

URINALYSIS

[Click Here to Start the Lab](#)



WHAT DO I NEED TO HAND IN WITH THIS LAB

When your are finished with this lab you will need to hand in the following for your lab report.

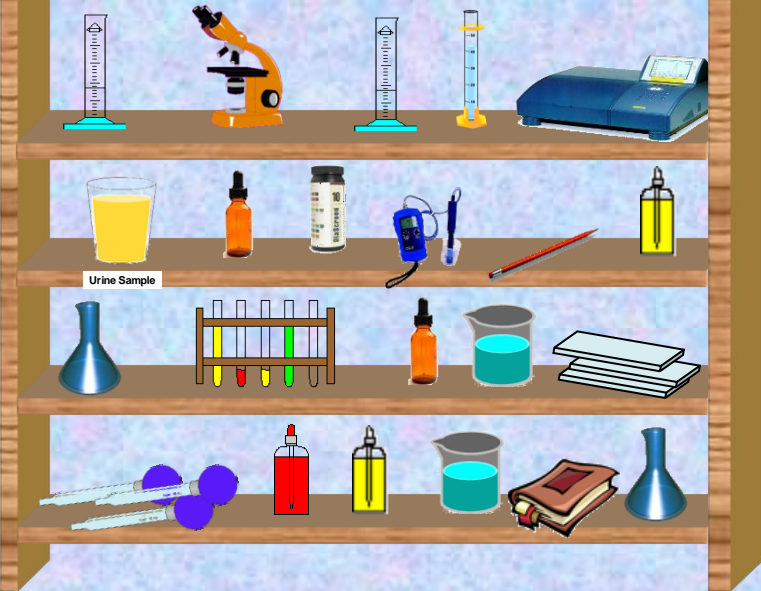
Macroscopic Observations Data Table

Chemstix Urinalysis Data Table

Microscopic Observations Data Table

Answers to Questions 1-7

[Click Here to Continue](#)



URINALYSIS LAB

At any point you can use your escape key to end the lab

[Click Here to Go Directly to Macroscopic Observations](#)

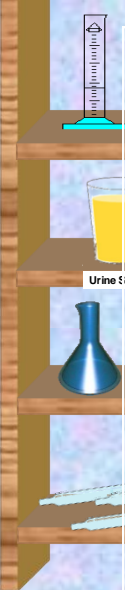
[Click Here to Go Directly to Chemstix Urinalysis](#)

[Click Here to Go Directly to Microscopic Observations](#)

[Click Here to Go Directly to Urinalysis Questions](#)

If you are just starting this lab you should click on the **CONTINUE** button to the right


[Click Here to Continue](#)



Tests on urine can provide clues to many diseases and information about your overall health. A routine urine screening test may be done to help find the cause for many types of symptoms. The kidneys remove waste material, minerals, fluids, and other substances from the blood for elimination in the urine. Therefore, urine can contain hundreds of different bodily waste products. Many factors (such as diet, fluid intake, exercise, and kidney function) affect what is in urine.

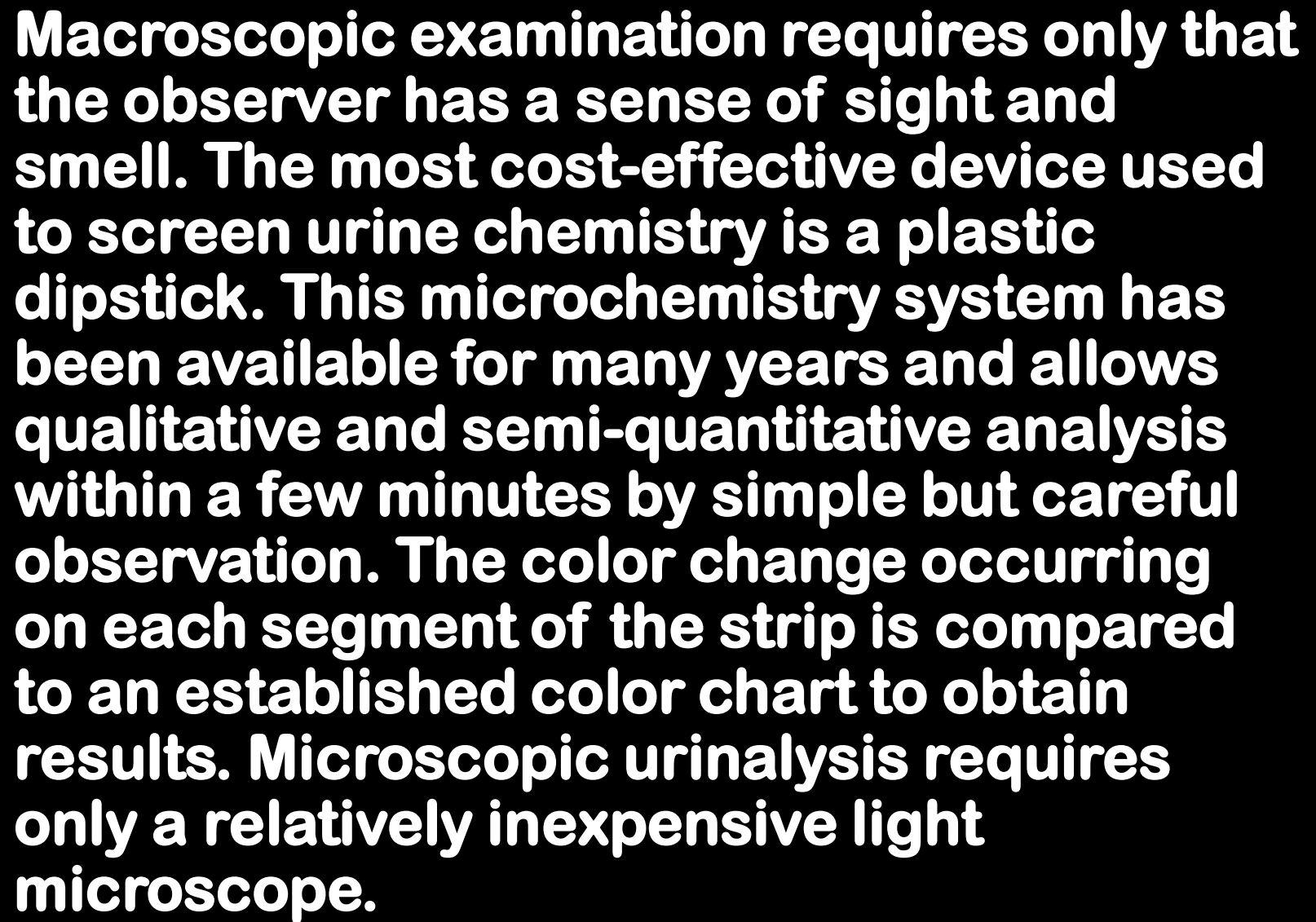


[**Click Here to Continue**](#)

A vertical shelf on the left side of the slide holds various pieces of laboratory glassware. From top to bottom, there is a graduated cylinder with blue liquid, a beaker with yellow liquid, a small blue flask, and a larger blue flask. The shelf is labeled "Urine S" at the bottom.

A urine test may be done as part of a routine physical examination to screen for a disease or infection of the urinary tract. Symptoms that may lead to a urine test include discolored or foul-smelling urine, pain during urination, difficulty urinating, flank pain, or fever. Urine tests are also performed to monitor the treatment of certain conditions such as diabetes, kidney stones, a urinary tract infection, hypertension, or some types of kidney or liver disease.

[Click Here to Continue](#)



Macroscopic examination requires only that the observer has a sense of sight and smell. The most cost-effective device used to screen urine chemistry is a plastic dipstick. This microchemistry system has been available for many years and allows qualitative and semi-quantitative analysis within a few minutes by simple but careful observation. The color change occurring on each segment of the strip is compared to an established color chart to obtain results. Microscopic urinalysis requires only a relatively inexpensive light microscope.

[Click Here to Continue](#)



In this lab we will perform three types of analysis on a urine sample.

1) MACROSCOPIC OBSERVATIONS


2) CHEMSTIX ANALYSIS

3) MICROSCOPIC OBSERVATIONS

For all three analysis you will need to complete data tables describing your observations.



[Click Here to Continue](#)



The urine sample was collected at the same time that you started the lab. You most likely viewed the collection process. The urine sample is potentially contaminated with pathogens. Wear latex barrier gloves and protective eyewear during the entire exercise. Place all disposable material that comes into contact with urine in the biohazard bag. Good luck and be careful.



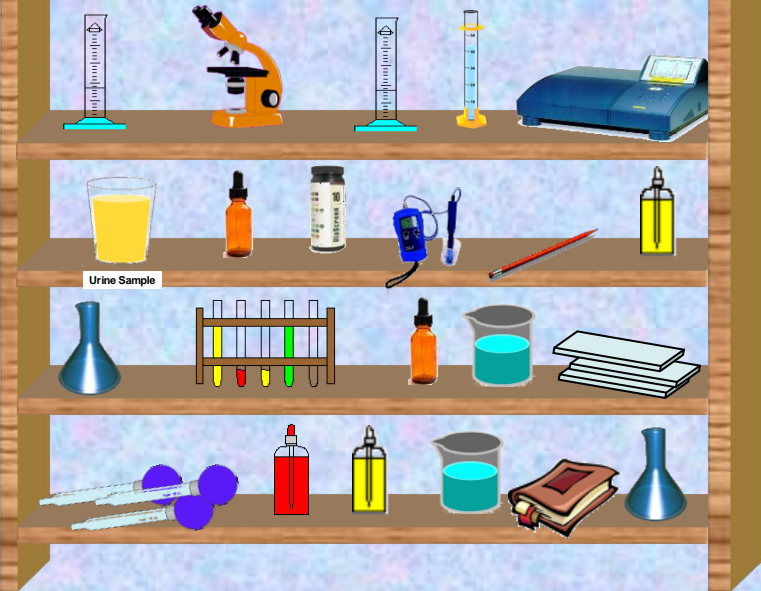
[Click Here to Continue](#)

MACROSCOPIC OBSERVATIONS



**Click Here to
Go Back to
where you
came from**

**Click Here to
Continue**



URINALYSIS LAB

At any point you can use your escape key to end the lab

**Click Here to
Go Directly to
Macroscopic
Observations**

**Click Here to
Go Directly to
Chemstix
Urinalysis**

**Click Here to
Go Directly to
Microscopic
Observations**

**Click Here to
Go Directly to
Urinalysis
Questions**

**Click Here to
Continue**

MACROSCOPIC OBSERVATIONS

The first part of a urinalysis is direct visual observation. We will observe the following characteristics of the urine sample. Be sure to enter your observations in the appropriate data table.

COLOR

TURBIDITY

ODOR

[Click Here to Continue](#)

COLOR

Normal, fresh urine is pale to dark yellow or amber in color and clear. The yellow color is due to the pigment urochrome, a metabolic product of hemoglobin breakdown. A red or red-brown (abnormal) color could be from a food dye, eating fresh beets, a drug, or the presence of either hemoglobin or myoglobin. If the sample contained many red blood cells, it would be cloudy as well as red.

[Click Here to Continue](#)

COLOR

The intensity of the color generally indicates the concentration of the urine; pale or colorless urine indicates that it is dilute. Colorless urine may be caused by conditions such as long-term kidney disease or uncontrolled diabetes. Deep yellow urine indicates that it is concentrated. Dark yellow urine can be caused by conditions such as low fluid intake or dehydration. Vitamin B supplements can also turn urine bright yellow.

[Click Here to Continue](#)

COLOR

The color of the urine sample is assessed subjectively and reported as:

- Colorless
- Light to medium yellow
- Very dark yellow
- Red to brownish red
- Reddish brown to brown
- Greenish tint



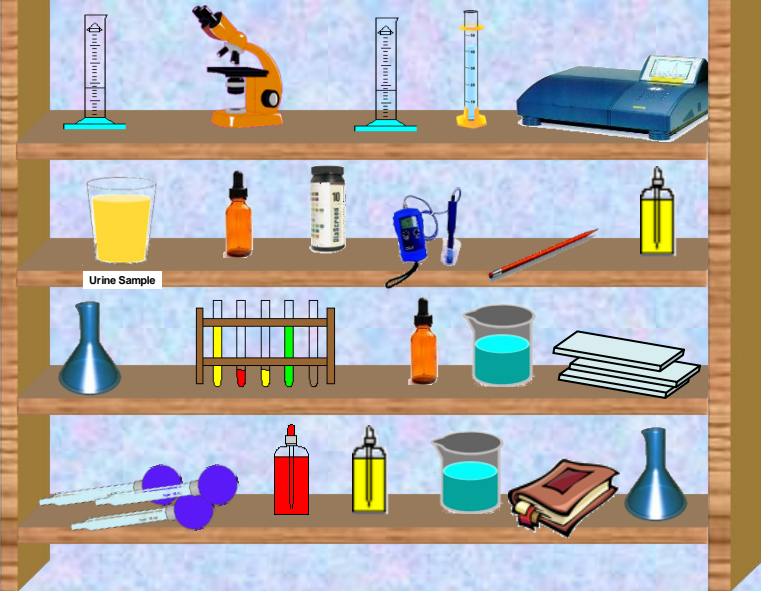
[Click Here to Continue](#)

COLOR

Some examples of various urine colors and corresponding common causes are shown below:

Color	Possible causes
light to medium yellow	normal
colorless	very dilute urine
very dark yellow	extremely concentrated; bilirubinuria
red to brownish red	hematuria, hemoglobinuria, myoglobinuria
reddish brown to brown	myoglobinuria, hemoglobinuria, methemoglobin
greenish tint	bilirubinuria

[Click Here to Continue](#)



Click on the urine sample on the shelf and record the Color and Intensity of color in your data table.



Click Here to Continue

TURBIDITY

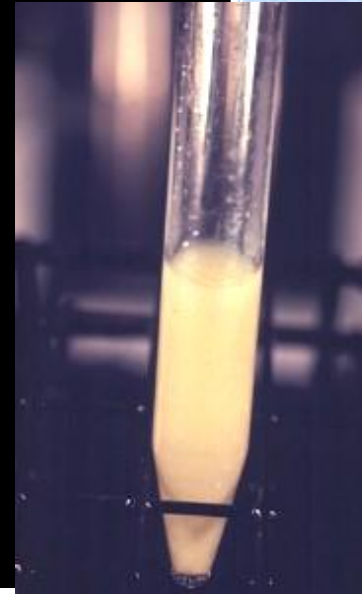
Also called transparency, opacity or clarity, this test determines the cloudiness of urine. Urine is normally clear. Bacteria, blood, sperm, crystals, or mucus can make urine appear cloudy. The turbidity of the urine sample is gauged subjectively and reported as:

- clear
- slightly cloudy
- cloudy
- opaque
- flocculent (cannot see through)

[Click Here to Continue](#)

TURBIDITY

Normally, fresh urine is clear to very slightly cloudy. Excess turbidity results from the presence of suspended particles in the urine. The cause can usually be determined based on the results of the microscopic urine sediment examination. The turbidity in the sample to the right was due to numerous crystals which precipitated upon cooling of the specimen to room temperature.



