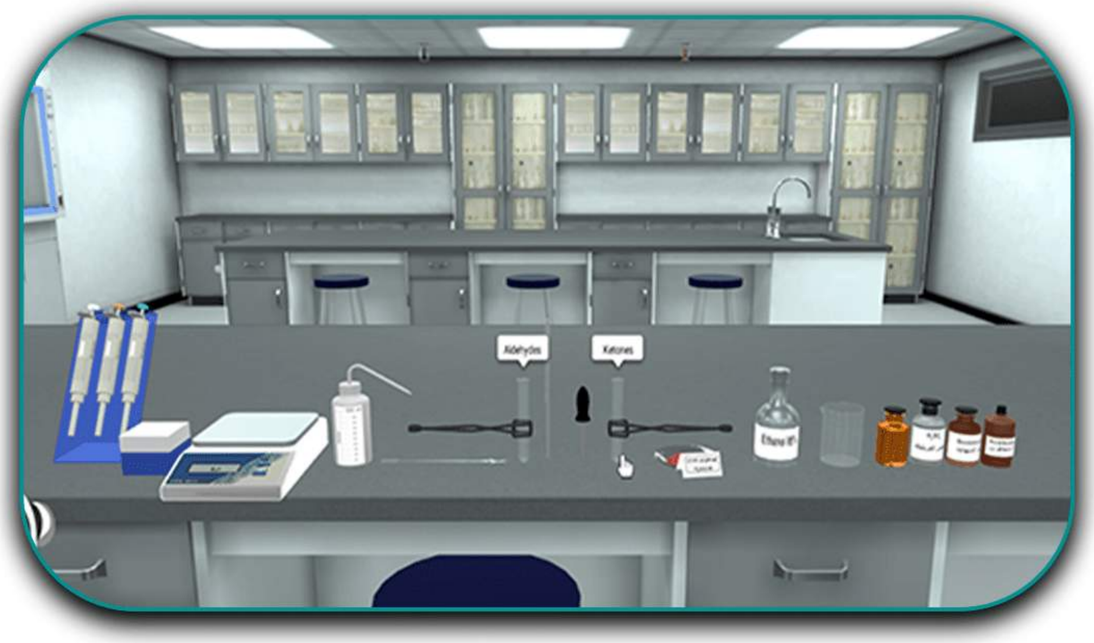
- Define and determine aromatic alcohols theoretically through their chemical structure
- Classify organic compounds containing hydroxyl groups into aliphatic and aromatic
- Compare between alcohols and other functional groups in terms of chemical structures, properties and reactions
- Identify aromatic alcohols experimentally
- Select the appropriate reagents to differentiate between alcohols and other organic compounds

Test for Amide Group

Learning Objectives (ILOs)

- Define and determine organic compounds containing amide groups theoretically through their chemical structure
- Classify organic compounds containing amide groups into aliphatic and aromatic
- Compare between amide groups and other functional groups in terms of chemical structures, properties and reactions
- Identify amides experimentally
- Select the appropriate reagents to differentiate between amides and other organic compounds

Tests for Aldehydic and Ketonic Groups



Learning Objectives (ILOs)

- Define and differentiate between carbonyl groups of aldehydes and ketones theoretically through their chemical structure
- Classify organic compounds containing carbonyl groups into aldehydes and ketones
- Compare between aldehydes and ketones in terms of chemical structures, properties and reactions
- Select the appropriate reagents to differentiate between aldehydes and ketones
- Identify aldehydic and ketonic functional groups in organic compounds by performing 2,4-dinitrophenylhydrazine test

Diels Alder Reaction

Learning Objectives (ILOs)

- Become proficient at running organic chemical reactions
- Learning basics of organic synthesis procedures
- Understand mechanism of Diels Alder reaction
- Learn function of Diels Alder reaction Get trained on how reflux and setup of reaction is used

Synthesis of Aspirin

Learning Objectives (ILOs)

- Become proficient at running organic chemical reactions
- Learning the basics of organic synthesis procedures
- Understand the mechanism of Aspirin synthesis reaction
- Learn the function of Aspirin synthesis reaction
- Get trained on how the setup of the reaction is used

Esterification

Learning Objectives (ILOs)

Become proficient at running organic chemical reactions

Learning basics of organic synthesis procedures

Understand the mechanism of Fischer Esterification reaction

Learn the function of Fischer Esterification reaction

Get trained on how reflux and setup of reaction is used

Electrophilic Substitution (Azo Coupling)

Learning Objectives (ILOs)

- Become proficient at running organic chemical reactions
- Learning basics of organic synthesis procedures
- Understand the mechanism of Azo coupling reaction
- Learn the function of Azo coupling reaction
- Get trained on how the reaction is used

Reaction of Alkyl Halides (Hydrolysis of Alcohols)

Learning Objectives (ILOs)

Become proficient at running organic chemical reactions

Learning basics of organic reaction procedures

Understand the mechanism of alkyl halides reactions

Learn the function of alkyl halides reaction

Understand the difference between SN1 and SN2 nucleophilic substitution reactions

Get trained on how the setup of the reaction is used

Friedel Crafts Acylation of Anisole

Learning Objectives (ILOs)

- Become proficient at running organic chemical reactions
- Learning basics of organic synthesis procedures
- Understand the mechanism of Friedel Crafts reaction
- Learn the function of Friedel Crafts reaction
- Get trained on how reflux and setup of reaction is used

Saponification Reaction New

Learning Objectives (ILOs)

- Become proficient at running organic chemical reactions.
- Learning basics of organic hydrolysis procedures.
- Understand the mechanism of saponification reaction.
- Learn the function of saponification reaction
- Get trained on how the setup of reaction is used.

Preparation of β–Naphthyl Acetate

New

Learning Objectives (ILOs)

- Become proficient at running organic chemical reactions.
- Learning basics of the organic synthesis procedures.
- Understand the mechanism of β-naphthyl acetate synthesis reaction.
- Learn the function of β-naphthyl acetate synthesis reaction.
- Get trained on how the setup of reaction is used.

Claisen Schimdt Reaction (Mixed Aldol Condensation)

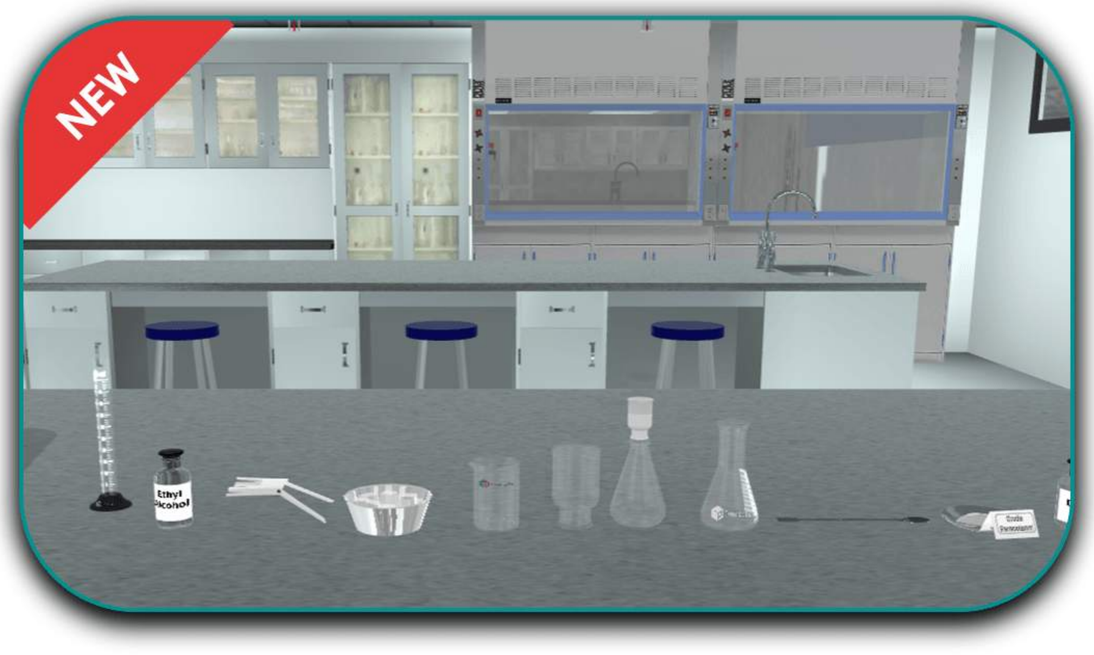
New

Learning Objectives (ILOs)

- Become proficient at running organic chemical reactions.
- Learning the basics of organic condensation procedures.
- Understand the mechanism of the Claisen-Schmidt condensation reaction.
- Learn the function of the Claisen-Schmidt condensation reaction.
- Understand the synthesis mechanism of dibenzalacetone.
- Get trained on how the setup of reaction is used.

Preparation of Paracetamol

New



Learning Objectives (ILOs)

- Become proficient at running organic chemical reactions.
- Learning basics of organic synthesis procedures.
- Understand the mechanism of paracetamol synthesis reaction.
- Learn about the function of paracetamol synthesis reaction

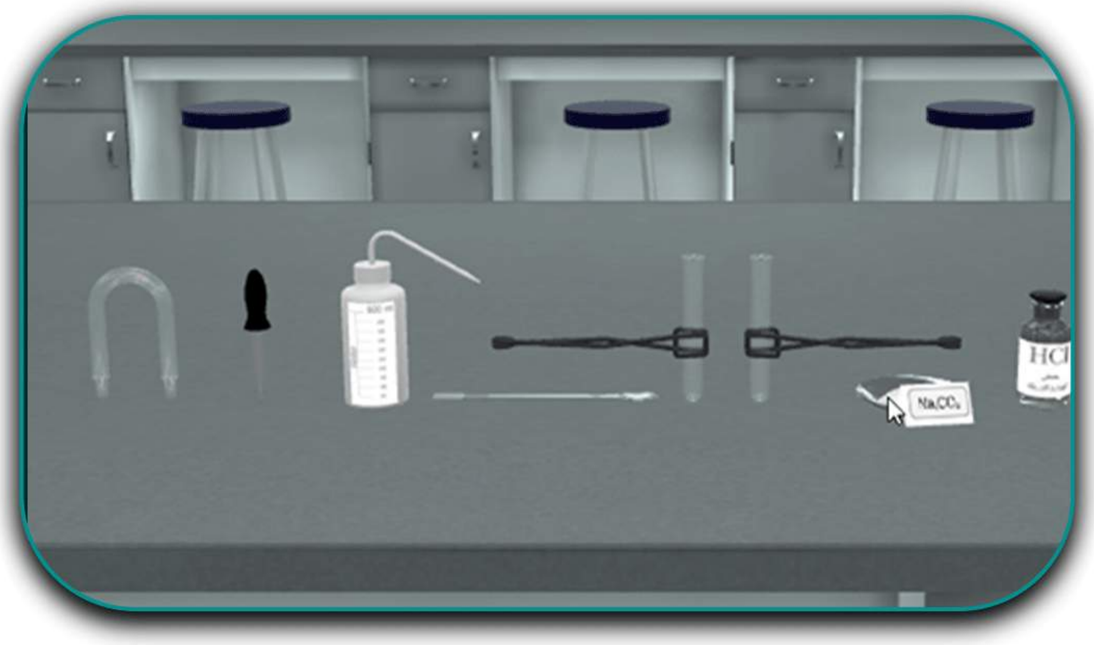
Inorganic Chemistry

Test for Sulphite Radical

Learning Objectives (ILOs)

- Define and differentiate between sulfite ions and other acid radicals through their chemical formulas
- Classify inorganic salts according to their acid radicals
- Compare between sulfite and other first group members in terms of chemical structures, properties and reactions
- Identify sulfite radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of sulfite radical

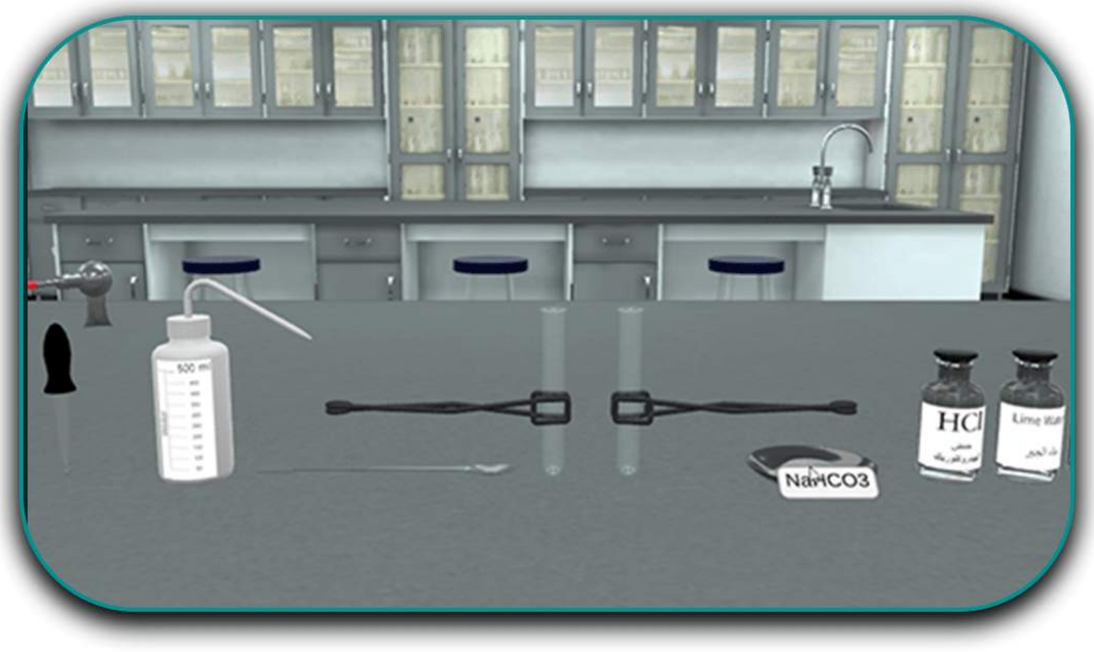
Test for Carbonate Radical



Learning Objectives (ILOs)

- Define and differentiate between carbonate ions and other acid radicals through their chemical formulas
- Classify inorganic salts according to their acid radicals
- Compare between carbonate and other first group members in terms of chemical structures, properties and reactions
- Identify carbonate radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of carbonate radical
- Balance the chemical equations of chemical reactions

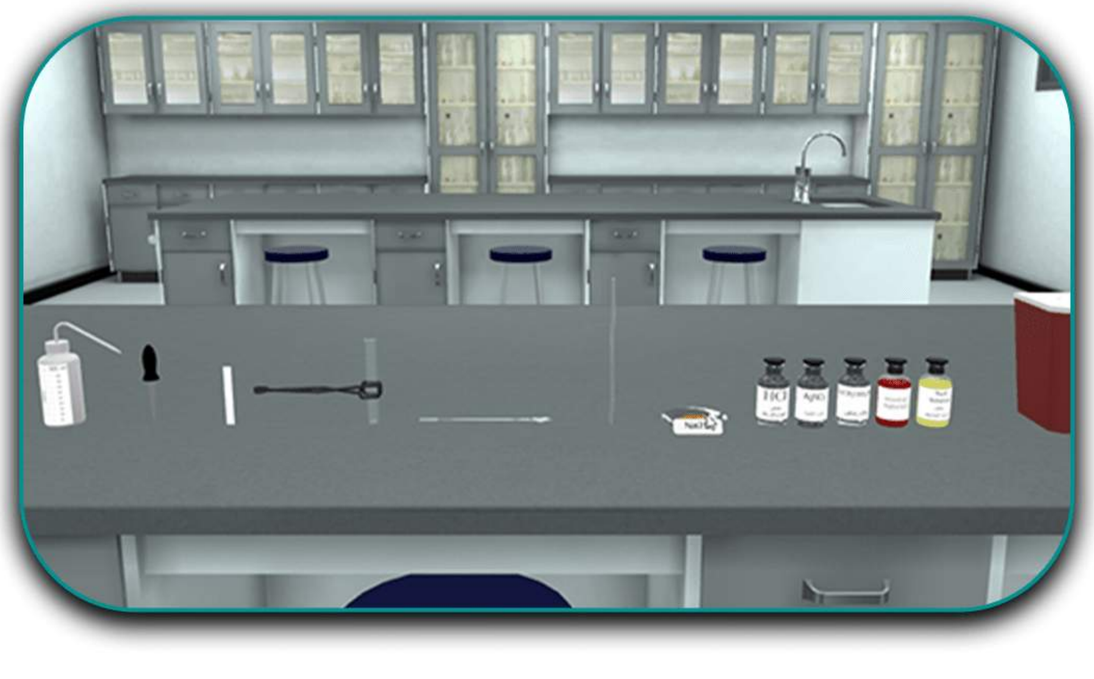
Test for Bicarbonate Radical



Learning Objectives (ILOs)

