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Molecular Biology Labs



مبدأً حكت الدكتورة ما نتعمق كثير بالكلام الموجود بالاسلايدات و رح نركز بأشياء معينة

في معظم ال Biological sciences احنا بنقدر نستخدم ال Molecular Biology Techniques

رجعت رتبت الاسلايدين بس قراءة سريعة و فهم بدون حفظ بصم *

✓ Some of the common applications of molecular laboratory include :

1.Genetics research

> to study the structure and function of genes , genetic variation, and the genetic basis of diseases.

> Techniques are used to identify and study genetic mutations and their effects :

من ال Techniques المستخدمة لدراسة الطفرات الجينية و تأثيرها

PCR, DNA sequencing, and microarray analysis

2.Cancer research:

> by identifying genetic mutations associated with the development and progression of cancer.

> These laboratories also use techniques such as :

1- gene expression analysis .

2- proteomics to study the molecular mechanisms underlying cancer development and to identify new targets for cancer therapies .

3.Infectious disease diagnosis:

> to diagnose infectious diseases by identifying the presence of pathogens such as bacteria, viruses, and fungi in patient samples.

> Techniques such as :

PCR and DNA sequencing are used to detect specific DNA or RNA sequences unique to the pathogen.

4.Pharmacogenomics علم الصيدلة الجيني

> to study the relationship between genetics and drug response.

>Use techniques to identify genetic variations that may affect drug metabolism, efficacy, and toxicity.

Such as:

1.genotyping.

2.gene expression analysis.

5.Personalized medicine:

> aims to provide individualized treatment based on a patient's genetic makeup

>Use techniques to identify genetic variations and molecular biomarkers associated with diseases and to develop targeted therapies.

Such as:

1.DNA sequencing.

2.Transcriptomics.

3.Proteomics.



Safety measures

*قراءة سريعة

□ General safety rules:

- Keep the benches and shelves clean and well organized
- Pay attention to others in the laboratory.
- Do not work alone in the laboratory.
- No eating, drinking and smoking in the laboratory.
- At the end of the lab period return all equipment to its place of origin.

Dress appropriately

*قراءة سريعة

□ Dress appropriately:

- Before entering the lab, make sure to put on a lab coat. The coat should always be worn with the sleeves rolled down.
- Long hair must be tied back in a ponytail, all hats must be removed or turned backward.
- Only bring the things you need into the lab.
- Wear gloves for safe handling of corrosive chemicals.

***الأهم



ASK FOR ASSISTANCE



KEEP AREA CLEAN



DRESS PROPERLY



DO NOT EAT



WASH HANDS

Important Lab Safety Rules



Know the location of safety equipment



Follow the instructions



Don't play mad scientist

Leave experiments at the lab

Dress appropriately



Know what to do in case of an accident



Don't eat or drink in lab

Don't taste or sniff chemicals



Don't experiment on yourself



Dispose of waste properly



Hazards

- Most hazards encountered fall into three main categories: ¹chemical, ²biological, or ³physical.
-
- Cleaning agents and disinfectants, drugs, anesthetic gases, solvents, paints, and compressed gases are examples of chemical hazards.
- Potential exposures to chemical hazards can occur both during use and with poor storage.

Hazards

- Biological hazards include potential exposures to allergens, infectious zoonotics (animal diseases transmissible to humans), and experimental agents such as viral vectors.
- Allergens, ubiquitous in animal research facilities, are one of the most important health hazards, yet they are frequently overlooked.

Hazards

- The final category contains **the physical hazards** associated with research facilities.
- The most obvious are slips and falls from working in wet locations and the ergonomic hazards of lifting, pushing, pulling, and repetitive tasks.
- Other physical hazards often unnoticed are electrical, mechanical, acoustic, or thermal in nature. Ignoring these can have potentially serious consequences.

