



**Department of Medical Education & Clinical Biochemistry Unit
Department of Pathology, College of Medicine
King Saud University**

Practical Biochemistry

Measurement of Glucose in Blood and Urine

Practical Biochemistry

Endocrine Block Year 2 Medicine

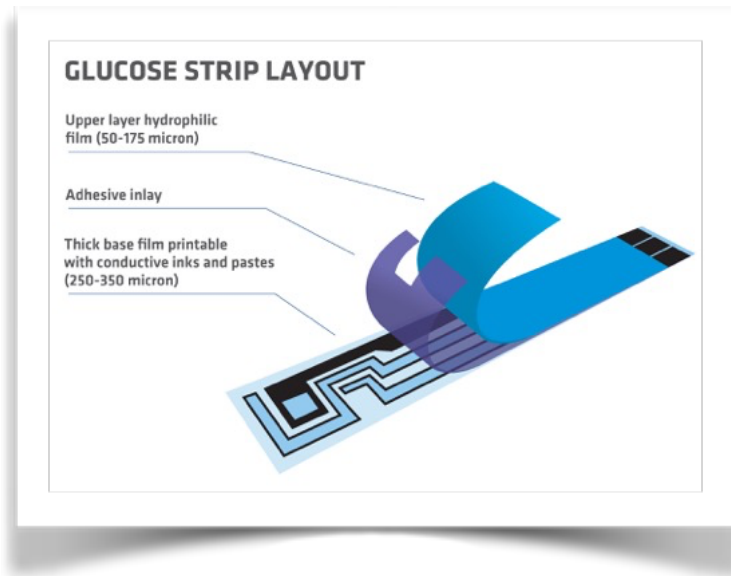
Tutors	All Biochemistry academic staff	
Time	2 Hours	
Place	Males:	Biochemistry Teaching Lab, College of Medicine
	Females:	College of Medicine, Girls Campus

Objectives

By the end of this hands-on practical session, the Second Year Medical students will be able to:

1. Perform the measurement of glucose in blood and urine using a glucometer and urine strips, respectively.
2. Describe the principle of the tests.
3. Record and calculate the results obtained from the experiments.
4. Interpret the results using the American Diabetes Association (ADA) guidelines.

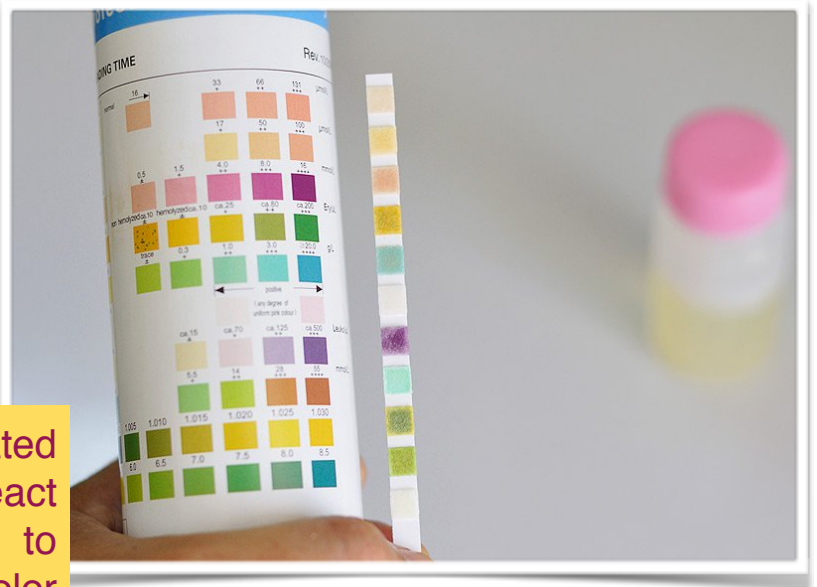
Principle Glucometer



1. The glucometer strip contains **glucose oxidase** enzyme that reacts with blood glucose converting it to **gluconic acid**.
2. The **Gluconic acid** then reacts with **ferricyanide** on the strip to produce **ferrocyanide**.
3. The glucometer detects **ferrocyanide** and displays the numbers on the screen.
4. The amount of **ferrocyanide** is equivalent to that of **glucose** in blood.