- Recognize bicarbonate salts in powder form or solution
- Apply the principles of safety measures
- Differentiate between carbonate and bicarbonate
- Understand various tests to identify the anion present in a given salt
- Understand the chemical reactions and their balanced equations that take place during each test
- Acquire the skill to perform the experiment in the real lab once they understand different steps in the procedure

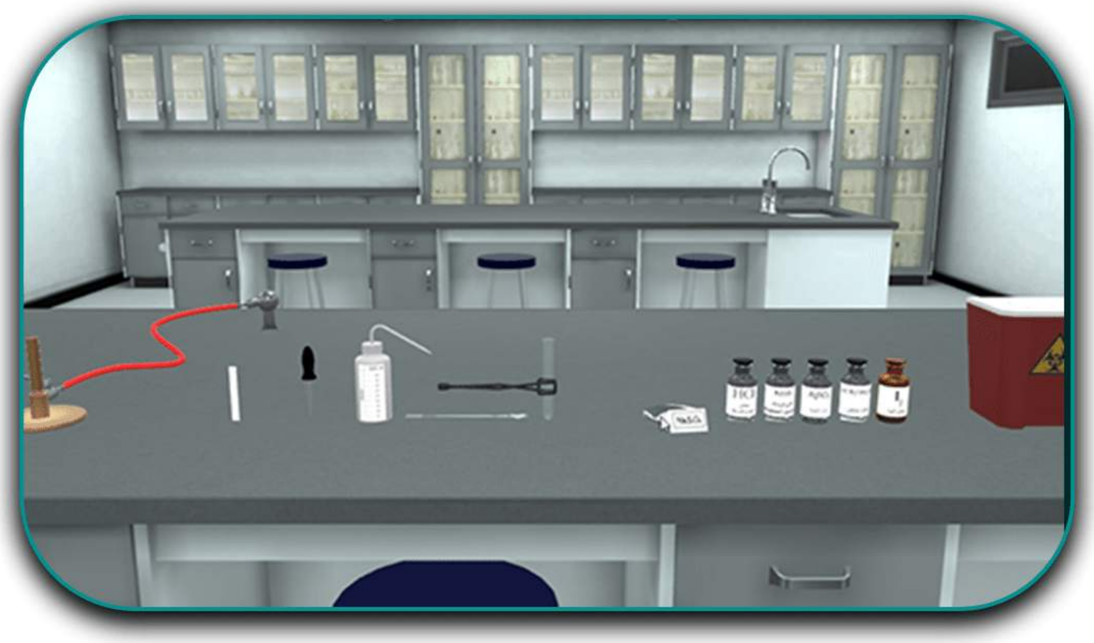
Test for Sulphide Radical



Learning Objectives (ILOs)

- Recognize sulphide salts in powder form or solution
- Apply the principles of safety measures
- Differentiate between sulphide and sulphite

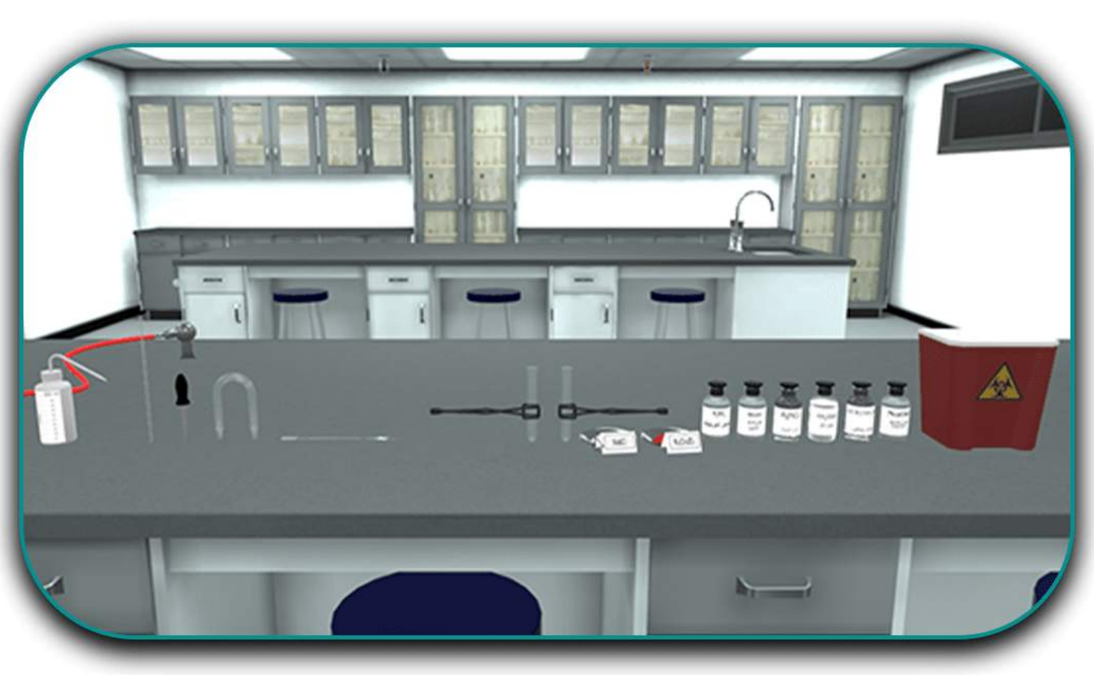
Test for Thiosulphate Radical



Learning Objectives (ILOs)

- Recognize thiosulphate salts in powder form or solution
- Apply the principles of safety measures
- Differentiate between thiosulphate and sulphate

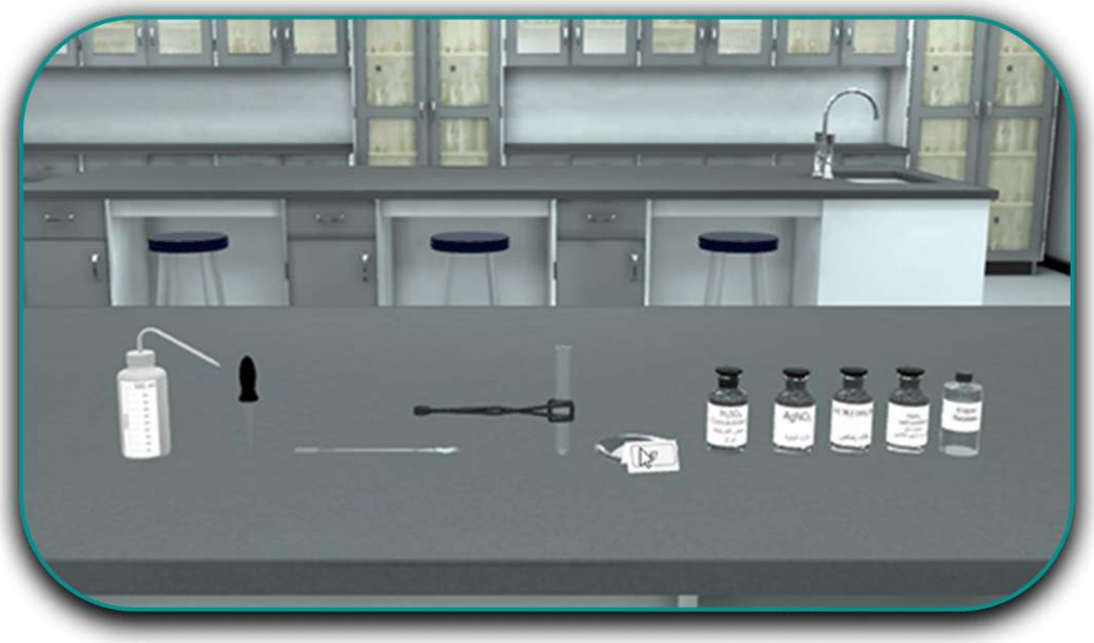
Test for Chloride Radical



Learning Objectives (ILOs)

- Define and differentiate between chloride ions and other acid radicals through their chemical formulas
- Classify inorganic salts according to their acid radicals
- Compare between chloride and other halide members in terms of chemical structures, properties and reactions
- Identify chloride radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of chloride radical
- Balance the chemical equations of chemical reactions

Test for Bromide Radical



Learning Objectives (ILOs)

- Define and differentiate between bromide ions and other acid radicals through their chemical formulas
- Classify inorganic salts according to their acid radicals
- Compare between bromide and other halide members in terms of chemical structures, properties and reactions
- Identify bromide radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of bromide radical

Test for Iodide Radical

Learning Objectives (ILOs)

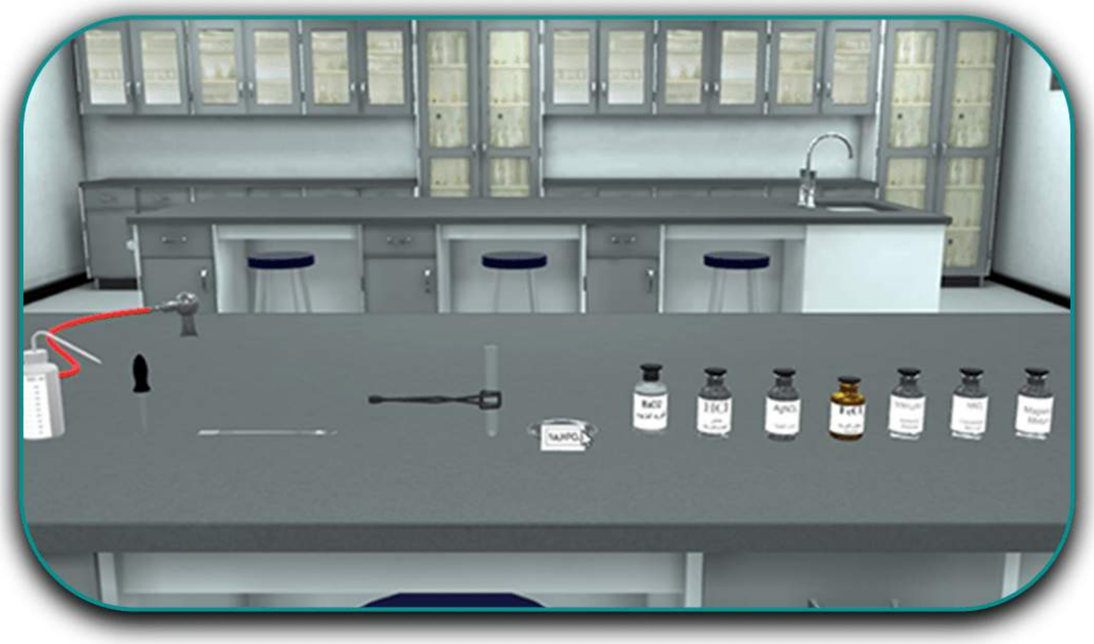
- Define and differentiate between iodide ions and other acid radicals through their chemical formulas
- Classify inorganic salts according to their acid radicals
- Compare between iodide and other halide members in terms of chemical structures, properties and reactions
- Identify iodide radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of iodide radical
- Balance the chemical equations of chemical reactions

Test for Sulphate Radical

Learning Objectives (ILOs)

- Recognize sulphate salts in powder form or solution
- Apply the principles of safety measures
- Differentiate between thiosulphate and sulphate

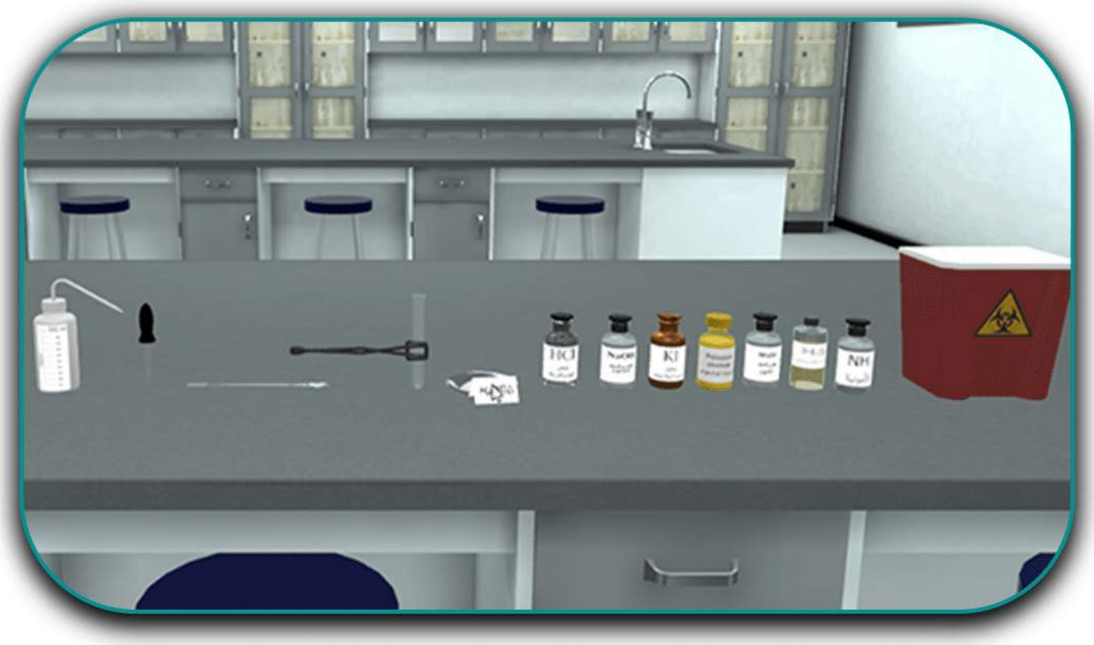
Test for Phosphate Radical



Learning Objectives (ILOs)

- Recognize phosphate salts in powder form or solution
- Apply the principles of safety measures
- Differentiate between phosphate and Arsenate

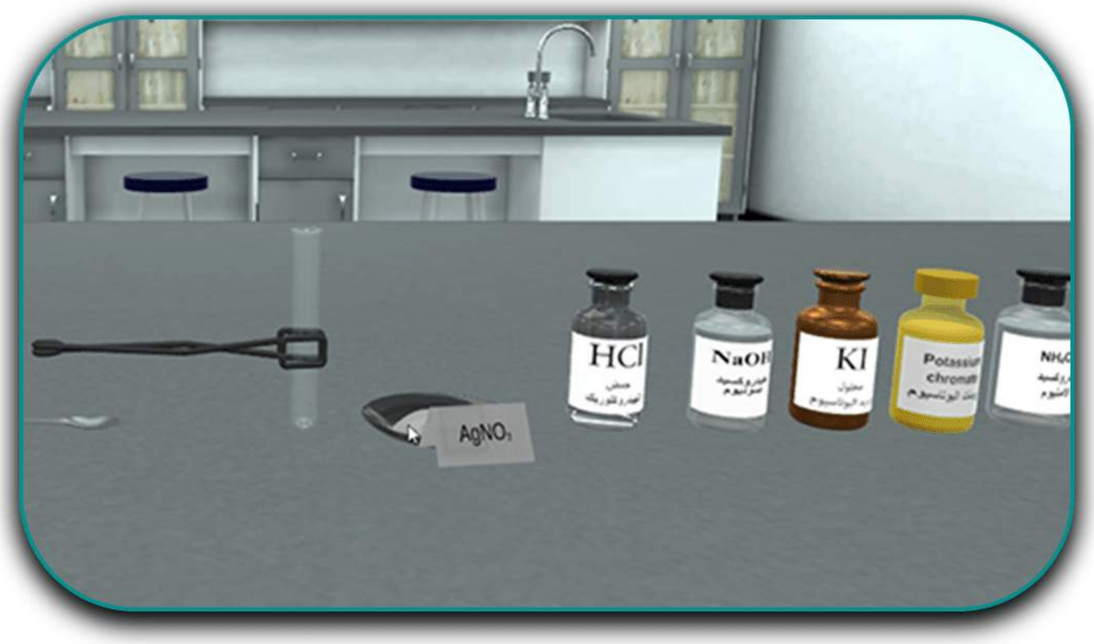
Test for Mercurous Radical



Learning Objectives (ILOs)