[Click Here to Continue](#)

TURBIDITY

Common causes of abnormal turbidity include :

- increased cells (RBC, WBC)
- numerous crystals
- bacteria
- lipiduria (lipids often rise to the surface)
- mucus
- semen
- fecal contamination

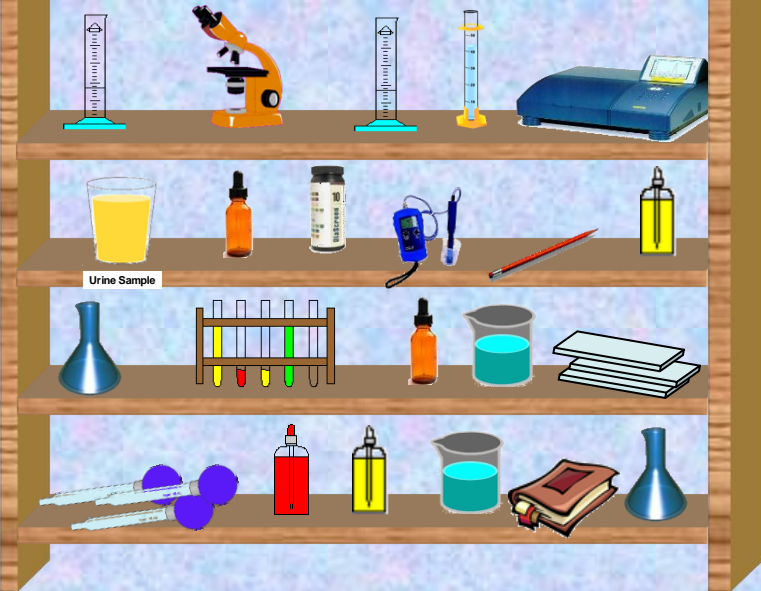
[Click Here to Continue](#)

TURBIDITY

Three urine samples are shown. The one at the left shows a red, cloudy appearance. The one in the center is red but clear. The one on the right is yellow, but cloudy



[Click Here to Continue](#)



Click on the urine sample on the shelf and record the Turbidity in your data table.



Click Here to Continue

ODOR

A normal odor for urine is a slightly "nutty" (aromatic) smell.



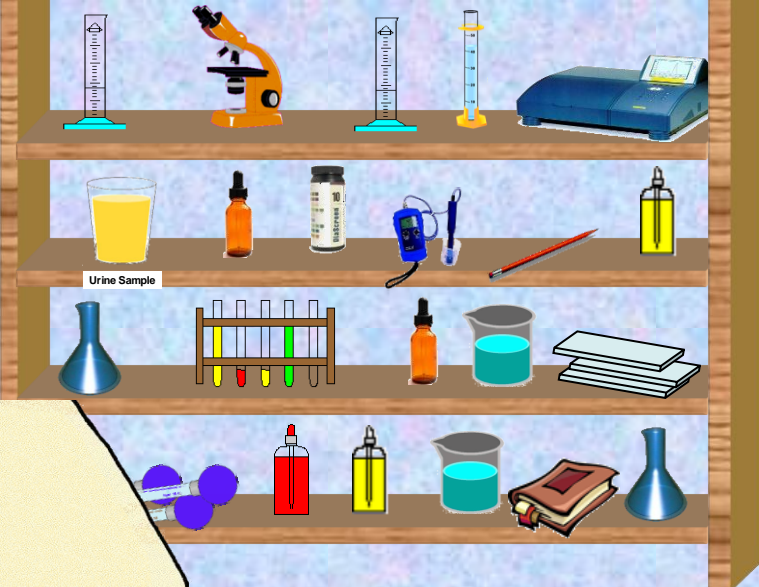
Some foods (such as asparagus), vitamins, and antibiotics (such as penicillin) can cause urine to develop an unusual odor.

[Click Here to Continue](#)

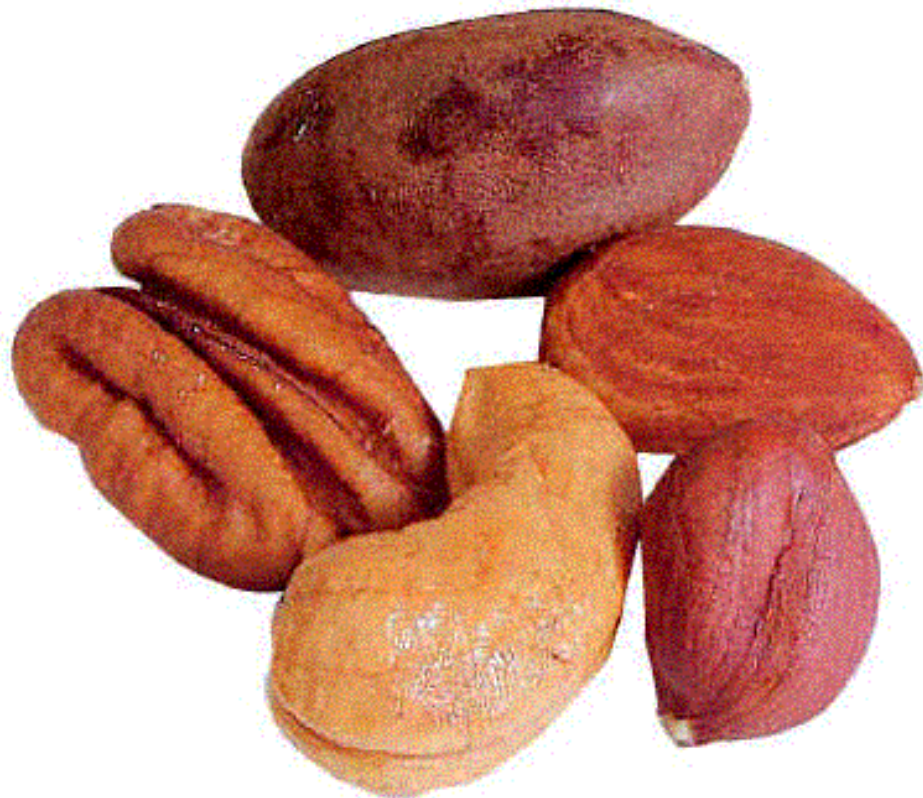
ODOR

Some diseases can cause a change in the normal odor of urine. For example, an infection with *E. coli* bacteria can cause a foul odor while diabetes or starvation can cause a sweet, fruity odor. Urine that smells like maple syrup can indicate maple syrup urine disease, a condition caused by the body's inability to break down certain amino acids.

[Click Here to Continue](#)



Click on the urine sample on the shelf. Sample the urine with your virtual nose and record the Odor in your data table.



A virtual nose is supplied in this instance. If you can identify the images emanating from the urine sample to the virtual nose, you will be able to enter a characteristic odor of the sample to the data sheet. If you are not able to identify the images click on the word ODOR below

ODOR

Click Here to Continue

MACROSCOPIC OBSERVATIONS

You have now completed your Macroscopic Observations on the urine sample. Be sure you have entered the data required on the Data Table. If you need to return to the start of the Macroscopic Observations, you can use the links supplied below.

[Click Here to Return to start of Macroscopic Observations](#)

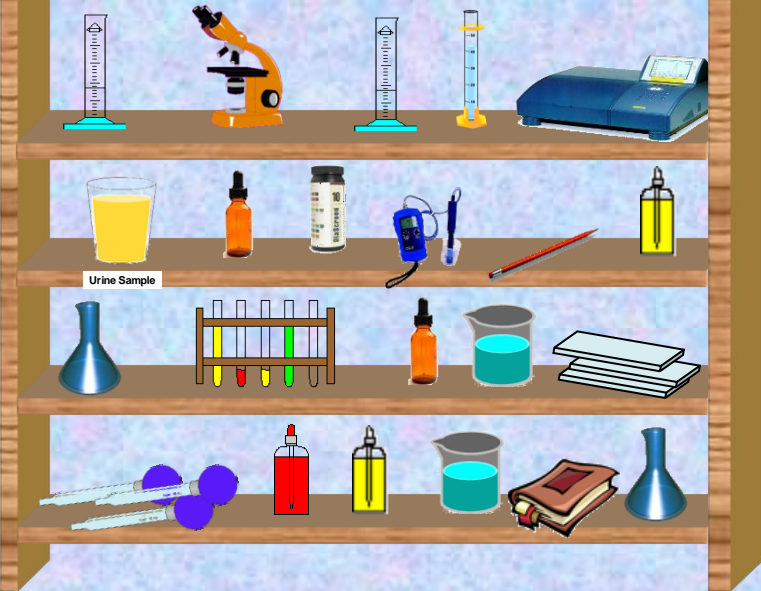
[Click Here to Continue](#)

CHEMSTIX ANALYSIS



**Click Here to
Go Back to
where you
came from**

**Click Here to
Continue**



URINALYSIS LAB

At any point you can use your escape key to end the lab

Click Here to Go Directly to Macroscopic Observations

Click Here to Go Directly to Chemstix Urinalysis

Click Here to Go Directly to Microscopic Observations

Click Here to Go Directly to Urinalysis Questions

Click Here to Continue

CHEMSTIX ANALYSIS

Chemstix strips are composed of sections of paper with test reagents embedded into the fibers. They react with urine components if present. The Chemstix are divided into ten individual panels which will change color in accordance with components that may be present in the urine sample. We can then compare the color changes to a color panel chart to assist in determining urine components.

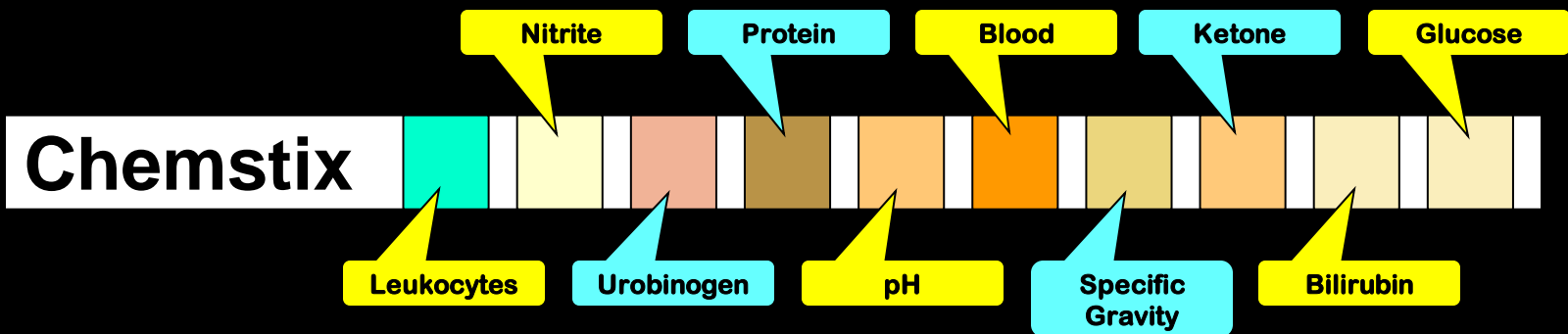
Chemstix



[Click Here to Continue](#)






CHEMSTIX ANALYSIS

The Chemstix below indicates the type of test that will be performed for each of the individual panels on the Chemstix. You will not have to memorize the panel key below. As each test is performed a key will be provided for you.








[Click Here to Continue](#)





CHEMSTIX COLOR CHART






LEUKOCYTES	Negative	Trace	Small	Moderate	Large
					








NITRITE	Negative	←-----Positive-----→ (Any degree of color change)
		







UROBILINOGEN	0.2	1	2	4	8
					

PROTEIN	Negative	Trace	33	100	200	2000
						







pH	5.0	6.0	6.5	7.0	7.5	8.0	8.5
							

BLOOD	Negative	Trace	Moderate	Trace	Small	Moderate	Large
							
	Non-Hemolyzed		Hemolyzed				

SPECIFIC GRAVITY	1.000	1.005	1.010	1.015	1.020	1.025	1.030
							

KETONE	Negative	Trace	Small	Moderate	Large	X Large
						

BILIRUBIN	Negative	Small	Moderate	Large
				

GLUCOSE	Negative	100	250	500	1000	2000
						

CHEMSTIX ANALYSIS

The chart to the left is what we will compare our sampled Chemstix against to determine the characteristics of the urine sample. You will not need to memorize the table as it will be provided to you as you perform the tests.

Click Here to Continue

CHEMSTIX ANALYSIS

We are now ready to perform tests on the urine sample that will analyze for the following characteristics:

- specific gravity
- pH
- protein
- glucose
- ketones

- nitrites
- bilirubin
- hematuria
- urobilinogen
- leukocytes

[Click Here to Continue](#)

CHEMSTIX ANALYSIS

The chart below shows what abnormalities may be associated with abnormal urine characteristics.

Leucocytes	A positive result may indicate renal disease or urinary tract infection.
Nitrite	A positive result may indicate urinary tract infection.
Urobilinogen (10SG only)	Normally present in urine: elevated levels may indicate liver abnormalities or excessive destruction of RBC's e.g. in haemolytic anaemia. Urobilinogen should be considered alongside bilirubin as a differential diagnosis.
Protein	A positive result indicates renal disease, raised blood pressure or urinary tract infection.
pH	Normal range 5-6. A pH above 7 suggests stale urine unsuitable for testing.
Blood	Presence in urine suggests serious renal or urological disease, or renal tract infection.
Specific Gravity	Monitors the concentrating and diluting power of the kidney. Assists in the interpretation of other tests.
Ketone	May indicate uncontrolled diabetes or a reduced carbohydrate diet.
Bilirubin (10SG only)	Indicative of hepatic or biliary disease. Bilirubin may appear in urine before other signs of abnormality are apparent.
Glucose	The most important cause of glucose in urine is Diabetes Mellitus.

[Click Here to Continue](#)

SPECIFIC GRAVITY

Specific gravity measures the amount of substances dissolved in the urine. It also indicates how well the kidneys are able to adjust the amount of water in urine.

Specific gravity can be considered to measure urine density, or the ability of the kidney to concentrate or dilute the urine over that of plasma. Urine specific gravity is a measurement of the density of urine compared to pure water. The specific gravity of water is 1.00.

[Click Here to Continue](#)

SPECIFIC GRAVITY

The higher the specific gravity, the more solid material is dissolved in the urine.

When you drink a lot of liquid, your kidneys should produce greater-than-normal amounts of dilute urine. When you drink very little liquid, your kidneys should make only small amounts of concentrated urine. Urine specific gravity can be determined using a Chemstix.

[Click Here to Continue](#)

SPECIFIC GRAVITY

Normal specific gravity of urine is measured at 1.005 – 1.035.

