



## PROTOCOL OF MASS AND VOLUME COMPARISONS BETWEEN SIM NMIs

### 1. General Information

This comparison is being carried out between SIM NMIs in order to compare the degree of equivalence in mass, conventional mass, volume and density calibration of high accuracy mass standards.

### 2. Data of the National Laboratories and Technical Contacts for the Comparison

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<b>5</b>	<b>National Metrology Institute</b>	<b>Instituto Ecuatoriano de Normalización (INEN) / Ecuador</b>
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### 3. General Considerations and Procedure

In order to evaluate the degree of equivalence between SIM NMIs in calibration of high accuracy mass standards, two exercises will be performed in this comparison:

1. Mass and conventional mass determination
2. Volume and density determination

For this comparison INEN-Ecuador agreed to act as Pilot Laboratory and CENAM-Mexico accepted to be the Support Laboratory.

Two set of mass standards property of the project “**FOMENTO COORDINADO DE LA INFRAESTRUCTURA DE LA CALIDAD EN LA REGIÓN ANDINA, PTB-CAN**” will be used for these comparisons. One set (SET 1) will be employed to measure the mass and conventional mass values of the weights, and the other set (SET 2), will be used to measure the volume and the density of the weights. These traveling standards will have the following nominal values and identification (see Tables 1 and 2):

Table 1. Set of weights for mass and conventional mass determination (SET 1)

Nominal value	Identification
2 kg	<b>141717</b>
1 kg	
200 g	
50 g	
1 g	
200 mg	

Table 2. Set of weights for volume and density determination (SET 2)

Nominal value	Identification
2 kg	<b>141716</b>
1 kg	
200 g	
1 g	

These sets of traveling standards will be circulated between all participating laboratories.

When the traveling standards arrive at the participating laboratory, a visual inspection should be made of the surfaces, and the findings should be recorded on the corresponding sheet (see Annex E).



Fig. 1. SET 1 (left) for the mass comparison and SET 2 (right) for the volume (and density) comparison.

The traveling standards must be always handled with tweezers, pincers or lifters but never with the bare hands.



Fig. 2. Sets for the Mass and Volume comparisons, both sets in individual aluminum cases.

The traveling standards should be stored at a place near to the balance under glass bell jars (or under a similar protective covering). They should be protected from dust, vapor etc.

The measurements should be made after an appropriate period of acclimatization, (at least 3 days after receiving them).

The calibration must be done in mass value and the conventional mass should be calculated from the mass value.

Air density must be determined with **CIPM-2007 formula**, in order to correct the air buoyancy effect.

The value for the volume thermal expansion coefficient for all the traveling standards (set 1 and set 2) will be  $48 \times 10^{-06} \text{ }^{\circ}\text{C}^{-1}$ .



### **3.1 Special Considerations for SET 1 (Mass and conventional mass determination)**

CENAM will determine the values of volume for the traveling mass standards that will be used in the mass comparison, SET 1.

The volume of the weights of SET 1 will be sent to the participating laboratories before to their participation in order to apply the corresponding buoyancy corrections.

Magnetic properties of set 1 will be measured at CENAM (except 200 mg weight) in order to verify that all of them are in accordance with magnetic specifications the E<sub>1</sub> accuracy class according to OIML-R111:2004.

**For SET 1, during the circulation between the participating laboratories volume or magnetic susceptibility of the weights must not be measure by any participant.**

For SET 1, the participating laboratories should determine the mass and conventional mass and their associated uncertainties for each traveling standard. The evaluation of the uncertainty should be done by each participating laboratory according to the own calibration system and at the best laboratory capability.

**Laboratories must not wash or rub the weights of SET 1 with any substance in order to clean them**, the only possibility, if it is necessary to passing a soft brush over the surface of the weights in order to take off dust or any other impurity over the weights.

### **3.2 Special Considerations for SET 2 (Volume and density determination)**

For SET 2, the participating laboratories should determine the volume and density at 20 °C and the associated uncertainty for the traveling standards.

The participating laboratories should make the measurements before the appropriate acclimatization time of the weights (inside of the liquid of reference). If density of water is used as reference in density, participating laboratories should calculate the density of water with **Tanaka's formula**.

The participating laboratories should report the lowest uncertainty values for the weights of set 2, according with the best capability of the laboratory.



#### 4. Transportation

The traveling standards will be placed in two aluminum cases for transportation purposes. Optical paper will be included in these boxes as well as cotton gloves, pincers and lifters for handling in the event that it becomes necessary to do so while the standards are being transported between participating laboratories.

It is strongly recommended that the transportation of the traveling standards between laboratories is made by technical staff of the laboratory. Each laboratory will be responsible for the delivery of the traveling standards to the next national metrology laboratory.

#### 5. Results

Participating laboratories should calibrate the travelling standards of SET 1 **in Mass and conventional mass value**, and measure the **Volume and density at 20°C** for weights of SET2 applying all corrections according with their own calibration systems and procedures.

Forms are attached in order to report the results of measurements, data of environmental conditions, used instruments and the traceability of reference standards.

Once the measurements of the travelling standards have been carried out by participating laboratories, they should submit their results (Annex A form) by e-mail or by fax to pilot laboratory.

Participating laboratories will have a maximum period of three weeks after they have finished their measurements to send their results to pilot laboratory.

The information of Annexes A, B and C will be send directly to the pilot laboratory.

Two separate reports of the comparison will be written by the pilot laboratory and agreed between participating laboratories (one report for mass and one report for volume). These reports will be presented to the Mass Working Group of SIM.



## 6. Analysis of Results

The pilot laboratory will gather the results of all participants and will draft a report of the comparisons. This draft will be circulated between all participants for comments before to write the final report.

For the reference value, if the uncertainty reported by CENAM is at least one third of the uncertainty reported by the other participants, CENAM will establish this reference value, otherwise the reference values will be proposed for the pilot laboratory and calculated from results of participants (e.g. by weighted mean of largest consistent values).