- Define and differentiate between members of the first group cations and those of other cation groups
- Classify inorganic salts according to their base radicals
- Compare between mercurous containing salts and other members of the same group in terms of chemical structures, properties and reactions
- Identify mercurous radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of the mercurous radical
- Balance the chemical equations of chemical reactions

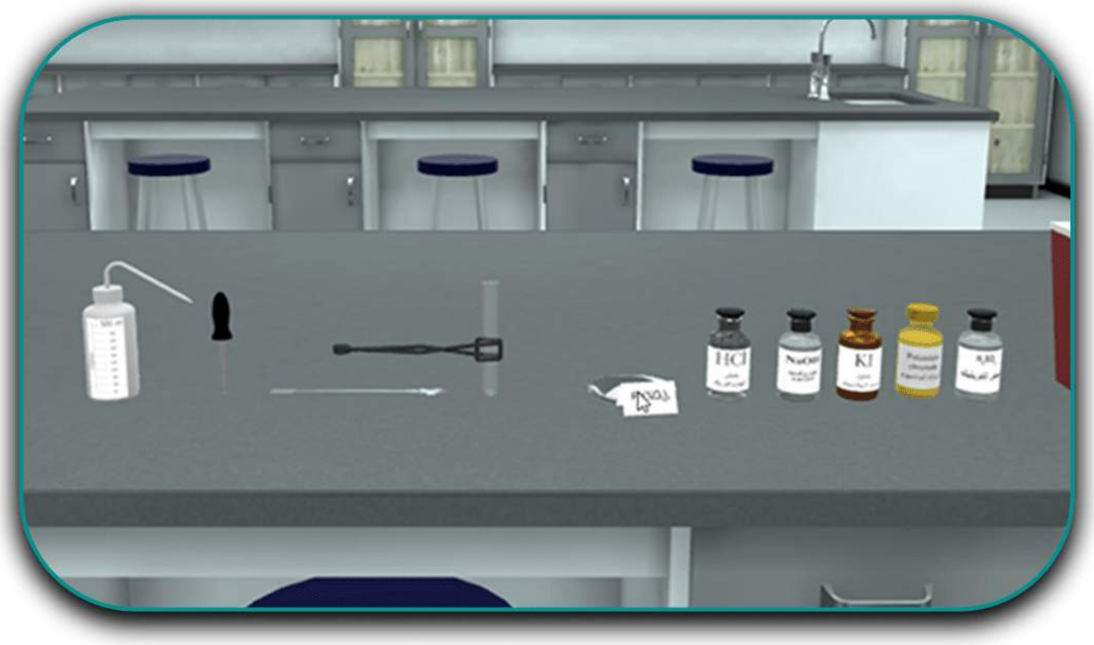
Test for Silver Radical



Learning Objectives (ILOs)

- Define and differentiate between members of the first group cations and those of other cation groups
- Classify inorganic salts according to their base radicals
- Compare between silver containing salts and other members of the same group in terms of chemical structures, properties and reactions
- Identify silver radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of silver radical

Test for Lead Radical



Learning Objectives (ILOs)

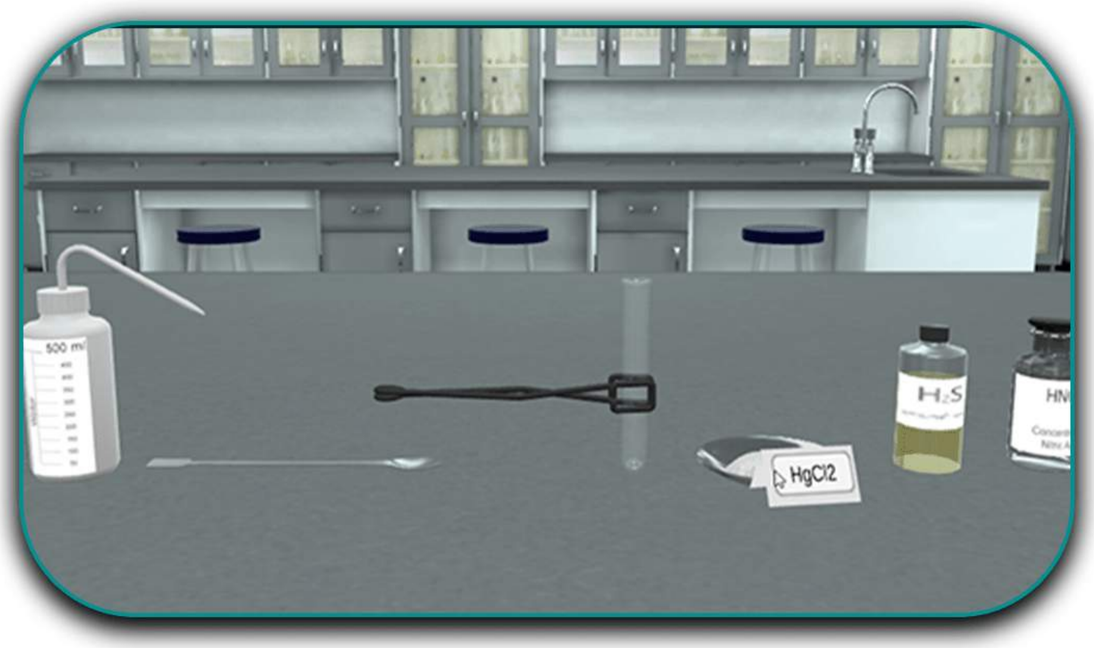
- Define and differentiate between members of the first group cations and those of other cation groups
- Classify inorganic salts according to their base radicals
- Compare between lead containing salts and other members of the same group in terms of chemical structures, properties and reactions
- Identify lead radicals containing salts experimentally.
- Select the appropriate reagents to detect the presence of lead radical
- Balance the chemical equations of chemical reactions

Test for Cadmium Radical

Learning Objectives (ILOs)

- Define and differentiate between members of the second group cations and those of other cation groups
- Classify inorganic salts according to their base radicals
- Compare between cadmium containing salts and other members of the same group in terms of chemical structures, properties and reactions
- Identify cadmium radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of cadmium radical
- Balance the chemical equations of chemical reactions

Test for Mercuric Radical



Learning Objectives (ILOs)

- Define and differentiate between members of the second group cations and those of other cation groups
- Classify inorganic salts according to their base radicals
- Compare between mercuric containing salts and other members of the same group in terms of chemical structures, properties and reactions
- Identify mercuric radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of mercuric radicals
- Balance the chemical equations of chemical reactions

Test for Cupric Radical

Learning Objectives (ILOs)

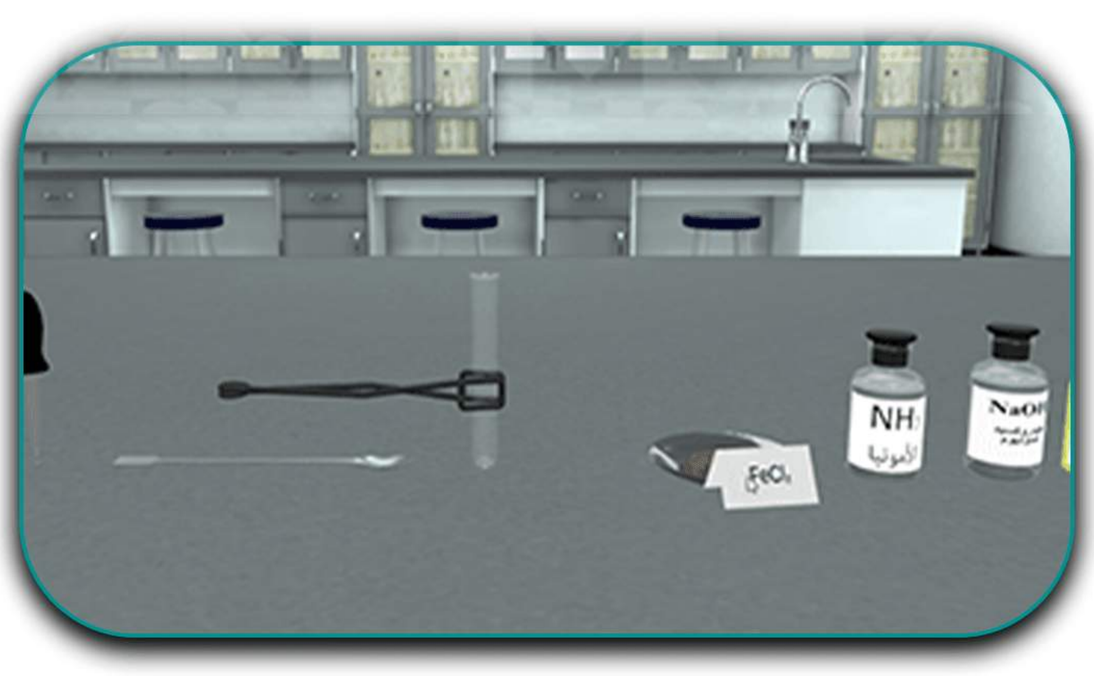
- Define and differentiate between members of the second group cations and those of other cation groups
- Classify inorganic salts according to their base radicals
- Compare between cupric containing salts and other members of the same group in terms of chemical structures, properties and reactions
- Identify cupric radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of cupric radical
- Balance the chemical equations of chemical reactions

Test for Chromic Radical

Learning Objectives (ILOs)

- Define and differentiate between members of the third group cations and those of other cation groups
- Classify inorganic salts according to their base radicals
- Compare between chrome containing salts and other members of the same group in terms of chemical structures, properties and reactions
- Identify chromic radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of chromic radicals
- Balance the chemical equations of chemical reactions

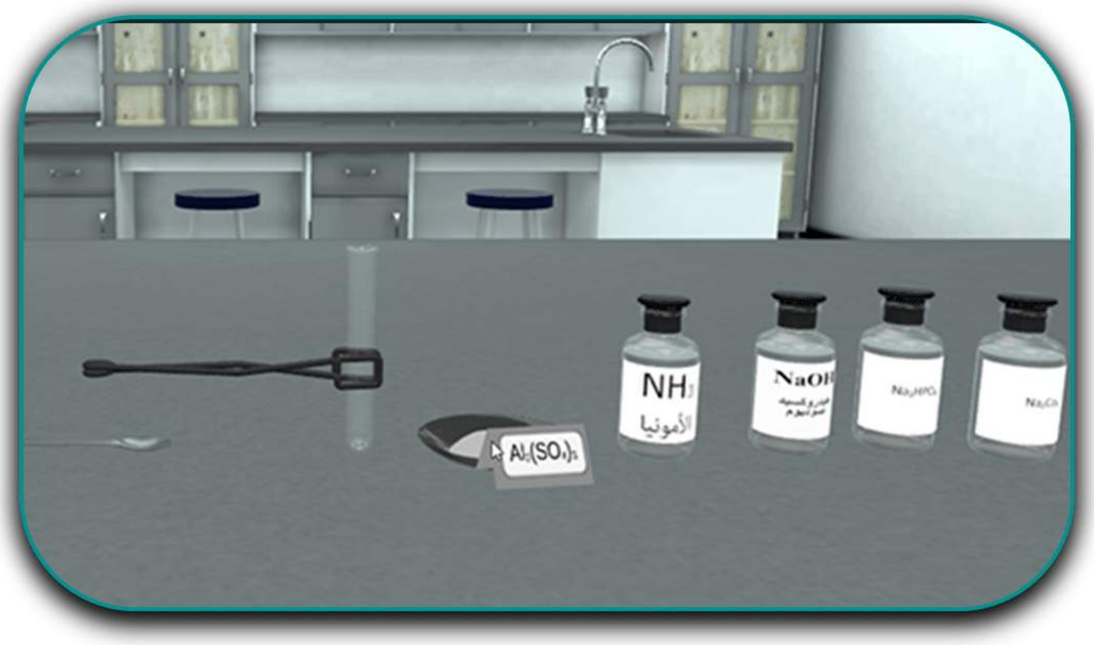
Test for Ferric Radical



Learning Objectives (ILOs)

- Recognize ferric salts in powder form or solution
- Apply the principles of safety measures
- Differentiate between ferric, chromic, and aluminum

Test for Aluminum Radical



Learning Objectives (ILOs)

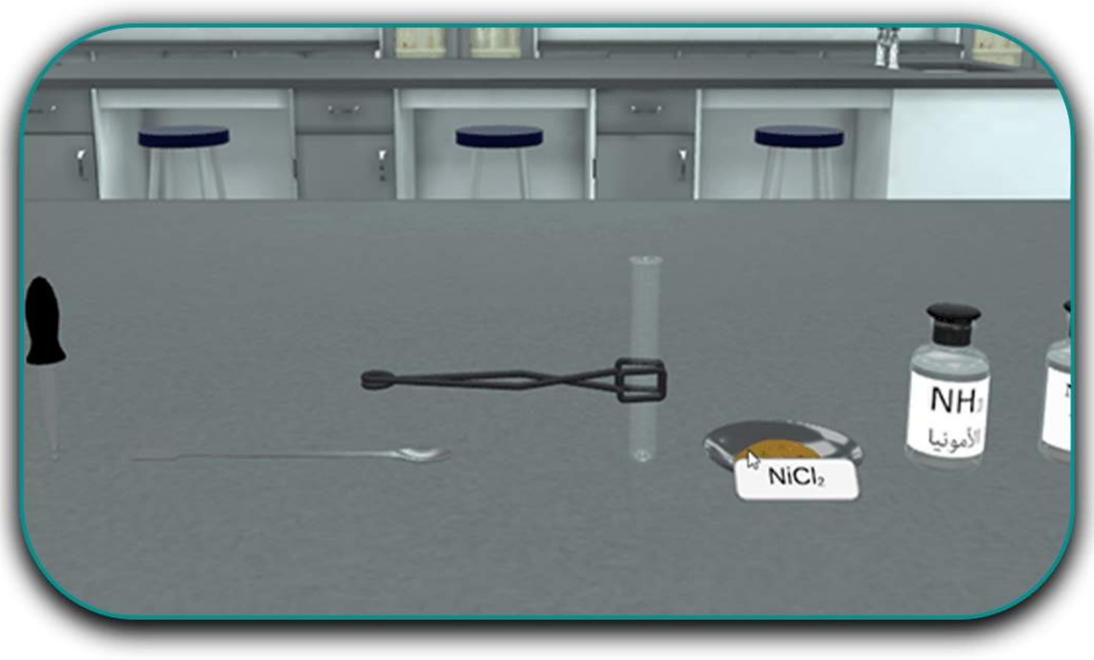
- Define and differentiate between members of the third group cations and those of other cation groups
- Classify inorganic salts according to their base radicals
- Compare between aluminum containing salts and other members of the same group in terms of chemical structures, properties and reactions
- Identify aluminum radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of aluminum radical

Test for Zinc Radical

Learning Objectives (ILOs)

- Define and differentiate between members of the third group cations and those of other cation groups
- Classify inorganic salts according to their base radicals
- Compare between zinc containing salts and other members of the same group in terms of chemical structures, properties and reactions
- Identify zinc radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of zinc radical
- Balance the chemical equations of chemical reactions