Abnormally low specific gravity indicates dilute urine, which may be caused by:

- drinking excessive amounts of liquid
- severe kidney disease
- the use of diuretics

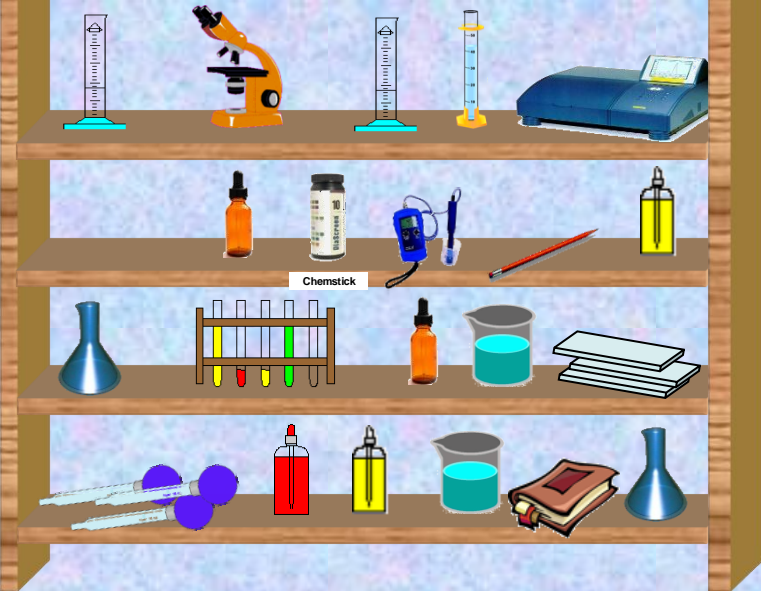
[Click Here to Continue](#)

SPECIFIC GRAVITY

Abnormally high specific gravity indicates very concentrated urine, which may be caused by:

- **not drinking enough liquid**
- **loss of too much liquid (excessive vomiting, sweating, or diarrhea)**
- **substances (such as sugar or protein) in the urine**

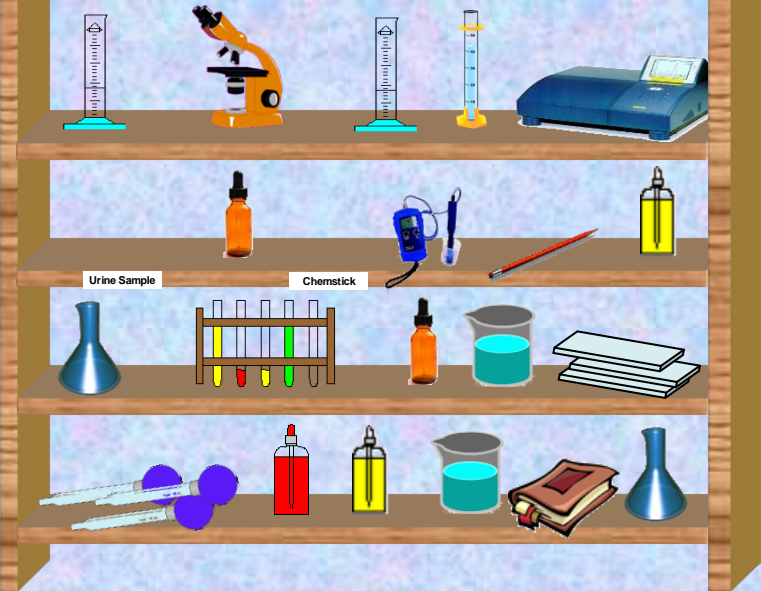
[Click Here to Continue](#)



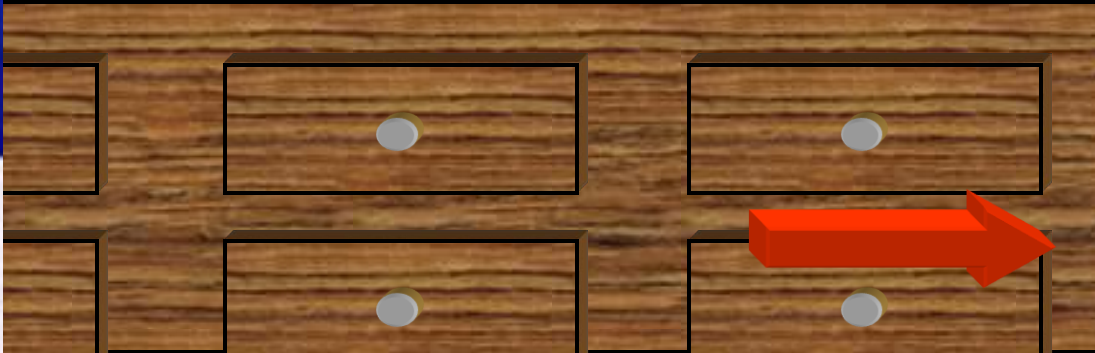
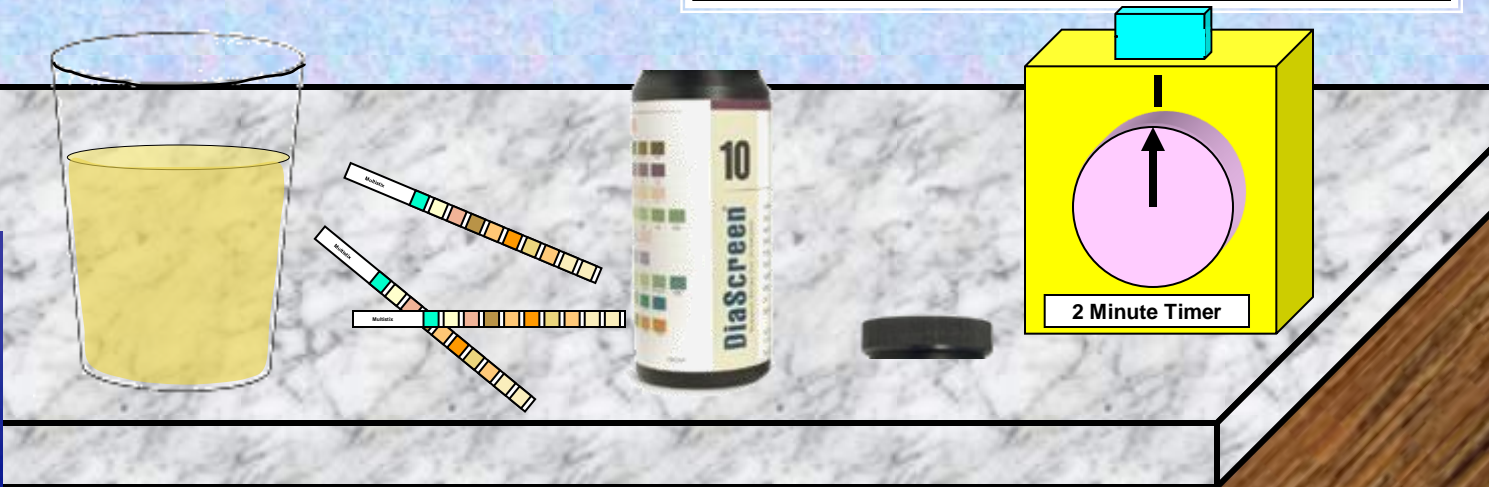
Click on the Chemstick bottle on the shelf. Next click on the cover of the bottle to obtain a few of the Chemstick.



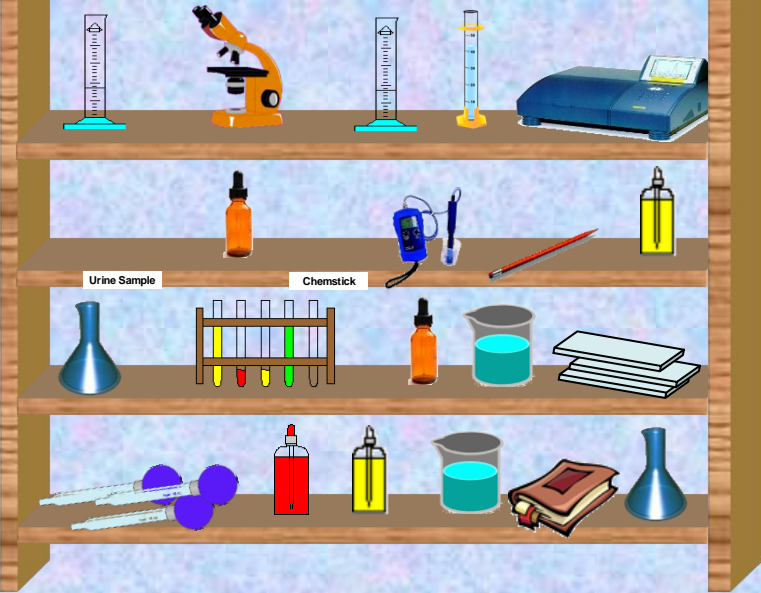
Click Here to Continue



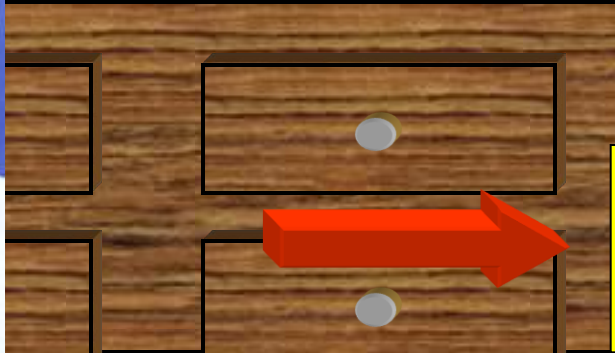
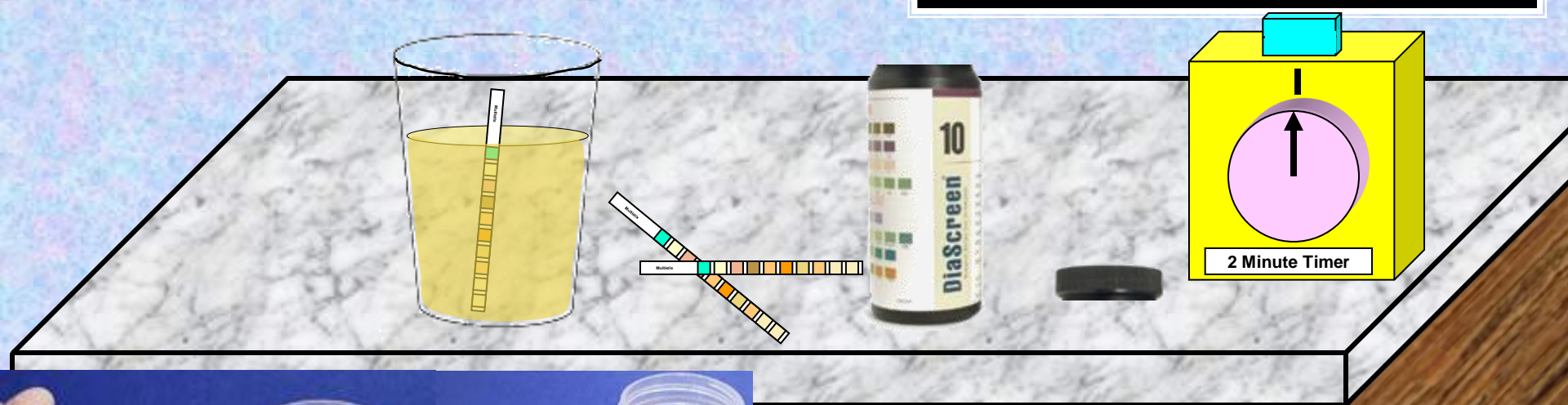
Click on the one of the Chemstix on the table to sample the urine. Now click on the blue button on top of the timer and leave the Chemstix in the urine sample for two minutes.



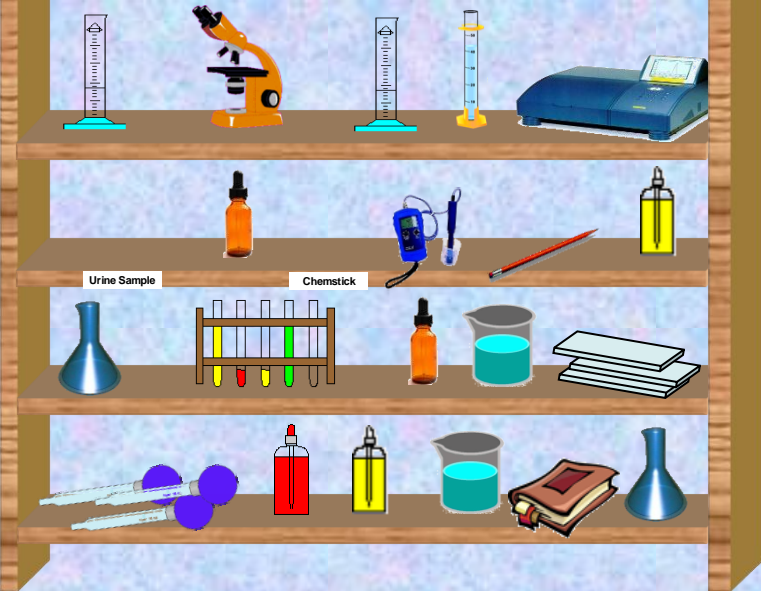
[Click Here to Continue](#)



The color panels on the Chemstix will change color in relation to the characteristics of the urine sample. Each of the color panels is associated specifically with a single urine characteristic.

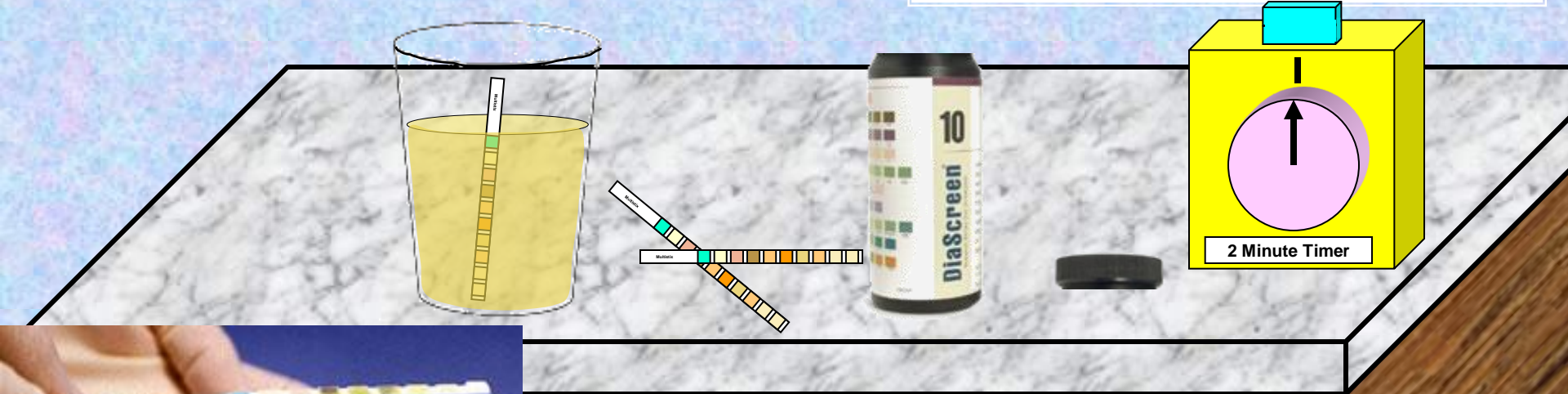


[Click Here to Continue](#)



Click on the CHEMSTIX to view a magnified view of the CHEMSTIX

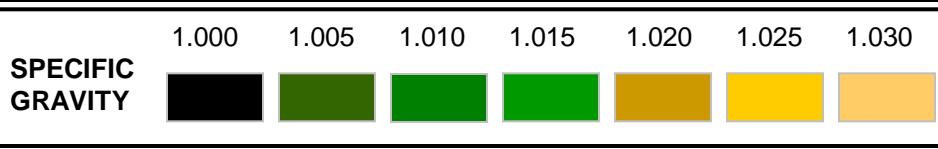
Click on the Chemstix in the urine sample to compare the stick to the color chart to read the Specific Gravity for the sample. Read the color panel indicated by the arrow above the stick.



Click Here to Continue

CHEMSTIX COLOR CHART

Compare the color of the panel indicated by the arrow to the color chart for **Specific Gravity** and record the value indicated in the data table for Chemstix Urinalysis.



Specific Gravity

[Click Here to Continue](#)



pH

The pH is a measure of how acidic or alkaline (basic) the urine is. A urine pH of 4 is strongly acidic, 7 is neutral (neither acidic nor alkaline), and 9 is strongly alkaline.

Sometimes the pH of urine may be adjusted by certain types of treatment. For example, efforts may be made to keep urine either acidic or alkaline to prevent formation of certain types of kidney stones.



[Click Here to Continue](#)

pH

Normal pH for urine ranges from 4.5 – 8.0. Some foods (such as citrus fruit and dairy products) and medications (such as antacids) can affect urine pH. In a diet high in protein the urine is more acidic, while a diet high in vegetable material yields a urine that is more alkaline.

[Click Here to Continue](#)

pH

A high (alkaline) pH can be caused by prolonged vomiting, a kidney disease, some urinary tract infections, and asthma.

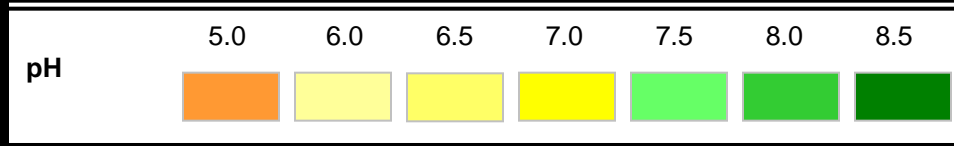
A low (acidic) pH may be a sign of severe lung disease (emphysema), uncontrolled diabetes, aspirin overdose, prolonged diarrhea, dehydration, starvation, drinking an excessive amount of alcohol, or drinking antifreeze (ethylene glycol).