## 7. Schedule of Comparison

Both sets of travelling standards will circulate joint according to the schedule of table 3.

Table 3. Circulation of the travelling standards

No.	National Metrology Institute	Arrival	Sending of results
1	CENAM-Mexico	2012-04-16	
2	INEN-Ecuador	2012-06-08	2012-07-15*
3	INDECOPI-Peru	2012-07-13	2012-08-19
4	INTN-Paraguay	2012-08-17	2012-09-23
5	IBMETRO-Bolivia	2012-09-21	2012-10-28
6	INM-Colombia	2012-10-26	2012-12-02
7	LACOMET-Costa Rica	2012-11-30	2013-01-06
8	INEN-Ecuador	2013-01-17	

INEN will send its results to CENAM. CENAM will check consistency between INEN results and CENAM results, once consistency is checked CENAM will send CENAM results to INEN in order to continue with the analysis of all results reported by participants.

## Annexes

- A. Calibration Results, environmental conditions during the calibration.
- B. Characteristics of the balances used on the measurement and instruments for measuring the environmental conditions.
- C. Traceability
- D. Uncertainty Budget.
- E. Records of the surface description of the traveling standards.





**Annex A**  
**SET 1**

**Calibration Results, Environmental Conditions during the Calibration**

Laboratory:		Date:	
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**Calibration Results**

Nominal Value	Mass Correction Value mg	Conventional Mass Correction Value mg	Standard uncertainty $u_m(k=1)$ mg	Measurement Method
2 kg				
1 kg				
200 g				
50 g				
1 g				
200 mg				

**Environmental Conditions during the Calibration**

Register the upper and lower limits of the environmental parameters and their standard uncertainties (1 $\sigma$ ). Example: Temperature  $t$  /°C from 20.4 to 20.8  $\sigma$ 0.2

Nominal Value	Temperature $t$ /°C	Barometric pressure /Pa	Relative humidity $h$ /%	Air density $\rho$ / g/cm <sup>3</sup>
2 kg				
1 kg				
200 g				
50 g				
1 g				
200 mg				





**Annex A**  
**SET 2**

**Calibration Results, Environmental Conditions during the Calibration**

Laboratory:		Date:	
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**Calibration Results**

Nominal Value	Volume at 20 °C $V$ $\text{cm}^3$	Standard uncertainty $u_v(k=1)$ $\text{cm}^3$	Measurement Method
2 kg			
1 kg			
200 g			
1 g			

Nominal Value	Density at 20 °C $\rho$ $\text{g/cm}^3$	Standard uncertainty $u_\rho(k=1)$ $\text{g/cm}^3$	Measurement Method
2 kg			
1 kg			
200 g			
1 g			



**Environmental Conditions during the Calibration**

Register the upper and lower limits of the environmental parameters and their standard uncertainties ( $1\sigma$ ). Example: Temperature  $t$  /°C from 20.4 to 20.8  $\pm$  0.2

Nominal Value	Temp. $t$ /°C	Barometric pressure /Pa	Relative humidity $h$ /%	Air density $\rho$ / g/cm <sup>3</sup>	Liquid Temp. $t$ /°C	Liquid density $\rho_L$ g/cm <sup>3</sup>
2 kg						
1 kg						
200 g						
1 g						



**Annex B**  
**SET 1**

**Characteristics of the Balances used for the Measurements and Instruments for  
Measurement the Environmental Conditions for Mass Determination**

Laboratory:		Date:	
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**Characteristics of the Balances**

Nominal Value	Manufacturer	Type	Range	Resolution	Standard Deviation
2 kg					
1 kg					
200 g					
50 g					
1 g					
200 mg					

**Characteristics of the Equipment for the Measurement of the Environmental  
Conditions for Mass Determination (for the air density evaluation)**

	Manufacturer	Type	Range	Resolution	Standard uncertainty $1\sigma$
Temperature $t / ^\circ\text{C}$					
Barometric pressure $p / \text{Pa}$					
Relative humidity $h / \%$					



**Annex B**  
**SET 2**

**Characteristics of the Balances used for the Measurements and Instruments for  
Measurement the Environmental Conditions for Volume Determination**

Laboratory:		Date:	
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**Characteristics of the balances for the weighing in air**

Nominal Value	Manufacturer	Type	Range	Resolution	Standard Deviation for the weighing in air
2 kg					
1 kg					
200 g					
1 g					

**Characteristics of the balances for the weighing in liquid**

Nominal Value	Manufacturer	Type	Range	Resolution	Standard Deviation for the weighing in liquid
2 kg					
1 kg					
200 g					
1 g					



**Characteristics of the Equipment for the Measurement of the Environmental  
Conditions for Volume and Density Determination (for the air density evaluation)**

	Manufacturer	Type	Range	Resolution	Standard uncertainty $1\sigma$
Temperature $t / ^\circ\text{C}$					
Barometric pressure $p / \text{Pa}$					
Relative humidity $h / \%$					

**Characteristics of the Equipment for the temperature measurement of transfer liquid**

	Manufacturer	Type	Range	Resolution	Standard uncertainty $1\sigma$
Temperature $t / ^\circ\text{C}$					



### Annex C

#### SET 1

##### Traceability for Mass Determination

Laboratory:		Date:	
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(Write the traceability of the reference standards up to national standards)

##### 2 kg

Identification	Mass value m	Uncertainty $U_m (k=2)$	Traceability and Date of Calibration

Please add lines as necessary.

##### 1 kg

Identification	Mass value m	Uncertainty $U_m (k=2)$	Traceability and Date of Calibration

Please add lines as necessary.

##### 200 g

Identification	Mass value m	Uncertainty $U_m (k=2)$	Traceability and Date of Calibration

Please add lines as necessary.

##### 50 g

Identification	Mass value m	Uncertainty $U_m (k=2)$	Traceability and Date of Calibration

Please add lines as necessary.