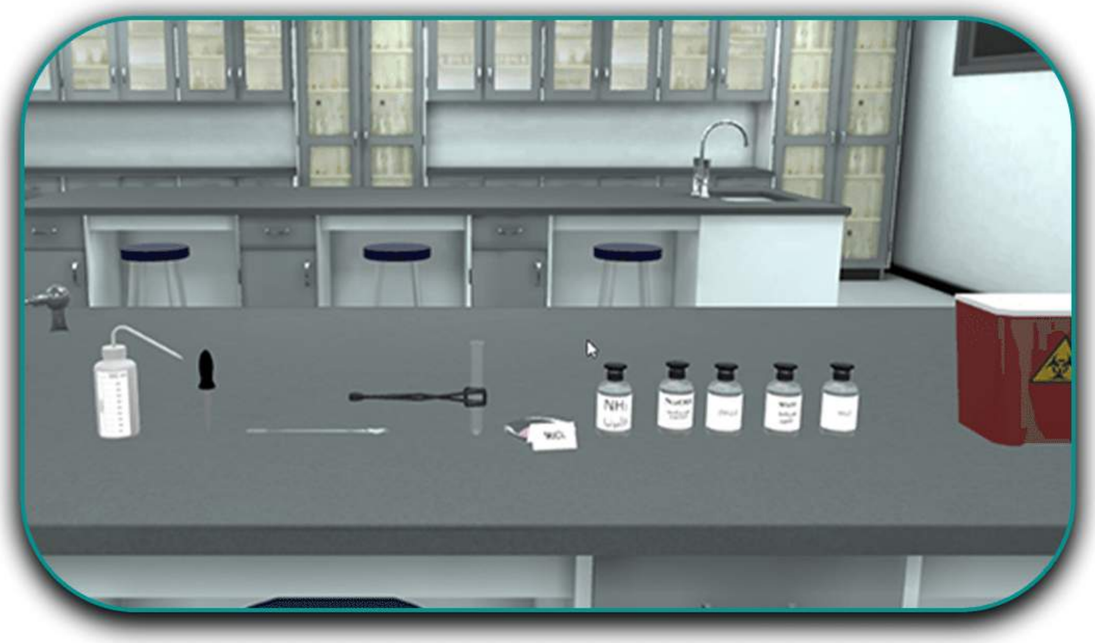
Test for Nickelous Radical



Learning Objectives (ILOs)

- Define and differentiate between members of the fourth group cations and those of other cation groups
- Classify inorganic salts according to their base radicals
- Compare between nickel containing salts and other members of the same group in terms of chemical structures, properties and reactions
- Identify nickel radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of nickel radical
- Balance the chemical equations of chemical reactions

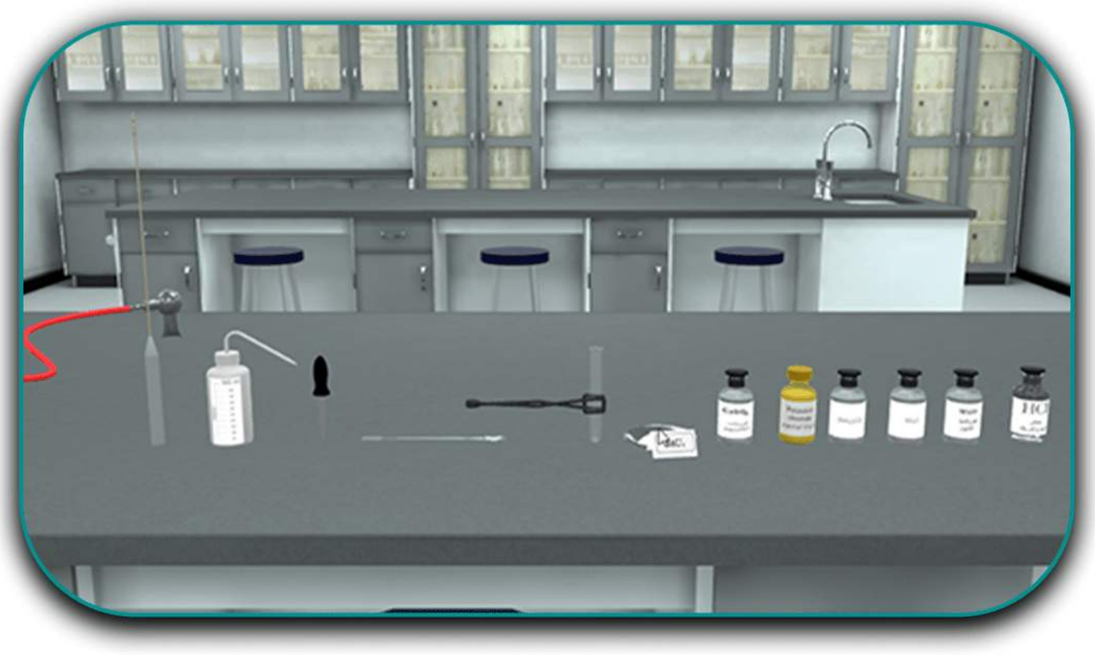
Test for Manganous Radical



Learning Objectives (ILOs)

- Define and differentiate between members of the fourth group cations and those of other cation groups
- Classify inorganic salts according to their base radicals
- Compare between manganese containing salts and other members of the same group in terms of chemical structures, properties and reactions
- Identify manganese radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of manganese radical

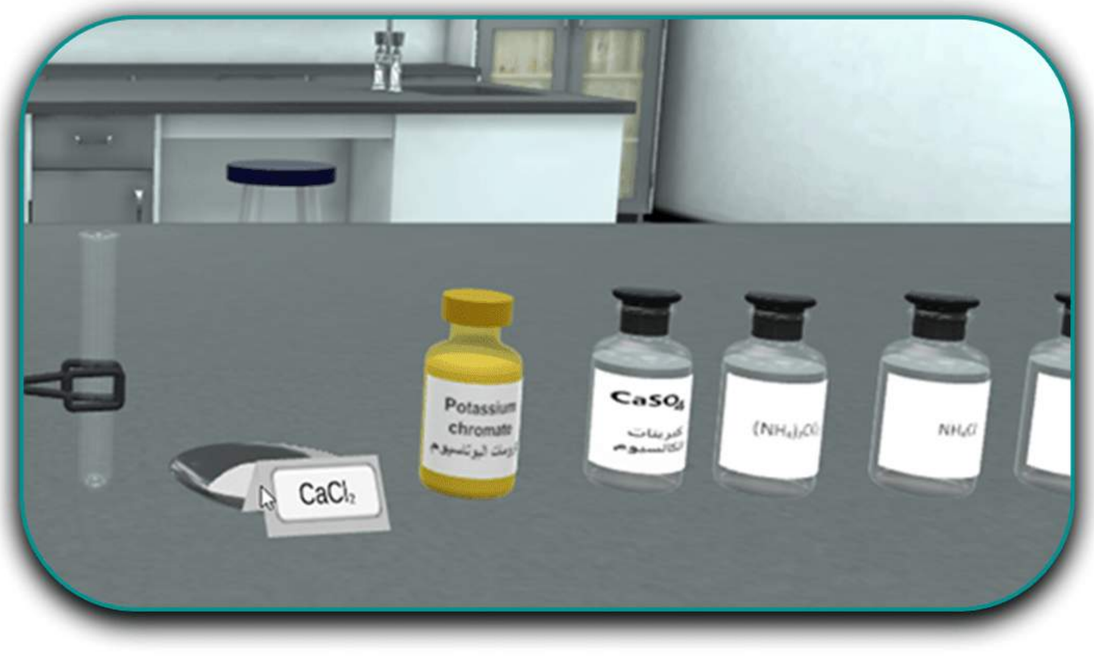
Test for Barium Radical



Learning Objectives (ILOs)

- Recognize Barium salts in powder form or solution
- Apply the principles of safety measures
- Differentiate between Barium, Calcium and strontium

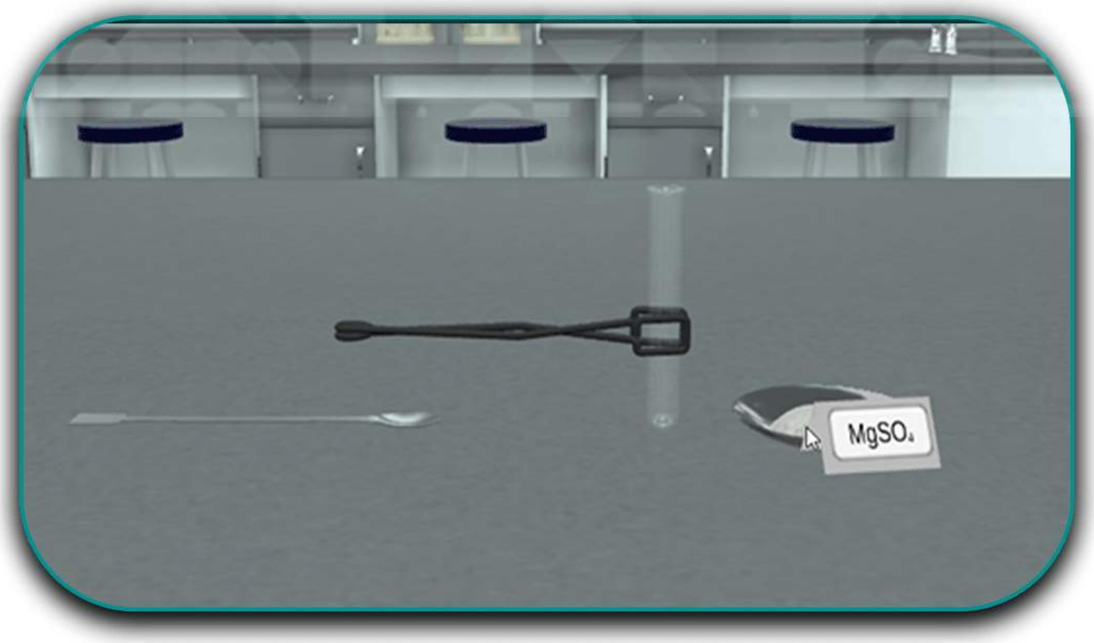
Test for Calcium Radical



Learning Objectives (ILOs)

- Define and differentiate between members of the fifth group cations and those of other cation groups
- Classify inorganic salts according to their base radicals
- Compare between calcium containing salts and other members of the same group in terms of chemical structures, properties and reactions
- Identify calcium radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of calcium radical
- Balance the chemical equations of chemical reactions

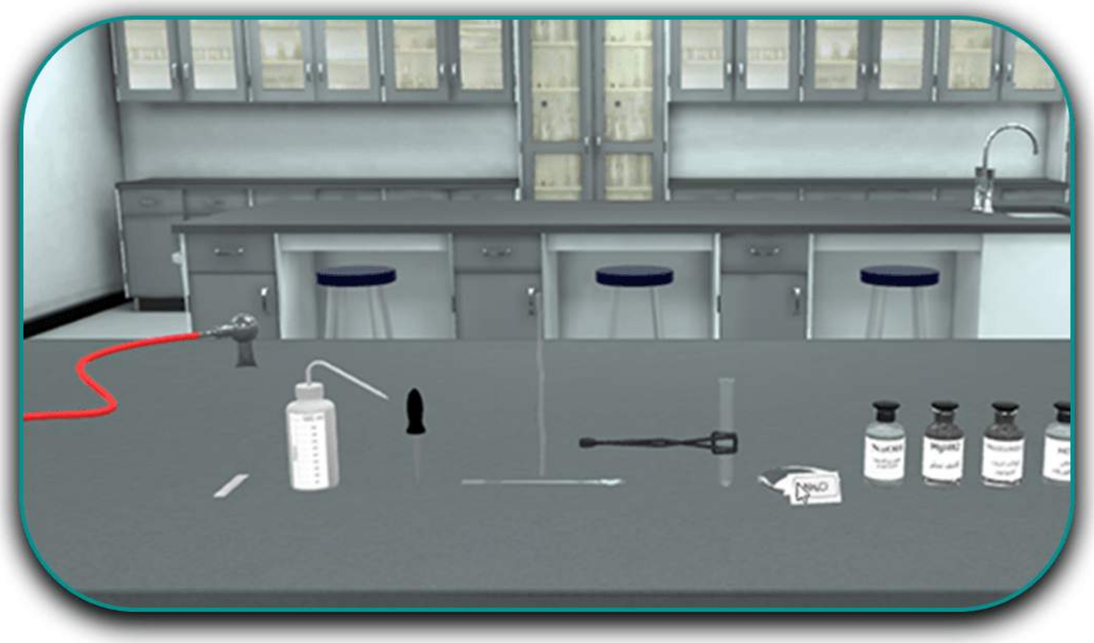
Test for Magnesium Radical



Learning Objectives (ILOs)

- Recognize magnesium salts in powder form or solution
- Apply the principles of safety measures
- Differentiate between magnesium and calcium

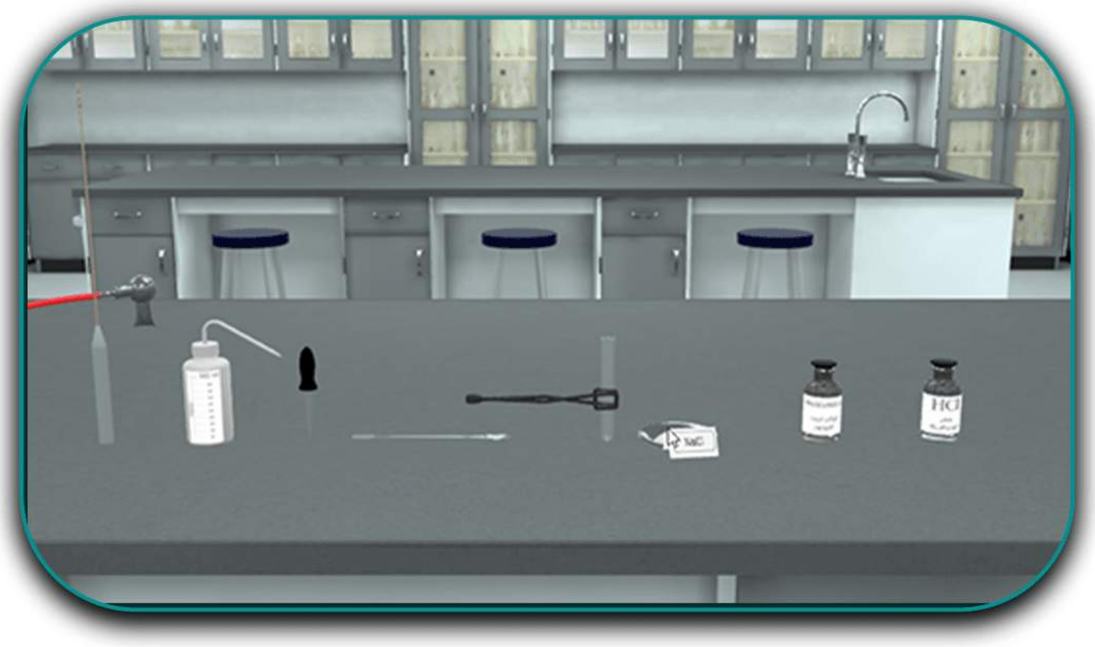
Test for Ammonium Radical



Learning Objectives (ILOs)

- Recognize ammonium salts in powder form or solution
- Apply the principles of safety measures
- Differentiate between ammonium, calcium and strontium

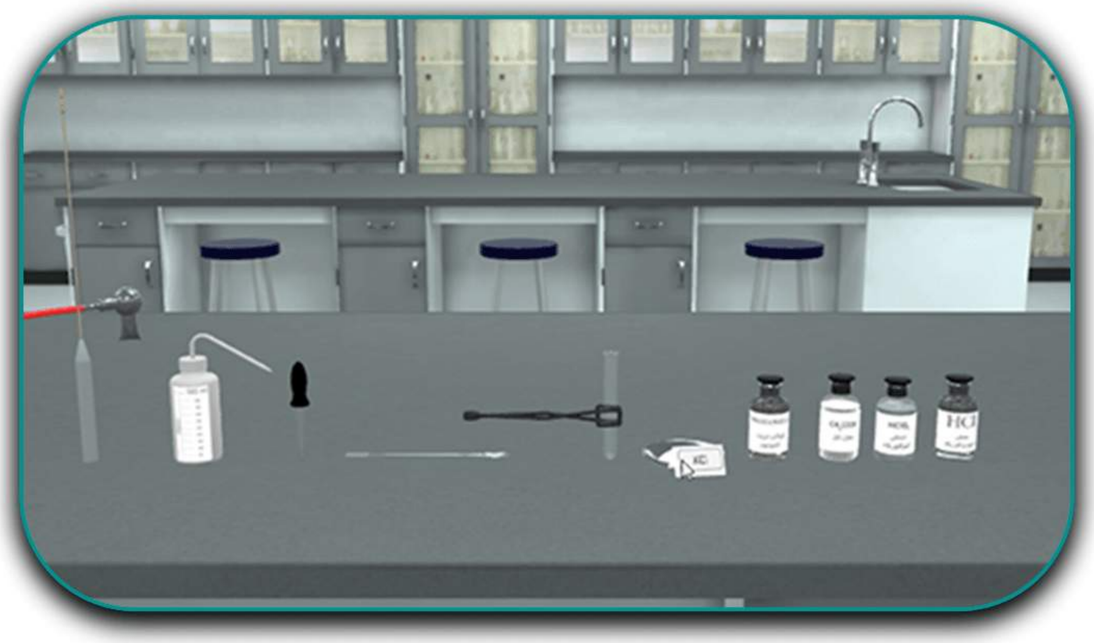
Test for Sodium Radical



Learning Objectives (ILOs)