Principle

Urine strips



The urine strips are impregnated with a variety of reagents that react with substances in the urine to produce color. The intensity of color is proportional to concentration of the substance being detected.

1. **Glucose:** Glucose oxidase enzyme on the strip reacts with glucose in urine to produce gluconic acid and hydrogen peroxide that reacts with peroxidase to produce **bluish-green, greenish-brown, dark brown** color.

2. **Protein:** Tetrabromophenol reacts with proteins to produce **yellow-green, green, blue-green** color.

3. **Ketones:** Sodium nitroprusside reacts with ketones to produce **pink, pink-purple** color.

4. **pH:** Bromothymol and methyl red indicators change color due to acidity or alkalinity of urine.

KETONES mmol/l	NEG	1.5	3	7.5	≥15
GLUCOSE mg/dl	NEG	100	300	1000	3000
PROTEIN g/l	NEG	0.3	1.0	3.0	≥10
pH	5	6	7	8	9

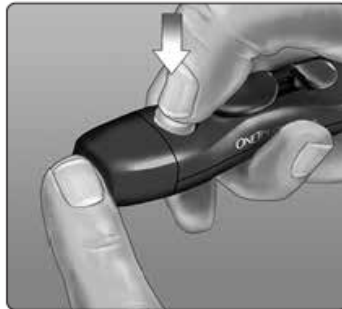
Procedure

Glucometer

Contact bars



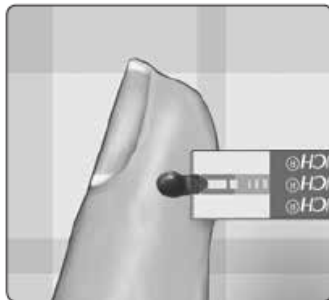
1 Test strip port



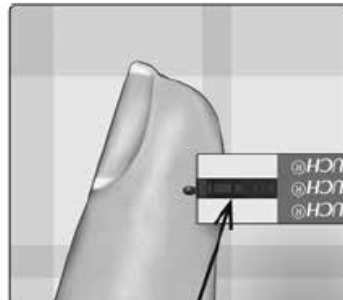
2



3



4



Confirmation window full



5

Instructions:

1. Insert the test strip in the glucometer as shown. This will turn on the meter.
2. Disinfect your fingertip using an alcohol swab. Let it dry. Prick the finger using the lancing device.