### Traceability for Mass Determination

**1 g**

Identification	Mass value m	Uncertainty $U_m (k=2)$	Traceability and Date of Calibration

Please add lines as necessary.

**200 mg**

Identification	Mass value m	Uncertainty $U_m (k=2)$	Traceability and Date of Calibration

Please add lines as necessary.





**Annex C**  
**SET 2**

**Traceability for Volume and Density Determination**

Laboratory:		Date:	
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**Mass standards used for volume and density measurement**

Identification	Range of Nominal Value	Accuracy Class	Date of Calibration

Please add lines as necessary.

**Traceability for Volume and density Determination**

**Density Standard**

Identification	Liquid Employed	Density Value $\rho$	Uncertainty $U_\rho (k=2)$	Traceability Source

Please add lines as necessary.



**Annex D**  
**SET 1**

Laboratory:		Date:	
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**Uncertainty Budget for Mass determination**

**2 kg**

<b>Influence quantity</b>	Mean value	Unit	Standard uncertainty	Unit	Degrees of freedom	Uncertainty in mass (g)
Mass standard		g		g		
Instability of the mass standard		g		g		
Density of the mass standard		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Density of the mass under test		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Air density		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Mass difference		g		g		
Sensibility of the balance		g		g		
Resolution of the balance		g		g		
Repeatability		g		g		
Eccentricity		g		g		
Additional uncertainty component 1						
Additional uncertainty component 2						
<b>Mass</b>						

Please add rows as necessary



**Annex D**  
**SET 1**

Laboratory:		Date:	
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**Uncertainty Budget for Mass determination**

**1 kg**

<b>Influence quantity</b>	Mean value	Unit	Standard uncertainty	Unit	Degrees of freedom	Uncertainty in mass (g)
Mass standard		g		g		
Instability of the mass standard		g		g		
Density of the mass standard		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Density of the mass under test		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Air density		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Mass difference		g		g		
Sensibility of the balance		g		g		
Resolution of the balance		g		g		
Repeatability		g		g		
Eccentricity		g		g		
Additional uncertainty component 1						
Additional uncertainty component 2						
<b>Mass</b>						

Please add rows as necessary



**Annex D**  
**SET 1**

Laboratory:		Date:	
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**Uncertainty Budget for Mass determination**

**200 g**

<b>Influence quantity</b>	Mean value	Unit	Standard uncertainty	Unit	Degrees of freedom	Uncertainty in mass (g)
Mass standard		g		g		
Instability of the mass standard		g		g		
Density of the mass standard		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Density of the mass under test		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Air density		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Mass difference		g		g		
Sensibility of the balance		g		g		
Resolution of the balance		g		g		
Repeatability		g		g		
Eccentricity		g		g		
Additional uncertainty component 1						
Additional uncertainty component 2						
<b>Mass</b>						

Please add rows as necessary



**Annex D**  
**SET 1**

Laboratory:		Date:	
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**Uncertainty Budget for Mass determination**

**50 g**

<b>Influence quantity</b>	mean value	Unit	Standard uncertainty	Unit	Degrees of freedom	Uncertainty in mass (g)
Mass standard		g		g		
Instability of the mass standard		g		g		
Density of the mass standard		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Density of the mass under test		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Air density		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Mass difference		g		g		
Sensibility of the balance		g		g		
Resolution of the balance		g		g		
Repeatability		g		g		
Eccentricity		g		g		
Additional uncertainty component 1						
Additional uncertainty component 2						
<b>Mass</b>						

Please add rows as necessary



**Annex D**  
**SET 1**

Laboratory:		Date:	
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**Uncertainty Budget for Mass determination**

**1 g**

<b>Influence quantity</b>	mean value	Unit	Standard uncertainty	Unit	Degrees of freedom	Uncertainty in mass (g)
Mass standard		g		g		
Instability of the mass standard		g		g		
Density of the mass standard		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Density of the mass under test		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Air density		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Mass difference		g		g		
Sensibility of the balance		g		g		
Resolution of the balance		g		g		
Repeatability		g		g		
Eccentricity		g		g		
Additional uncertainty component 1						
Additional uncertainty component 2						
<b>Mass</b>						

Please add rows as necessary



**Annex D**  
**SET 1**

Laboratory:		Date:	
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**Uncertainty Budget for Mass determination**

**200 mg**

<b>Influence quantity</b>	mean value	Unit	Standard uncertainty	Unit	Degrees of freedom	Uncertainty in mass (g)
Mass standard		g		g		
Instability of the mass standard		g		g		
Density of the mass standard		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Density of the mass under test		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Air density		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Mass difference		g		g		
Sensibility of the balance		g		g		
Resolution of the balance		g		g		
Repeatability		g		g		
Eccentricity		g		g		
Additional uncertainty component 1						
Additional uncertainty component 2						
<b>Mass</b>						

Please add rows as necessary





**Annex D**

**SET 2**

Laboratory:		Date:	
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**Uncertainty Budget for Volume or Density Determination**

**2 kg**

Influence quantity	mean value	Unit	Standard uncertainty	Unit	Degrees of freedom	Uncertainty in volume or density (g/cm <sup>3</sup> )
Mass standard weighing in air		g		g		
Instability of the mass standard for the weighing in air		g		g		
Density of the mass standard for the weighing in air		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Mass standard weighing in liquid		g		g		
Instability of the mass standard for the weighing in liquid		g		g		
Density of the mass standard for the weighing in liquid		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Density of the reference liquid		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Instability of the reference liquid		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Temperature of the liquid		°C		°C		
thermal expansion of the liquid		g/cm <sup>3</sup> °C		g/cm <sup>3</sup> °C		
Air density		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Mass difference in air		g		g		
Sensibility of the balance weighing in air		g		g		
Resolution of the balance		g		g		
Repeatability weighing in air		g		g		
Eccentricity weighing in air		g		g		
Mass difference in liquid		g		g		
Sensibility of the balance weighing in liquid		g		g		
Resolution of the balance		g		g		
Repeatability weighing in liquid		g		g		
Eccentricity weighing in liquid		g		g		
Additional uncertainty component 1						
Additional uncertainty component 2						
<b>Density</b>		g/cm <sup>3</sup>				