Hazard Symbols

جایین بالامتحان *



General Warning



Biohazard



Explosive Hazard



Harmful Irritant



Poison/Toxic Material



Toxic Gas



Noise Sign



Corrosive Material
Hazard



High Voltage



Electrical Hazard





Laser Beam
Hazard




Low Temperature
Warning Symbol

ما رح تجيب بالامتحان هاي التفاصيل بس حكت مهم نقرأهم و نركز على الأشياء الي عليها هايلايت بس





General warning Hazards

Name of Symbol	Symbol	Indication
General Warning	 General Warning	Presence of possibly hazardous materials/environment
Health Hazard	 Health Hazard	Presence of chemical, physical, or biological factors with the potential to have a negative effect on our health





Biological Hazards

Name of Symbol	Symbol	Indication
Biological Hazard		Presence of Biohazardous materials




Chemical Hazards

Name of Symbol	Symbol	Indication
Poison/ Poisonous Materials		Presence of toxic materials
Carcinogenic		Presence of carcinogenic materials
Corrosive Material Hazard		Presence of corrosive substances
Harmful Irritants		Presence of harmful chemicals causing irritations






Physical Hazards

Name of Symbol	Symbol	Indication
High Voltage		Supply of high-voltage electricity
Electric Hazard		Risk of getting electric shock. (The device might give mild to severe electric shock.)
Cryogenic Hazard		Low-temperature zone
Flammable Material		Presence of combustible materials (a substance that can easily burn)

Physical Hazards

Oxidizing Material	 <p>Oxidizing Material</p>	Presence of oxidizing chemicals
Explosive Material	 <p>Explosive Material</p>	Presence of explosive and/or self-reactive substances
Hot Surface	 <p>Hot Surface</p>	Risk of burning if you touch with naked hands

Physical Hazards

Ionizing Radiation (Radiation) Hazard		Presence of radioactive materials emitting ionizing radiation or the presence of electromagnetic waves having the capacity to ionize an atom
Non-ionizing Radiation Hazard		Presence of electromagnetic waves that don't have ionizing capacity but have the capacity to excite electrons
UV Radiation Hazard		Presence of UV light
Laser Hazard		Presence of laser radiation
Glassware Hazard		Presence of broken glasses

Equipment

قراءة بس معرفة كيف نفرق بين الأنواع بشكل عام

❑ Different kinds of safety gloves

❖ water-soluble products

⇒ latex or nitrile gloves

❖ acids, bases, alcohols

⇒ vinyl or nitrile gloves

❖ toxic or corrosive products, s

⇒ nitrile gloves

❖ manipulation of glassware

⇒ kevlar gloves

الاعتماد على الاستخدام في الـ lab



Pipettes

- It is a laboratory tool commonly used in chemistry, biology and medicine to transport a measured volume of liquid.

نستخدمها بكل التجارب

- Pipettes come in several designs for various purposes with differing levels of accuracy and precision, from single piece glass pipettes to more complex adjustable or electronic pipettes.

اذا بدي استخدم volume كثير قليل مثلاً 20 مايكرو لتر رح استخدم fixed micro pipettes

Pipettes

Pipettes can be classified into:

1-Automatic pipettes

2-Non automatic pipettes, which can be classified into:

- Non quantitative
- Quantitative

☐ Classified into two types:

- Fixed volumetric
- Graduated

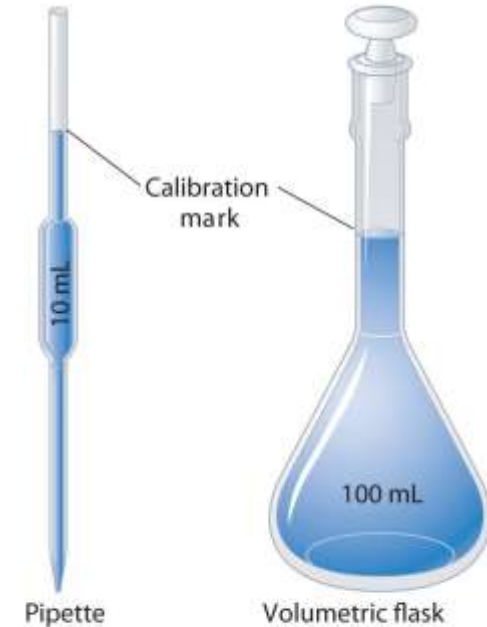
☐ Classified into two types:

- Mohr
- Serological

Pipettes

Volumetric pipettes

- Volumetric pipettes or bulb pipettes allow the user to measure a volume of solution extremely accurate.
- These pipettes have a large bulb with a long narrow portion above with a single graduation mark as it is calibrated for a single volume (like a volumetric flask).
- Typical volumes are 10, 25, and 50 ml.