- Define and differentiate between members of the sixth group cations and those of other cation groups
- Classify inorganic salts according to their base radicals
- Compare between sodium containing salts and other members of the same group in terms of chemical structures, properties and reactions
- Identify sodium radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of sodium radical
- Balance the chemical equations of chemical reactions

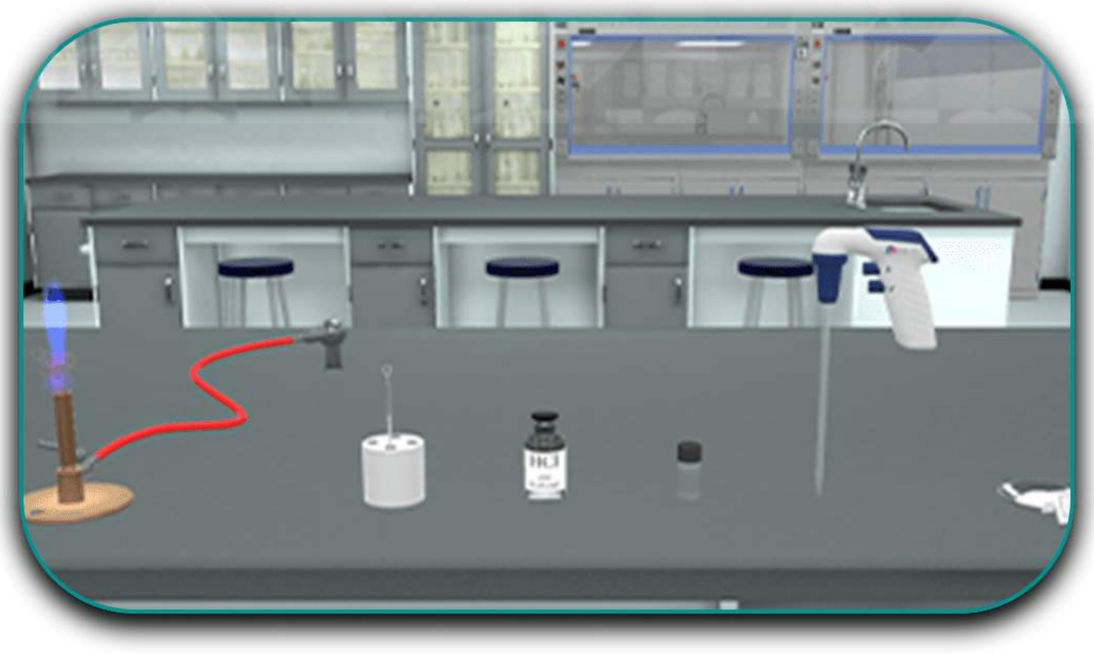
Test for Potassium Radical



Learning Objectives (ILOs)

- Define and differentiate between members of the sixth group cations and those of other cation groups
- Classify inorganic salts according to their base radicals
- Compare between potassium containing salts and other members of the same group in terms of chemica structures, properties and reactions
- Identify potassium radicals containing salts experimentally
- Select the appropriate reagents to detect the presence of sodium radical

Flame Test

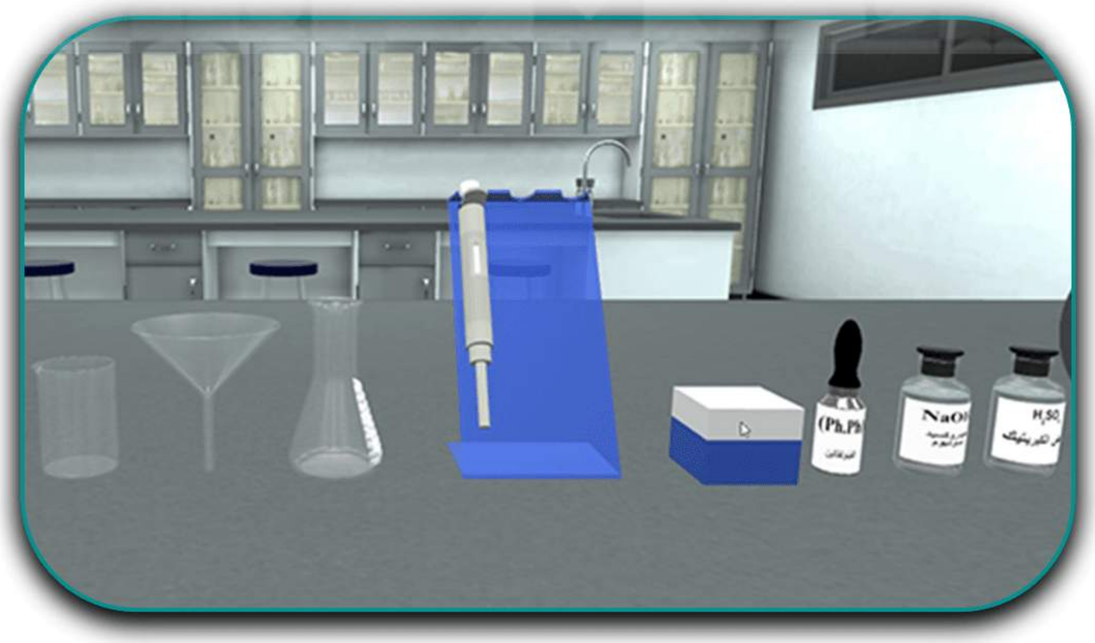


Learning Objectives (ILOs)

- Become proficient at running the identification of flame tests
- Learning basics of analytical procedures
- Understand the mechanism of flame test in electron excitation
- Learn the function of the flame test
- Get trained on the setup of flame test

Analytical Chemistry

Determination of Sulphuric Acid Concentration by Titration



Learning Objectives (ILOs)

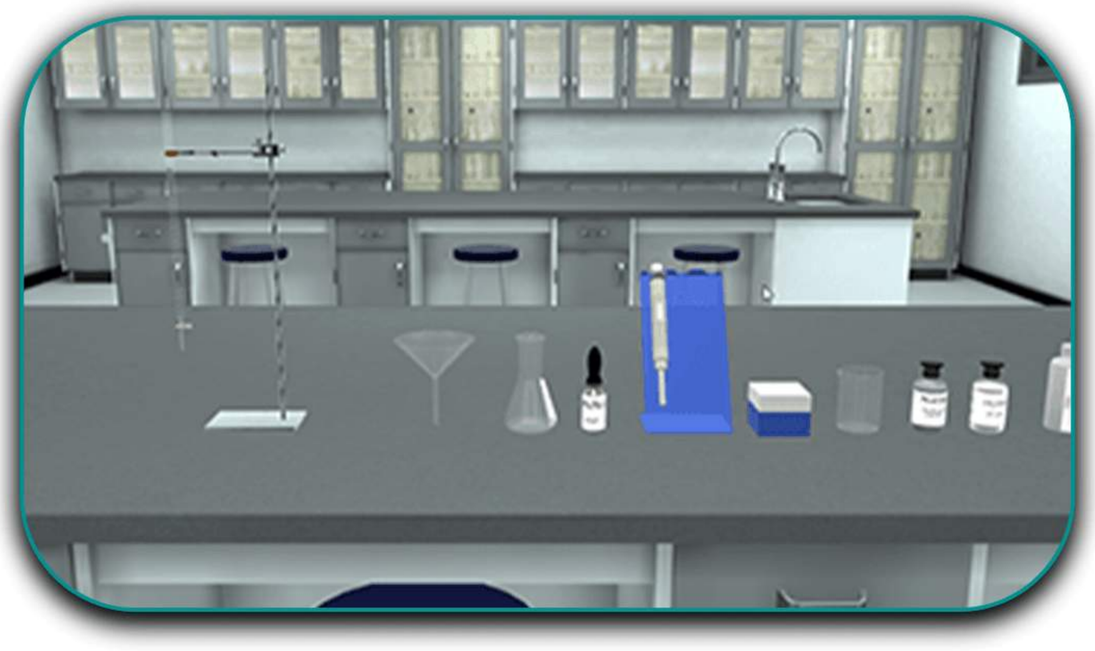
- Determine the concentration of sulphuric acid
- Acquire the correct technique of titration
- Carry out acid- base titration using phenolphthalein as indicator

Analysis Mixture of Sodium Hydroxide and Sodium Carbonate by Warder Titration

Learning Objectives (ILOs)

- Determining the individual concentration of mixture ingredients
- Understanding the neutralization reactions
- Understanding the concept of acid base titration
- Understanding the concept of double indicator method in acid base titration

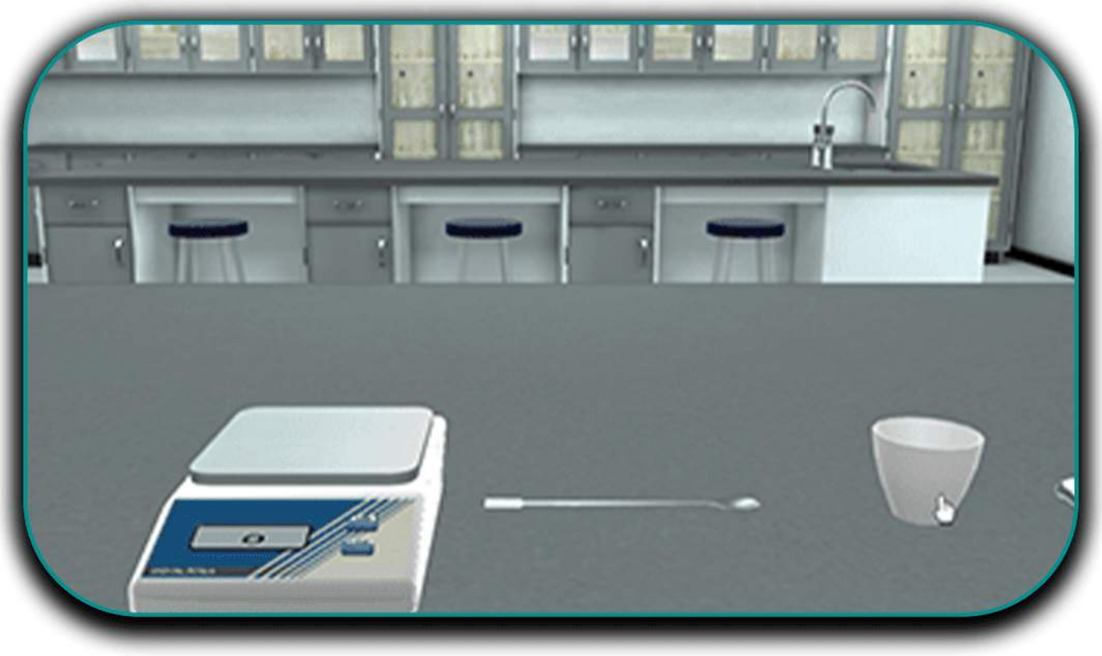
Determination of Concentration of Acetic Acid Solution in Its Commercial Vinegar Titration



Learning Objectives (ILOs)

- Identify the difference between acid and base
- Define the meaning of a standard solution
- Predict how a certain sample could be analyzed
- Determine accurately the concentration of acetic acid in vinegar via volumetric analysis, making use of the reaction of acetic acid with a strong base, sodium hydroxide
- Acquire the correct techniques of titration

Determination of Number of Particles of Water Crystallization in Borax



Learning Objectives (ILOs)

- Determine the number of particles of water of crystallization in borax

Determination of Concentration of Citric Acid in Soda by Titration

Learning Objectives (ILOs)

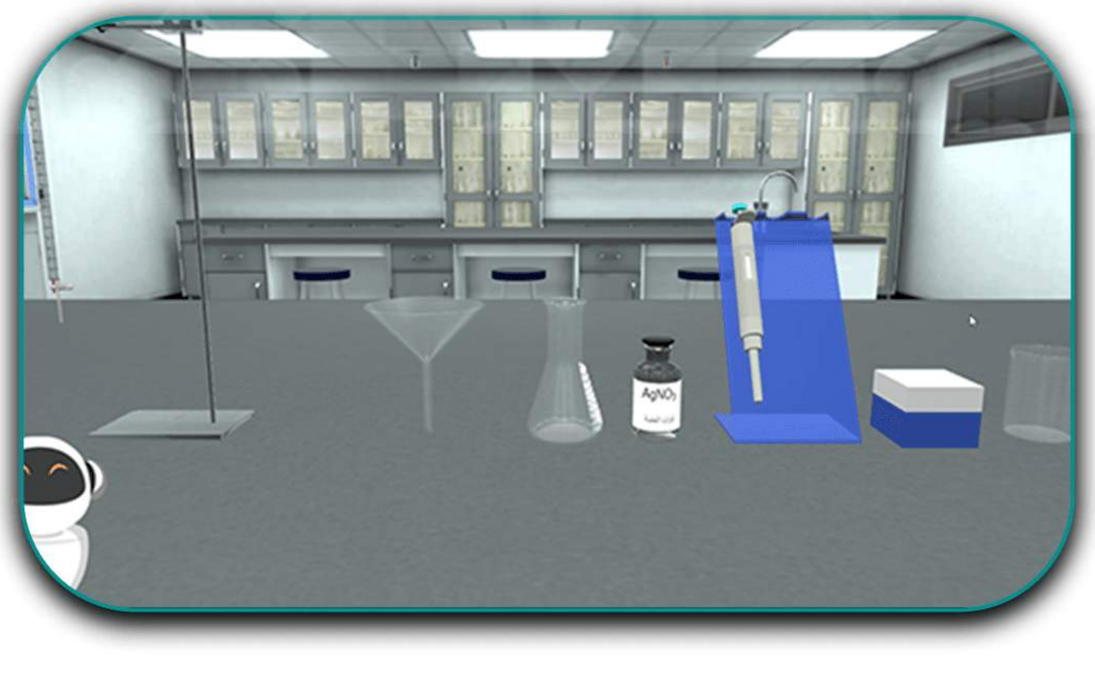
- Identify the difference between acid and base
- Define the meaning of a standard solution
- Predict how a certain sample could be analyzed
- Understanding the concept of acid base titration
- Understanding the neutralization reactions
- Determination of amount of citric acid in soda beverages available in the market

Determination of Concentration of Silver Nitrate by Fajan's Method

Learning Objectives (ILOs)

- Understand fajan's method
- Analyze silver nitrate solution by following Fajan's method
- Explain how adsorption indicators show change in color after end point

Determination of Concentration of Silver Nitrate by Mohr's Method



Learning Objectives (ILOs)

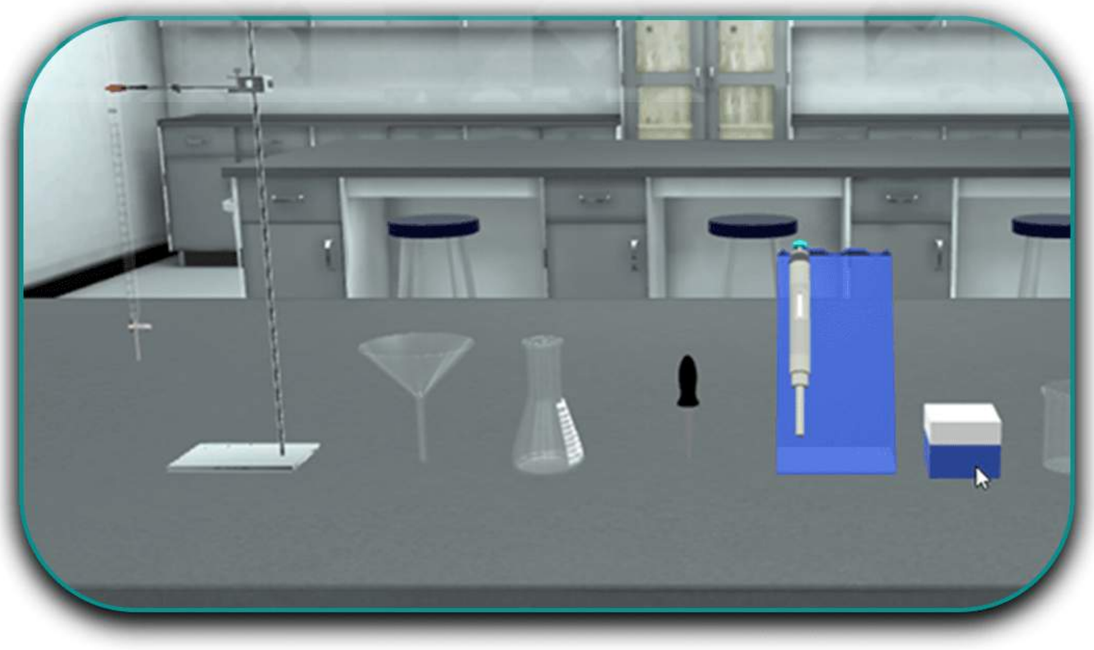
- Understands Mohr's method
- Analyze silver nitrate solution by following Mohr's method