Please add rows as necessary



**Annex D**

**SET 2**

Laboratory:		Date:	
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**Uncertainty Budget for Volume or Density Determination**

**1 kg**

Influence quantity	mean value	Unit	Standard uncertainty	Unit	Degrees of freedom	Uncertainty in volume or density (g/cm <sup>3</sup> )
Mass standard weighing in air		g		g		
Instability of the mass standard for the weighing in air		g		g		
Density of the mass standard for the weighing in air		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Mass standard weighing in liquid		g		g		
Instability of the mass standard for the weighing in liquid		g		g		
Density of the mass standard for the weighing in liquid		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Density of the reference liquid		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Instability of the reference liquid		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Temperature of the liquid		°C		°C		
thermal expansion of the liquid		g/cm <sup>3</sup> °C		g/cm <sup>3</sup> °C		
Air density		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Mass difference in air		g		g		
Sensibility of the balance weighing in air		g		g		
Resolution of the balance		g		g		
Repeatability weighing in air		g		g		
Eccentricity weighing in air		g		g		
Mass difference in liquid		g		g		
Sensibility of the balance weighing in liquid		g		g		
Resolution of the balance		g		g		
Repeatability weighing in liquid		g		g		
Eccentricity weighing in liquid		g		g		
Additional uncertainty component 1						
Additional uncertainty component 2						
<b>Density</b>		g/cm <sup>3</sup>				

Please add rows as necessary



**Annex D**

**SET 2**

Laboratory:		Date:	
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**Uncertainty Budget for Volume or Density Determination**

**200 g**

Influence quantity	mean value	Unit	Standard uncertainty	Unit	Degrees of freedom	Uncertainty in volume or density (g/cm <sup>3</sup> )
Mass standard weighing in air		g		g		
Instability of the mass standard for the weighing in air		g		g		
Density of the mass standard for the weighing in air		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Mass standard weighing in liquid		g		g		
Instability of the mass standard for the weighing in liquid		g		g		
Density of the mass standard for the weighing in liquid		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Density of the reference liquid		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Instability of the reference liquid		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Temperature of the liquid		°C		°C		
thermal expansion of the liquid		g/cm <sup>3</sup> °C		g/cm <sup>3</sup> °C		
Air density		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Mass difference in air		g		g		
Sensibility of the balance weighing in air		g		g		
Resolution of the balance		g		g		
Repeatability weighing in air		g		g		
Eccentricity weighing in air		g		g		
Mass difference in liquid		g		g		
Sensibility of the balance weighing in liquid		g		g		
Resolution of the balance		g		g		
Repeatability weighing in liquid		g		g		
Eccentricity weighing in liquid		g		g		
Additional uncertainty component 1						
Additional uncertainty component 2						
<b>Density</b>		g/cm <sup>3</sup>				

Please add rows as necessary



**Annex D**

**SET 2**

Laboratory:		Date:	
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**Uncertainty Budget for Volume or Density Determination**

**1 g**

Influence quantity	mean value	Unit	Standard uncertainty	Unit	Degrees of freedom	Uncertainty in volume or density (g/cm <sup>3</sup> )
Mass standard weighing in air		g		g		
Instability of the mass standard for the weighing in air		g		g		
Density of the mass standard for the weighing in air		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Mass standard weighing in liquid		g		g		
Instability of the mass standard for the weighing in liquid		g		g		
Density of the mass standard for the weighing in liquid		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Density of the reference liquid		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Instability of the reference liquid		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Temperature of the liquid		°C		°C		
thermal expansion of the liquid		g/cm <sup>3</sup> °C		g/cm <sup>3</sup> °C		
Air density		g/cm <sup>3</sup>		g/cm <sup>3</sup>		
Mass difference in air		g		g		
Sensibility of the balance weighing in air		g		g		
Resolution of the balance		g		g		
Repeatability weighing in air		g		g		
Eccentricity weighing in air		g		g		
Mass difference in liquid		g		g		
Sensibility of the balance weighing in liquid		g		g		
Resolution of the balance		g		g		
Repeatability weighing in liquid		g		g		
Eccentricity weighing in liquid		g		g		
Additional uncertainty component 1						
Additional uncertainty component 2						
<b>Density</b>		g/cm <sup>3</sup>				