تبدأ بأرقام كبيرة (not specific) بقدر استخدامها بتجارب ما يحتاج حجم معين أو بتحتاج احجام كبيرة

Pipettes

Graduated pipettes

نفس الشيء الأحجام هون بتكون كبيرة

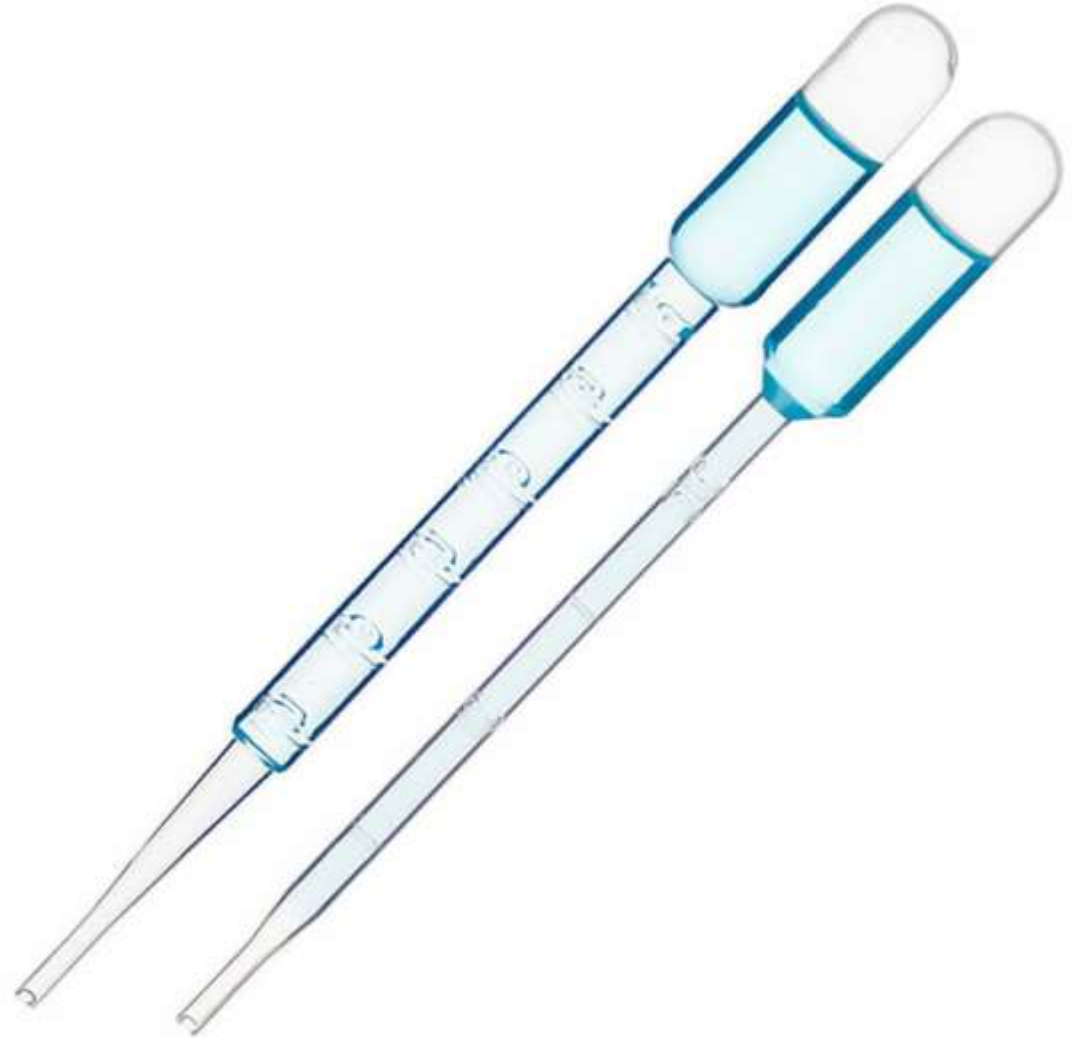
- They are micropipettes consisting of a long tube with a series of graduations, as on a graduated cylinder, to indicate different calibrated volumes.
- They also require a source of vacuum.
- Graduated pipettes commonly come in 5, 10, 25 and 50 ml volumes.



