Name: _____

Period: _____

Measuring

Why We Measure

Science gains knowledge that must be verified through experimentation.
Good measuring allows us to collect data that can be verified.

Reading The Meniscus

Water adheres (sticks) to glass and seems to be "climbing the sides". This is called the "*meniscus*".

Read at eye-level

Read at the bottom of the meniscus!

35

32 mL of water

30

Did you know? There is no meniscus in plastic!

25

Reading from above gives a high reading. Reading from below gives a low reading.

Reading the Scale

Before you measure read the scale to know what each hash mark means.

1mL = 10 marks
So, 0.1 mL per mark

$1 + 6(0.1)$
$= 1 + 0.6$
$= 1.6$ mL

2
1

10mL = 5 marks
So, 2 mL per mark

$20 + 2(2)$
$= 20 + 4$
$= 24$ mL

20
10

Balance Scales

Balance scales are used to measure mass. Move the sliders until the scale is "balanced", then add together the amounts for each slider to find the total.

| 0 10 20 30 40 50 60 70 80 90 100g |
| 0 100 200 300 400 500 g |
| 0 1 2 3 4 5 6 7 8 9 10g |

$40\,grams$ Slider 1
$+300\,grams$ Slider 2
$+1.7\,grams$ Slider 3
$341.7\,grams$ **Total mass**

Make sure the scale is balanced when there is nothing on it. If not, you will have to "zero" it – adjust it to read zero before you use it.

Accuracy vs. Precision

Accuracy: how close a measurement is to the correct number. Ex. If 35.6 grams is the correct mass, then 35.7 g is accurate (very close to the correct number).
Precision: how close measurements are to each other. A precise instrument will give the same number if multiple people measure with it. Ex.: 12.11 cm; 12.12 cm; 12.10 cm are all very close to each other, so they are precise.

Accurate (hit the center)

Precise (all close to the same spot), but not accurate (missed the center).

Recalibration:
If an instrument is precise, but not accurate it can be recalibrated with a known quantity. Then it will be both precise and accurate.

After recalibration: Precise AND Accurate!

Most good scientific devices are able to be recalibrated.

Precision is increased by a finer instrument.

Not precise: only accurate to 0.5 cm; It is hard to tell the exact length of the object.

More Precise: accurate to 0.1 cm; Easy to measure the exact length of the object.

Around 17 or 18 mm?

1   2   3   4
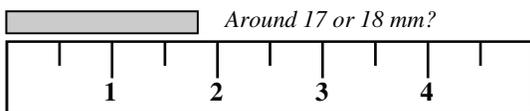
Closer marks
=
More precise

Precisely 18 mm!

1   2   3   4