Please add rows as necessary

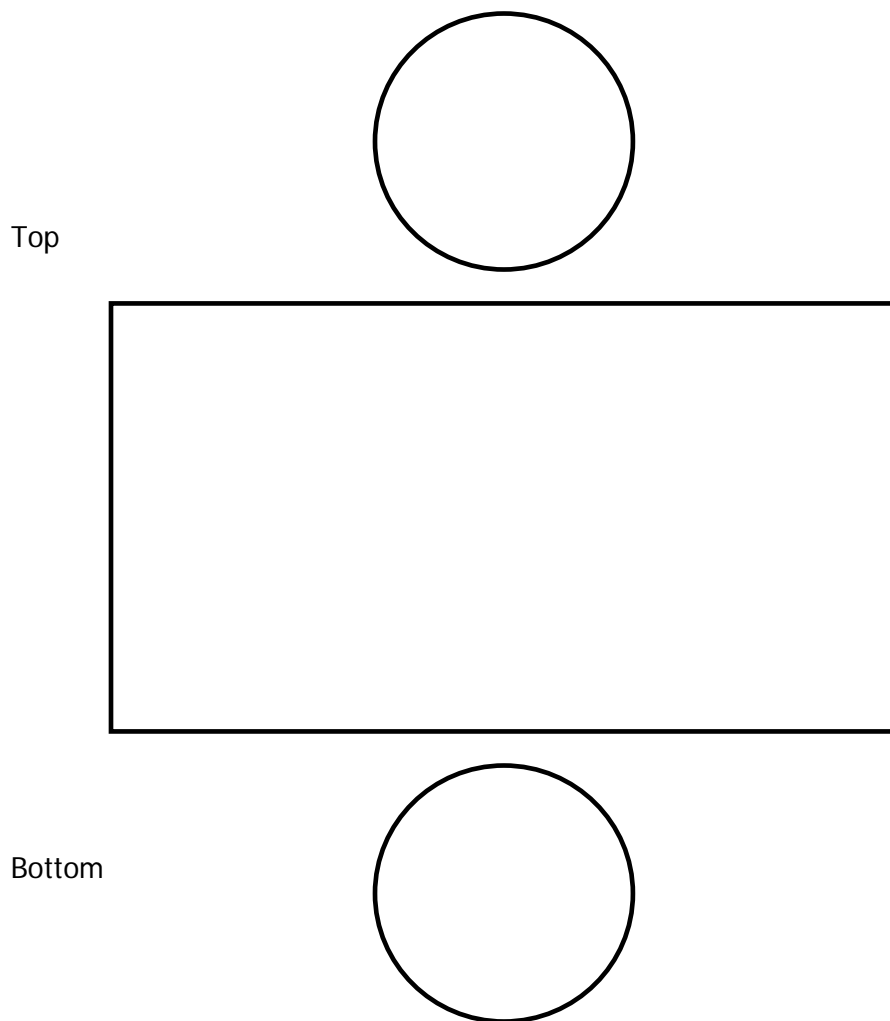


**Annex E**  
**SET 1**

**Surface Description of the Traveling Standards**

Laboratory:		Date:	
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**2 kg**





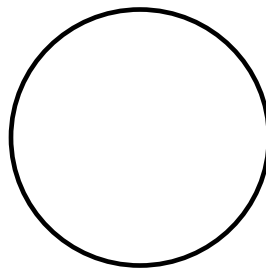
**Annex E**  
**SET 1**

**Surface Description of the Traveling Standards**

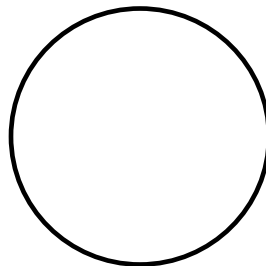
Laboratory:		Date:	
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**1 kg**

Top



Bottom



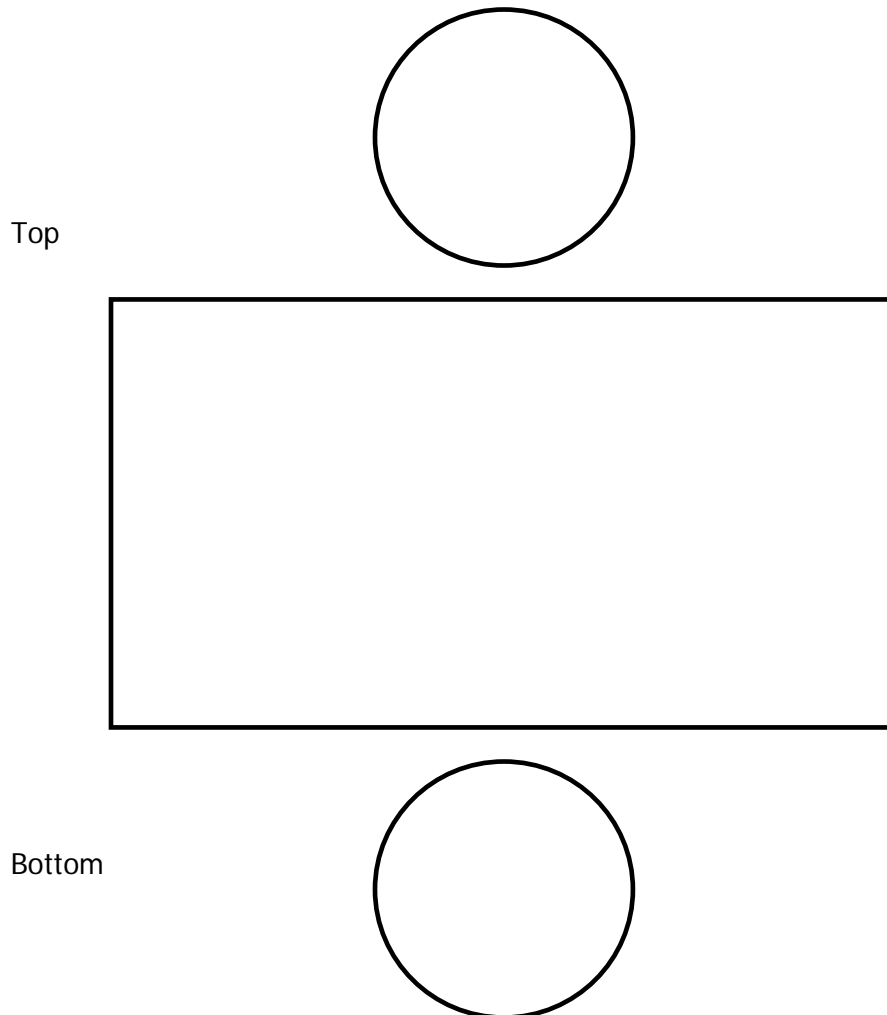


**Annex E**  
**SET 1**

**Surface Description of the Traveling Standards**

Laboratory:		Date:	
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**200 g**