Pipettes

Pasteur pipette

- Are plastic or glass pipettes used to transfer small amounts of liquids but are not graduated or calibrated for any particular volume.
- Pasteur pipettes are also called eye droppers or chemical droppers.



Pipettes

Air displacement micropipettes

- Air displacement micropipettes can measure volume between about 0.1 μ l to 1000 μ l (1ml).
- These pipettes require disposable tips that come in contact with the fluid.
- The four standard sizes of micropipettes correspond to four different disposable tip colors:



Pipette type	Volumes (μ l)	Tip color
P10	0.1 – 10	white
P20	2 – 20	yellow
P200	20 – 200	yellow
P1000	200 – 1000	blue

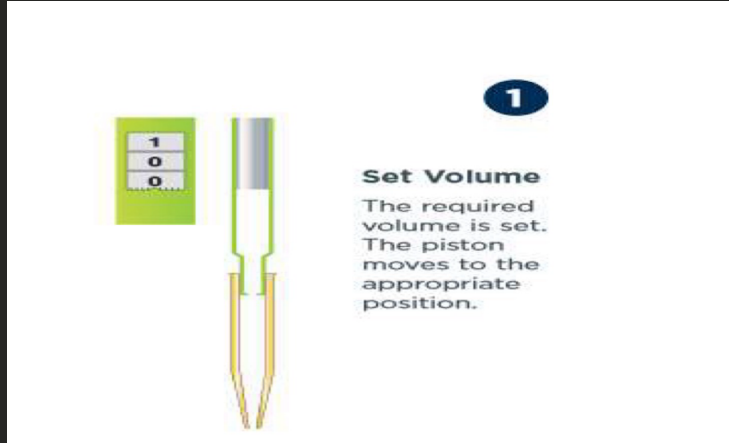
Working Principle of Air-Displacement Pipettes

When the push button is pressed on an air-displacement pipette, the piston inside the instrument moves down to let air out. **Air is displaced by the piston.** The volume of air displaced is equivalent to the volume of liquid aspirated.

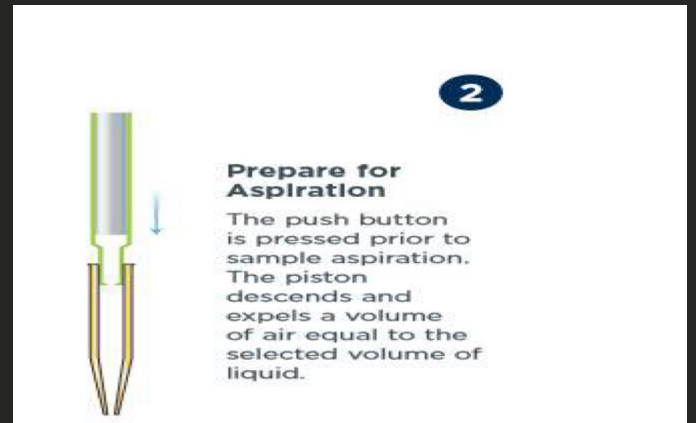
The schematic drawings show how the piston determines the volume of air displaced and subsequently the volume of sample aspirated.

<https://youtu.be/QGX490kuKjg?si=9aMR0QdlOFARHzAn>

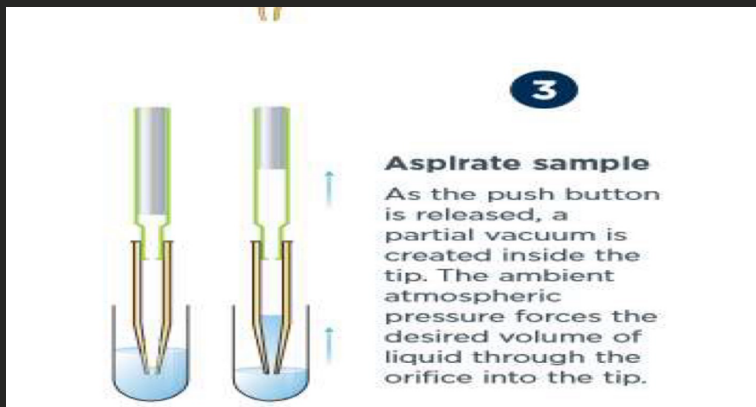
مبدأ عملهم طبعاً في عنا مكبس piston بنضغط عليه للاسفل و بطلع الهواء لبره و بسحب العينة