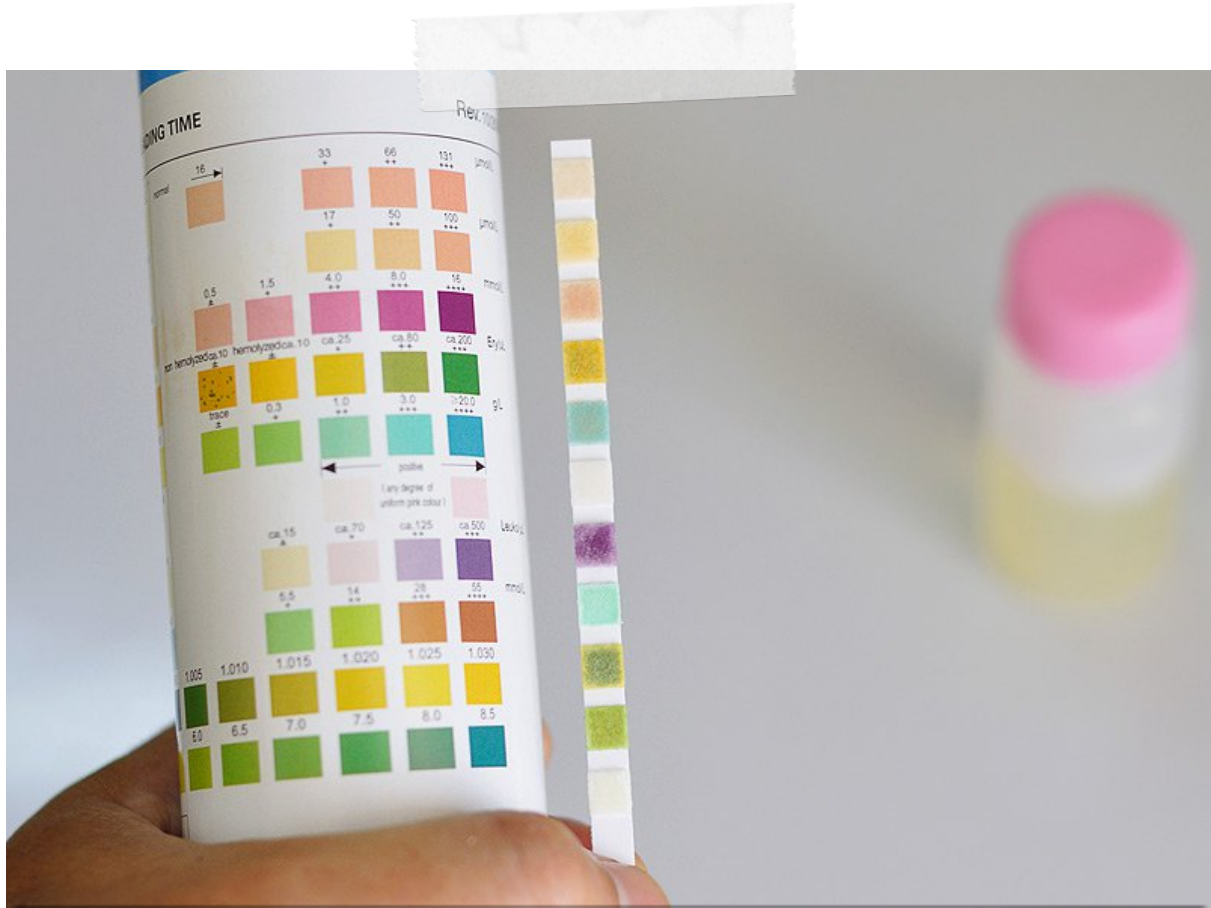


CAUTION! The lancet in the lancing device is for single use only. Discard it after each use.

3. Position the glucometer near your finger as shown.
4. Draw up blood using the strip until the confirmation window is full.
5. Wait for a few seconds until results are displayed. Results can be read as mmol/L or mg/dL.
6. Record and interpret your results.

Procedure

Urine strips

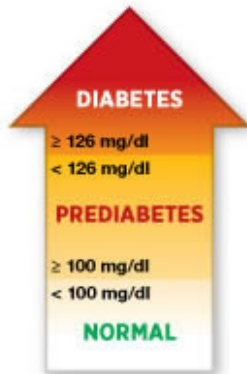


1. Dip the urine strip into the test tube containing the urine sample.
2. Remove immediately.
3. Wipe off excess urine. Invert the strip upside down and align it with the reference chart as shown in the picture above.
4. Read the color within 30-60 sec. by matching with the reference chart as shown above.
5. Interpret your results.



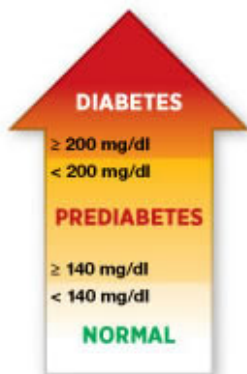
Do not read the strip after 60 sec. Color changes after 60 sec. are of no significance.

ADA Criteria for the Diagnosis of Diabetes



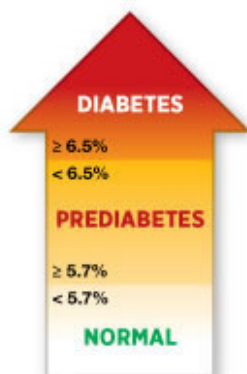
FPG

Result	Fasting Plasma Glucose (FPG)
Normal	less than 100 mg/dl
Prediabetes	100 mg/dl to 125 mg/dl
Diabetes	126 mg/dl or higher



OGTT

Result	Oral Glucose Tolerance Test (OGTT)
Normal	less than 140 mg/dl
Prediabetes	140 mg/dl to 199 mg/dl
Diabetes	200 mg/dl or higher



A1C

Result	Glycated Hemoglobin A1C (Also called HbA1C)
Normal	less than 5.7%
Prediabetes	5.7% to 6.4%
Diabetes	6.5% or higher

www.diabetes.org/diabetes-basics/diagnosis/
 American Diabetes Association (ADA) 2018.

Test Results and Interpretation

Record your results and interpretation for each test in the table below:

Test	Results	Interpretation
Blood glucose		
Urine protein		
Urine ketones		
Urine glucose		
Urine pH		



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