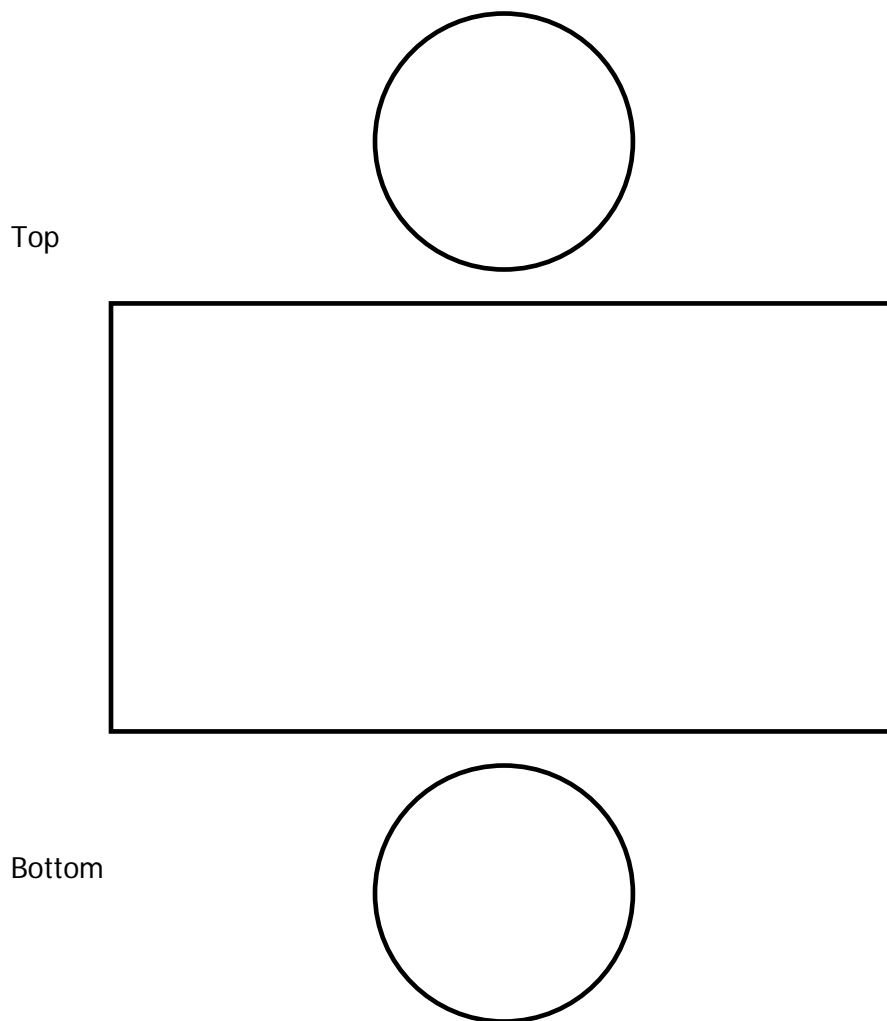


**Annex E**  
**SET 1**

**Surface Description of the Traveling Standards**

Laboratory:		Date:	
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**50 g**