هون بنحدد الحجم الي احنا بدنا إياه بحيث انه المكبس رح ينزل بالقدر الي رح يسحب منه الحجم المطلوب بس

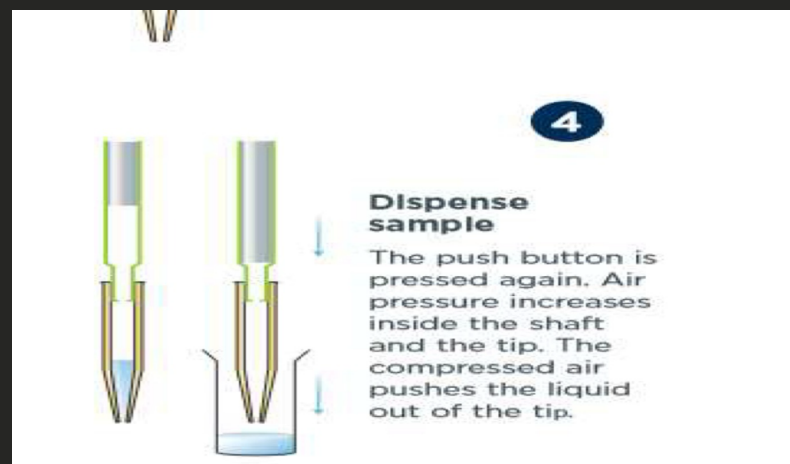


بنجهز للامتصاص
بنضغط على الزر قبل ما نسحب من العينة حتى نطلع من الهواء و حجم الهواء الي رح يطلع بكون نفس حجم العينة الي حددنا انه رح نسحبه

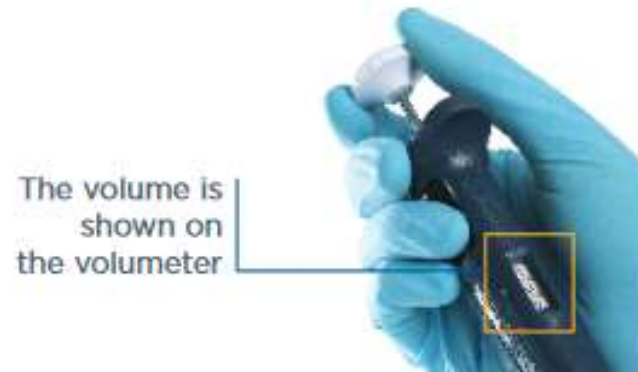


بنترك الزر و بسحب من العينة

الآن بفرغ العينة الي سحبتها عن طريق
إني اضغط على زر الضغط مرة ثانية



Adjust the Volume Display



Reading and Adjusting the Volume

Hold the body of the micropipette in one hand and use the other hand to rotate the thumbwheel or the push button. With the push button, the volume can be easily adjusted with one hand. Push button volume adjustment is available on all MICROMAN pipettes and on PIPETMAN pipettes (except PIPETMAN L) manufactured after April 1995.



A Helpful Hint for Improving Reproducibility and Accuracy

Always finish setting clockwise for best reproducibility. This is how to obtain a clockwise volume setting:

- When decreasing the volume setting, slowly reach the required setting, making sure not to pass the setting.
- When increasing the volume setting, pass the required value by 1/3 of a turn and then slowly decrease to reach the volume, making sure not to pass the setting.

1

Preparation

Hold the instrument in a nearly vertical position. Depress the plunger smoothly to the first stop position.

2

Aspiration

Immerse the pipette tip in the liquid*. Allow the plunger to move up smoothly to the rest position. Wait one second so that all the liquid has time to move up into the tip.

3

Dispense

Place the pipette tip at an angle (10° to 45°) against the inside wall of the receiving vessel. Depress the plunger smoothly to the first stop position.