Determination of Concentration of Chlorides in Water Sample (Volhard's Method)

Learning Objectives (ILOs)

- Understand Volhard's method
- Analyze Chloride by following Volhard's method

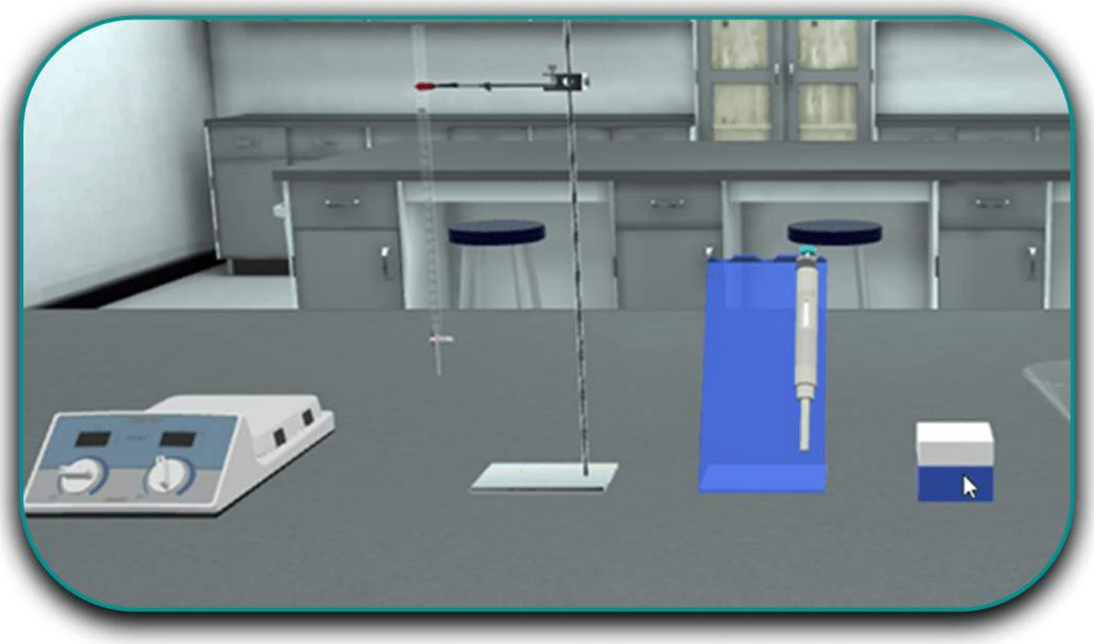
Determination of Water Hardness by Complexometric Titration



Learning Objectives (ILOs)

- Determination of concentration of total amount of calcium and magnesium salts in water
- Knowing about drawbacks of high water hardness in our real life
- Understanding the complexation reactions
- Understanding the concept of direct titration

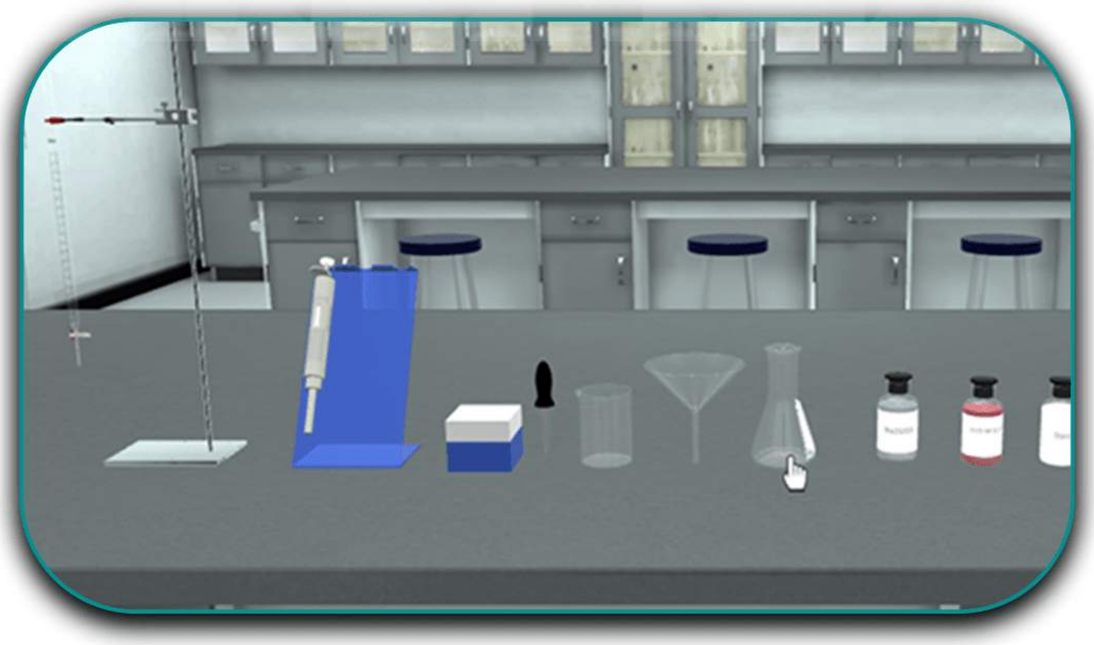
Standardization of Potassium Permanganate



Learning Objectives (ILOs)

- Define direct titration
- Define the meaning of a standard solution
- Differentiate between primary and secondary standards
- Predict how a certain sample could be analyzed
- Determine the strength of potassium permanganate with a standard oxalic acid solution
- Perform titration with the control of the temperature
- Calculate the molarity and the strength of a given standard based on a similar procedure

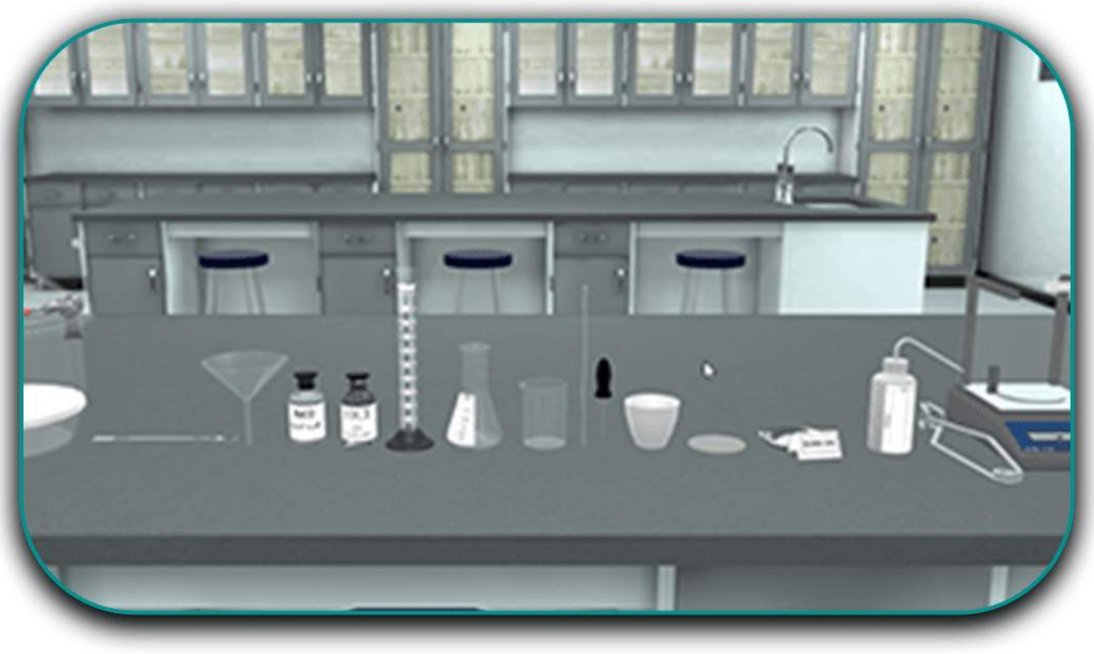
Standardization of Sodium Thiosulphate using Iodimetric Titration



Learning Objectives (ILOs)

- Standardization of a prepared solution of sodium thiosulphate
- Understanding the difference between iodometry and iodimetry
- Understanding the concept of iodometry
- Understanding the concept of redox reactions

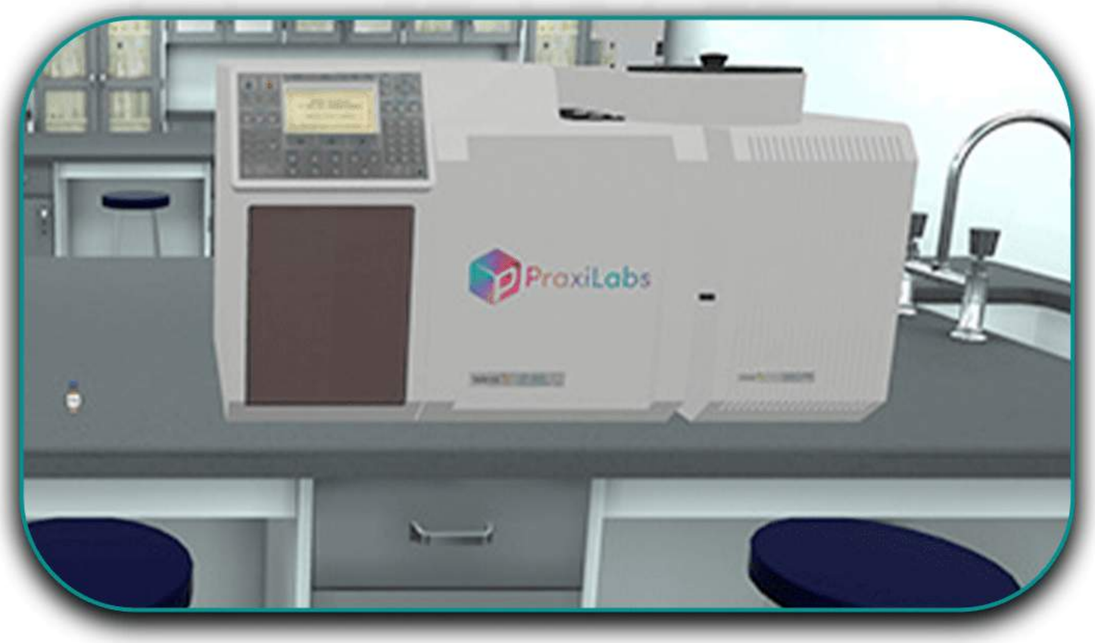
Gravimetric Analysis of Sulphate



Learning Objectives (ILOs)

- Explain the principle of gravimetry
- Enumerate the steps of gravimetry
- To learn the techniques associated with gravimetric analysis
- To use stoichiometry to calculate the percentage by mass of sulfate in an unknown sulfate salt
- Propose a gravimetric method for the analysis of different salts based on knowledge gained from this experiment

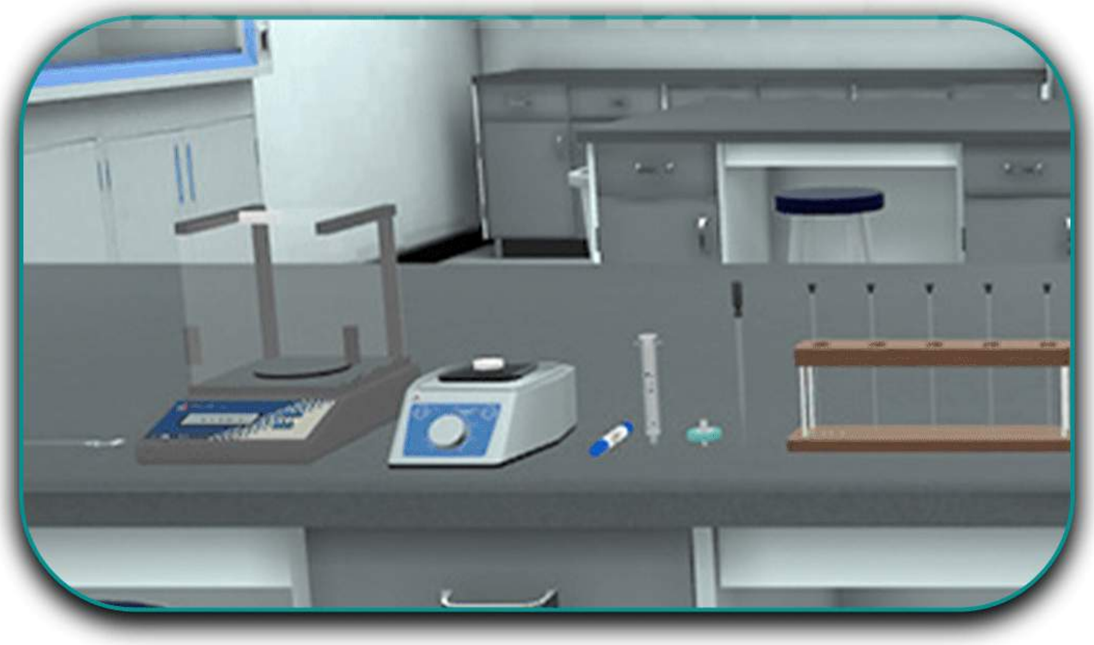
GC/MS Analysis



Learning Objectives (ILOs)

- Become proficient at basic concepts of water samples analysis
- Learning basics of chromatographic techniques
- Understand mechanism of operation of GC/MS
- Learn functions of GC and MS in water sample analysis
- Get trained on using the instruments and their software

NMR Analysis



Learning Objectives (ILOs)

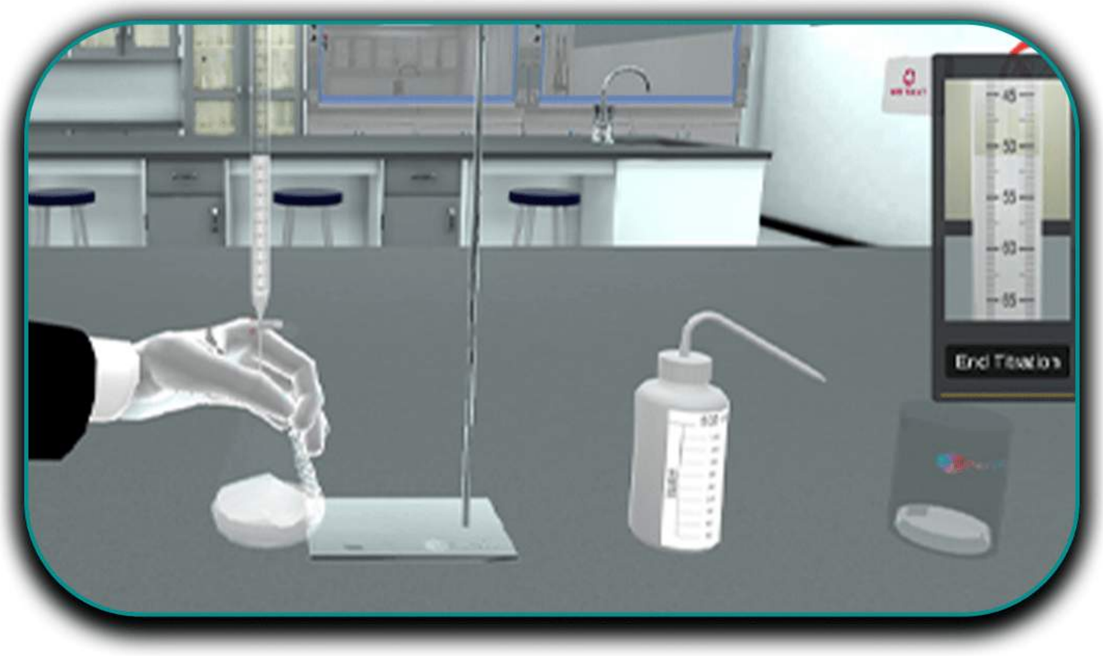
- Become proficient at basic concepts of chemical characterization of chemical compounds
- Learning basics of spectrometry techniques
- Understand mechanism of operation of proton NMR
- Learn functions of NMR in chemical compounds analysis

