

# U r i n e testing

We all produce urine, but everybody's is slightly different! Forensic scientists and doctors can discover a lot about someone from their urine, including kidney disease and diabetes. You are going to analyse some urine samples.



Remember – it might be a wee bit of artificial urine today (made to a special recipe), but it's pretty realistic, so treat it with care!

Start off with Sample X to get you into the swing of it. Make sure you note down all your observations in your Urine Testing Chart.

## Job 1

First, examine the urine carefully by eye and ... nose! Comment on the colour of the urine. Try to use words like **yellow**, **amber**, **dark** and **pale**.

Examine the sample for its odour (smell). Also note whether the sample is clear or cloudy. Record your observations in your Urine Testing Chart.

## Job 2

Now you need to find out the pH of the unheated urine:

- dip a piece of universal indicator paper into the urine
- quickly take it out, and leave it for 30 seconds.

Compare the paper colour with the pH colour chart. Note the pH number on your Chart.

## Job 3

Next, find out if the sample contains protein. You are doing this because protein leaks into the urine if the kidneys are damaged.

Divide the sample equally between two test tubes:

- put one tube into the hot water bath, leave the other at room temperature.

After a few minutes, take the test tube out of the water bath, and compare the heated and unheated urine. If the heated sample is more cloudy, it contains protein. Note your result in your Chart. Flush away the heated urine, and keep the unheated sample.

## Job 4

The last test is to find out if the urine contains glucose, which may indicate that the patient has diabetes:

- dip a glucose test strip into the unheated urine sample
- immediately take it out
- count to ten, then check the colour with the colour chart.



Record the amount of glucose shown by the colour of the test strip.



You are now a fully-fledged Tinkle Tester, ready to test other urine samples to reveal who the villain is.

There are four suspect urine samples, and one from the scene of the crime. See if you can work out who was caught on the job!

# Urine Testing Chart

Name \_\_\_\_\_

Record your results for Sample X in the table below.

Job 1	colour of urine	
	odour of urine	
Job 2	universal indicator colour	
	pH of urine	
Job 3	appearance of unheated urine	
	appearance of heated urine	
Job 4	glucose test strip result	

Record your results for Samples A to D, and for the villain's sample, in the table below.

	Sample A	Sample B	Sample C	Sample D	Villain
colour					
odour					
pH of urine					
protein (✓ or ✗)					
glucose					

I think that Sample \_\_\_\_\_ belonged to the villain.

Were you right?

Get your chart checked to see if you really are flushed with success!

# Urine testing

## Teacher Guide

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- Activity notes
- Student checklist
- Technician notes

### Activity notes

There is a fair amount of excitement involved in this activity, so it is important to impress upon the students that they should treat the samples following normal laboratory rules. The substances used are low hazard, but you may want to insist on eye protection as a way to remind the students to work sensibly.

The identity of the villain can be changed if you run the activity more than once. The students should easily distinguish between the samples listed below, but you could make up other combinations.

Students should carry out the tests on Sample X first. The purpose of this sample is to check the ability of the students to obtain positive results. It is wise to check these before allowing the students to work on the other samples.

The protein test works well, but you might want to use the biuret test instead. Urine glucose test strips are easy to use for glucose testing, and give the activity an authentic feel. However, you may wish to use Benedict's reagent instead.

The expected results are shown in the table below.

	Sample				
	X	A	B	C	D
odour	✓	✓	✓	✓✓	
pH	4	3	10	7	7
protein	✓			✓	✓
glucose	✓	✓	✓		✓

The 'villain' is your choice of samples A to D.

### 1 M ammonia solution ⚠

Irritant to the skin and eyes. However, completed Sample B contains only just enough ammonia to produce a faint smell and an alkaline pH.

## Urine testing

### Student checklist

Check that you have the following things.

- 2 × test tubes
- 1 × test-tube rack
- 1 × teat pipette
- Urine Testing Charts (one each)
- universal indicator paper with pH colour chart
- glucose test strips with colour chart

Note that you need **two different** colour charts:

- one for the universal indicator paper
- one for the glucose test strips

You will also need access to a hot water bath set at 70 °C. Take care – remember that this is HOT!

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# Urine testing

## Technician notes

### Per group of students

2 × test tubes (or boiling tubes)

1 × test-tube rack

1 × teat pipette

universal indicator paper with pH colour chart

urine glucose test strips with colour chart

Urine Testing Chart (1 per student)

### In the lab

Thermostatically-controlled water bath set at 70 °C, containing a test tube rack (place a warning notice on the water bath)

Artificial urine samples: dissolve the following substances and solutions into 1 dm<sup>3</sup> of water, according to the table below. Add a few drops of yellow food colouring to each sample.

	Sample				
	X	A	B	C	D
NaCl /g	3	3	3	3	3
urea /g	5	5		5	
glucose /g	1	1	1		1
albumin /g	1			1	1
2 M HCl(aq) /cm <sup>3</sup>	0.1	0.2			
1 M NH <sub>3</sub> (aq) /cm <sup>3</sup>			1		

In addition, select one of the samples A to D as the 'villain sample'. Depending on the volume needed, either make up another sample or divide the chosen sample.