4

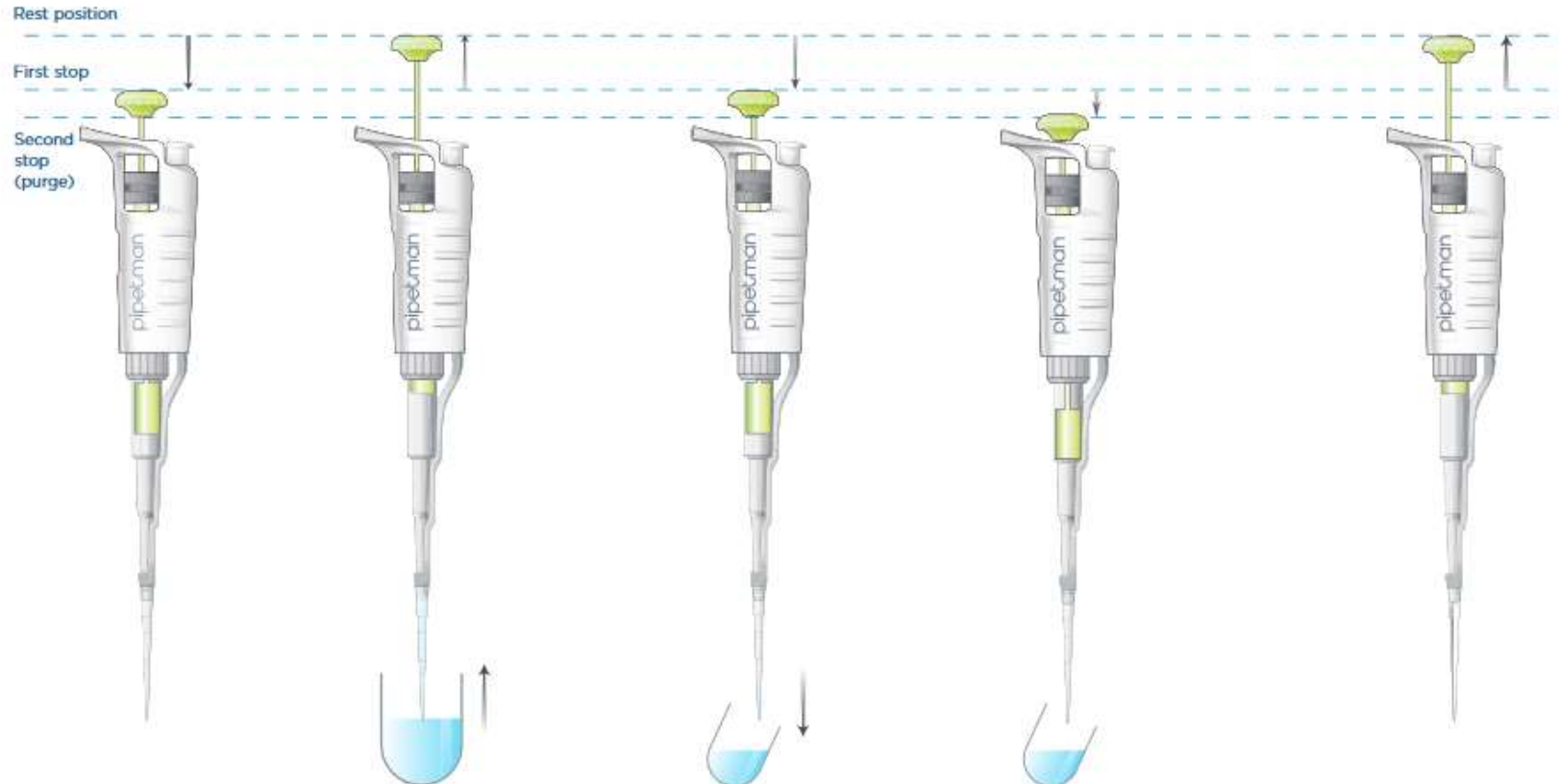
Purge

Wait one second, then depress the plunger to the second stop position. This purge stroke removes any remaining sample from the tip. Remove pipette tip end from sidewall by sliding it up the wall.

5

Home

Allow the plunger to move up to the rest position.