IR Analysis

Learning Objectives (ILOs)

- Become proficient at basic concepts of chemical characterization of chemical compounds
- Learning basics of spectrometry techniques
- Understand mechanism of operation of FTIR
- Learn functions of FTIR in chemical compounds analysis
- Get trained on using the FTIR and its software
- Get trained on using the instruments and their software

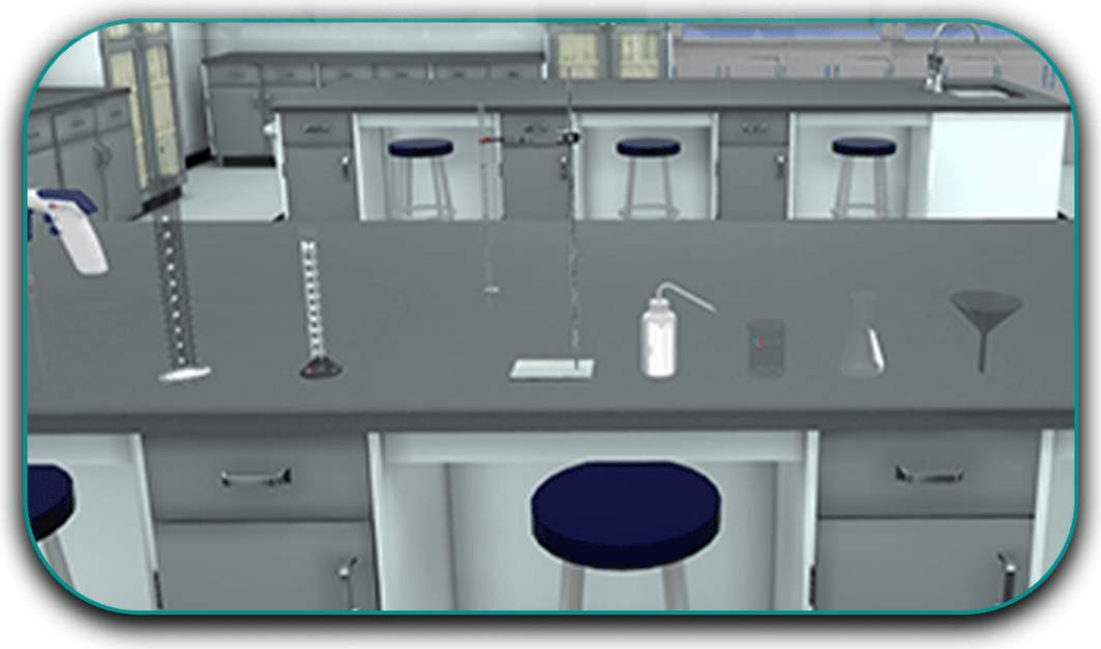
Strong Acid/Strong Base Titration (HCl/NaOH)



Learning Objectives (ILOs)

- Gain the knowledge of how acids and bases will react if their formulas are known
- Understand the titration concept
- Standardize an aqueous solution of sodium hydroxide to be used as the titrant
- Calculate the concentration of an unknown strong acid given the amount of base necessary to titrate it
- Use titration data or a titration curve to calculate reaction quantities such as the concentration of the substance being titrated

Weak Base/Strong Acid Titration



Learning Objectives (ILOs)

- Gain the knowledge of how acids and bases will react if their formulas are known
- Understand the titration concept
- Standardize an aqueous solution of hydrochloric acid to be used as the titrant
- Calculate the concentration of an unknown weak base given the amount of acid necessary to titrate it
- Use titration data or a titration curve to calculate reaction quantities such as the concentration of the substance being titrated

Aspirin titration (Weak Acid / Strong Base Titration) New

Learning Objectives (ILOs)

- Become proficient at carrying out titrations.
- Learn the basics of analytical procedures.
- Understand the mechanism of back acid-base titrations.
- Learn the function of titrations as analytical methods.
- Get trained on the setup of titration experiments.

Determining the percent of citric acid in apple juice

New

Learning Objectives (ILOs)

- Identify the difference between acids and bases.
- Determine the meaning of the standard solution.
- Predict how a specific sample could be analyzed.
- Understanding the neutralization reactions.
- Understanding the concept of acid-base titration.
- Determine the amount of citric acid in apple juices available in the market.

Determining the Molarity of HCl Solution By a Standard Solution of Sodium Carbonate Using Phenolphthalein and Methyl Orange as pH Indicators

New

Learning Objectives (ILOs)

- Gain knowledge of how acids and bases will react if their formulas are known.
- Understand the titration concept.
- Understand the difference in the concept of phenolphthalein and methyl orange indicators.
- Calculate the concentration of an unknown strong acid, by giving the amount of Na2CO3 necessary to titrate it.

Determining the Molarity of NaOH Solution by a Standard Solution of HCl Using Two different pH Indicators Phenolphthalein and Methyl Orange

New

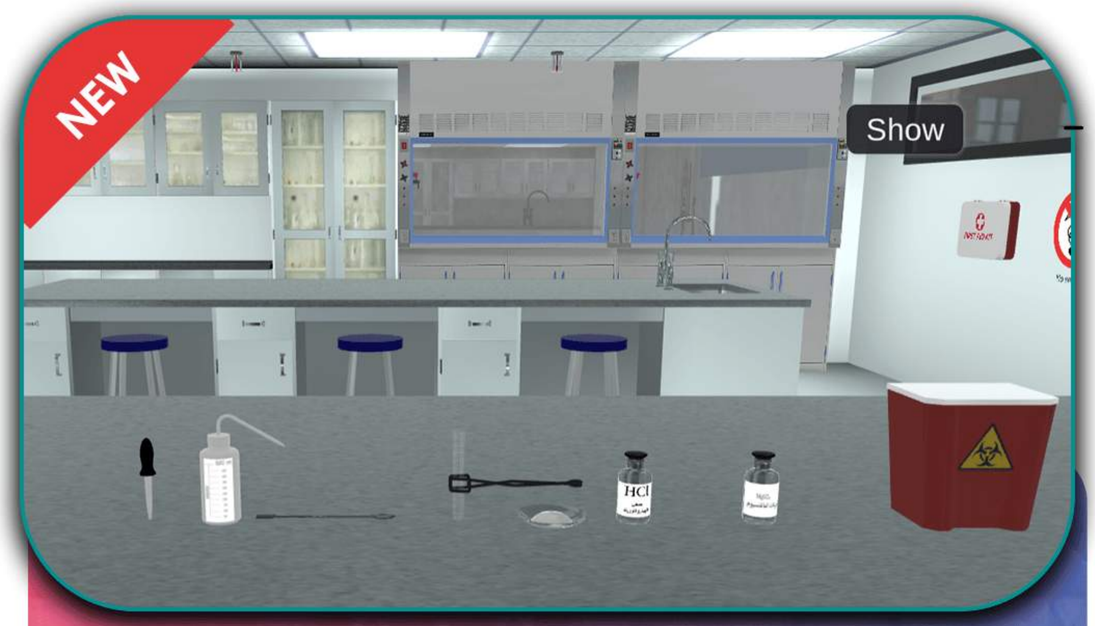
Learning Objectives (ILOs)

- Determine the individual concentration of mixture ingredients.
- Determine the purity of the sample.
- Detecting impurities in the sample.
- Understanding the neutralization reactions.
- Understanding the concept of acid-base titration.
- Understanding the concept of the double indicator method in acid-base titration.

Acidic Radical Tests

Learning Objectives (ILOs)

- Students understand various tests to identify the anion present in a given salt.
- Students understand the chemical reactions that take place during each test.
- Students acquire the skill to perform the experiment in a real lab once they understand the different steps in the procedure.

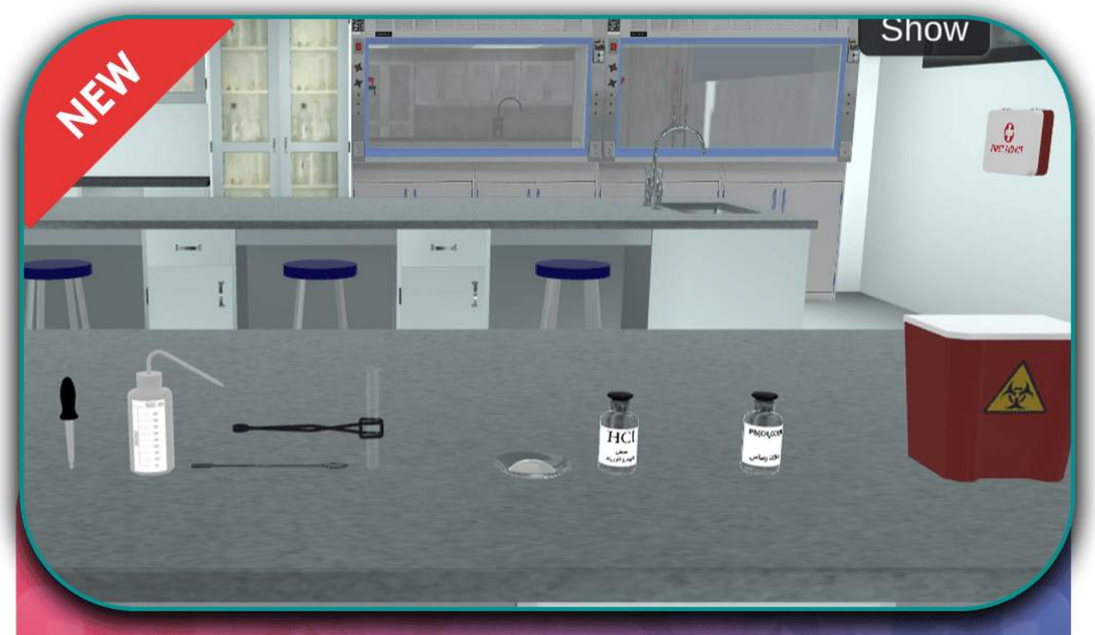


Test for Unknown Acidic Radical 1

Test for Unknown Acidic Radical 2

Test for Unknown Acidic Radical 3

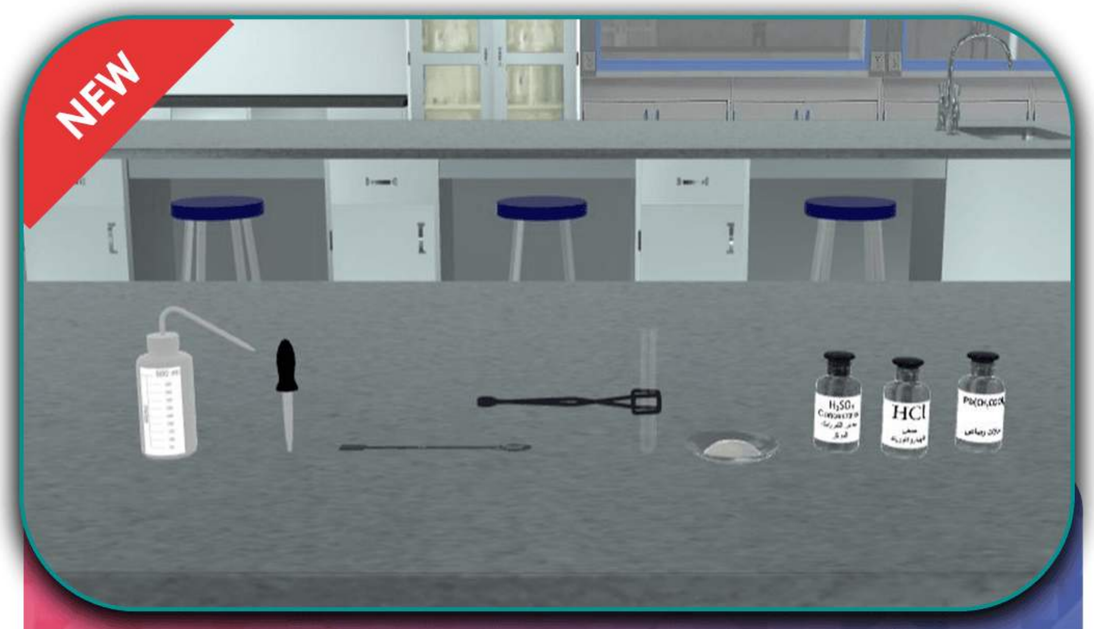
Test for Unknown Acidic Radical 4



Test for Unknown Acidic Radical 5

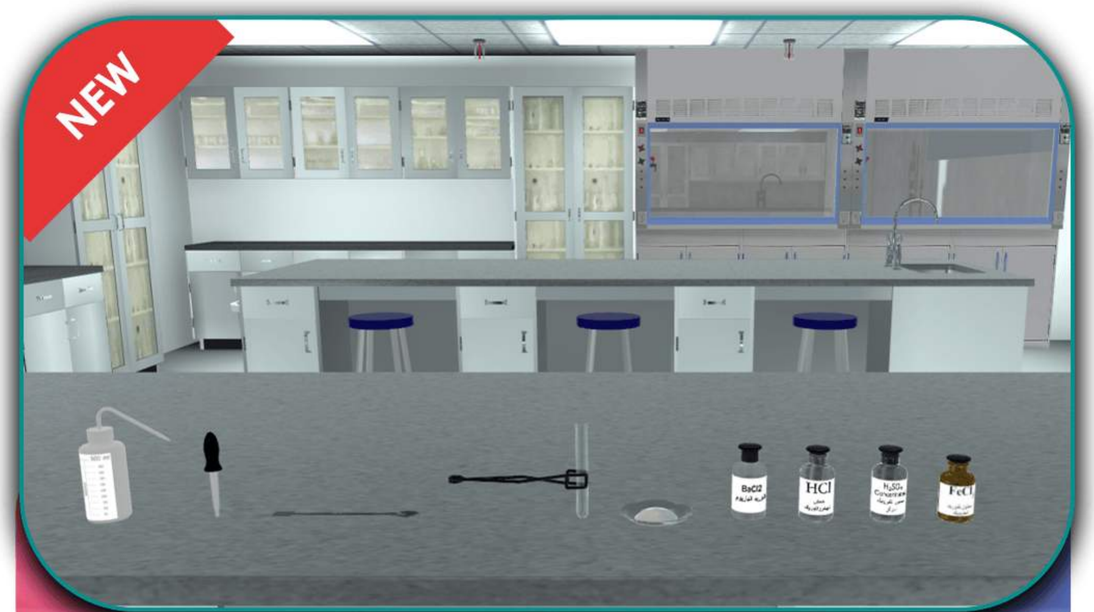
Test for Unknown Acidic Radical 6

Test for Unknown Acidic Radical 7



Test for Unknown Acidic Radical 8

Test for Unknown Acidic Radical 9



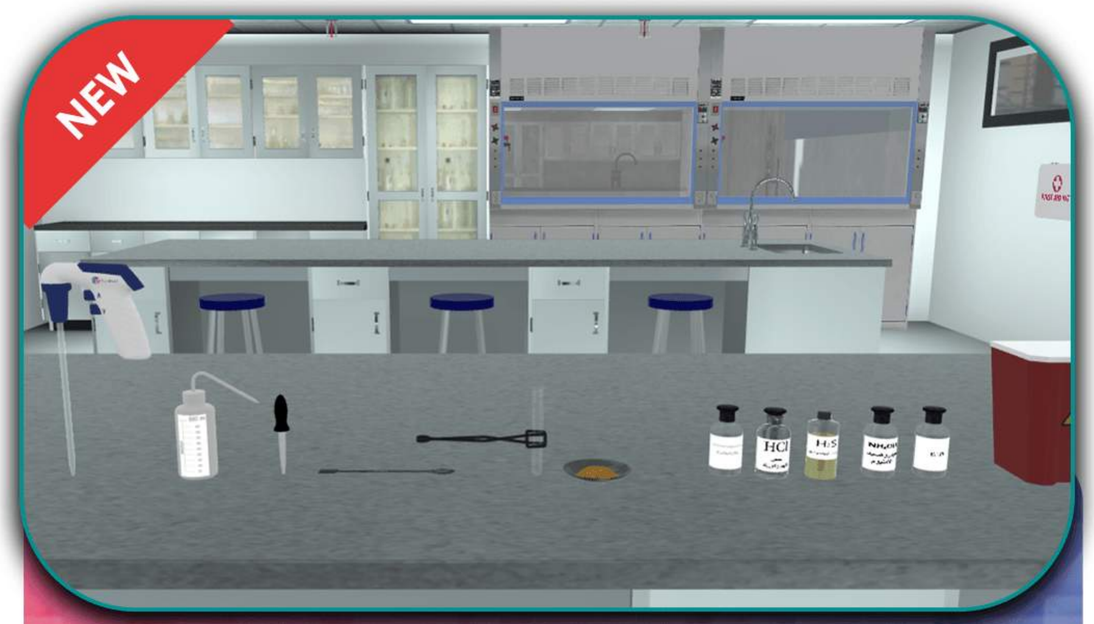
Test for Unknown Acidic Radical 10

Basic Radical Tests

Learning Objectives (ILOs)

- Students understand various tests to identify the cation present in a given salt.
- Students understand the chemical reactions that take place during each test.
- Students acquire the skill to perform the experiment in a real lab once they understand the different steps in the procedure.