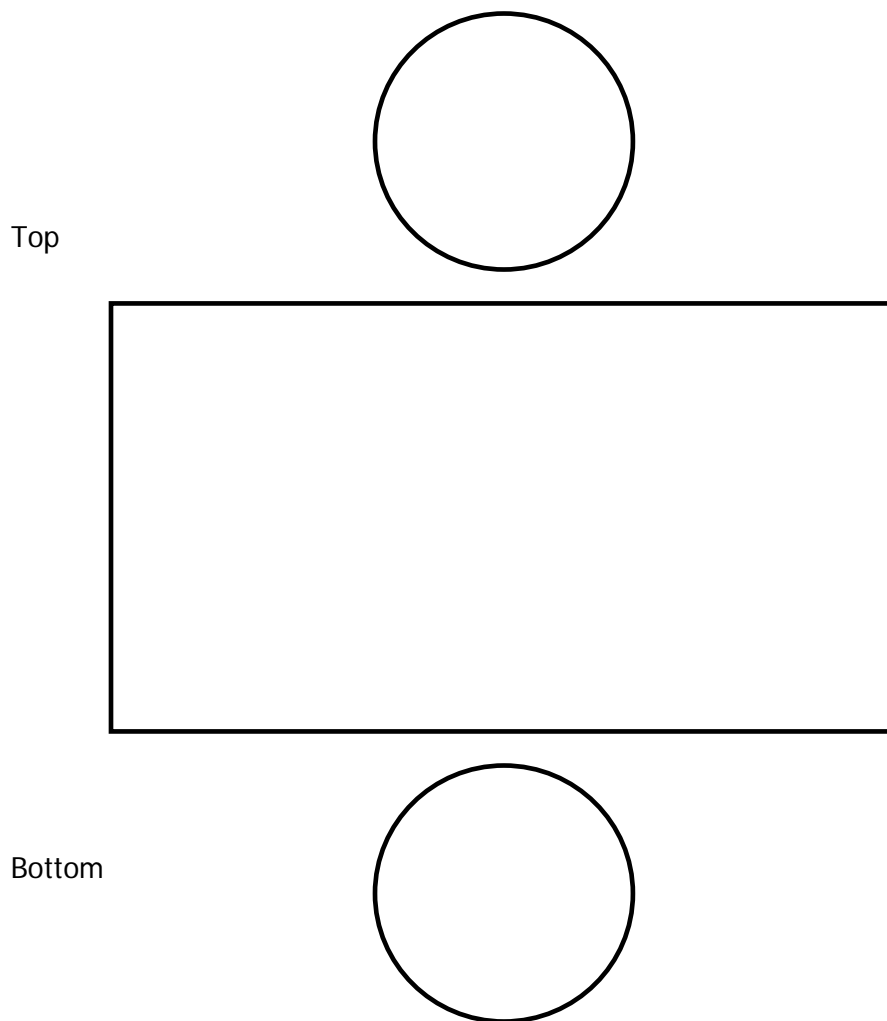


**Annex E**  
**SET 1**

**Surface Description of the Traveling Standards**

Laboratory:		Date:	
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**1 g**

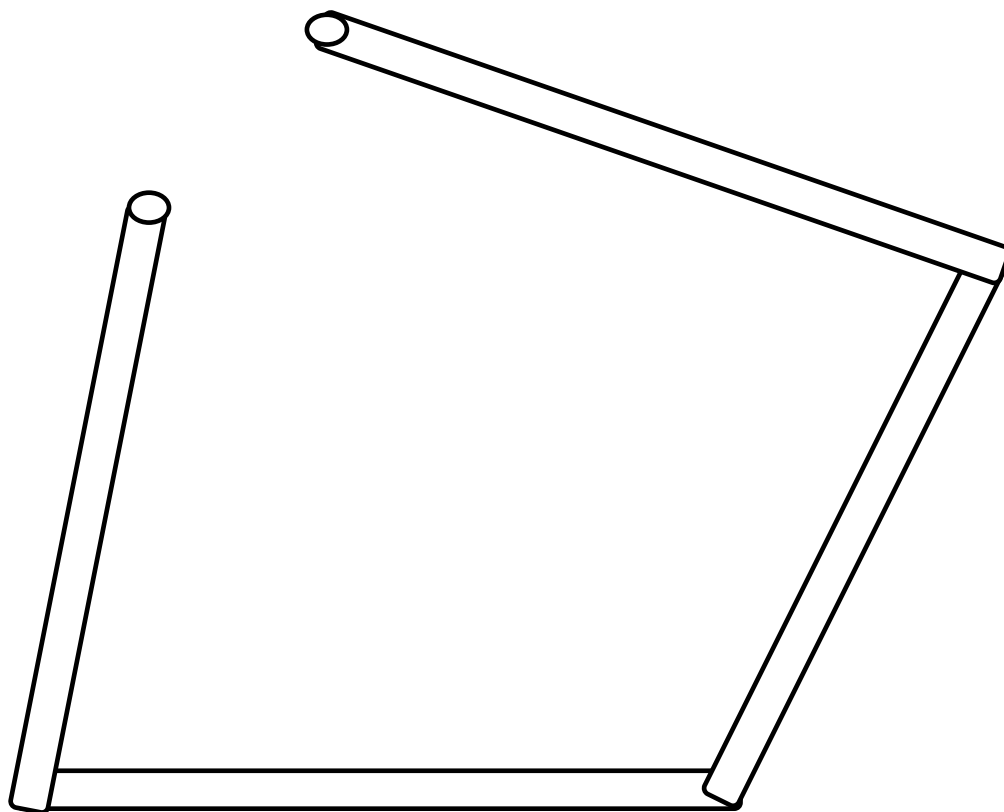


**Annex E**  
**SET 1**

**Surface Description of the Traveling Standards**

Laboratory:		Date:	
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**200 mg**



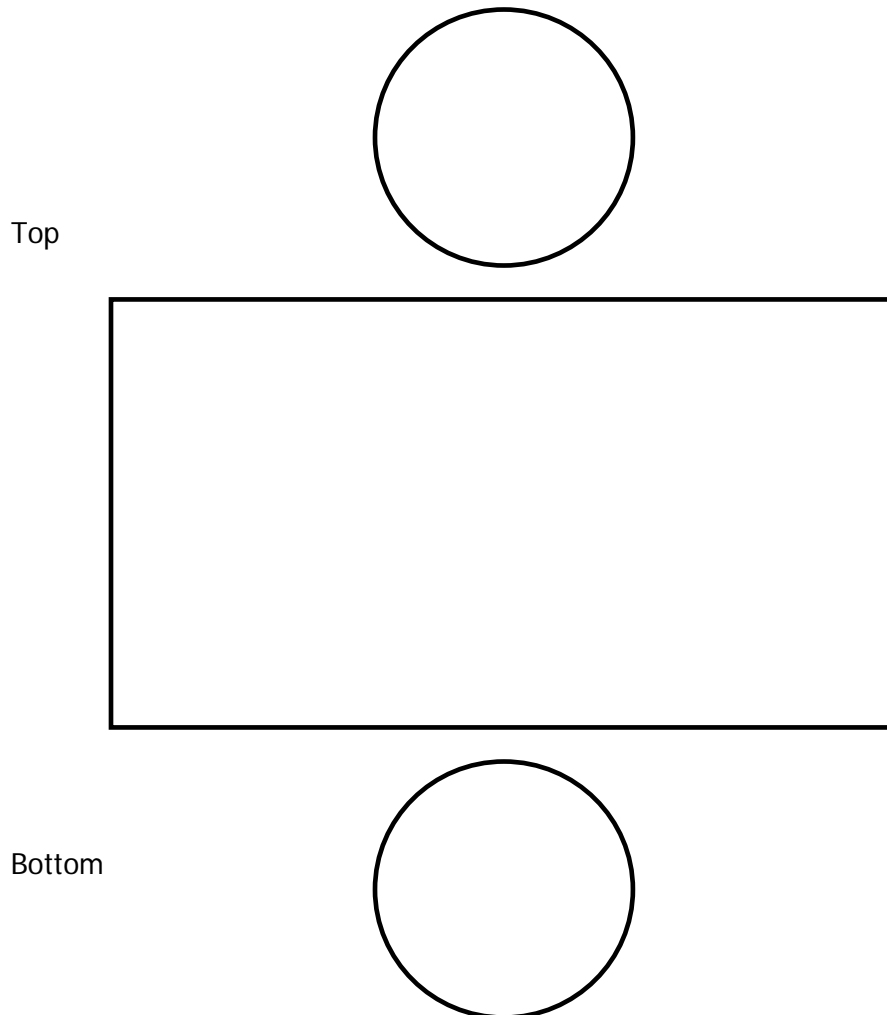


**Annex E**  
**SET 2**

**Surface Description of the Traveling Standards**

Laboratory:		Date:	
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**2 kg**