هون بس بقلنا انه ال Disposable pipette tip بنمسك ال pipette بايد وحدة و بثبتها في disposable tip بثني ايدي بشكل خفيف حتو تثبت بقوة على طرف ال pipettes و ما بصير اضغط بقوة كثير حتى ما تنكسر لما اثبت

Fitting a Disposable Pipette Tip



Press down with a rotating motion



Avoid hammering the tip into the pipette

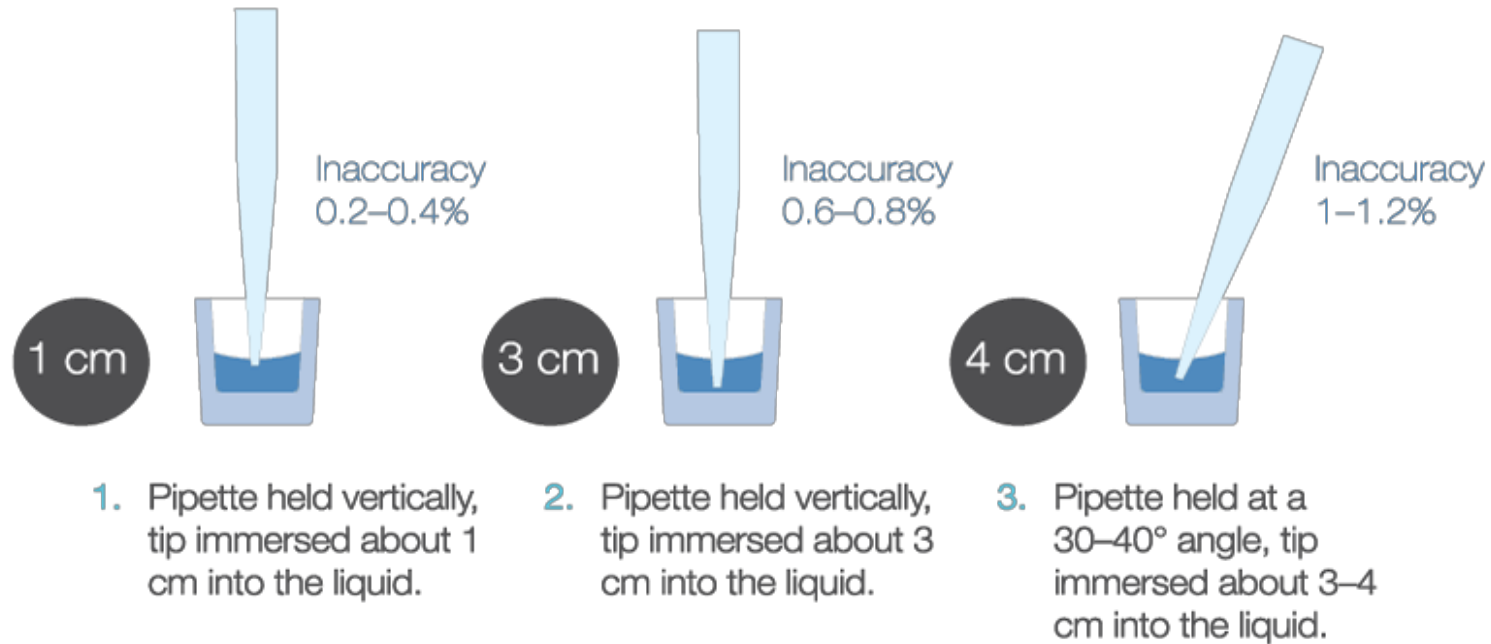
To Fit a Disposable Tip on a PIPETMAN Single Channel

Hold the micropipette in one hand, lower the pipette into the tip, and use a slight twisting movement to seat the tip firmly on the tip holder of the micropipette to ensure an air-tight seal.

To protect your pipette, avoid tapping the tip onto the pipette like a hammer. Tips are available in TIPACK racks for easy mounting with no hand contact.

حتى يكون الدقة اكثر لازم يتم إمالة الtip تقريبا 30-40 درجة و نغمرها في 3-4 cm

Tip Immersion Depth and Angle



Effects of immersing the tip too deeply and tilting the pipette are greater with small sample volumes, e.g., using 1–10 μ l pipette.