[Click Here to Continue](#)

CHEMSTIX COLOR CHART



Compare the color of the panel indicated by the arrow to the color chart for **pH** and record the value indicated in the data table for Chemstix Urinalysis.



pH

[Click Here to Continue](#)

PROTEIN

Normal urine contains little protein. Negative to trace reactions are usual in concentrated urine. A Chemstix protein reaction greater than 33 in concentrated or dilute urine indicates significant proteinuria. There are numerous causes of proteinuria, the most common of which are urinary tract inflammation, hematuria, and glomerular disease.

[Click Here to Continue](#)

PROTEIN







Proteinuria is usually a sign of kidney disorders, but it may occur normally after strenuous exercise such as marathon running. Fever, strenuous exercise, normal pregnancy, and some diseases (especially kidney disease) may also cause protein in the urine. Protein in the urine can also be caused by heart failure, leukemia, poison (lead or mercury poisoning), or a condition during pregnancy that results in high blood pressure (preeclampsia).

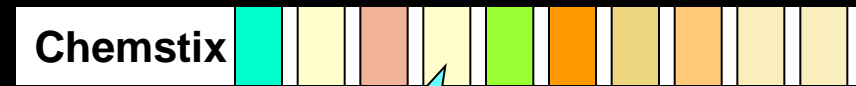
[Click Here to Continue](#)

CHEMSTIX COLOR CHART



Compare the color of the panel indicated by the arrow to the color chart for **Protein** and record the value indicated in the data table for Chemstix Urinalysis.

	Negative	Trace	33	100	200	2000
PROTEIN						



Protein

[Click Here to Continue](#)

GLUCOSE

Glucose is the type of sugar usually found in blood. Normally there is very little or no glucose in urine. However, when the blood sugar level is very high, as in uncontrolled diabetes, it spills over into the urine.

Glycosuria (excess sugar in urine) generally means diabetes mellitus. Glucose can also be present in urine when the kidneys are damaged or diseased.

[Click Here to Continue](#)

GLUCOSE

Some medications can cause glucose in the urine. Excess glucose in the urine is often caused by uncontrolled diabetes. Other conditions that may cause glucose in urine include an adrenal gland problem, liver damage, brain injury, certain types of poisoning, and certain types of kidney diseases that decrease their ability to reabsorb glucose from the urine.

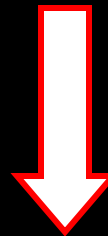
[Click Here to Continue](#)







CHEMSTIX COLOR CHART

Compare the color of the panel indicated by the arrow to the color chart for **Glucose** and record the value indicated in the data table for Chemstix Urinalysis.



Glucose



	Negative	100	250	500	1000	2000
GLUCOSE						

[Click Here to Continue](#)

KETONES

When fat is broken down for energy, the body produces by-products called ketones (or ketone bodies) and releases them into the urine. Common ketones include acetone, acetoacetic acid, and beta-hydroxybutyric acid. Normally there are no ketones in the urine.

[Click Here to Continue](#)

KETONES

Large amounts of ketones in the urine may signal a dangerous condition known as diabetic ketoacidosis. Ketones in the urine can indicate poorly controlled diabetes, a very low-carbohydrate diet, starvation (including disorders that result in poor nutrition such as anorexia nervosa or bulimia), alcoholism, or poisoning from drinking rubbing alcohol (isopropanol).

[Click Here to Continue](#)

KETONES

Ketones are often found in the urine when a person does not eat (fasts) for 18 hours or longer. This may occur when a person is sick and avoids food or vomits for an extended period of time. Low levels of ketones are sometimes found in the urine of a healthy pregnant woman.






[Click Here to Continue](#)

CHEMSTIX COLOR CHART

Compare the color of the panel indicated by the arrow to the color chart for **Ketone** and record the value indicated in the data table for Chemstix Urinalysis.



Ketones

	Negative	Trace	Small	Moderate	Large	X Large
KETONE						

[Click Here to Continue](#)

NITRITES

A positive nitrite test indicates that bacteria may be present in significant numbers in urine. Gram negative rods such as E. coli are more likely to give a positive test. High nitrite levels indicate an infection.

[Click Here to Continue](#)

CHEMSTIX COLOR CHART

Compare the color of the panel indicated by the arrow to the color chart for **Nitrites** and record the value indicated in the data table for Chemstix Urinalysis.

NITRITE

Negative



←-----Positive-----→

(Any degree of color change)



Chemstix

Nitrites

[Click Here to Continue](#)

BLOOD

This test is based on detection of the molecules of heme (present in hemoglobin or myoglobin). Blood in the urine (hematuria) is detectable by Chemstix and confirmed by viewing the urine with a microscope. Sometimes the urine contains enough blood to be visible, making the urine appear red or brown.

[Click Here to Continue](#)

CHEMSTIX COLOR CHART



Compare the color of the panel indicated by the arrow to the color chart for **Blood** and record the value indicated in the data table for Chemstix Urinalysis.

Chemstix



Blood

BLOOD

Negative	Trace	Moderate	Trace	Small	Moderate	Large
Non-Hemolyzed			Hemolyzed			

[Click Here to Continue](#)

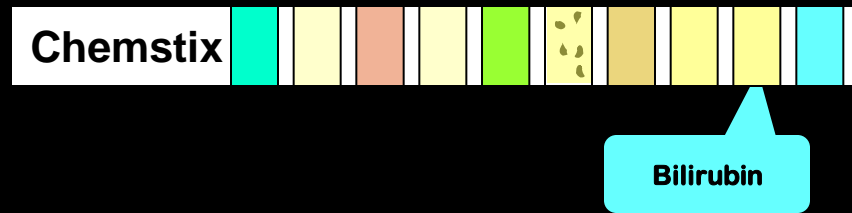
BILIRUBIN




The color change indicating a positive reaction, however, is a rather subtle transition among shades of beige, and sometimes is obscured by color inherent in the urine itself. Detection of bilirubin in urine is generally an abnormal finding. Bilirubinuria generally results when conjugated bilirubin levels in blood are elevated as a result of hepatobiliary disease.

[Click Here to Continue](#)

CHEMSTIX COLOR CHART

Compare the color of the panel indicated by the arrow to the color chart for **Bilirubin** and record the value indicated in the data table for Chemstix Urinalysis.



	Negative	Small	Moderate	Large
BILIRUBIN				

Click Here to Continue

LEUKOCYTE

Leukocyte esterase (an enzyme found in certain white blood cells) in the urine can be detected by Chemstix. Leukocyte esterase is a sign of inflammation, which is most commonly caused by a urinary tract infection. A positive leukocyte esterase test results from the presence of white blood cells either as whole cells or as lysed cells.



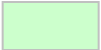


[Click Here to Continue](#)

LEUKOCYTE

A negative leukocyte esterase test means that an infection is unlikely and that, without additional evidence of urinary tract infection, microscopic exam and/or urine culture need not be done to rule out significant bacterial infection in the urinary tract.

[Click Here to Continue](#)

CHEMSTIX COLOR CHART

	Negative	Trace	Small	Moderate	Large
LEUKOCYTES					



Compare the color of the panel indicated by the arrow to the color chart for **Leukocytes** and record the value indicated in the data table for Chemstix Urinalysis.



Leukocytes

[Click Here to Continue](#)

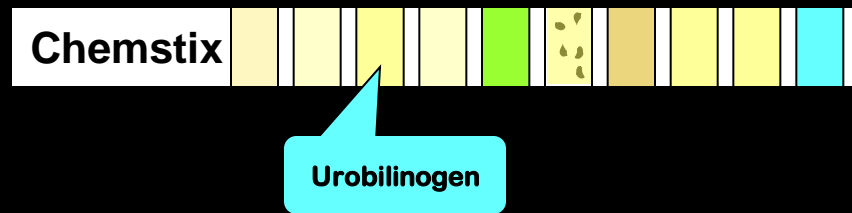
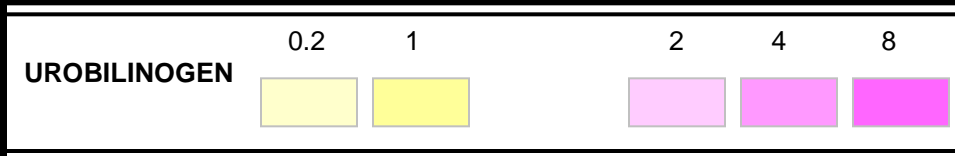
UROBILINOGEN

Normal ranges of urobilinogen are 0.2 to 1. Increases in the secretion of urobilinogen indicate significant hemolysis of erythrocytes to the point that the liver cannot process the bilirubin. The bilirubin increases in the plasma and the formation of urobilinogen in the intestines increases as well. The urobilinogen diffuses into the blood, where it is filtered by the kidneys.

[Click Here to Continue](#)

CHEMSTIX COLOR CHART

Compare the color of the panel indicated by the arrow to the color chart for **Urobilinogen** and record the value indicated in the data table for Chemstix Urinalysis.



[Click Here to Continue](#)

CHEMSTIX URINALYSIS

You have now finished the Chemstix Urinalysis. Be sure that you have entered all the data required for the Data Table. If you need to perform the Chemstix Urinalysis again, you can use the links below.

**Click Here to Return to
start of Chemstix
Urinalysis**

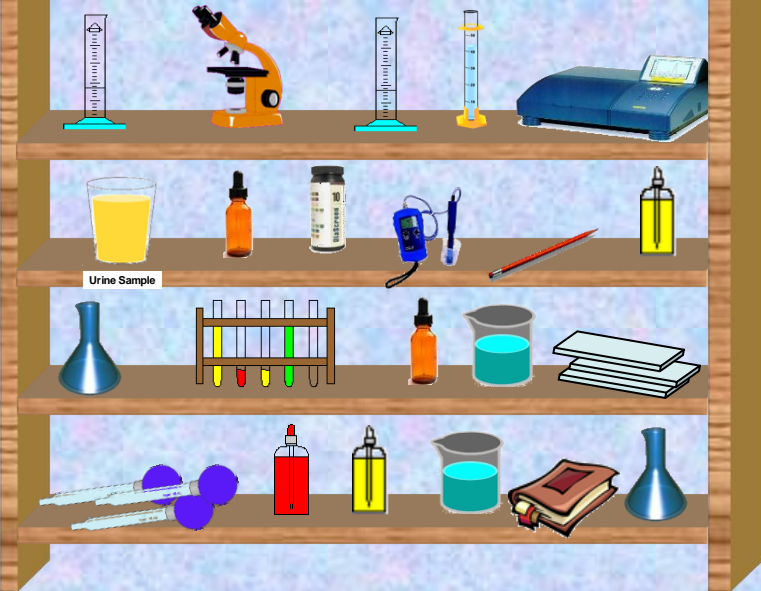
**Click Here to
Continue**

MICROSCOPIC OBSERVATIONS



**Click Here to
Go Back to
where you
came from**

**Click Here to
Continue**



URINALYSIS LAB

At any point you can use your escape key to end the lab

**Click Here to
Go Directly to
Macroscopic
Observations**

**Click Here to
Go Directly to
Chemstix
Urinalysis**

**Click Here to
Go Directly to
Microscopic
Observations**

**Click Here to
Go Directly to
Urinalysis
Questions**

**Click Here to
Continue**

MICROSCOPIC ANALYSIS

Sediment in urine can be examined under a microscope to provide information about a possible kidney or urinary tract disorder. Normally, urine contains a small number of cells and other debris shed from the inside of the urinary tract. A person who has a kidney or urinary tract disorder usually sheds more cells, which form a sediment if urine is centrifuged or allowed to settle.

[Click Here to Continue](#)

MICROSCOPIC ANALYSIS

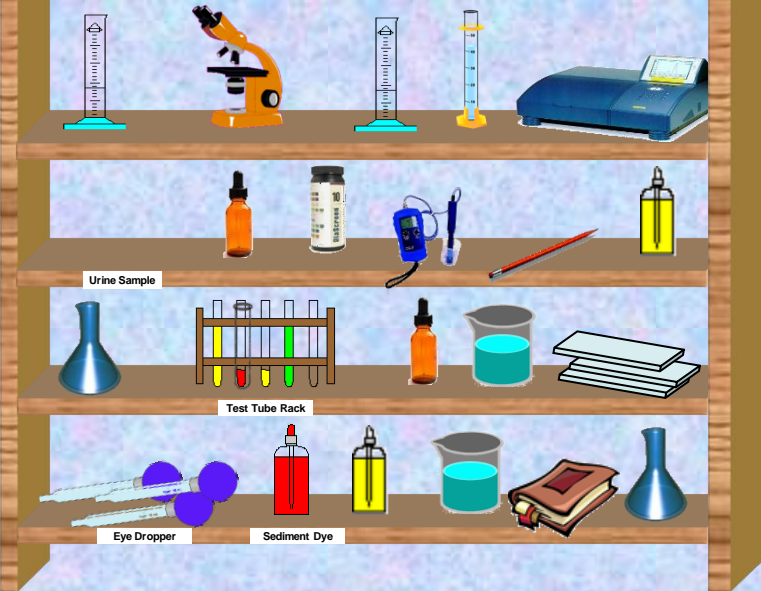
In this test, urine is spun in a centrifuge so the solid materials (sediment) settle out.

The sediment is spread on a slide and examined under a microscope.

Types of materials that may be found include:

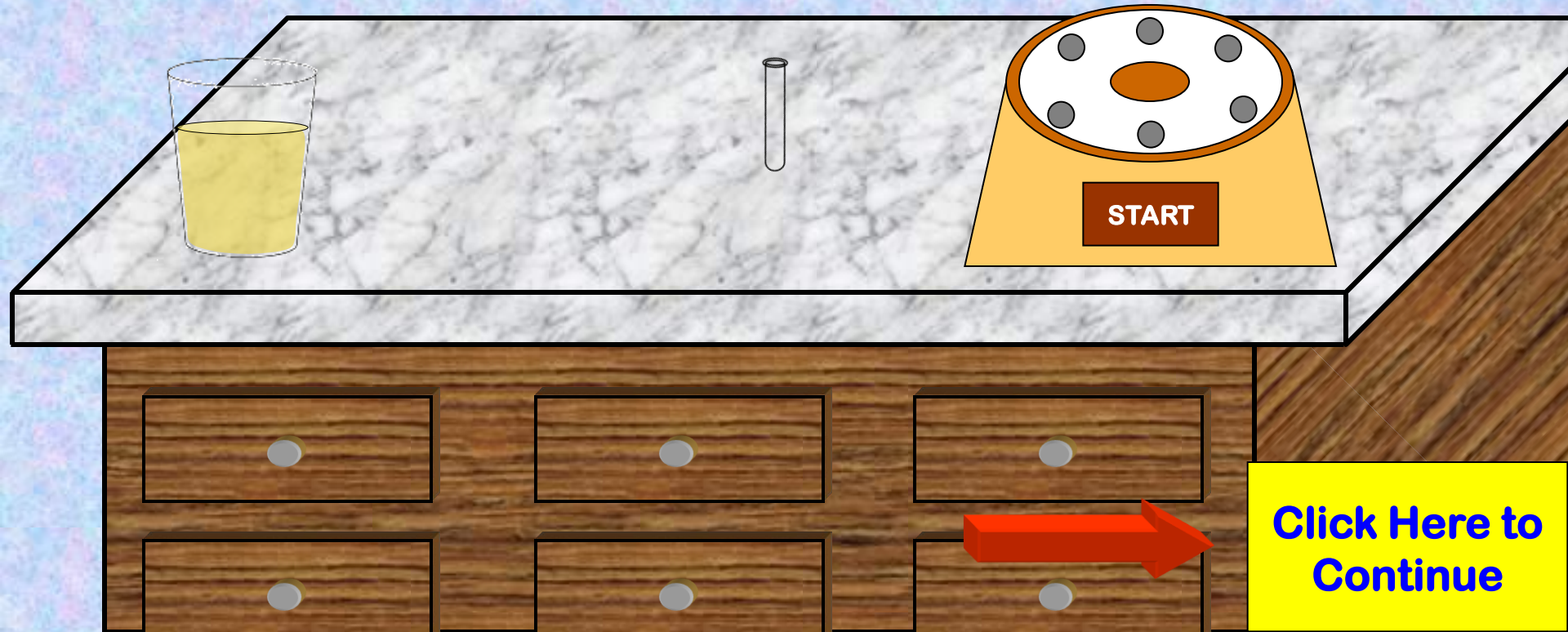
- Microorganisms
- Cells
- Crystals
- Casts and Fibers

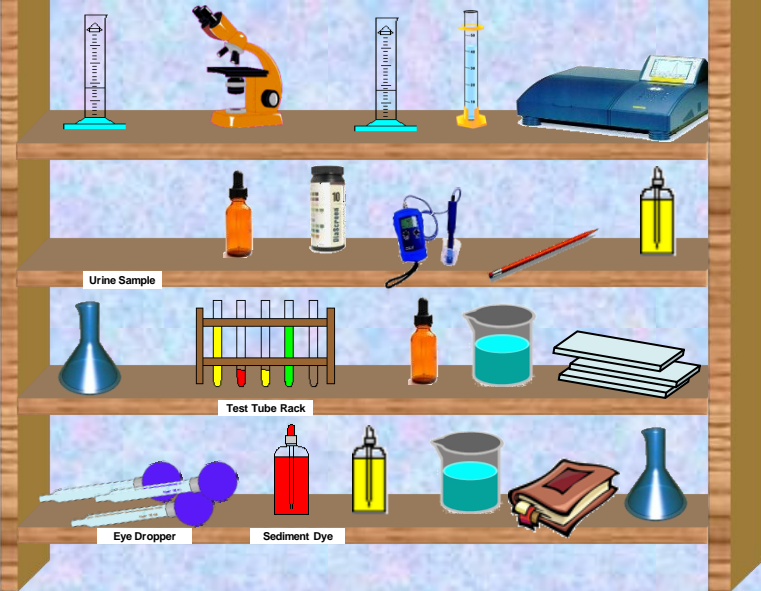
[Click Here to Continue](#)



MICROSCOPIC ANALYSIS

Click on the test tube rack to acquire a test tube to fill with a portion of the urine sample.