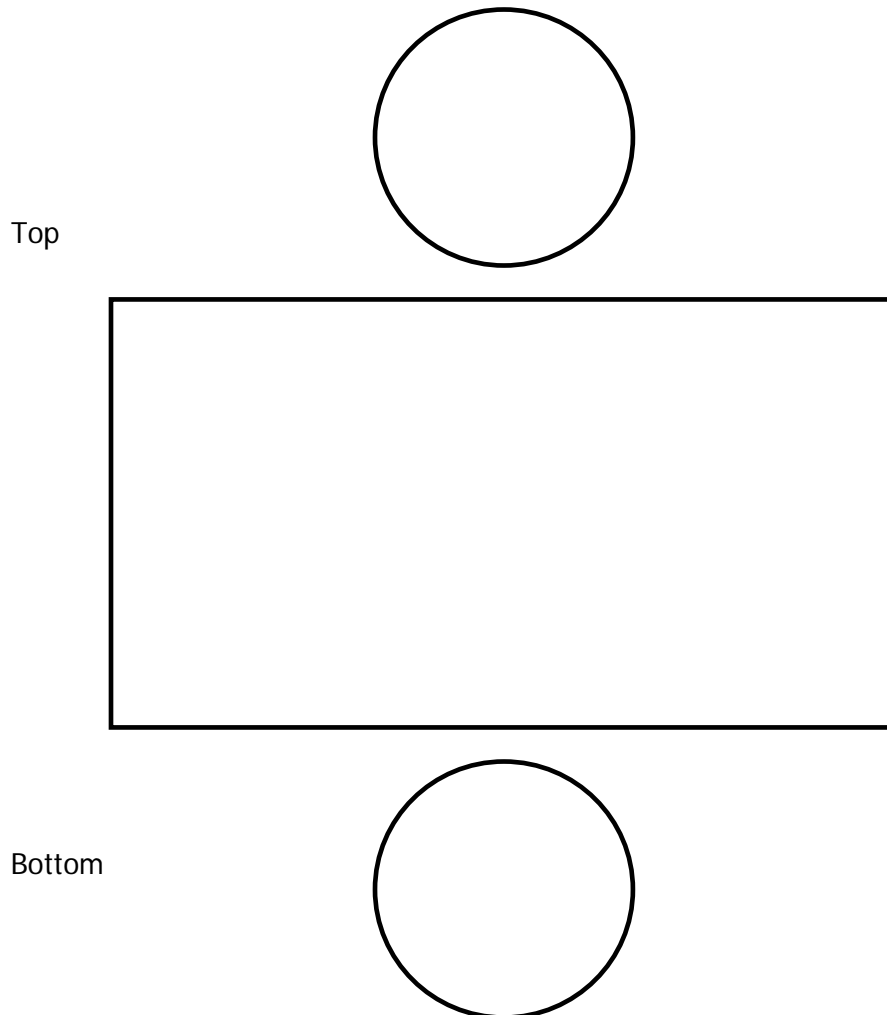


**Annex E**  
**SET 2**

**Surface Description of the Traveling Standards**

Laboratory:		Date:	
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**1 kg**



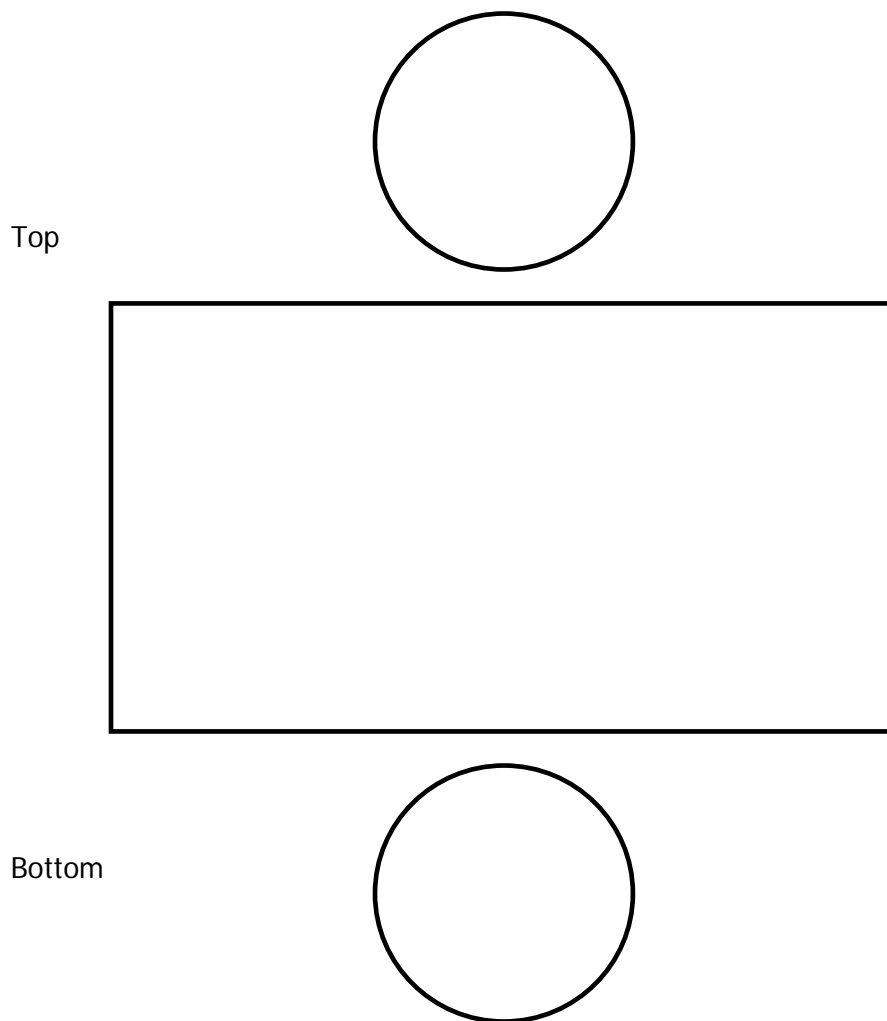


**Annex E**  
**SET 2**

**Surface Description of the Traveling Standards**

Laboratory:		Date:	
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**200 g**





**Annex E**  
**SET 2**

**Surface Description of the Traveling Standards**

Laboratory:		Date:	
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**1 g**