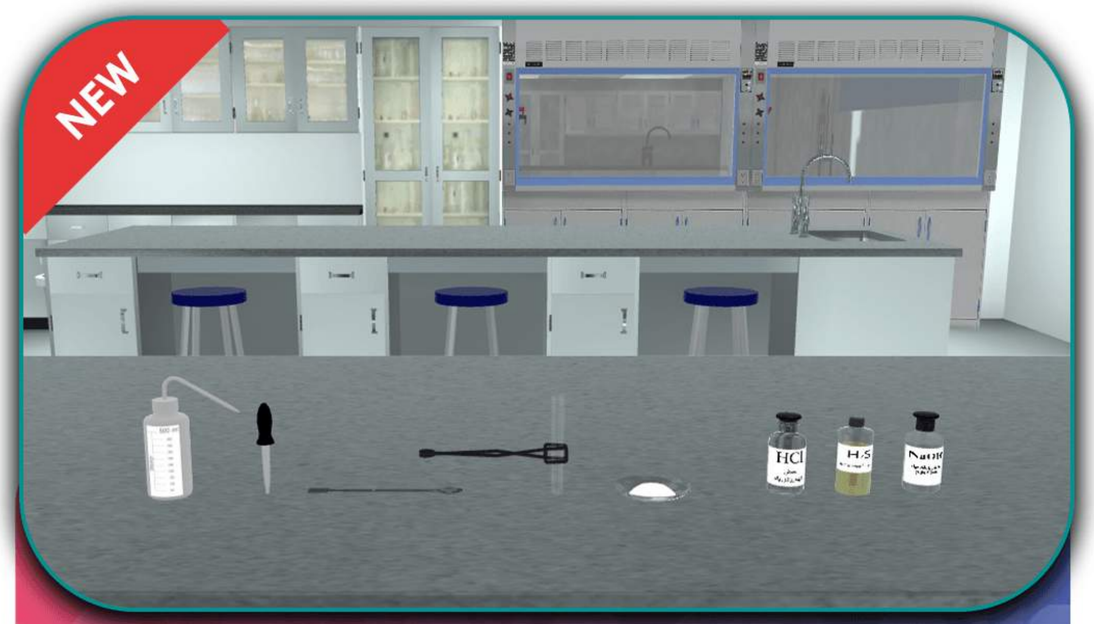
Test for Unknown Basic Radical 1



Test for Unknown Basic Radical 2

Test for Unknown Basic Radical 3

Test for Unknown Basic Radical 4

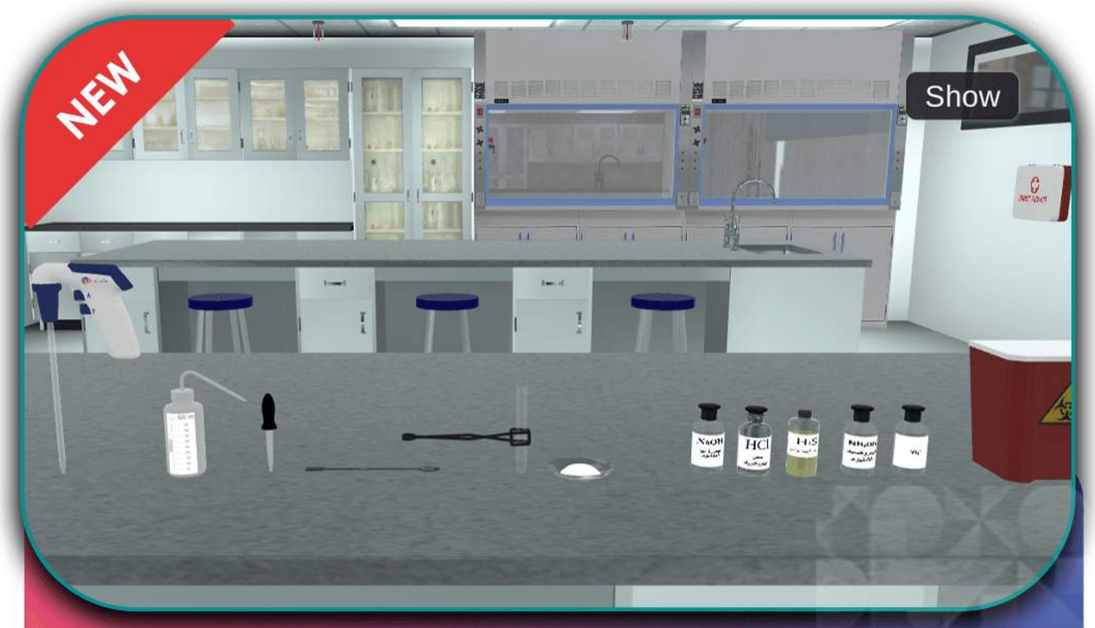


Test for Unknown Basic Radical 5

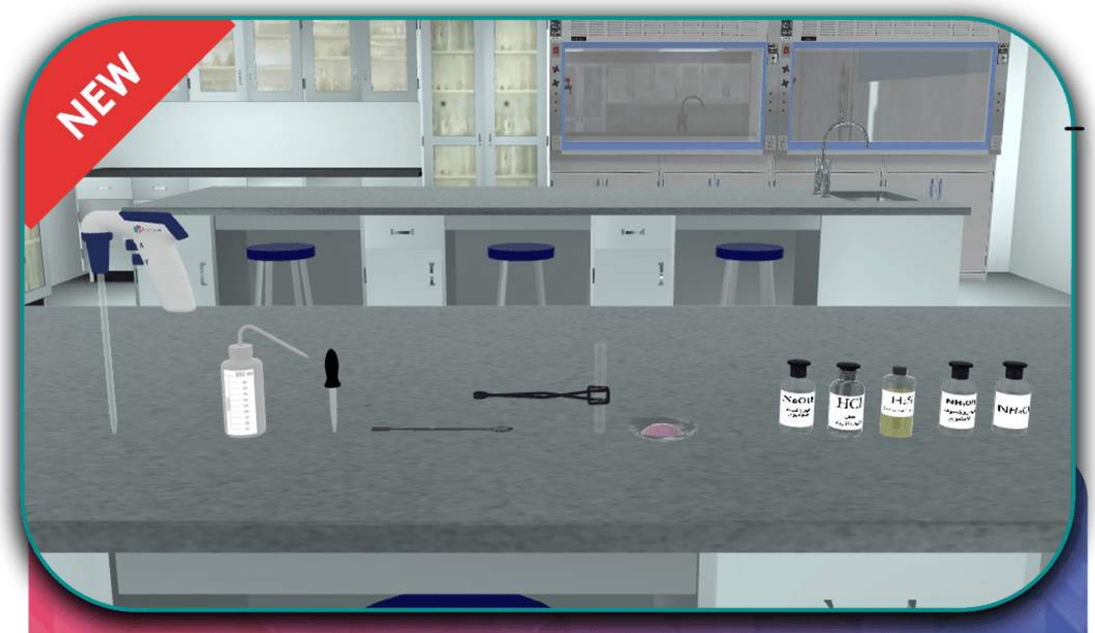
Test for Unknown Basic Radical 6

Test for Unknown Basic Radical 7

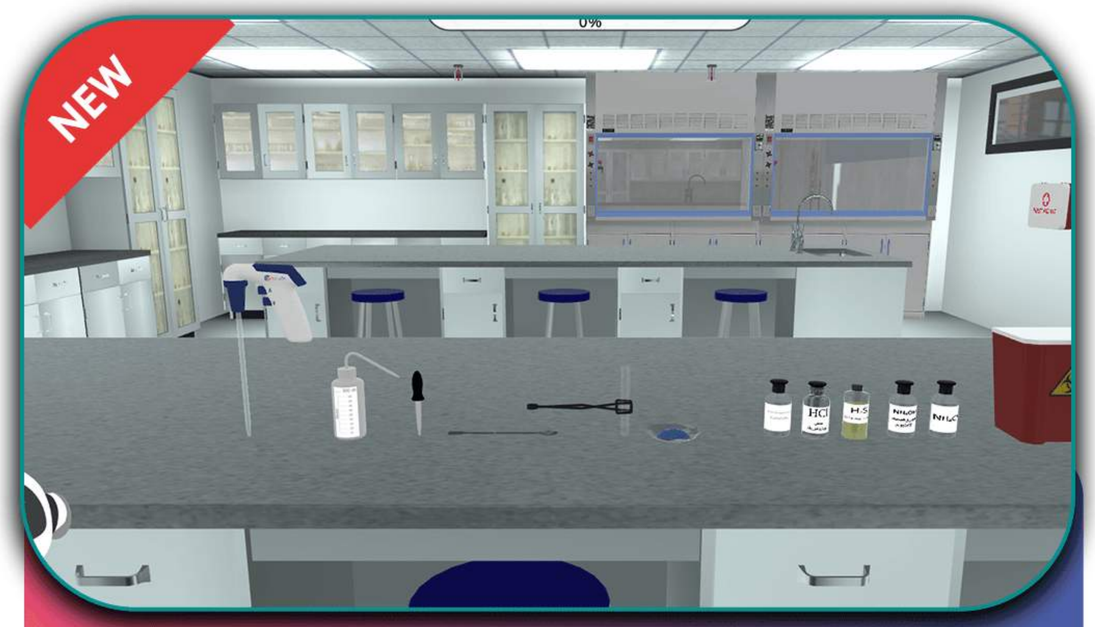
Test for Unknown Basic Radical 8



Test for Unknown Basic Radical 9



Test for Unknown Basic Radical 10

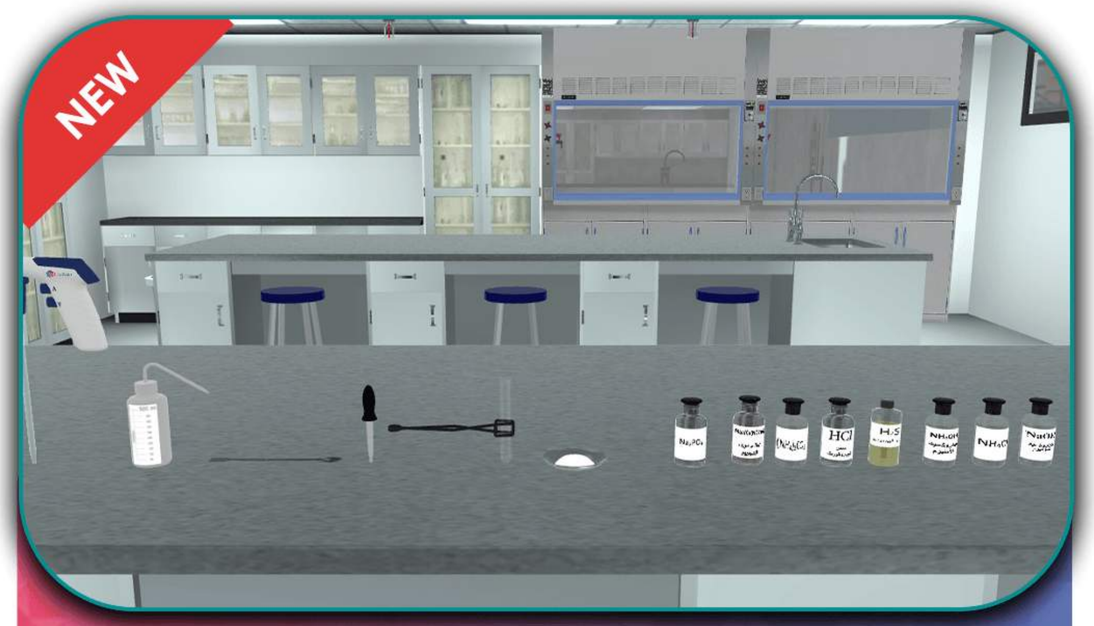


Test for Unknown Basic Radical 11

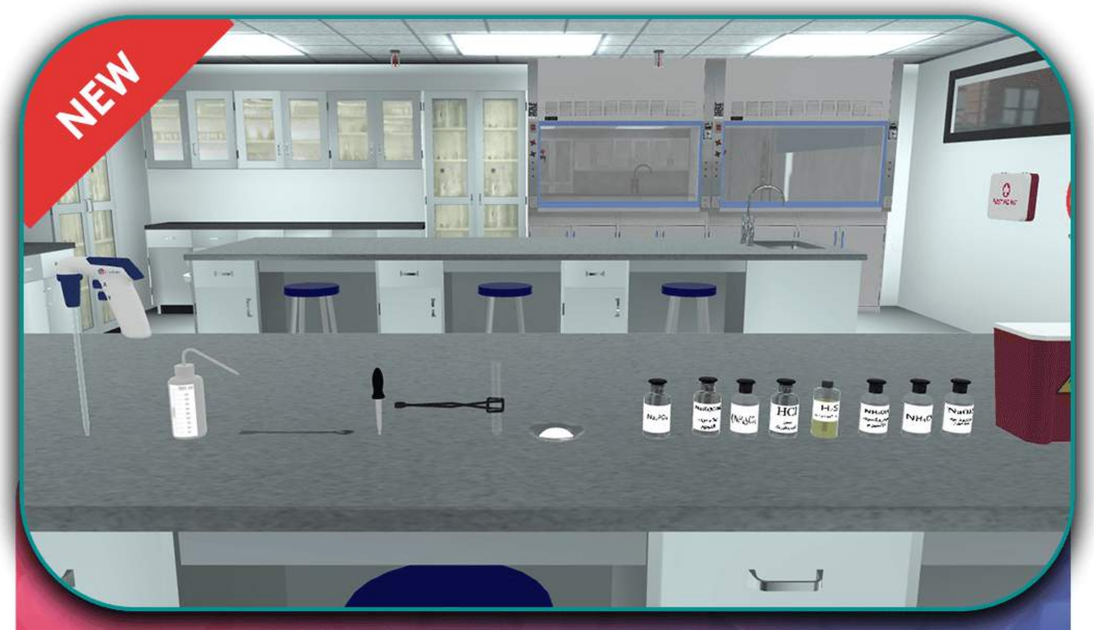
Test for Unknown Basic Radical 12

Test for Unknown Basic Radical 15

Test for Unknown Basic Radical 16



Test for Unknown Basic Radical 17



Test for Unknown Basic Radical 18

General

Safety Laboratory

Learning Objectives (ILOs)

- Identify different safety signs
- Distinguish between different types of signs
- Practice a real experiment applying safety measures
- Anticipate right and wrong actions in a science lab
- Examine material safety data sheet
- Decide what to do if small accidents could happen