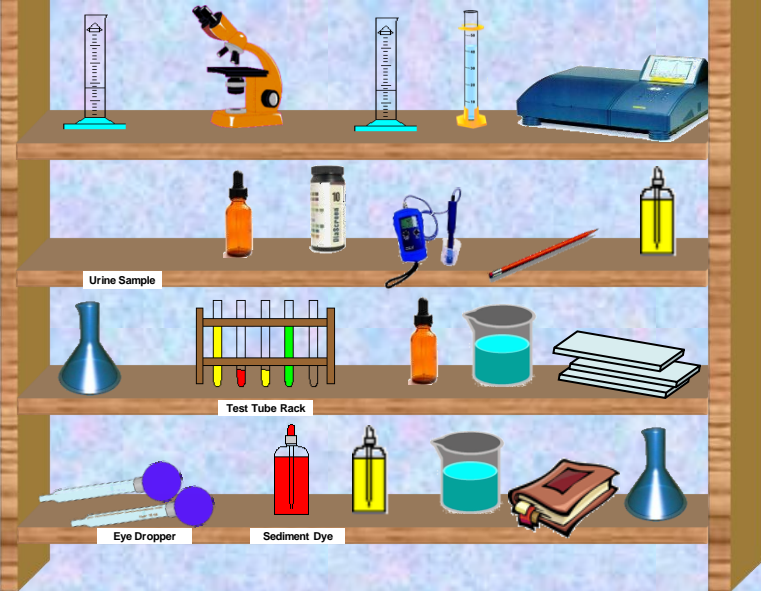




MICROSCOPIC ANALYSIS

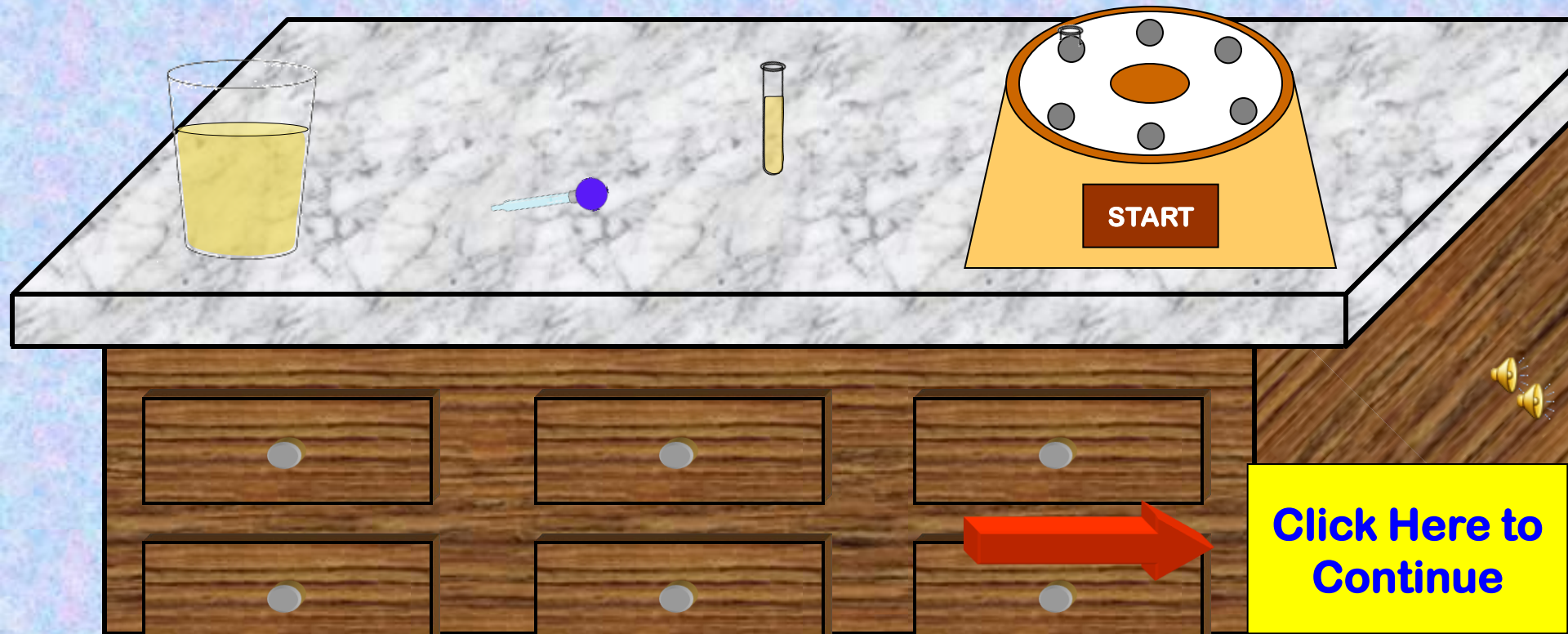
Click on one of the blue eye droppers to bring a portion of the urine sample to the test tube.

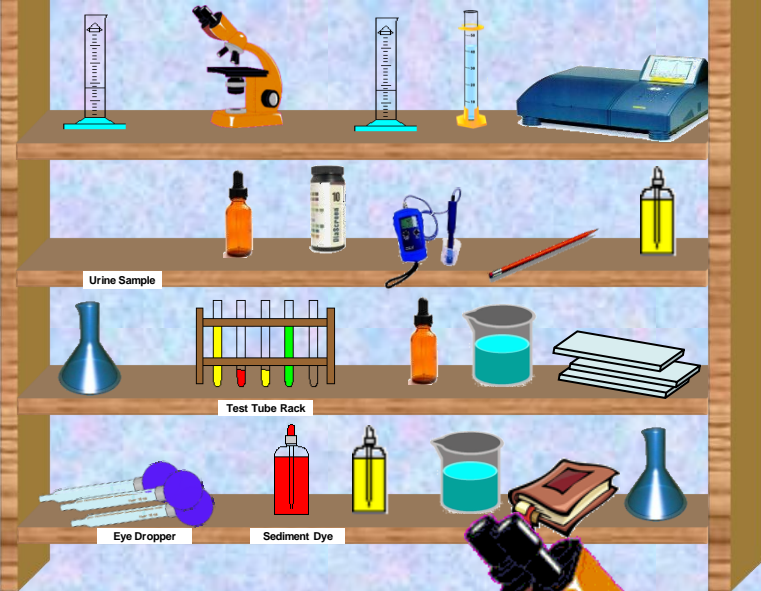




MICROSCOPIC ANALYSIS

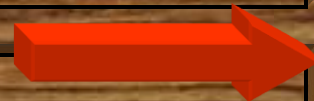
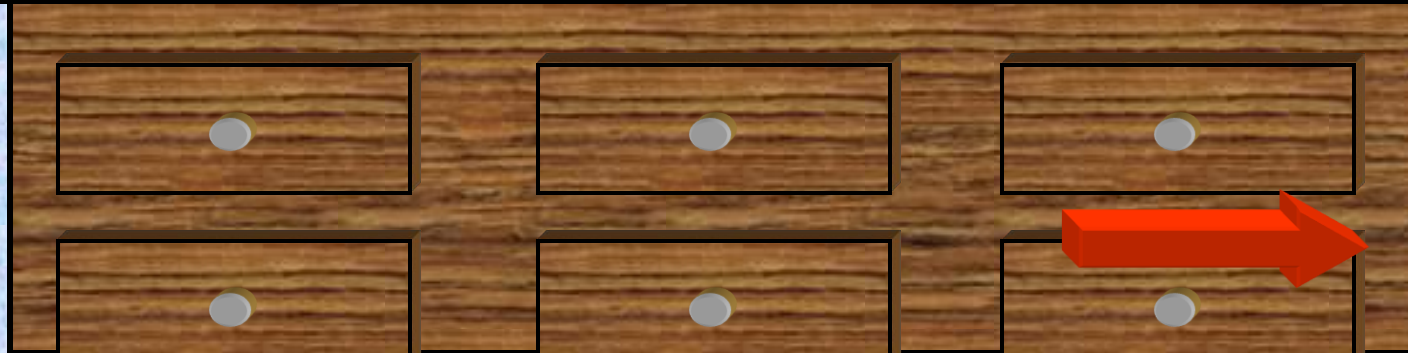
Click on the test tube to insert it into the centrifuge. Next click on the start button to centrifuge for two minutes.





MICROSCOPIC ANALYSIS

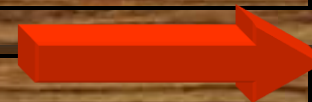
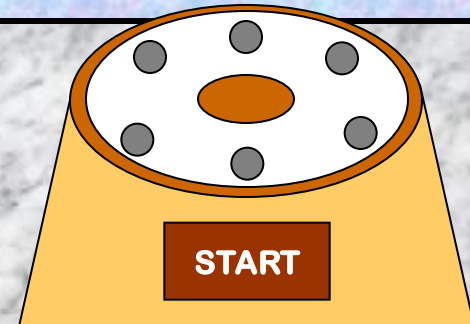
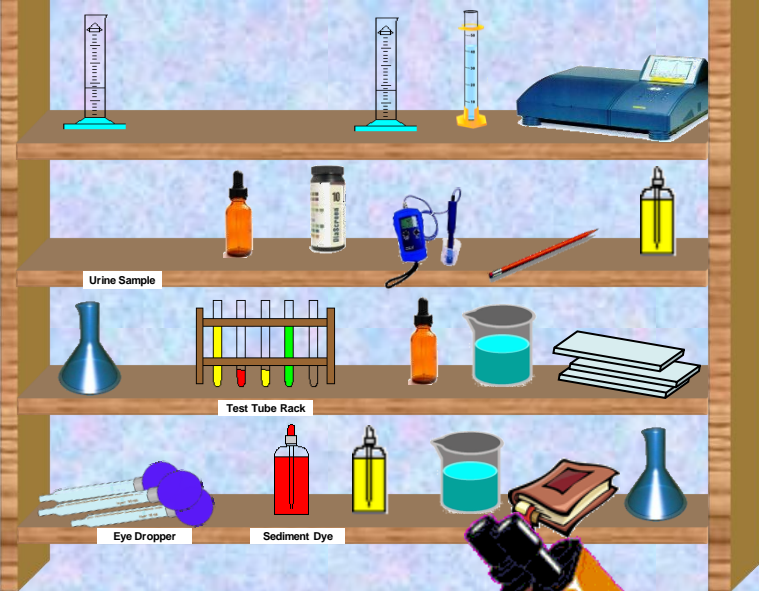
Click on the test tube in the centrifuge to bring it to the table. Notice the sediment that has collected at the bottom of the test tube. Next click on the microscope to bring it to the table.



Click Here to Continue

MICROSCOPIC ANALYSIS

Click on one of the slides to bring it to the microscope stage. Next click on the blue eyedropper to sample the sediment at the bottom of the test tube.



Click Here to Continue

MICROSCOPIC ANALYSIS

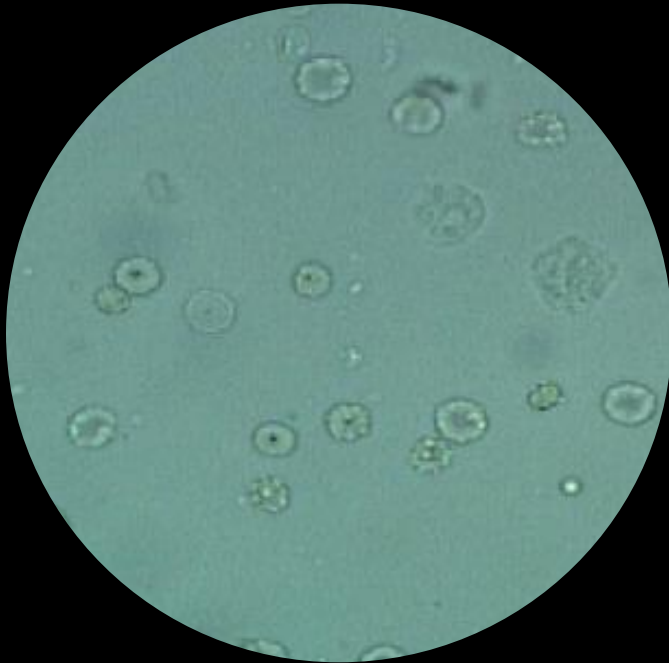
After discussions on the sediments following these slides you will be able to view the microscope slide for sediments.

The sediment is first examined under Low power (about 100 X) to identify most crystals, casts, epithelial cells, and other large objects.

[Click Here to Continue](#)

MICROSCOPIC ANALYSIS

Click on the eye piece of the microscope to view the urine sediment sample. You are currently on **Low** power (about 10x magnification). We will return later to view.



RT

[Click Here to Continue](#)

MICROSCOPIC ANALYSIS

Next, examination is carried out at High power (about 400 X) to identify crystals, cells, and bacteria.

Again, remember you will be able to view these slides again after a discussion of the characters in the sediment.

[Click Here to Continue](#)

MICROSCOPIC ANALYSIS

Click on the eye piece of the microscope to view the urine sediment sample. You are viewing on **High** power (40 X). We will return these slides.



[Click Here to Continue](#)

MICROSCOPIC ANALYSIS

Normally very few or no red or white blood cells or casts are seen. No bacteria, yeast cells, or parasites are present. A few crystals are usually normal.

[Click Here to Continue](#)

MICROSCOPIC ANALYSIS

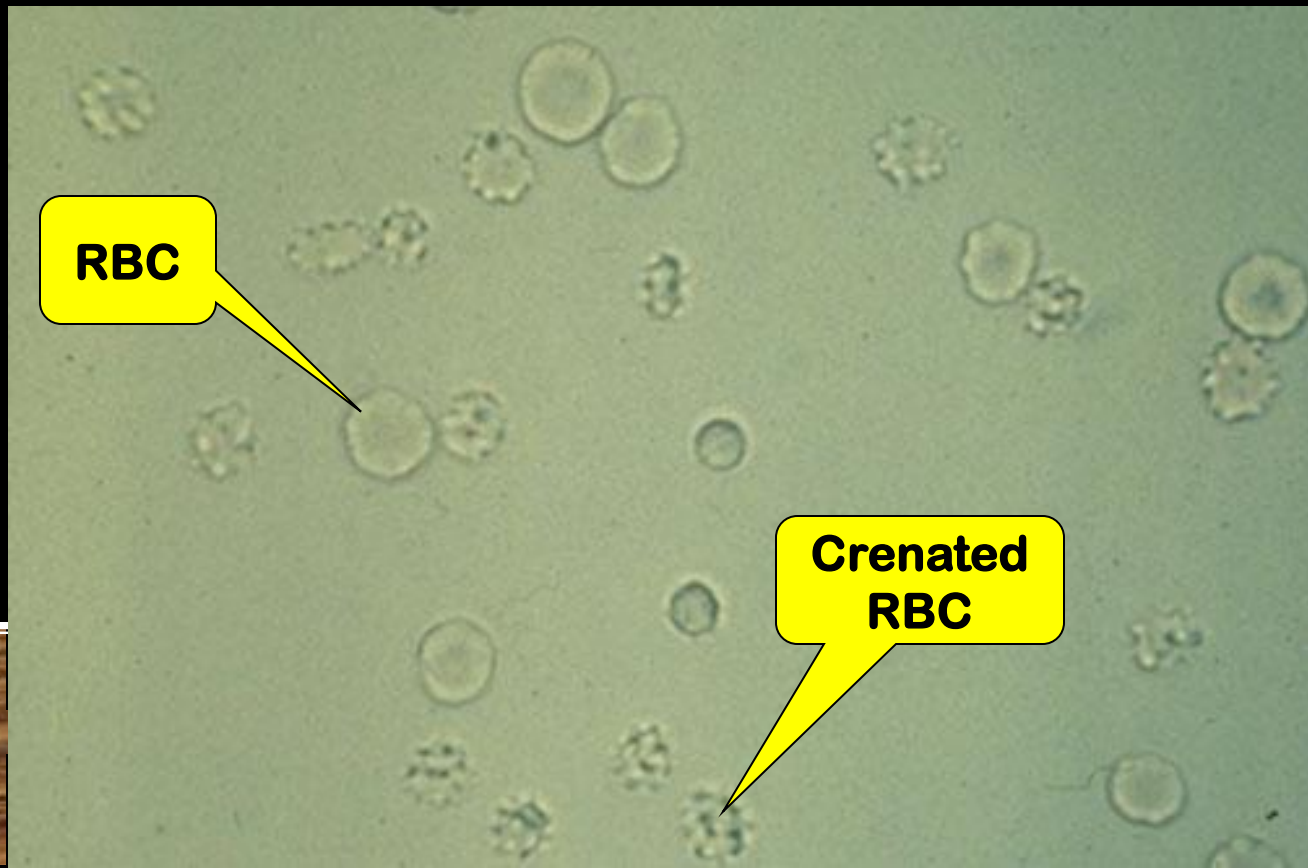
In the sample you have looked at under the microscope, we will attempt to quantify and identify if the following are present in our sediment sample:

- Red blood cells
- White blood cells
- Casts
- Epithelial cells
- Bacteria
- Crystals

[Click Here to Continue](#)

RED BLOOD CELLS

Red blood cells in urine appear as shiny disks. With hypertonicity of the urine, the RBC's begin to have a crenated appearance.



RBC

**Crenated
RBC**

**Click Here to
Continue**

RED BLOOD CELLS

Red blood cells are reported quantitatively as number seen per **High** power field (HPF):

none seen

<5

5-20

20-100

>100



Red blood cells are normal in urine in low numbers. Up to 5 RBC/HPF generally are considered acceptable.

[Click Here to Continue](#)

RED BLOOD CELLS

Hematuria is the presence of abnormal numbers of red blood cells in urine due to glomerular damage, kidney trauma, urinary tract stones, urinary tract infections, blood toxins, and physical stress. Red cells may also contaminate the urine from the vagina in menstruating women. Theoretically, no red blood cells should be found, but some find their way into the urine even in very healthy individuals.

[Click Here to Continue](#)

WHITE BLOOD CELLS

These white blood cells in urine have lobed nuclei and shiny cytoplasmic granules.



WBC with 3
lobed nuclei

[Click Here to
Continue](#)

WHITE BLOOD CELLS

The various types of cells are usually described as the number of each type found per average high power field (HPF).

Example: 1-5 WBC/HPF

If two or more white blood cells appear in the **High** power field the specimen is probably abnormal. White blood cells have lobed nuclei and granular cytoplasm.

[Click Here to Continue](#)

WHITE BLOOD CELLS

Pyuria refers to the presence of abnormal numbers of WBC that may appear with infection in the urinary tract. WBC from the vagina, especially in the presence of vaginal and cervical infections, or the urethra in men and women may contaminate the urine.



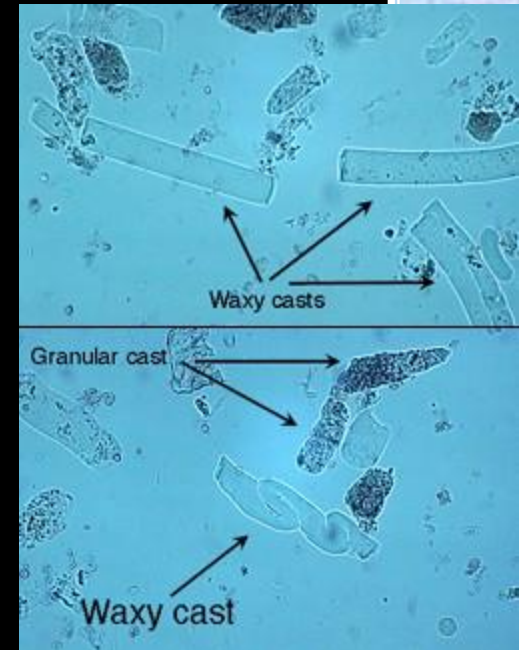
WBC

RBC

[Click Here to Continue](#)

CASTS

Some types of kidney disease can cause plugs of material (called casts) to form in the nephrons of the kidneys. Casts are cylindrical protein-based molds of the nephron tubule which can then get flushed out into the urine. Casts can be made of different types of material, such as red or white blood cells, waxy or fatty substances, or protein. The type and make-up of cast can provide clues about the type of kidney disease that may be present.



[Click Here to Continue](#)

CASTS

Depending on the type, casts can indicate inflammation or damage to the nephrons in the kidneys, poor blood supply to the kidneys, metal poisoning (such as lead or mercury), heart failure, or a bacterial infection. They are absent or very few in urine samples. The numbers of casts seen are usually reported as number of each type found per **Low** power field (LPF). Example: 5-10 casts/LPF.



[Click Here to Continue](#)

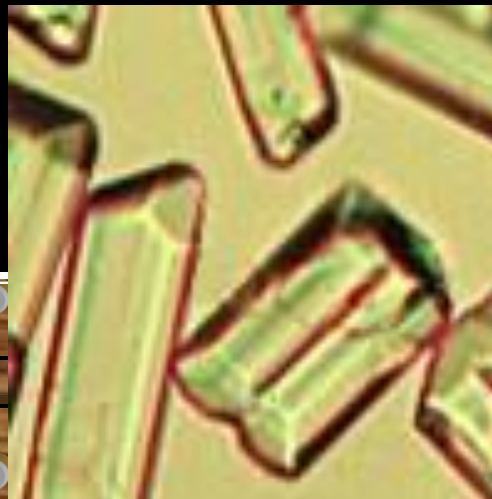
CRYSTALS

Healthy people often have only a few crystals in their urine. However, a large number of crystals, or the presence of certain types of crystals, may indicate kidney stones or a problem with how the body is using food (metabolism). Some medications and certain types of urinary tract infections can also increase the number of crystals in urine.

[Click Here to Continue](#)

CRYSTALS

Most often, crystals in routine urine sediment preps are without significance. Several different types can be seen in normal samples. A few specific types, however, can be important in certain clinical situations. Shown below are struvite crystals (magnesium ammonium phosphate), which are a common finding in normal urine.



[Click Here to Continue](#)

MICROORGANISMS

Normally there are no bacteria, yeast cells, or parasites in urine. Bacteria are too few to count in cleanly collected fresh urine from healthy individuals. Their presence can indicate an infection. Bacteria in the urine indicate a urinary tract infection (UTI). Yeast cells or parasites (such as the parasite that causes trichomoniasis) can indicate an infection of the urinary tract.

[Click Here to Continue](#)

MICROORGANISMS

Bacteria can be common in urine specimens because of the abundant normal microbial flora of the vagina or male urethra and because of their ability to rapidly multiply in urine standing at room temperature. Therefore, microbial organisms found in all but the most scrupulously collected urines should be interpreted in view of clinical symptoms.



[Click Here to Continue](#)

MICROORGANISMS

Diagnosis of bacteriuria in a case of suspected urinary tract infection requires culture. A colony count may also be done to see if significant numbers of bacteria are present. Generally, more than 100,000/ml of one organism reflects significant bacteriuria.

[Click Here to Continue](#)

MICROORGANISMS

Yeast cells are often difficult to distinguish from red blood cells and some crystals but are distinguished by their tendency to bud. Most often they are *Candida*, which may colonize bladder, urethra, or vagina.



[Click Here to Continue](#)

EPITHELIAL CELLS

Renal tubular epithelial cells, usually larger than white blood cells, contain a large round or oval nucleus and normally slough into the urine in small numbers. However, with nephrotic syndrome and in conditions leading to tubular degeneration, the number sloughed is increased.

[Click Here to Continue](#)

EPITHELIAL CELLS

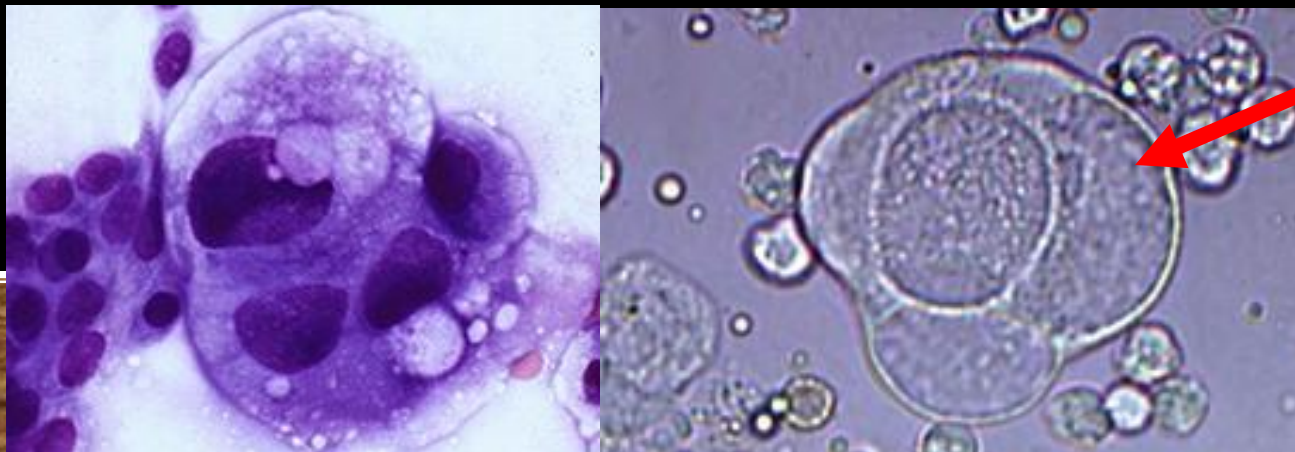
Epithelial cells in urine are generally of little specific diagnostic utility. Cells lining the urinary tract at any level may slough into the urine. In the case of voided samples, even cells from the genital tract can appear in the sample. Most commonly seen are epithelial cells from the urethra, vulva, bladder and urethra.



[Click Here to Continue](#)

CANCER CELLS

Microscopic examination of the urine to look for cancer cells, is sometimes useful in diagnosing cancers of the kidneys and urinary tract. For people at high risk (for example, smokers, petrochemical workers, and people with painless bleeding) urine sediment analysis may be used to screen for cancer of the bladder and kidneys.

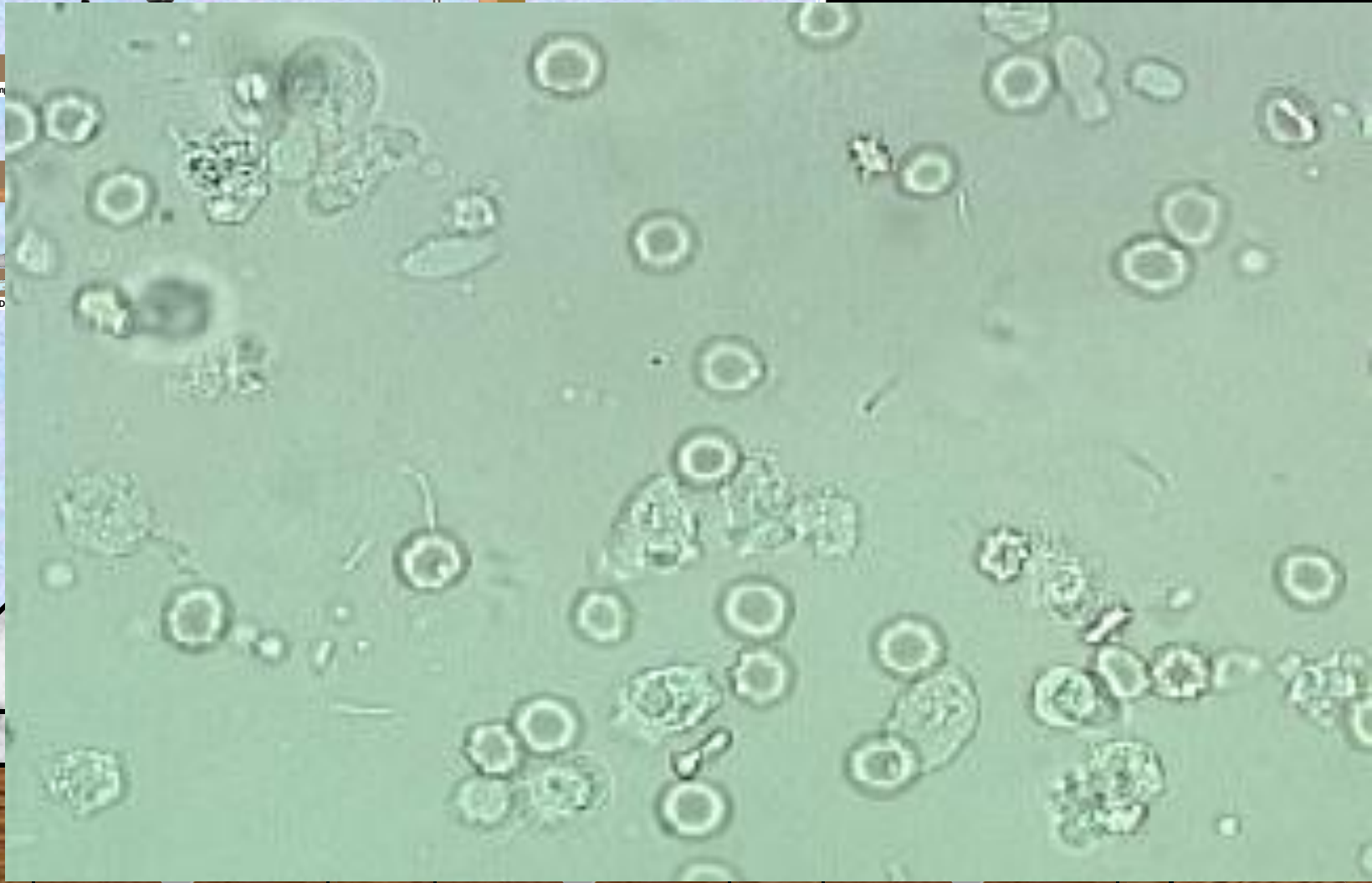


[Click Here to Continue](#)

MICROSCOPIC ANALYSIS

Click on the eye piece to view

the
data



Urine Sam

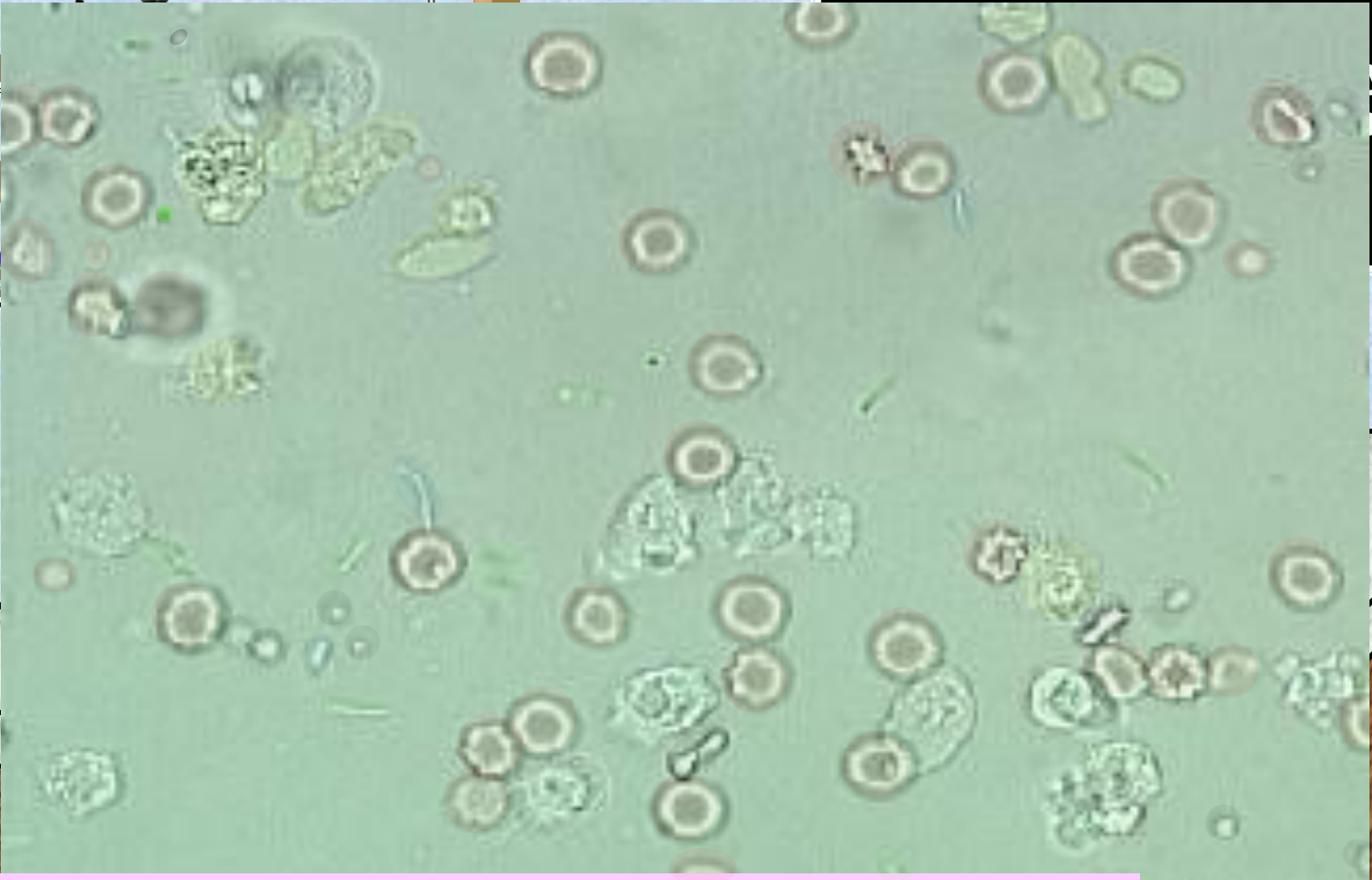
Eye D

On the next slide you will be able to click your mouse cursor on any of the sediment parts you see in the microscope to identify them. [Click Here to Continue](#) to the next slide.

[Click Here to Continue](#)

MICROSCOPIC ANALYSIS

Click on the eye piece to



Urine Samp

Eye Di

y
r

Move your mouse cursor over any of the sediment particles that you see in the microscopic image above. The sediments will be identified for you. You will need to click on the hyperlink below the image identification to return back to here. When you are finished identifying the sediment particles enter your findings in the data sheets and click on the yellow hyperlink to the right to continue with the lab.

[Click Here to Continue](#)

MICROSCOPIC OBSERVATIONS

You have now finished the Microscopic Observations. Be sure that you have entered all the data required for the Data Table. If you need to perform the Microscopic Observations again, you can use the links below. Click on **CONTINUE** to answer questions on the Urinalysis Lab.

[Click Here to Return to start of Microscopic Observations](#)

[Click Here to Continue](#)

URINALYSIS QUESTIONS

- 1) What metabolic by-product from hemoglobin colors the urine yellow?
- 2) How can adequate water intake be judged by the color of urine?
- 3) What is hematuria?
- 4) What is the normal value for glucose in the urine?
- 5) What is ketonuria
- 6) Elevated levels of white blood cells produce what condition in urine?
- 7) What cells would be found in urine that come from the urethra or bladder?

[Click Here to Print Urinalysis Questions](#)

[Click Here to Return to last slide viewed](#)

[Click Here to Continue](#)

URINALYSIS

You have now completed the Urinalysis lab.
You will need to include the following in
your lab report.

Macroscopic Observations Data Table
Chemstix Urinalysis Data Table
Microscopic Observations Data Table
Answers to Questions 1-7

**Click Here to Simply End
the Urinalysis Lab**

**Click Here to
Go Directly to
Macroscopic
Observations**

**Click Here to
Go Directly to
Chemstix
Urinalysis**

**Click Here to
Go Directly to
Microscopic
Observations**

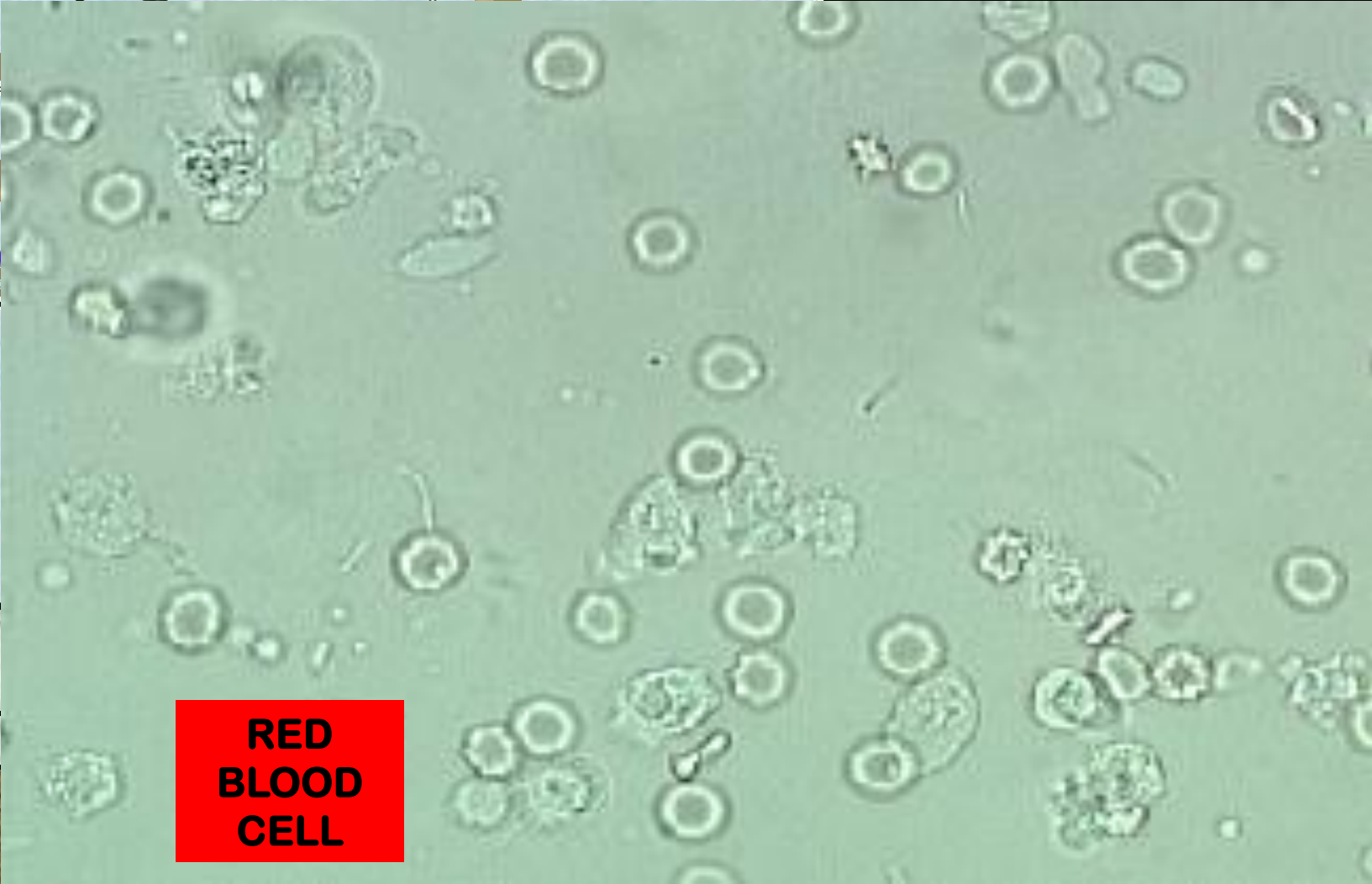
**Click Here to
Go Directly to
Urinalysis
Questions**

REFERENCE

- **The following pages are for reference for the Microscopic Analysis**

MICROSCOPIC ANALYSIS

Click on the eye piece to



**RED
BLOOD
CELL**

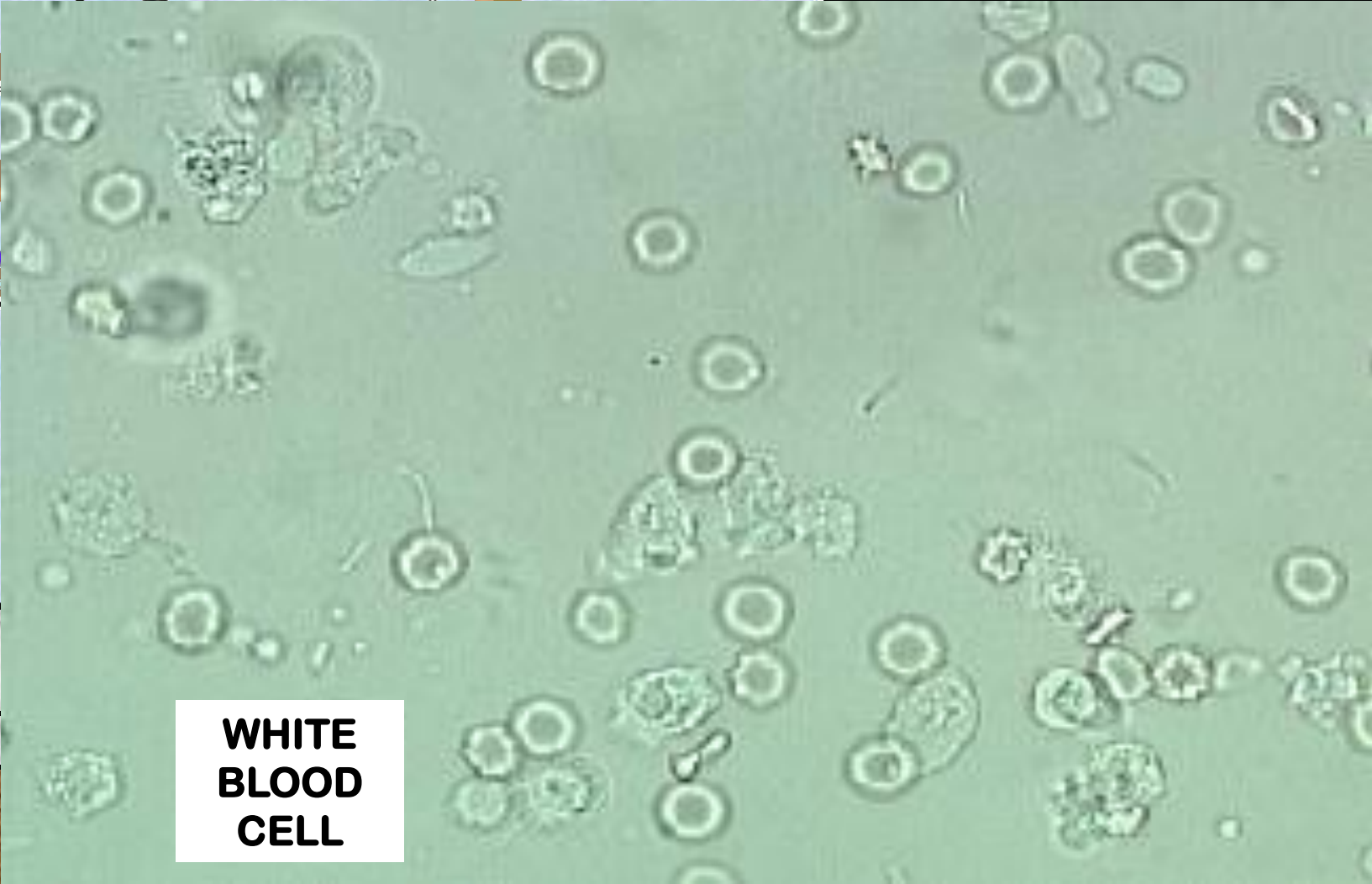
**Click Here to Identify
other Sediment Particles**

Urine Samp

Eye Di

MICROSCOPIC ANALYSIS

Click on the eye piece to



**WHITE
BLOOD
CELL**

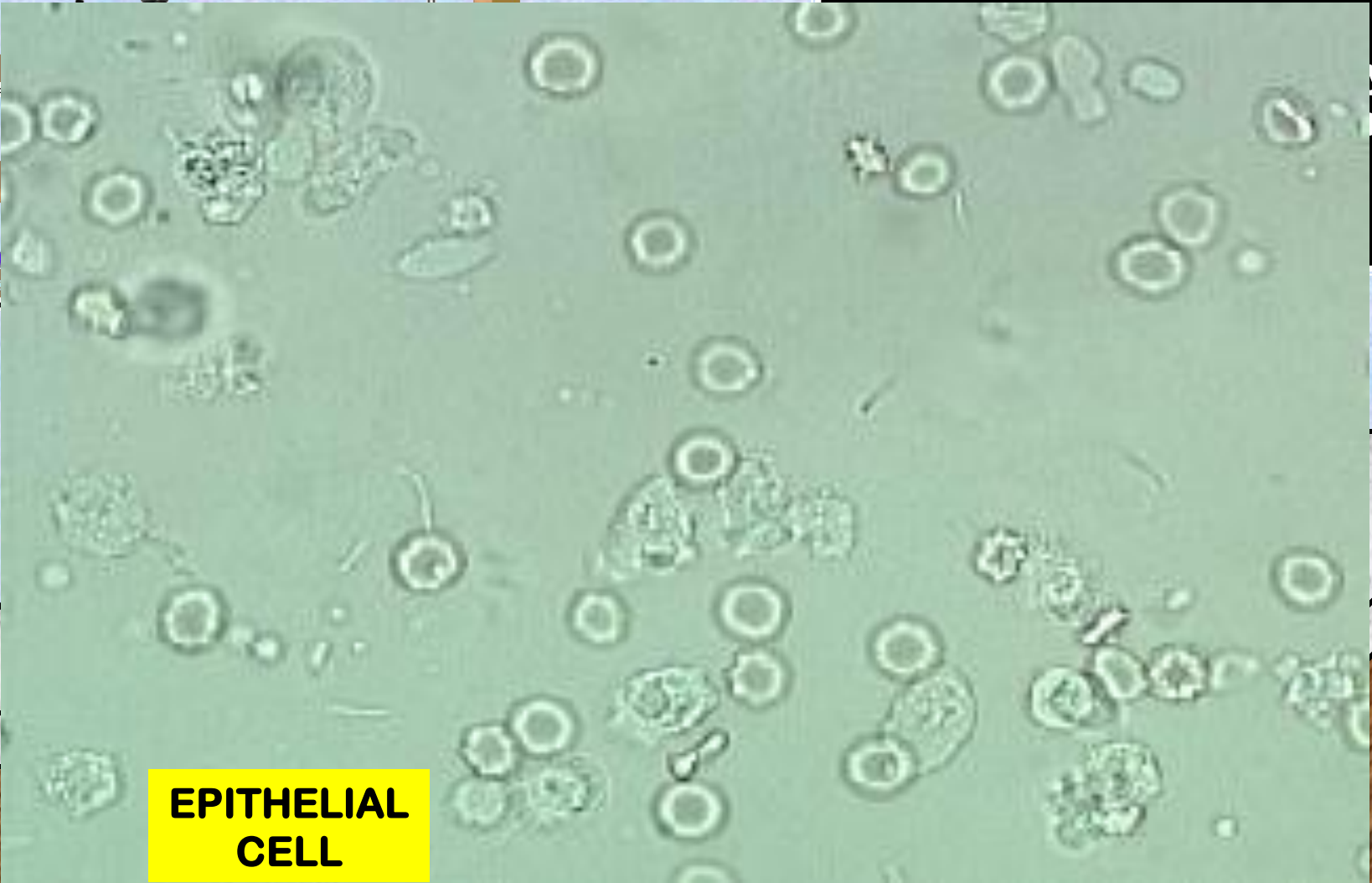
**Click Here to Identify
other Sediment Particles**

Urine Samp

Eye Di

MICROSCOPIC ANALYSIS

Click on the eye piece to



**EPITHELIAL
CELL**

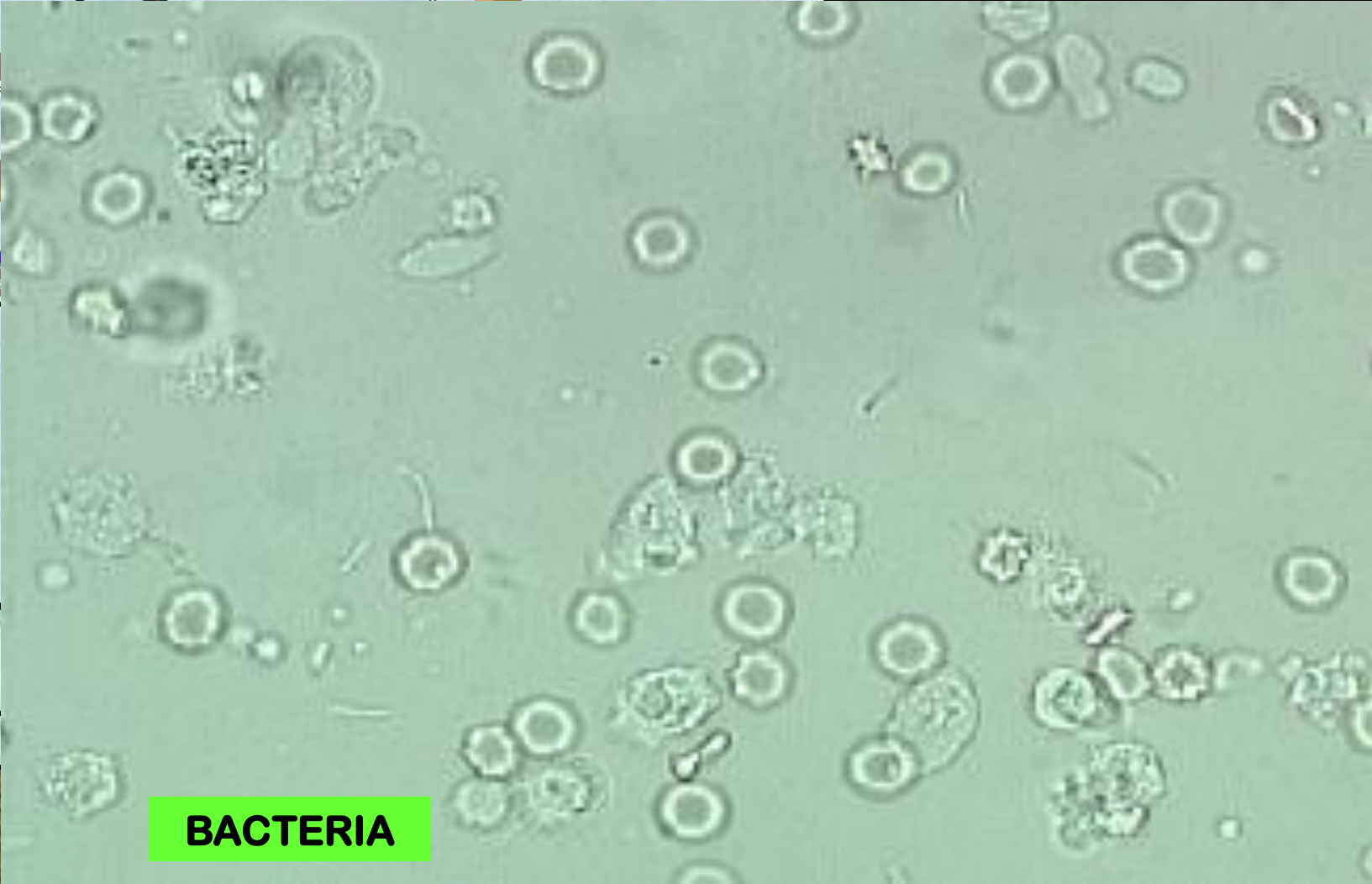
**Click Here to Identify
other Sediment Particles**

Urine Samp

Eye Di

MICROSCOPIC ANALYSIS

Click on the eye piece to



BACTERIA

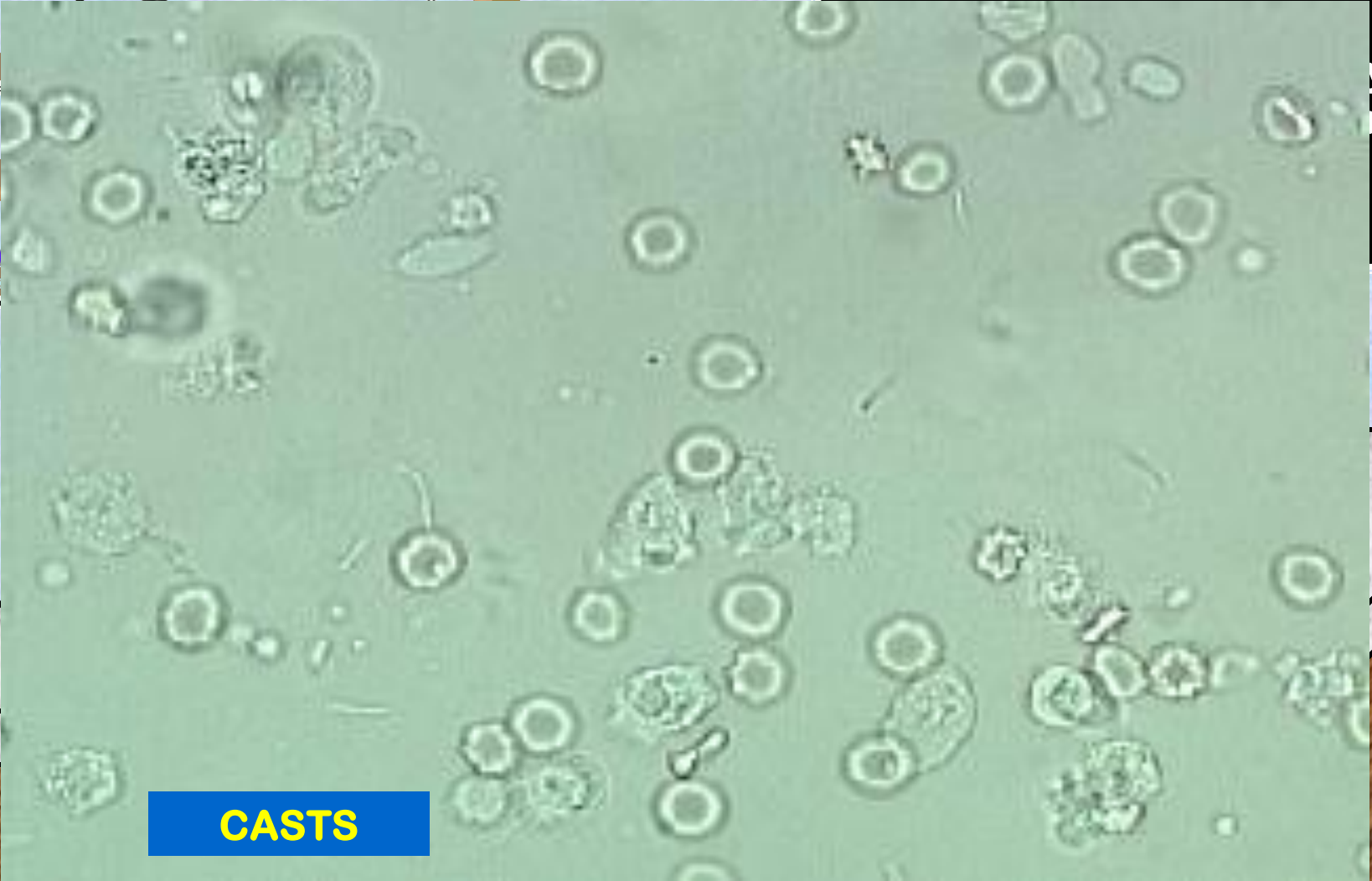
[Click Here to Identify
other Sediment Particles](#)

Urine Samp

Eye Di

MICROSCOPIC ANALYSIS

Click on the eye piece to



CASTS

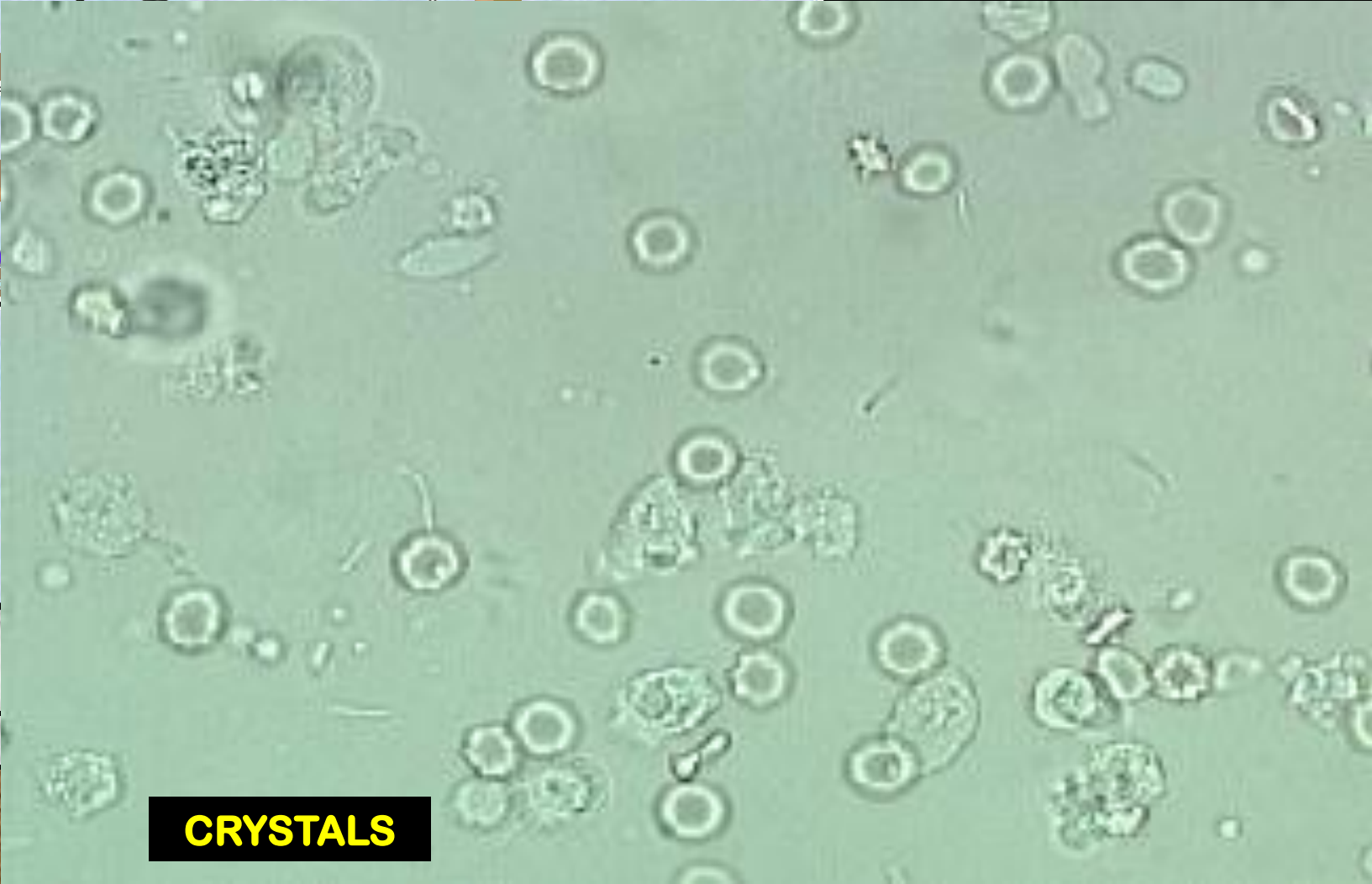
**Click Here to Identify
other Sediment Particles**

Urine Samp

Eye D

MICROSCOPIC ANALYSIS

Click on the eye piece to



CRYSTALS

[Click Here to Identify
other Sediment Particles](#)

Urine Samp

Eye Di

DATA SHEETS

- The following are three data sheets to be used in the lab

MACROSCOPIC OBSERVATIONS DATA SHEET

Characteristic	Normal Value or Range	Measured Results (Circle One)	Diagnosis (use a √)		Possible Causes (Enter only if abnormal)
			Normal	Abnormal	
COLOR		Colorless Light to medium yellow Very dark yellow Red to brownish red Reddish brown to brown Greenish tint			
TURBIDITY		Clear Slightly cloudy Cloudy Opaque Flocculent			
ODOR		Odorless Musty Nutty Sweet & Fruity Maple syrup			

[Click Here for a printable version of this Data Sheet](#)

[Click Here to Return](#)

[Click Here for a printable version of this Data Sheet](#)

CHEMSTIX URINALYSIS DATA SHEET

[Click Here to Return](#)

Characteristic	Normal Value or Range	Measured Results	Diagnosis (use a √)		Possible Causes (Enter only if abnormal)
			Normal	Abnormal	
Specific Gravity					
pH					
Protein					
Glucose					
Ketone					
Nitrite					
Blood					
Bilirubin					
Leukocytes					
Urobilinogen					

MICROSCOPIC OBSERVATIONS DATA SHEET

Observed Character	Normal Value or Range	Measured Results	Diagnosis (use a ✓)		Possible Causes (Enter only if abnormal)
			Normal	Abnormal	
Red Blood Cells					
White Blood Cells					
Casts					
Crystals					
Microorganisms					
Epithelial Cells					
Cancer Cells					

[Click Here for a printable version of this Data Sheet](#)

[Click Here to Return](#)